ANALYSIS OF SOCIO-ECONOMIC IMPACTS OF CHOME NATURE RESERVE TO ADJACENT COMMUNITIES IN SAME DISTRICT, TANZANIA

SULEMAN K. BURENGA

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN ENVIRONMENTAL AND NATURAL RESOURCES ECONOMICS OF SOKOINE UNIVERSITY OF AGRICULTURE.

MOROGORO, TANZANIA.

2015

ABSTRACT

This study was conducted in Same District, Tanzania to assess the socio-economic impacts of Chome nature reserve (CNR) to adjacent communities. Specific objectives were to: determine benefits accrued and cost incurred on management of CNR; analyze coping strategies of the communities for not accessing CNR; and assess the perceptions of adjacent communities on CNR impacts. A total of 120 household respondents were randomly sampled in 4 villages namely Marieni, Kambeni, Mvaa and Ntenga. Data were collected through household survey using a questionnaire, direct observations, focus group discussion, participatory rural appraisal and literature survey. The Statistical package for social science (SPSS) was used to analyze data. Results showed that, 52.5% of respondents responded that water, firewood, and Non -Timber Forest Products (NTFPs) are the benefits accrued and accessible. Approximately 57% of respondents specified the costs such as; high price to purchase forest produces from other sources, long walking distance to access forest produces from other sources, inadequate supply of good quality timber and firewood of high calorific value, high rate of firewood consumption, illegal activities in CNR and other sensitive areas such as rivers. Coping strategies were; agriculture for commercial reported by 40% of respondents, tree planting reported by 29% of respondents, off-farming activities reported by 14.2% of respondents, alternative source of energy and energy saver stoves reported by 10.3% and illegal exploration of natural resources reported by 2.5% of respondents. The variables enhancing the livelihoods and conservation of CNR were;- distance from homesteads to CNR ($p < 0.01$), income ($p < 0.01$), land ownership ($p < 0.05$). In order to enhance net benefits for both conservation of CNR and livelihoods, it is recommended that Government through Tanzania Forest Services (TFS) should strongly involving adjacent communities in management of CNR.

DECLARATION

I, SULEMAN KATEREGA BURENGA, 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 it has neither being submitted nor being concurrently submitted in any other institution.

S Burenga

Suleman K. Burenga

(MSc. Candidate)

03/07/2015

Date

The above declaration is confirmed

Dr. L. P. Lusambo

(Supervisor)

03/7/2015

Date

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ACKNOWLEDGEMENT

First and foremost, I would like to thank ALLAH (subhannahu wata'ala) for giving me strength and calmness during the whole period of the study.

I am indebted to the Tanzania Forest Service (TFS) Agency for providing the financial support to my MSc studies. I would like, in a special way to thank my supervisor, Dr. L. P. Lusambo for his contribution, encouragement, professional guidance, constructive criticisms and sincere interest in this study.

Also, my thanks go to Prof. Y. M. Ngaga, Prof. Chamshama, Prof. S. Idd, Prof. Kessy, Prof. Mwamakimbullah, Dr. Abdallah, Dr. Dos Santos, Dr. Zahabu, Dr. Nzunda, Mr. G. Nyamoga, Mr. C. Kilawe, Mr. S. P. Kingazi, and Mr. B. J. Temu for their constructive contributions which led to completion of this work.

I am also thankful to Mr. C. Mafupa, Mr. J. Mialla, Mr. F. Mahenge (The late), Mr. A. Ngoma, Mr. M. Buyobe, Mr. H. Mbonea, and all those not mentioned from Tanzania Forest Services Agency. Mr. A. Mngwaya (DFO) and Same Administrative staff in general for their support during data collection. Moreover, I am thankful to village government leaders and all respondents in the Marieni, Kambeni, Mvaa and Ntega villages for their close cooperation, kindness and patience during my data collection.

DEDICATION

This work is dedicated to my dear mother, Mgeni Suleman to whom I shall always greatly be thankful for her motherly love, to my beloved wife Fadhila K. Makundi, to my beloved sons Rashid, Rajab, Mgunda and my daughter Winnie, for their moral, tireless patience and encouragement to ensure my success.

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ABBREVIATIONS AND ACRONYMS

APP	Africa Progress Panel
CCFR	Chome Catchment Forest Reserve
CNR	Chome Nature Reserve
CNRO	Chome Nature Reserve Officer
CTF	Conservation Trust Fund
FBD	Forest and Beekeeping Division
FGD	Focus Group Discussion
GDP	Gross Domestic Product
ICDP	Integrated Conservation and Development Projects
IGA	Income Generating Activities
IUCN	International Union for Conservation of Nature
JFM	Joint Forest Management
JFMG	Joint Forest Management Guidelines
Kg	Kilogrammes
MDG	Millennium Development Goals
MNRT	Ministry of Natural Resource and Tourism
MoU	Memorandum of Understanding
MPA	Marine Protected Areas
NGO	Non Governmental Organization
NR	Nature Reserve
NSGRP	National Strategy for Growth and Reduction of Poverty
NTFP	Non Timber Forest Product
ONGAWA	Engineering for Human Development

PES	Payment for Environmental Services
PFM	Participatory Forest Management
PRA	Participatory Rural Appraisal
SACCOSS	Savings and Credit Cooperative Societies
SARS	Severe Acute Respiratory Syndrome
SDC	Same District Council
SFM	Sustainable Forest Management
SMFE	Small Medium Forest Enterprises
TFF	Tanzania Forest Fund
TAFORI	Tanzania Forest Research Institute
TANESCO	Tanzania Electricity Supply Company
TIP	Traditional Irrigation Programme
TFCG	Tanzania Forest Conservation Group
TNRF	Tanzania Natural Resource Forum
TZS	Tanzanian shillings
UNDP	United Nation Development Programme
URT	United Republic of Tanzania
USD	American Dollar
VICOBA	Village cooperative Bank
VNRC	Village Natural Resource Committee
WCST	Wildlife Conservation Society of Tanzania

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Establishment of protected areas such as Nature Reserves is regarded to be among the major strategies for reducing the rapid loss of global biodiversity (Liu *et al.*, 2012). In Africa, the growth of protected areas has been particularly high. It is estimated that the area of land under protection has increased thirteen-fold since 1970 (Himmelfarb, 2006). Many of these protected areas are established on the philosophy of protectionism i.e. human use of resources is prohibited (Brockington, 2002; Chatty *et al.*, 2002; Brockington *et al.*, 2004; Borgerhoff *et al.*, 2005; Himmelfarb, 2006). IUCN (1994) defines protected area as an area of land and/or seas especially dedicated to protection and maintenance of biological diversity, and of natural and associated cultural, genetic resources in undisturbed, dynamic and evolutionary state and managed through legal or other effective means. The Law on nature and Landscape Protection provide five different levels of nature protection, from the 1st protection level, which means unprotected landscape, to the 5th protection level (IUCN, 1994; IUCN, 2004; Burgess *et al.*, 2004; Dudley, 2008; and Kovalcik *et al.*, 2012). Each level is defined by the list of activities which are restricted in it as they can have a negative impact on the object of protection. The first level of protection with the least restrictions applies to so called open landscape outside protected areas. The range of restrictions increases with the protection level number. Any forestry activity is prohibited in the highest 5th level of protection (in particular, nature reserves). Nature reserve is a new reservation category under the Tanzania Forest Act Cap 323 [R. E. 2002].

Today, in Tanzania, there are more than 150 reserves which exist on the Eastern Arc Mountains and are variously managed as follows: - nature conservation (National Parks and Nature Reserves); catchment protection (National Forest Reserves); and production (Production Forest Reserves) (URT, 2008; MNRT, 2010). The trend in recent years has been to impose strictly protection of forests in Tanzania, and to upgrade the most important reserves with high biodiversity in terms of higher levels of protection. According to Tanzania Forest Services (TFS) (2013), in Tanzania, forests cover about 48 million hectares (ha) and account for 55% of the total land area. Out of this 55% of total forest land there are 9 nature reserves which are within 6 of the 13 blocks of the Eastern Arc Mountains which have a total of 451,365 ha owned by TFS (MNRT, 2010).

Furthermore, in January 2010 TFS had gazetted four of the eight proposed Nature Reserves across the Arc, Chome nature reserve (CNR) being among them. The legal status of nature reserve is the most appropriate for most of Eastern Arc forests given their national and international biological values and genetic resources (Doggart, 2005). However, Once the protected areas are established, activities such as collecting firewood, grazing of livestock, hunting, gathering of medicinal plants, and harvesting of timber that were relied on by the communities for improving their livelihoods are forthwith declared illegal (MNRT, 2003; Brockington *et al.*, 2004; Himmelfarb, 2006).

1.2 Problem Statement

Socio-economic issues (income, education, occupations etc.) have close connection with forestry sector development as well as rural development (URT, 2005). The National Forest Policy of 1998 (URT, 1998) advocates for upgrading normal/catchment forest reserve with high biodiversity to Nature Reserves where forest exploitation is not allowed. CNR in South Pare Mountain in Same District was upgraded and gazetted in 2010 (MNRT, 2010). However, rigorous literature review reveals that, the socio-

economic impacts of CNR to adjacent communities have not been studied in detail. There are many important gaps on the influence of socio-economic factors and the available policy options and their impact on the forest sector. Thus, the potentially adverse socio-economic consequences of nature reserve establishment are not well known (Kingazi, 2002; Schmidt-Soltau *et al.*, 2004; MNRT, 2010; TFS, 2013). Several studies show that changes in forest reserve status to nature reserve can lead to adverse consequences to livelihoods of the adjacent communities (Schmidt-Soltau *et al.*, 2004; Jambia *et al.*, 2005; Himmelfarb *et al.*, 2006; Masovera, 2006; MNRT, 2010; TFS, 2013). Therefore, this study attempted to fill these gaps by using Chome nature reserve in Same District as a case study.

1.3 Justification of the Study

1.3.1 Significance of study findings

The findings of this study will help policy and decision makers to come up with appropriate management planning strategies of nature reserves in the country and giving assistance to local communities to improve their livelihoods as well as conservation. Indeed, findings from this study can be applied in other nature reserves in the country depending on the nature of the resources and ecosystem services.

1.3.2 Why study Chome nature reserve

The study was conducted in Chome NR because this reserve is in the Mountain block with the highest numbers of endemic and threatened species due to its highly populated area, high previous impacts due to the people's dependency on forest. Again, may represent the existing situation in Eastern Arc Mountains. South Pare Mountains where CNR is established is potential for provision of greater spatial distribution of Mountain blocks which is also an important Bird area compared to other nature reserves (MNRT, 2010).

1.3.3 Why study on Socio-economic impacts

The study mainly focused on socio-economic because any effort done for conservation and protection is to improve the communities' livelihoods. Economists are often required to provide support for particular policies. Without economic data it is often difficult, if not impossible, to make policy recommendations (Anderton, 2000). At a conceptual level, both economic and political emphases of any nation are on consumers as the ultimate target. While economic deals with allocation of scarce resources among consumers' competing wants (Lusambo, 2009), people's welfare is the central concern of the political systems. Thus, placing the consumer in the focus of interest sounds non-inconsequential as may contribute to relevant strategies on the side of policy makers as far as biodiversity conservation is concerned. This may provide the common perspective for experts from various disciplines as well as decision makers and the wider public (Lusambo, 2009).

1.4 Objectives of the Study

1.4.1 Main objective

The overall objective of the study was to analyze the socio-economic impacts of the Chome Nature Reserve to adjacent communities so as to suggest environmental friendly activities that will ensure sustainable socio-economic well-being as well as prudent forest protection.

1.4.2 Specific objectives

The specific objectives were to:

i. Determine the benefits accrued and costs incurred on management of CNR.
ii. Analyze the copying strategies of local communities for not accessing Chome nature reserve.
iii. Assess the perceptions of adjacent local communities on Chome nature reserve's impacts.

1.5 Conceptual Framework

This study was based on the improved livelihoods of adjacent communities as well as conservation of nature reserve as the impact of upgraded nature reserve. A livelihood is sustainable if it can cope with and recover from stresses and shocks and maintain or enhance its socio-economic factors both now and in future, while maintaining or improving the resource base (Odindi *et al.*, 2010). Improved socio-economic factors; distance from homesteads to resource, income, sex, land ownership, age, education, household size and occupations will significantly improve the livelihoods as well as conservation and protection of Chome nature reserve. According to Odindi *et al.* (2010) community involvement in natural resource conservation involves a strong economic rationale. Figure 1 shows the conceptual framework of the study.

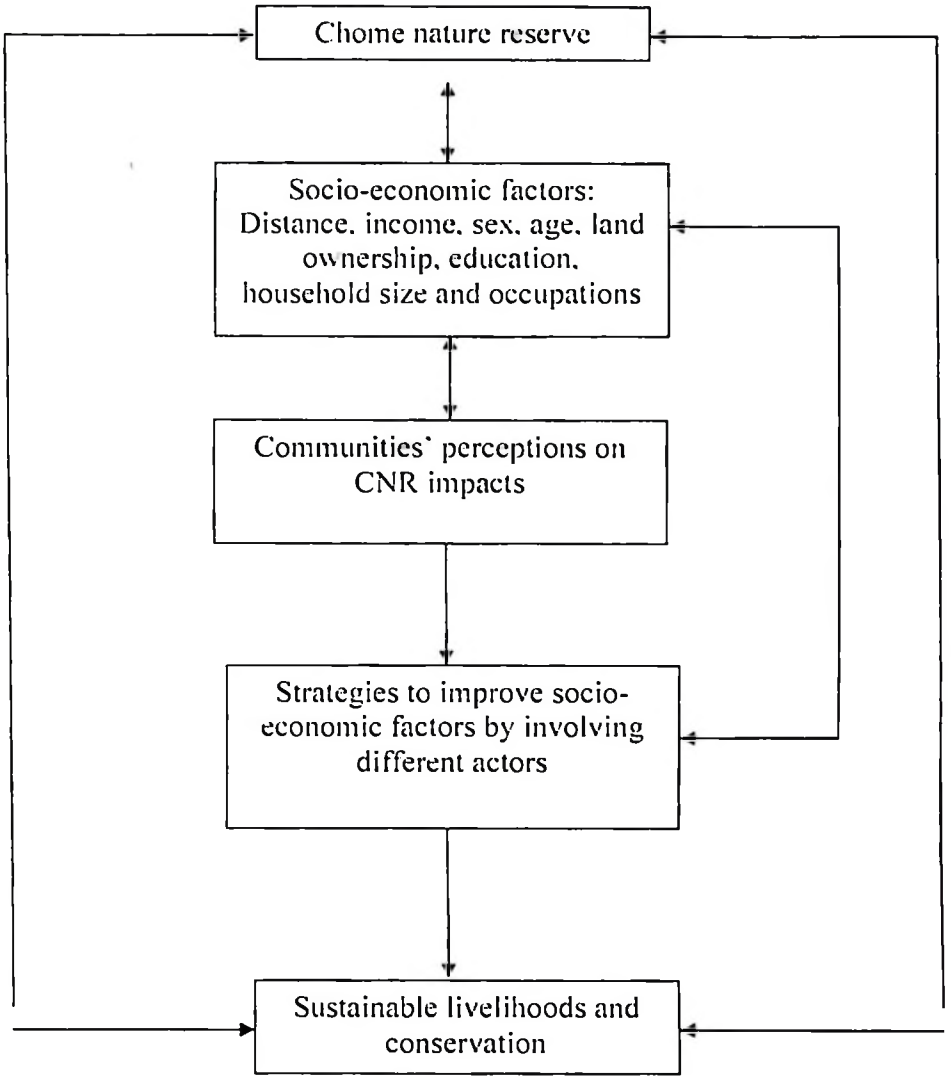

Figure 1: Conceptual framework of the study

1.6 Limitations of the Study

1.6.1 Reluctance of household respondents to give information

In some cases, the respondents were reluctant to give out some of the information based on the past. Sometimes it was difficult for them to remember everything that was supposed to be captured. For example, some of household respondents failed to quantify or tended to underestimate agricultural crops produced and income acquired at household per year and even per month. It could be assumed that, in case of support those with surplus they could not be supported. Also some respondents kept silent when asked about harvesting of forest products inside the nature reserve as such activities are illegal. This is supported by the fact that, respondents felt unease at the initial stage of the interview by perceiving that the researcher was on investigation rather than research mission.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Protected Areas Worldwide

Over the last half century, the coverage of protected areas worldwide has increased by ten-fold whereas the trend in global biodiversity loss continues. Protected areas play great roles in national and international conservation strategies. Protected area has been defined as an area of land and or/seas especially dedicated to protection and maintenance of biological diversity, and natural and associated cultural resources, and managed through legal or other effective means (IUCN, 1994). Today, protected areas cover 12.7% of the world's terrestrial area and 1.6% of the global ocean area (Wei Liu *et al.*, 2012). At the United Nations Conference on Sustainable Development (Rio+20), world leaders reaffirmed the value of biological diversity, its critical role in maintaining ecosystem services and the urgency to implement actions to halt and reverse the loss of biodiversity.

In Africa, the growth of protected areas has been particularly high, estimated that the area of land under protection has increased thirteen-fold since 1970 (Himmelfarb, 2006). Many of these protected areas are established on the philosophy of protectionism i.e. human use of resources is prohibited (Brockington 2002; Chatty *et al.*, 2002; Brockington *et al.*, 2004; Borgerhoff *et al.*, 2005; Himmelfarb, 2006). Post-colonial African governments continued to embrace and carry on colonial conservation strategies that exclude human use of resources of protected areas (Masozera, 2002). In recent years, in many parts of Africa, and specifically in Southern Africa, different models of community based conservation programs (CBC) that seek to link conservation with the alleviation of rural poverty, as well as encouraging community participation were undertaken. Community based conservation stresses the need to include local people, either physically

in protected areas management or politically in the conservation policy process. While biodiversity conservation is complex (Masozera, 2002) the Tanzanian situation is even more complex.

Tanzanian Forest Act Cap 323 [R.E. 2002] accords nature forest reserves the highest conservation status. Land Act Cap 113 [R.E. 2002] and Village Land Act Cap 114 [R.E. 2002] identify 3 categories of Lands; General land; Village land and reserved land. Socio-economic activities are permitted on land in the first two categories of general/public land and Village land but not permitted or restricted in land reserved for national parks, protected areas and wildlife/forest reserves except under special conditions stipulated by the Law (URT, 1999). In the Eastern Arc Mountains Forests of Tanzania there are 9 protected areas within 6 of the 13 mountain blocks which are;- Amani and Nilo nature reserves in East Usambara Mountains block, Mkingu nature reserve in Nguu Mountains block, Chome nature reserve in South Pare Mountain block, Kilombero nature reserve, Udzungwa national park and Udzungwa nature reserve in Udzungwa Mountains block, Uluguru nature reserve in Uluguru Mountains block and Magamba nature reserve in West Usambara Mountains block (MNRT, 2010).

2.2 Benefits accrued and costs incurred on management of nature reserves

2.2.1 Benefits of nature reserves worldwide

Protected areas remain one of the cornerstones for promoting biodiversity, ecosystem services and human well-being. They store 15% of the global terrestrial carbon stock, assist in reducing deforestation, habitat and species loss, and support the livelihoods of over one billion people (Wei Liu *et al.*, 2012). Protected areas can provide a wide range of ecosystem services such as clean water provision, food and fuel, building materials, medicines, agricultural pollination, nutrient cycling, climate regulation via carbon storage

and sequestration, protection from flooding and other natural disasters, cultural services and eco-tourism. Many people in rural and urban areas depend on protected areas for their livelihood, and that forest-related income provides a significant share of total household income. Livelihoods of people living in forest-adjacent communities tend to be diversified and forest-based. For instance, small-scale agriculturalists include forest resources in their livelihood strategy, simply because they cannot obtain sufficient income from any single strategy to survive, and to reduce risks. Protected areas, when carefully designed and managed, can contribute to poverty reduction and sustainable development including the achievement of millennium development goals (MDGs) (Mulongoy *et al.*, 2008).

Alternative development and livelihood options are necessary under the current and upgraded Nature Reserve impacts. In China, according to the current regulation, all kind of resources development activities within nature reserve are prohibited (Heng, 2013). Although some multiple uses are permitted in fragile areas, the protected areas in China are mainly supposed to be zones with little or no human activity (Xue and Melick, 2007; Heng, 2013). State authorities and conservation organizations are striving to find ways in which protected areas can provide real benefits in economic, social and environmental forms to local groups but handicapped by need of measurement and understanding of the costs involved. The benefits of nature reserves include; additional revenue to local and national stakeholders from nature-activities and other investment attracted to the area by the nature reserve; improved management of the forest resource including its water catchment, climate, biodiversity conservation services; improved awareness about the forest; additional investment from central government, development partners and the private sectors; and greater recognition and therefore payment for value of ecological services provided by the particular nature forest reserve (Liu *et al.*, 2012; Doggart, 2005;

MNRT, 2005; Jambia *et al.*, 2004; MNRT, 2003). According to Heng (2013) it was observed that resources development within nature reserve in China in economic, social and environmental benefits forms, economically, Chanbaishan Reserve could earn 10 million Yuan yearly only for eco-tourism business mainly from entrance fee and transportation services. The revenue can constitute 60% of whole budget in the reserve. Socially, the industries for resource development within nature reserve have enabled reserves to invest money for conserving facilities and ensured a normal operation for administrative work. However, in many cases, people are ready to be restricted to nature reserves where employment opportunities are limited but often do not agree given the uncertainties of developing secure livelihoods and lack of faith in the government to deliver the promised benefits (Heng, 2013). URT (2005) and Doggart (2005) suggested that promotion of the advantages of nature forest reserve category (Self accounting and self autonomy) provides benefits over the normal central government 'managed national' forest reserve in such a way that local communities and other stakeholders appreciate. The ecological, economic and social benefits of protected areas can only be enhanced and sustained when they are effectively managed through good governance (FAO, 2011).

2.2.1.1 Benefits of nature reserves to local communities in Tanzania

Inscription of the world heritage list brings increased international recognition of the importance of the nature, assistance in safeguarding the natural heritage of the sites, and assistance in encouraging local populations to participate in conserving and benefiting from the natural heritage of the sites (MNRT, 2010). The Eastern Arc Mountains where CNR has established are important biological refugia with numerous endemic taxa representing ancient lineages that have survived millions of years of climatic fluctuations elsewhere on the African continent, as well as being centres of more recent speciation and radiation. Participatory and equitable conservation, with involvement of indigenous and

local communities, can enhance net benefits for both conservation and people. Collaboratively managed protected areas and community conserved areas are the two broad categories of participatory conservation that incorporate several principles of good governance. Socio-economic benefits from protected areas are eco-tourism, firewood, timber, non- timber forest products (NTFPs), water resource and compensation (Heng, 2013). Nature reserve industries also can create a job positions for reserve itself and local communities. This can actually promote local economy development and improve local social stability. Environmentally, resource conservation and sustainable development can mutually supportive each other. The revenue from resource development can greatly support reserve's normal conservation and improve staff's working and living conditions, and conversely, it can ensure conservation. The MNRT (2013) provides a guideline on what management responsibilities are likely to be undertaken by the community and what they can be expected in return in terms of concrete forest benefits from forest nature reserves (Table 1).

2.2.1.2 Management costs of nature reserves

The costs related to nature reserve include; additional expenses of establishing and running a nature reserve relative to a forest reserve for both central government and the local communities; and also, reduced access to forest resources for communities (Doggart, 2005). Costs imposed on a community restricted from nature reserves are in terms of food security, availability of fire wood and fodder, income from forest products and NTFPs resulting in overall reduction in welfare (Ghate *et al.*, 2011). Adjacent local communities are subject to strict restrictions on the harvest of forest products that are a significant component of their traditional livelihoods. However, many people are not able to afford the costs of the alternatives. Also, cost-benefit sharing guidelines are yet operationalized and thus, 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.

Therefore, Socio-economic value of forests is recognized where wood for fuel and other uses are harvested from man-made forests, while natural forests are protected (Joroge *et al.*, 2011). Local communities who depend on forests for many commodities and services not just timber, are more sensitive to their protective functions and the wide variety of goods available from them in sustainable harvest. But when the governments overrule traditional use rights to forests, local communities and individual households are unable, and less willing to prevent destructive encroachment or overexploitation.

There is some evidence suggesting that local communities are more likely to comply and to commit themselves to long-term conservation strategies when their knowledge and opinions are incorporated into nature reserve decision-making processes (Andrade *et al.*, 2012). Allowing more active local participation in nature reserve decision-making processes means that the financial resources can be better invested in improving governance, local capacity building, participation, and outreach programs rather than draconian measures. For instance, patrolling and management costs could be reduced with local collaboration (Boissière *et al.*, 2009).

Table 1: Sharing of benefits and costs of forest management in Protective Forests (Nature Reserves)

Community Responsibilities (Conditional on receipt of benefits)	Community Benefits (Conditional on fulfillment of responsibilities)
Participate in preparation and implementation of the JMA	46% of profit gain from carbon is paid to the communities, the remaining part to go to the owner of the forest
Patrolling and enforcing laws stipulated in the management plan of the forest	32% of fines retained in the village from offences committed in the VFMA, the remaining part to go to the owner of the forest
Prevention, controlling and fighting fire in VFMA	36% of research, entry, camping, installation of transmission towers and filming (permits) fee goes to the Village Government and the remaining part to go to the owner of the forest
Conduct village meetings to discuss general forestry issues quarterly and monthly VNRC meetings	26% of revenue generated from ecotourism is paid to the communities, the remaining part to go to the owner of the forest
Controlling and timely reporting accurately on illegal activities to the relevant forest authorities	49% of the net revenue from confiscated forest products goes to the Village Government and the other 51% goes to TaFF/District Council. The confiscated equipment and tools are surrendered to relevant forest authorities
Vermin control and loss of crops, property and human life in collaboration with the owner of the forest	Employment opportunities in various Forest activities
Develop tourism areas and ensure security of tourists, students and researchers in VFMA	
Removal of invasive exotics, (based on supportive research and on managed basis) boundary planting and gap management using right species and allowing natural regeneration to take place to ensure recovery of biodiversity	Access to forest for collection of vegetables, mushrooms, medicinal plants (without damaging the plant), fibres, thatching and fodder grass collection, dead fuel wood and fruits. Also right of way, attending ritual areas, bamboo wine taping and water access for irrigation and domestic use basing on regulations governing the forest use
Submit quarterly implementation and monitoring report to the owner of the forest	Access to forest for beekeeping activities using appropriate technology
Prepare and keep proper forest management records	
Participate in protecting and controlling illegal activities along water sources and environment inside and outside the forest	
Report on revenue collection and expenditure to the village assembly quarterly	
Participate in all meetings related to the management of the forest	
Ensure forest boundary beacons and signs are not removed or destroyed	

Source: MNRT (2013).

2.3 Coping strategies of local communities against lack of accessibility

Coping strategies refer to the specific efforts, both behavioral and psychological, that people employ to master, tolerate, reduce or minimize stressful events (Lazarus *et al.*, 1994). The study by Paumgarten *et al.* (2011) in South Africa revealed that, increased use and sale of NTFPs is a common manifestation of the safety-net function. Delacote (2009); McSweeney (2004) reported that, included in the range of possible coping strategies was the use and sale of NTFPs. However, poor households had fewer options with the increased use or sale of NTFPs being the second most commonly adopted strategy. NTFPs as rural safety-net offer both consumption and income smoothing options. On the other hand, Shahabuddin and Ghate (2009) reported the adverse impacts due to socio-economic and cultural constraints that forest-dependent people face in re-establishing, particularly when people are on transitioning from a forest-dependent lifestyle to an agricultural livelihood. Such constraints are heightened in situations where basic agricultural infrastructure is not fully developed and the alternatives inadequate. The role of forests and trees providing economic alternatives and support to other sectors is also being recognized. This has necessitated the shift of objectives and priority needs from traditional forest management for provision of timber and fuel wood to multiple trees and forest management (MNRT, 2010).

Some coping strategies are common to communities irrespective of their location, characteristics or the shock experienced, while other strategies are used more specifically for coping with particular types of shock (Maxwell *et al.*, 1999). To reconcile long-term economic development and biodiversity conservation, it is important to understand people's use of natural resources and the factors that affect this use, including their responses to shocks and stresses.

2.4 Perception of local communities on the impact of Chome nature reserve

The mindset that the local communities and their livelihood adversely affect conservation continues to prevail almost for a century when the restriction on forest use was imposed for the first time. There is a perception that locking up biodiversity in nature reserves, while ignoring wider social and political realities, has been an ineffective strategy (Ghate *et al.*, 2011). Heng (2013) argued that correlation between benefit and positive attitude towards conservation of natural resources has been endorsed by many cases. The perception on the impact of CNR to its adjacent local communities based on socio-economic factors towards well-being livelihoods impact from CNR. Socio-economic factors on the local communities' perception here refer to; distance from homestead to nature reserve, household income, wealth category, education level, household size, age, sex, and occupations.

2.4.1 Distance from homesteads to Chome nature reserve

Distance is a factor that can determine the access of nature reserve for various needs such as forest and non-forest products. Villagers living closer to the forest have high tendency to access the forest than those living far away. According to Sapkota and Oden (2008) the distance and time to reach particular forest resources impose a natural limit on how much the adjacent local communities can extract at any one time and possibly over all time. Logically, increased distance from homestead to the forests increases transaction costs of resource collection and vise versa (Fisher and Shively, 2005). The increase the distance to the source of resources, the higher the costs of obtaining the forest and non-forest products, and the fall the net benefits, and thus, reducing incentives to engage in forest activities (Fisher and Shively, 2005).

Communities being adjacent to CNR have significant role to play in the management of the reserve. However, the involvement of local communities is still passive; a situation which renders inadequate participation in the management through instruments to facilitate community participation does exist. FAO (2001) as cited by Kijazi (2006) estimated that around 350 million people living around dense forests in the world depend on them for subsistence or income. On the other hand, the long distance to be covered by the household to collect firewood and other forest products from other sources apart from closer ones indicates forest resources depletion in the area. Household near the reserve who have hard time to meet their basic survival needs are unlikely to care for conservation (Masovera, 2002).

Biodiversity conservation will succeed only if local communities participate in protected area management and in return receive sufficient benefits. The variable was recorded with respect to the estimated total distance from homesteads to the resources in CNR. The expected sign of the regression coefficient was positive (+β) (Table 3). This implies that the closer the distance to the resources (CNR), the higher the socio-economic dependency of the forests. On the other hand the long distanced covered to obtain forest basic needs benefits from other sources encourages encroachments in CNR for illegal obtaining of forest resource benefits.

2.4.2 Household income

Income factor can be used to determine the well-being livelihood in the communities, increased income among the communities seen as a reasonable outcome of market sources. The pattern of demand is likely to change when income changes (Anderton, 2000). It is reasonably assumed that consumers increase their demand for most goods when their income increases (normal goods). However, increases in income result in a fall

in demand for other goods (inferior goods). There is a fall in demand because consumers react to an increase in their income by purchasing products which are perceived to be of better quality. For example, consumers switch from firewood to gas/electricity; from timber for construction to metal or iron material etc. Again, restriction in the supply of forest products from nature reserve leads to a price rise and thus, leads to a fall in demand for forest products and switch for coping strategies. Based on the fact that high income earners have a greater purchase power on the alternative goods and services in the markets, access to outside market affects forest resources extraction in different ways. On one hand, access to markets may open up better employment opportunities thereby making people less dependent on forest resources. On the other hand, market access may facilitate commercialization of forest resources and thus may promote extractive activities.

Masozera (2002) suggested that, agricultural income and access to outside markets reduce forest dependency. Godoy and Bava (1993) found that indigenous people who live far away from markets can deplete forest resources. However, it is hard to determine, a priori, the impact of market accessibility on forest dependency. The households assumed to be well-off tend to prefer more stable on-farm and off-farm investments, whereas the poor households have limited ability to invest in on-farm and off-farm activities. People living in isolated areas with poor infrastructure are likely to be more dependent on forests. In general, people from farm-dependent villages depend less on forest resources. Forest dependency is inversely related to agricultural income.

Income poverty (basic needs and food poverty) varied across geographical areas, with the rural areas being worse off. People whose main source of income is their farm, are five-times more likely to be poor than their counterparts whose receive a wage from the public

or public sector (Lusambo, 2009). The variable was recorded with respect to the estimated total income of the household respondents per month or year. The expected sign of the regression coefficient was (+β) (Table 3). This implies that, decreasing of household income increases the high dependency of forests and high costs to obtain benefits from other sources, thus, increased illegal actions to access benefits in nature reserves.

2.4.3 Wealth category (Land ownership)

Wealth category is a factor that used in the study to determine the impact of CNR in improving livelihoods of the adjacent local communities. The household fall in the very rich category depend less on forest resources from forest reserve compared to household in the very poor category, wealth influencing the experience of shocks or stresses as well as responses. Masozera (2002) reported that families with more land are likely to earn more income from their own land and therefore depend less on forest resources. According to Lusambo (2009) rural poverty is strongly associated with lack of land and livestock, as well as inability to secure non-farm alternatives to diminishing farm opportunities.

Various social, economic and demographic factors push the poor to cause environmental degradation which in turn stimulates poverty. In Tanzania, there are five wealth categories in rural areas: very rich, rich, average, poor and very poor of which vary from one region to another. For example, according to Lusambo (2009), these wealth categories in rural areas are shown in Kilimanjaro Region (Table 2). Lusambo (2009) posited that, the poverty in Tanzania is a rural phenomenon; 85% of the population lives in rural areas; 59% of this population is poor, and 44% of the poor are very poor. The author suggested that, rural poverty is strongly associated with lack of land and livestock as well as inability to secure non-farm alternatives to diminishing farm opportunities.

The challenge is how to influence willingness to pay and accept among the poor and adjacent communities. For instance, asking how the nature reserve is accepted among firewood dependents, timber harvesters, poachers, and those who depend on the forest for food.

Therefore, wealth categories are inversely related to forest dependency. Wealth category factor pushes the poor to cause environmental degradation which in turn stimulates poverty. The variable was recorded with respect to the wealth categories on how can influence well-being impact of CNR to its adjacent local communities in the study area. The expected sign of the regression coefficient was positive (+β) (Table 3).

Table 2: Typology of wealth categories in rural areas of Kilimanjaro Region

Category	Descriptions
Very rich	Has > 10 acres of land; use fertilizer and improves seeds; own tractor; children go to the best secondary schools; rich and responsible.
Rich	Owns 4 – 8 acres of land; 2 dairy cattle; 10 goats; small shop; children attend private schools.
Average	2 – 3 acres of land; problems in buying inputs; occasionally own oxen plough; children attend schools up to standard VII; can't afford secondary education.
Poor	Owns < 1 acre; uses hand hoe (first works as labourer to others); cannot afford agricultural inputs; no cattle; eats once (if lucky, twice) a day.
Very poor	No land or very small plot of land; does not cultivate; depend on relatives.

Source: Lusambo (2009)

2.4.4 Education level

Education factor determines more labour force productivity. Increasing the quality of labour input is likely to be far more important in the long run. Labour is not all the same. People can be made more productive by education and training. According to Anderton (2000), increases in human capital are essential for a number of reasons; people need to be sufficiently educated to cope with the demands of the existing stock capital.

These might seem very low grade skills but it requires a considerable educational input to get most of the population up to these element levels; people need to be flexible, flexibility requires broad general education as well as in – depth knowledge of a particular task; and people need to be able to contribute to change. It is easy to see that scientists and technologists are essential if inventions and new products are to be brought to the market. What is less obvious, but as important, is that every individual can contribute ideas to the improvement of techniques of production. An ability of all people to take responsibility and solve problems will be increasingly important in the future.

Masozera (2002) reported that, high educated people have greater off-farm employment opportunities than less educated people. In general education opens up diverse and taken as the key to better employment opportunities, accessibility to information, services, and independent and correct decisions for survival and socio-economic development. As such people tend to move away from subsistence agricultural and gathering activities. Kajembe *et al.* (2000) suggested that, gender based local knowledge is a central issue in the selection, collection and preparation of wild foods. While women are very much knowledgeable about direct food consumption activities men are more knowledgeable and responsible with income generating non-wood forest products. Education is perceived as among the factors that influence an individual's perception of a particular development intervention for decision making. Also, it encourages a person to learn more and seek more information regarding interventions (Kingazi, 2002). Therefore, it is hypothesized that forest dependency is inversely related to the education level of the members of the family. The variable was recorded with respect to the household respondent's education to measure the perception on CNR impact to its adjacent local communities in the study area. The expected sign of the regression coefficient was negative (-β) (Table 3).

2.4.5 Household size

Families with more labour tend to extract more forest resources (Gutanilake, 1998; Hedge and Enters, 2000; Masozera, 2002). Generally, large families require more resources to meet their subsistence needs, therefore, have a higher prosperity to extract resources from the reserve. In addition, families with more labour can mobilize part of it for forest dependent activities while maintaining the labour supply for village-based activities. Increasing the number of labours in an economy should lead to economic growth (Anderton, 2000). Increases in the labour force can result from three factors; change in demography. If more young enter the workforce than leave it, then the size of the workforce will increase; increasing in participation rates. Nearly all men who wish to work are in the labour force. However, there exists a considerable pool of women who could be brought into the labour force if employment opportunities are present. It is hypothesized that size of the family is directly related to forest dependency. On other hand, families with large number of members can enhance effectiveness of labour force at household level against income deficit. It is hypothesized that size of the family is directly related to forest dependency. The variable was recorded with respect to the size of households on how influential is on the well-being impact of CNR to its adjacent local communities in the study area. The expected sign of the regression coefficient was negative (-β) (Table 3).

2.4.6 Age of household heads

Age is an important variable in determining forest dependency. Forest dependent activities in protected forests are labour intensive because people have to walk a long distance to reach and search for forest resources. Elderly people may not take a risk of going into the forest to do illegal activities following the prohibition of human activities in protected forests, while the young and middle age people who are energetic and

assumed to provide an effective labour force are the key risk takers in forest related activities. However, some of elderly people are more experienced and knowledgeable in forest conservation and use of environmental resources. The indigenous knowledge they have may play a big role in wise use of forest resources for sustainable forest management. Forest dependency is inversely related to the age. The variable was recorded with respect to the age distributions among the household respondents in the study area. The expected sign of the regression coefficient was negative (-β) (Table 3).

2.4.7 Sex of the household respondents

Increase in the labour force in the foreseeable future will result from women returning or starting work (Anderton, 2000). Nature collection and use of forest resources depend on the sex of the individual (Masozera, 2002). For example, men carry out activities such as hunting and mining while collection of wild vegetables and thatching grass are exclusively carried out by women. Since forest dependent activities are labour intensive and prohibited in the reserve, men are more likely to take the risk relative to women to enter the forest. Forest contribution, demands and preferences can be different even at individual household level. For instance, while a key priority for women is firewood for cooking, heating and non-wood forest product; men are more in need of wood products like timber and building poles. However, cultivation and fire wood collection are joint activities. Also, cultural barriers which give males more priority make hard for women to access the productive resources accrued from NR. The key question at this level is how to compensate household requirements based on gender schemes. Therefore, household with males as heads have a greater forest dependency than households with women heads. The variable was recorded with respect to the sex of the household respondents in the study area. The expected sign of the regression coefficient was negative (-β) (Table 3).

2.4.8 Occupations of household respondents

The stock of capital in the economy needs to increase over time if economic growth is to be sustained (Anderton, 2000). This means that there must be sustained investment in the economy. However, there is not necessarily a correlation between high investment and high growth. Investment can also be wasted if it takes place in industries which fail to sell products. Investment must therefore be targeted at growth industries. Ezebilo and Mattson (2009) as cited by Heng (2013) suggested that, economic benefits from protected areas at a local scale are indirectly originated from investment by government or non-government actors in different types of infrastructure (school, health centre etc.), in the provision of services (e.g. agricultural development and small business facilitation) as well as employment in tourism-related enterprises. In the majority of Tanzania's rural areas, around 60 to 80 percent of adults report agriculture as their main activity. Despite the importance of agriculture particularly in rural areas, some 40 percent of rural household income is derived from sources outside household on-farm production (Yanda, 2010). Yanda (2010) posited that on- and off- farm earnings depend on a strong agriculture sector as well as other rural sectors, including forestry, wildlife, fisheries, and tourism. MNRT (2000) posited that, about 80% - 90% of forestry enterprises are Small and Medium Forest Enterprises (SMFEs). It should be readily apparent, however, that SMFEs offer a significant proportion for the poor to capture employment opportunities in forest sector (Duncan, 2006).

Lack of employment opportunities outside agriculture and livestock production as common ventures in the rural areas intensifies dependency on natural forests for livelihood needs of the ever-growing human population and more serious encroachments for production of food and cash crops as well as forest produces (MNRT, 2000). Forests in general have potential of generating employment and income to rural households in the form of artisanal wood-based industry and non-wood forest products.

Together with significant contribution of forests to local livelihoods and national economy, forest destruction, poor management, and environmental degradation continue and, with it, negative impacts on marginal communities that depend on forests and forest products (Mariki, 2001). The variable was recorded with respect to the activities allowed to be undertaken inside and outside CNR by the adjacent local communities. The expected sign of the regression coefficient was negative (-β) (Table 3).

Table 3: Summary and description of variables used in Binary logistic regression

Variable	Description	Expected sign
Y	Binary variable (1= Positive impact, 0 = Negative impact	
X_1	Distance from homesteads to Chome Nature Reserve	±β
X2	Household income	±β
X3	Wealth category (Land ownership)	±β
X4	Education level	±β
X5	Household size	±β
X6	Age of household heads	±β
X7	Sex of the household respondents	±β
X8	Occupations of household respondents	±β

CHAPTER THREE

3.0 METHODOLOGY

This chapter describes the methodology used for acquiring and analyzing data relevant to this study. This chapter includes a description of the study area, research design, sampling procedure, methods of data collection and analysis.

3.1 Study Area Description

3.1.1 Location

3.1.1.1 Chome nature reserve and study villages

The study was conducted in CNR, Same District in Kilimanjaro Region by involving four villages namely Marieni, Kambeni, Mvaa and Ntenga. CNR is situated in the South Pare Mountains in North East Tanzania between 4^0 10' to 4^0 24'South and 37^0 53' to 38^0 00'East and falls in the Eastern Arc Mountains blocks and surrounded by 27 villages. CNR covers 14,283 ha owned by TFS under MNRT. CNR includes the highest ridge of the range and the highest peak, Mt Shengena (2463m) but slopes down to an elevation of 1250m on its Eastern edge. Figure 2 shows the map of study area.

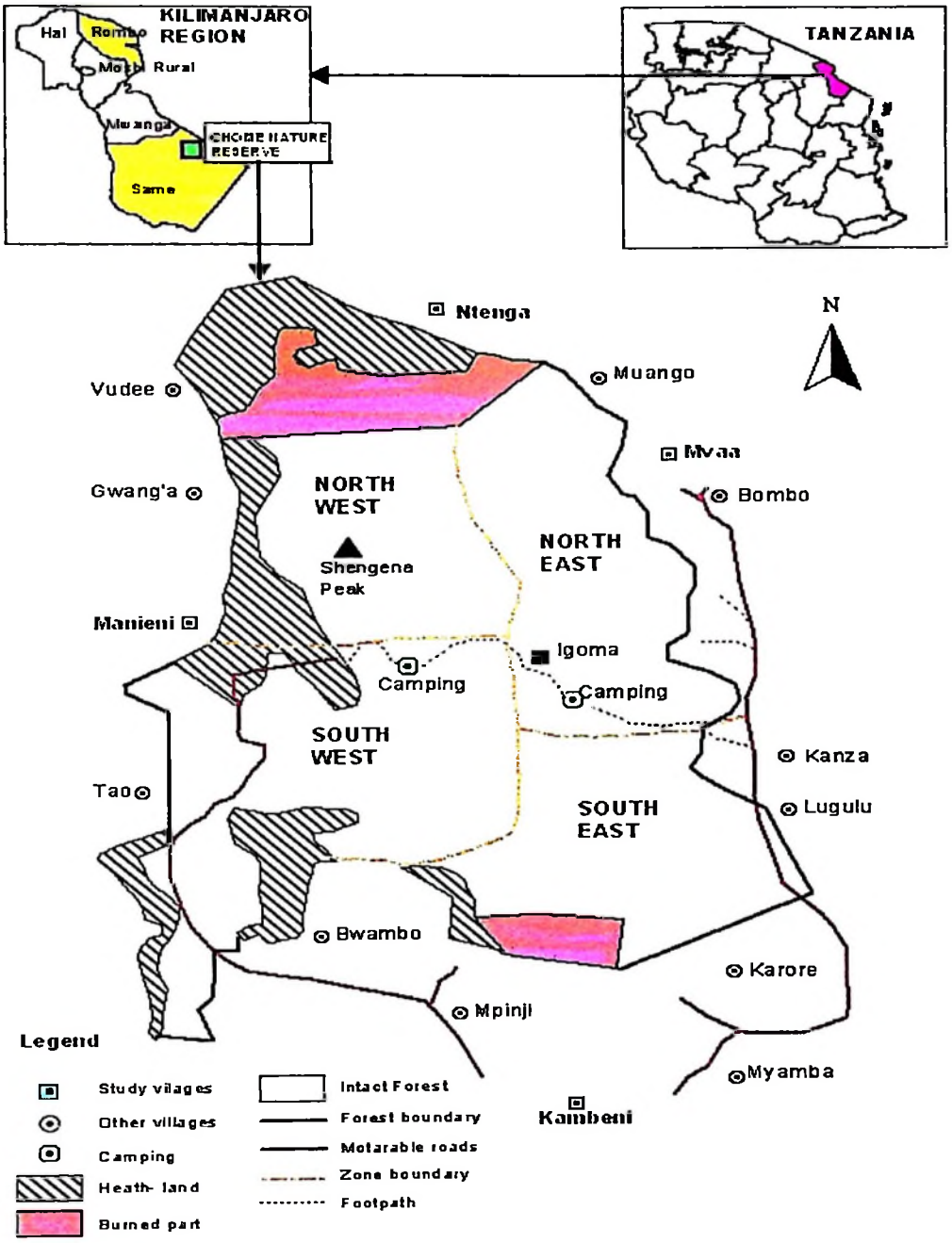

Figure 2: Location of CNR in Same District, Kilimanjaro Region

3.1.1.2 Population and socio-economic activities

Marieni village has an estimated total population of 1965 people (975 male and 990 female), 437 households with average household size of 4.5 and sex ratio of 98, Kambeni village has a population of 2633 (1304 male and 1329 female) with 572 households with

average household size of 4.6 and sex ratio of 98, Mvaa village has a total population of 1843 (904 male and 939 female) and 419 households with average household size of 4.4 and sex ratio of 96, whereas Ntenga village has a population of 3575 (1763 male and 1812 female), 745 households with average household size of 4.8 and sex ratio of 97 (URT, 2013). The main socio-economic activities are agriculture and livestock keeping. Traditional irrigation is mostly practiced supported by water reservoirs (Ndiva). Others are retail trade, ceremonies, traditional healing and so on. Main food and cash crops produced are maize, cassava, beans, banana and ginger. Access to Chome NR is mainly through earth roads from Same town follows; Same – Mwembe – Chome route; Same – Makanya – Chome route; Same – Vudee – Ndolwa – Chome route; and Same – Mbaga – Mtii – Suji – Chome route. Generally, most of these routes are passable throughout a year.

3.1.1.3 Soils

Soil types vary with topography. Acidic lithosols predominate on ridges with ferralitic latosols on the slopes. On the Chome-Suji Plateau (Western grasslands) lithosols have developed in depressions under the heath and bog vegetation (MNRT, 2009). The Shengena range was formed by faulting uplift some 25-100 million years ago (MNRT, 2009) and consists of gneiss and magma precambium crystalline basement rocks.

3.1.1.4 Climate

The climate in Same District is highly influenced by the altitude whereby upland receives rainfall from 1,250 to 2,000 mm per annum. Temperature ranges between 15°C and 25°C in the highlands. Therefore, it is very cool in the highland with reliable rainfall (*ibid*). The climate of CNR is characterized by bi-modal weather systems. Short rains occur between October and December while long rains fall between March and May.

The amount of rainfall ranges from 1500-2000 mm in the western side of the forest to 3000 mm in the eastern side of CNR. Dry season is between July and September. The high rainfall and extensive forest cover gives the reserve a high catchment value. Eastern slopes receive more rainfall than Western slopes, with a most effect at higher attitudes. Mossy and bryophyte vegetation properties also make it efficient for taping atmospheric moisture. Temperature ranges between 15°C minimum (July) and 20°C maximum (February) (URT, 2010).

3.1.1.5 Special sites

The forests are informally tied up with the cultural and spiritual value of the Wapare. Several sacred areas within the forest which are used for different purpose, for example, Ndiva Nkundu area is used for cleansing. Shengena peak for worshiping and initiation of traditional healers. Kiete cha Mmbono a market place where communities from the East and West part of the forest met and traded. Several Clans have their own sacred grooves within and outside the forest. These include Kwanambache (inside the forest) adjacent to Marieni village while others found outside the forest include Itembua in Marieni village; Heiganda, Mtwisi and Tia-Igoma in Duma village and Mpungi in Msindo village. There are also some special features and sites inside and outside CNR that a visitor may be interested to visit. Other special sites include clan and viewpoints inside and outside clan forests.

3.1.1.6 Vegetation

Main vegetation types are sub-montane, montane, and upper montane forests. Montane forest occurs above 1,500m, with a drier type on lower slopes and rain shadow areas and wetter type covering about 60% of the Reserve mainly on eastern and western slopes of valleys at 2,000-2,300 m. Common tree species include *Parinari excelsa* in the sub-

montane forest and species such as *Ocotea usambarensis*, *Albizia gummifera* and *Podocarpus lalifolius* in the montane forests. *Ocotea usambarensis* is the dominant emergent tree, with specimens 45 m in height and 2 m in diameter being common. Moss – covered upper montane forest occurs above 2,300 m, with elfin forest on the highest ridges. Primary heath dominated by *Erica arborea*, occurs along rocky ridges in shallow, acidic soils; secondary heath and grassland have colonized large areas between 1,600 m and 2,000 m in drier montane forest that have been subject to fires. There is remarkable variation in term of species composition between the northern and southern parts of Chome and between leeward and windward sides. Studies also indicate that the western side is richer in species than the eastern side (MNRT, 2010).

3.2 Research Design

This study employed a cross - sectional research design whereby data were collected at a single point in time. According to Kothari (2004), a cross sectional research design, allows for collection of in-depth information on specific cases at one point in time. This design is useful in that it helps to generate in-depth qualitative and quantitative data. Mixes of quantitative and qualitative methods were used in data collection and analysis in a triangulation manner. Triangulation is the act of combining several research methods to study a particular phenomenon with the effect of balancing each method and giving a hopefully true account (Olsen, 2004; Hussein, 2009).

3.3 Sampling Procedure and Sample size Determination

Villages in the study area were stratified into 4 locations (strata); North, South, East, and West (Table 4). The villages selected by using the procedure explained were Ntenga (North), Kambeni v (South), Mvaa (East) and Marieni village (West). A total of 30 households were selected per village covering all social classes found in the particular village.

The listed households from village register were categorized into wealth categories so as to have representative from each category of wealth, and then the selected respondents in each wealth category were determined by using ratios of households in each wealth categories from village registers multiplying by sample size of the village (Table 5). From the selected villages, village register was used to select respondents by using Random number table. Sample size was determined based on Boyd *et al.* (1981). The authors posit that in socio-economic studies, a sample should at least be 5% of the total population provided that 5% is not less than 30.

Table 4: Stratification of villages surrounding Chome nature reserve*

	North	East	West	South
Name of ward	Vudee	Bombo	Chome	Mtii
	Msindo	Vuje	Suji	Bwambo
		Lugulu		Mpinji
				Myamba
				Mpinji
Name of villages	Vudee	Mvaa	Mhero	Myombo
	Ndolwa	Mjema	Marieni	Bwambo
	Menamo	Mvango	Gwang'a	Mtii
	Msindo	Kanza	Tae	Ivuga
	Duma	Lugulu	Malindi	Mang'a
	Mbakweni		Gonjanza	Kambeni
	Ntenga			Sambweni
Randomly				Mpinji
Selected villages				Kirore
	Ntenga	Mvaa	Marieni	Kambeni
Total	7	5	6	9

*Source: Adapted from Lusambo (2009)

Table 5: Number of households sampled in the study area

Study Village	Number of selected hamlets	Number of randomly selected household in each Hamlet	Total number of selected households/Village
Marieni	5	6	30
Kambeni	5	6	30
Mvaa	4	7.5	30
Ntenga	4	7.5	30
Total			120

3.4 Data Collection

3.4.1 Primary and secondary data collection

Before the actual study a reconnaissance was conducted to provide general picture of the study area. Questionnaire were tested and adjusted accordingly. This enabled the instrument to elicit data in valid and reliable way. Semi-structured questionnaire was administered to collect primary data from the households.

The research consisted two phases of data collection whereby primary and secondary data were collected. Methods used to collect data were; - Questionnaire survey, Interview of key informants, focus group discussion (FGD), Participatory rural appraisal (PRA) and direct observation. Secondary data was gathered from various publications, reports and other relevant documents. Both quantitative and qualitative data were collected.

3.4.1.1 Questionnaire survey

Semi-structured questionnaire with open-ended, close-ended and ranking questions were administered to collect primary data from the households. The questionnaire was designed (Appendix 1) to collect socio-economic data, benefits accrued, costs incurred trends, copying strategies, management issues and perceptions from local communities on CNR. In the open-ended questions, households gave their views while in the closed-ended questions they chose among the listed alternative answers. Prior to data collection, questionnaires was tested and adjusted accordingly. This enabled the instrument to elicit data in valid and reliable way.

3.4.1.2 Key informant interview

Checklist of questions were administered and used to guide the interview with key informants namely, Conservator of CNR, District forest officer (DFO), Zonal manager-

Tanzania forest service, Village natural resource committee (VNRCs) and Tanzania forest conservation group (TFCG) representatives, a Non-governmental organizations dealing with environmental issues (Appendix 2). Interview was conducted to both individuals and groups so as to encourage a collective response and identify differences of opinions as well as areas of consensus within the group (Lusambo, 2009). The types of data collected involved management history, forest regime change since independence, conflicts, their sources and measures taken to resolve conflicts in managing CNR, impacts brought about by CNR to its adjacent local communities, coping strategies, resource management and perceptions of the communities on socio-economic impacts from upgraded CNR.

3.4.1.3 Focus group discussion

Focus group discussion (FGD) was guided by checklist of questions (Appendix 3). Only individuals of 18 and above years were involved through village authorities. In each village the group was made up of 10 individuals who were purposively selected because they had certain characteristics in common that related to the topics or issues under discussion (Cheng and Zepeda, 2005; Kreuger, 1998). Davies *et al.* (2000) posit that the group size is usually between 6-12 people, but it can be as small as 4 people. According to Ogunbameru (2003), the group size is in the range of 7-10 people but at times can range from 4-12 people, while Lusambo (2009) maintains that the group size is between 6-10 people.

3.4.1.4 Direct observations

As the data collection was carried out, direct observation method was used to supplement data collected from social surveys. A researcher and assistants observed the conservation situation and other related issues such as boundaries and buffer zone, human behaviours, infrastructures, housing characteristics and activities conducted around nature reserve.

The assistants were provided with training on the critical issues of the study to be captured. The information obtained enabled the researcher to discuss with respondents (households, key informants and focus groups) for triangulation purposes. Again, this tool was used for generation of first hand data which was not interfered by other factors standing between researcher and respondent. This covered the gaps left by other data collection instruments for example cross checking whether what was claimed to be facts and actual facts were compared. A checklist containing issues to be cross checked was used in recording the observed data. Also, digital camera was used to take photographs relevant to the study.

3.4.1.5 Participatory rural appraisal (PRA)

PRA is a research planning methodology in local community studies an issue that concerns the population, priorities problems, evaluates options for solving the problems and comes up with a community action plan to address the concerns that have been raised (Kingazi, 2002). This approach was developed in early 1990s with considerable shift in paradigm from top-down-to bottom up approach, and from blue print to the learning process (Covestro, 2003). PRA is based on village experiences where communities effectively manage their natural resources. It is based on the principle that local people are creative and capable and can do their own investigations, analysis and planning. The basic concept of PRA is to learn from rural people. Purposive local people chosen to participate in the exercise are free to give out their indigenous knowledge, experience and ability to share information based on themes required. 10 participants from each village were selected to participate in PRA led by the village chairman. Influential, elders, experts, youths and some of village leaders were involved. The main PRA tools used in this study were; Resource mapping, Pair wise ranking, Venn diagram and Time lines.

Resource mapping

Visual maps to represent the village, land uses and different available natural resources were identified and drawn by the participants. The participants were able to identify the village boundaries, natural resources' status (conserved or deteriorated, abundant or scarce), how they are used, problems facing the resources and potential opportunities to develop them.

Pair wise ranking

Pair wise ranking or Matrix scoring and ranking aimed at analyzing preferences of households of different socio-economic activities and reasons for preferences, analyzing common impacts brought about by upgraded CNR and identification of coping strategies by not accessing CNR and score or rank these in order of importance. The pair wise ranking was conducted in all four villages; Marieni, Kambeni, Mvaa and Ntenga. The exercise was ended up by the participants to suggest the way forward to tackle all impacts and improve all socio-economic activities mentioned as coping strategies in order of their importance for sustainable conservation of natural resources and economic development.

Venn diagram

Venn diagram was used to identify institutions/Organization/groups working in or with the community in study areas which are dealing with environment and natural resources management and conservation. In this exercise, all institutions/organizations were listed by the participants and through discussion, regarded most important by the villagers and why are regarded so important? This was made possible by using venn diagrams of different sizes, the biggest diagram showed high importance or close relationship to the communities, natural resources and environment in general.

Time lines

The method used to understand the history of natural resources; land, forests, water, and so on in relation with Institutions used to manage those resources. Also the method used to identify key events and trends of CNR since it was catchment forest reserve (Shengena). The most elder persons given the chance to narrate historical background, events and trends concerning management of forest reserves at the past, other participants also were given the chance to cheap in all important events occurred recently. Discussion on the effect of key events in history was conducted with respect to management of CNR in relation to socio-economic impacts to its adjacent local communities.

3.4.2 Secondary data

Secondly data were obtained through reviewing relevant literature from various books, journals and reports on related studies from Sokoine National Agricultural Library (SNAL), Tanzania forest service (TFS) Zonal Office, Chome nature reserve office, Same District Council office, Tanzania forest conservation group (TFCG), and websites.

3.5 Data Analysis

Two types of statistical analysis namely, descriptive and inferential statistical analyses were carried out. Quantitative data from questionnaire was analyzed statistically. Qualitative data from focus group discussion and key informants was analyzed through content analysis. Content analysis was useful in analyzing details of the components of verbal discussions held with Key informants and FGD (Kajembe, 1996) as cited by Kijazi (2006).

3.5.1 Descriptive statistical analysis

Descriptive statistical analysis is concerned with understanding the sample. The statistical package for social sciences (SPSS version 16.0) and Microsoft excel computer programs

were employed to analyse quantitative data and give outputs in frequencies, percentages, means, variance and standard deviations of variables such as age, sex, education level, household size and income.

3.5.2 Inferential statistical analysis

Inferential statistical analysis involved application of Binary logistic regression model to assess the existence of functional relationship between local community perceptions on the impacts of forest regime change of upgrading CCFR into CNR to the socio-economic well-being of the adjacent local communities. The binary dependent variable with the value of '1' if the response is that there is a positive impacts of the upgraded CNR to its adjacent local communities and '0' if negative. Using regression coefficients (β), the prediction model was then developed and used to analyze marginal effects (positive or negative) of the unity change in the independent variables on the dependent variable. The dependent variable was impact to socio-economic well-being (+ve or -ve impact) while independent variables were socio-economic factors including; income, distance from homestead to NR, activities (occupations), household size (members of the family), age, education, social classes and sex. The independent variables (socio-economic factors) considered to influence the impacts of CNR to its adjacent local communities in the study area.

The following predicted model was developed:

$$Yi = \frac{1}{1 + e^{-(\beta_0 + \beta_{1x1})}} \quad \ldots\ldots (1)$$

But for more than one independent variable the model can be written as:

$$Yi = \frac{1}{1 + e^{-z}} \quad \ldots\ldots (2)$$

The basic statistical model for binary logistic regression model was as follows:

$Yi = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 \ldots \beta n\, Xn + ei$ ..... (3)

Where:

Yi = Observed value of the dependent variable representing a linear combination of independent variables underlying socio-economic impacts of CNR to its adjacent

local communities. Hence Y_i is a binary variable with value of 1 if the response is positive impacts and '0' if negative.

β_0 = Constant term of the model without the independent variable

β_1 - βn = coefficients (β) of independent variables showing the marginal effects (positive or negative) of the unit change in the independent variable and these were used in developing prediction equations on influence of household accessing benefits accrued from CNR.

X_1- Xn = Independent variables (income, distance to CNR, occupations, household size, age, education, wealth category (land ownership) and sex

ei = Error or Residual term

i = denotes the i- th observation in the sample 1, 2 ... n is the number of variables.

n = Total number of independent variables

Independent variables included in the model are; income, distance to CNR, occupations, household size, age, education, wealth category (land ownership), and sex.

A binary logistic model was used to provide information on the socio-economic factors to be discussed on how they could influence socio-economic impacts of upgraded CNR to its adjacent local communities. The model predicted the socio-economic factors at 95% and statistically significant at 5% ($P < 0.05$) by involving 120 household respondents as sample size in the study area.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

This chapter presents the characteristics of the respondents and research findings based on study objectives. The objectives were to: - determine benefits accrued to local communities adjacent to CNR and costs incurred in management; analyze coping strategies of local communities for not accessing CNR; and assess the perceptions of adjacent local communities on CNR's impacts.

4.1 Socio-economic Characteristics of the Respondents

4.1.1 Wealth categories of respondents

The study revealed that the household respondents in the study area fall under three wealth categories; higher, middle, and lower. The results revealed that, 42.5% of the respondents are in lower category, 35.8% are in middle category and 21.7% in upper category (Table 6). The study revealed that wealth categories identified in the study area was in terms of wealth whereby the values recognized through animate and inanimate assets owned by households. Since a selection of household respondents in the study area was done by considering the social classes, inanimate assets particularly land ownership was highly recognized among the social classes, the household owning a big size of land more than 10 acres termed higher wealth category and less than 1 acre the lower wealth category.

Table 6: Wealth categories of respondents in the study area (n = 120)

Classes	Percent (%)
High category	21.7
Middle category	35.8
Lower category	42.5
Total	100

The results concurred with study conducted by Lusambo (2009) which identified five wealth categories in rural areas in Tanzania whereby poor household owns < 1 acre of land and very poor owns no land or very small plot of land, whereas, very rich owns > 10 acres of land and average owns 2-3 acres of land. According to Ellis and Mdoe (2003) as cited by Lusambo (2009), rural poverty in Tanzania is strongly associated with lack of land as well as inability to secure non-farm alternatives to diminishing farm opportunities.

4.1.1.1 Land size owned by household respondents

Figure 3 revealed results on size of land owned by household respondent as follows; 56.7% of households own less than 1 ha of land, 33.3% own 2 ha, and 10% own more than 2 ha of land. The study revealed that, majority own less than 1 ha of land and very few own more than 2 ha.

The results are more or less the same to the MNRT (2009) which reported that, most households surrounding CNR possess only an acre of land which is not enough to feed them and about 13% have no land at all. Land with highest potential for crop production is densely populated. SDC (2013) reveals that, although citizens above 18 years old need land and have to fulfill conditions of land right occupancy regardless of the gender differences, most of the people in the district know nothing about land ownership. These results imply that land ownership is a big problem to sustain the livelihood in the study area and thus, threatening CNR conservation as well as communities' livelihoods. There is a need to provide education to the adjacent communities on how to acquire and own land as this will support economic growth and sustainable conservation of natural resources and livelihoods of the people surrounding CNR.

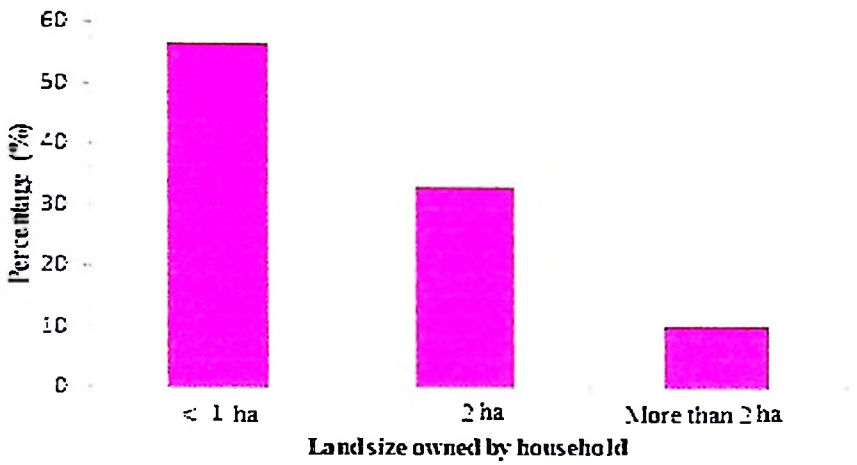

Figure 3: The average size of land owned by household (n = 120)

4.1.1.2 Land acquisition and uses

The study results revealed that, 67.5% of households inherited, 15.8% of households used to borrow, 10.8% of household purchased, 4.2% of households used to rent, and 1.7% of households allocated by village government (Figure 4).

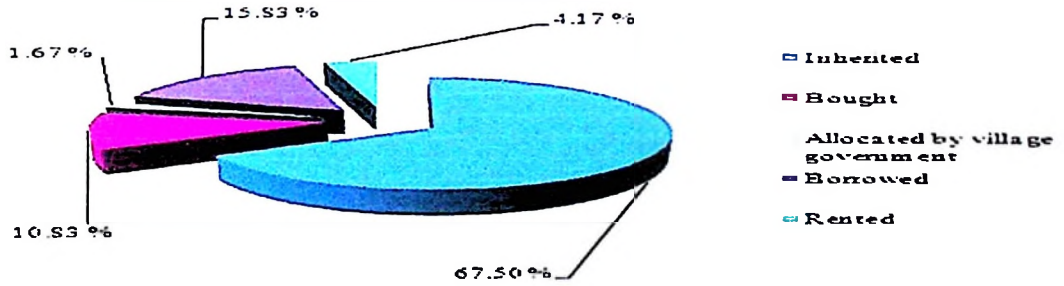

Figure 4: Land acquisition in the study area (n = 120)

4.1.1.3 Land uses

The results revealed that, 41.7% of households used land for farming and livestock keeping, 30% used land for farming only, 21.7% used land for farming, fodder and tree planting, 4.1% used for tree planting and 2.5% others. This implies that most of land is used for farming and fodder in the study area.

4.1.1.4 Household income

The results revealed that, 35% of households are earning TZS 10, 000 – 50, 000/=; 20.8% of respondents are earning TZS 51, 000 – 100, 000/=; 15% earning 101, 000-200, 000, 10.8% earning more than 200.000/=. 10.8% earning less than 10.000, and 7. 5% are unknown (Table 7). Main sources of income at the households are on and off-farm activities as shown in Table 16.

Table 7: The overall income at household without accessing CNR (n = 120)

Income per month	Percent (%)
< 10.000/=	10.83
10.000- 50.000/=	35.00
51.000- 100.000/=	20.83
101,000-200.000/=	15.00
>200.000/=	10.83
Not known	7.51
Total	100

4.1.2 Sex and education level of household heads

The study results revealed that, out of the 120 total household surveyed, 120 (100%) of the total households surveyed responded to this question. According to the responses from this sub-sample, while 55% (66 households) were male headed, 45% (54 households) were female headed households. This implies fairly good gender balance which was justified by the answers to the question on division of labour in the household, whereby equity in distribution of roles and responsibilities among the members of the households was observed. However, majority of the female headed household might be separated, divorced, widowed, and single or their husbands were on transit, this was assumed because there was no statistical evidence on the marital status. Figure 5 shows the education level of the respondents. The results revealed that, 57.5% of the household respondents attained primary school, 26.7% attained secondary school, 10.8% were illiterate and 5% attained college level. The findings revealed that the level of illiteracy in the study area seem to declining while the level of awareness increased to the promising

extent that might increase willingness to participate in socio-economic development particularly in management and sustainable use of natural resources in the study area.

SDC (2013) posited that, actual enrolment of pupils into primary education in 2013 was 8447; Girls 4133 and Boys 4314 which is 99% of children eligible for enrolment. The primary school education progress between 2012 and 2011 has been of a rising trend. This is justified by the following indicators which have shown positive development; number of schools has increased by 11% and number of streams has gone up by 30%. Kingazi (2002) posited that education is perceived as among the factors that influence an individual's perception of a particular development intervention for decision making. Furthermore, it imparts the desire of an individual to learn more, to attend training and seek information regarding interventions.

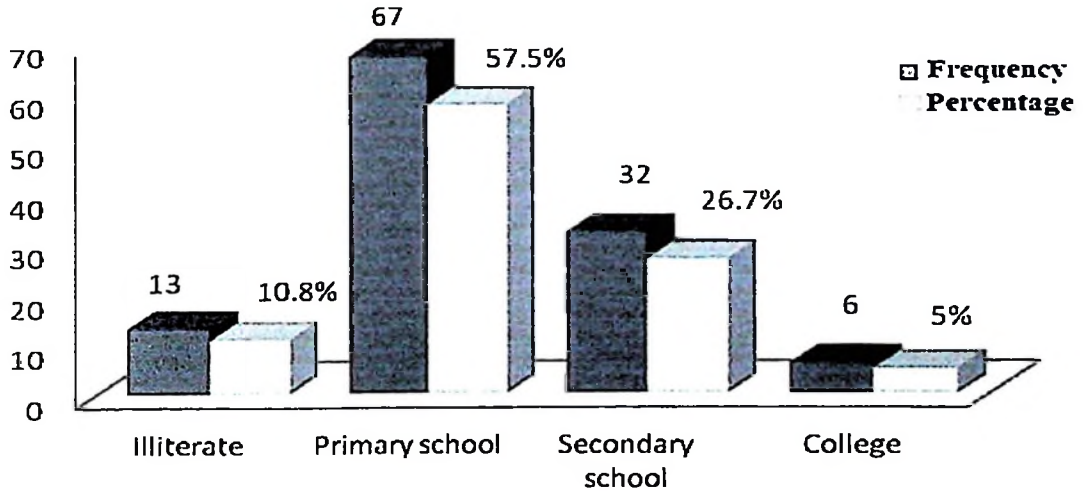

Figure 5: Education level of household head (n = 120)

4.1.3 Age of household head and household size

Study results revealed that, the age distribution of the household head respondents in the study area was as follows; 36.7% of household level belongs to age between 44 – 56

years old, 32.5% belong to age between 31 - 43 years, 16.7% belongs to age between 18 - 30 years old, and 14.1% belong to age greater than 56 years old (Table 8). The results show that the majority (85.9%) of the household respondents were the young and medium people between the age of 18 to 56 years which is the most potential, energetic and active age groups in decision making. This reflects the high level of labour force among the communities adjacent to CNR which is a good indicator for socio-economic development as far as economic growth for sustainable development is concern.

Table 8: Age of household head (n = 120)

Age distribution	Percent
18 - 30 years	16.7
31 – 43 years	32.5
44 – 56 years	36.7
More than 56 years	14.1
Total	100

The result reveals that, 51.7% had family size between 5 – 10 members, 35.5% of respondents had family size between 1 – 4 members, and 15.8% had family size of more than 10 members (Table 9).

Table 9: Number/size of household members

Number	Percent
1 – 4 members (small family)	32.5
5 – 10 members (medium family)	51.7
More than 10 members (large family)	15.8
Total	100

4.1.4 Main socio-economic activities by household in the study area

Table 10 shows different types of farming techniques within main socio-economic activities; agropastoral farming responded by 55.8% of respondents, agrosilvicultural farming responded by 17.5% of respondents, aposilvicultural farming responded by 10% of respondents, agrosilvopastoral farming responded by 6.7% of respondents, aquosilvicutural farming responded by 4.2% of respondents, silvopastoral system

responded by 3.3% of respondents, and off-farm activities (retail and wholesale shops, carpentry, quarry etc) responded by 2.5% of respondents. The study revealed that, although not properly done and inadequate provisions of agricultural inputs, agropastoral farming system (55.8%) ranked first as it is conducted by the majority people in the study area. Off-farm activities such as retail and whole sale shops, carpentry, quarry, beekeeping, fish farming, and ecotourism-activities are the least activities conducted by the community in the study area.

The results concurred with MNRT (2010), SDC (2013), and Kingazi (2002). According to MNRT (2010), the main activities done by adjacent local communities in the study area are agriculture and subsistence livestock farming. SDC (2013) posits that, about 90% of Same District population lies in the rural areas and depends on agriculture and livestock husbandry for their livelihood. The author lamented that, the majority of the rural populations are small scale farmers and agro-pastoralist their semi traditional farming system is characterized by low use of farm inputs therefore the agricultural production is technically below the average obtainable levels. In his study Kingazi (2002) reported that both on-farm and off-farm are mostly conducted by 74%. SDC (2013) lamented that, the cultivated land has remarkably lost its fertility leading to poor crop yield making the forest vulnerable to encroachment and illegal exploitation of valuable timber tree species which regarded by local communities as a means to earn their living. However, some farmers in the study area have adopted soil and water conservation practices by planting trees and contour terraces construction and Zero grazing is mostly practiced since it is environmentally friendly as far as land scarcity and difficult terrain is concern. The informal sector provides an alternative source of employment and income. The main agricultural crops produced for both food and cash crops in the study area are; maize, beans, bananas, ginger, potatoes, cassava, and vegetables with the average production of

< 5 bags (45.0%), 5 – 10 bags (40.8%) and > 10 bags (14.2%). The production figures were obtained from respondents whom were not having real records on crops produced in five years back. This implies that, agriculture and subsistence livestock keeping are the main socio-economic activities conducted in the study area.

Table 10: Main socio-economic activities (n = 120)

Activities	Percent (%)
Agrosilvicultural farming	17.5
Silvopastoral system	3.3
Agropastoral system	55.8
Agrosilvopastoral farming	6.7
Aquosilvicultural farming	4.2
Aposilvicultural farming	10
Off-farm activities (small shops, carpentry, quarry, etc)	2.5
Total	100

4.1.5 Activities supported by existence of Chome nature reserve

Based on the priorities, the respondents mentioned activities supported by CNR as; farming and livestock keeping (53.3%) of respondent farming only (30%) of respondent which are supported through traditional irrigation systems, collection of dry firewood, medicinal plants and other non-wood products (9.2%) of respondents illegal trade of timber, firewood livestock keeping and mining (5.8%) of respondents and livestock keeping only (1.7%) of respondents. The findings revealed that farming and livestock keeping (53.3%) ranked higher compared to other activities. Also, the critical finding and observation is a continuation of illegal trade of timber, firewood and mining, and last is livestock keeping. The implication of these findings is that, the adjacent local communities still depending much on CNR to sustain their livings. Efforts on sustainable forest management are a vital.

4.1.6 Distance from homestead to Chome nature reserve

The results revealed that, (58.3%) of the respondents live less than 5km from Chome Nature Reserve, (35%) of the respondents live 5 – 10km, and (6.7%) of respondents live more than 10km from CNR (Table 11).

Table 11: Distance from homestead to CNR (n = 120)

Distance	Percent
< 5km	58.3
5-10km	35.0
> 10km	6.7
Total	100

4.2 Benefits accrued from Chome Nature Reserve and Costs incurred

4.2.1 Benefits accrued and accessible

Benefits accrued from CNR and accessible by households in the study area are presented in Figure 6. The study results revealed that the main benefits accrued and accessible are; - water, firewood and NTFPs reported by 52.5% of respondents, water and dry firewood reported by 25.8% of respondents, water and NTFPs reported by 15.8 % of respondents, and NTFPs and firewood reported by 5.8% of respondents. The study revealed that water, firewood and variety of NTFPs are the benefits accrued and mostly accessible by the communities in the study area reported by 52.5% of household respondents.

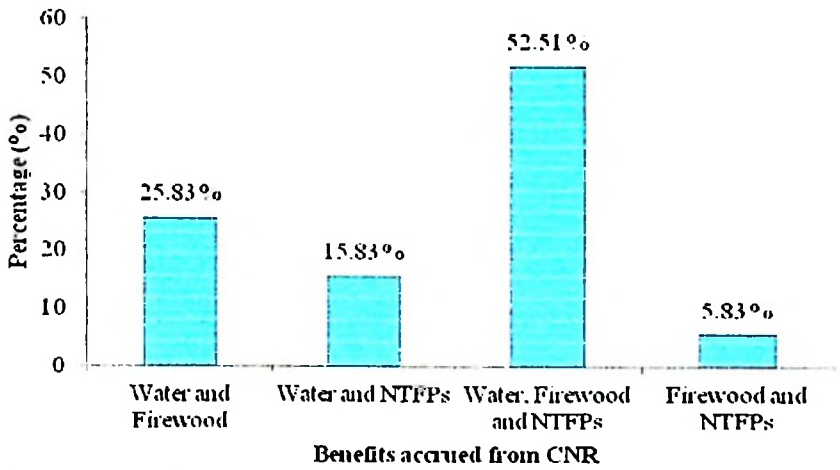

Figure 6: Benefits accrued and accessible in CNR

The results concurred with that of Bekley (1998); Kingazi (2002); MNRT (2009); Yanda (2010); (Liu *et al.,* 2012; MNRT, 2005; Jambia *et al.,* 2004; and MNRT, 2003); Heng (2013). Bekley (1998) argues that, humans depend upon forests directly for timber, NWFPs, and recreational experience and indirectly for things such as air and water quality, biodiversity, carbon sequestration, and other ecological services. Kingazi reported that, only benefit accruing from CCFR were collection of firewood once a week.

Moreover, MNRT (2008); Blomley and Idd (2009) posited that nature reserves play a critical role in protecting the fragile soils in these fertile and mountainous areas thereby enhancing agricultural productivity and production, improving food security and contributing to the livelihoods of the 1.5 million people living immediately adjacent to the area. Whereas, Heng (2013) reported that in nature reserve, water resource is accessible without limitation. Yanda (2010) suggests that, Tanzania's nature reserves which established and upgraded within Eastern Arc Mountains are fundamental to the livelihoods of the local, forest-dependent communities; include critical watersheds that provide water for domestic, industrial and agricultural use for more than 25% of Tanzania's national population.

Furthermore, Heng (2013) reported that, in Cambodia the benefits in which local people can obtain from protected area comprise the collection of firewood which can serve them money about USD 90 annually. The author continues that, NTFPs also provides a fairly big benefit to local people livelihood. However, Heng (2013) posits that, while in 2 villages in China in Chang Qing nature reserve more than 90% of household use firewood as the main source of energy but not even 1% of fire wood is collected from within nature reserve. The benefits accrued and accessible in CNR was also found during FGD (Appendix 7). These observations imply that, water, firewood and different type of NTFPs are the mostly benefits accrued and accessible in CNR.

On the other hand, the study results revealed that, 78.4% of household respondents said that they are accessing the identified benefits accrued from CNR freely, 15.8% obtain benefits by permission, and 5.8% said that sometimes and some benefits are accessed in either means, free or permission (Table 12). The study revealed that the most benefits obtained freely from CNR are water services, whereas dried fire wood and other non-wood forest products such as wild vegetable, fruits, medicinal plants need permits.

Table 12: Means used to obtain benefits accrued in CNR (n = 120)

Means	Percent (100)
Free	78.3
Permission	15.8
Free and Permission	5.8
Total	100

4.2.2 Costs incurred to obtain benefits not accessible in Chome nature reserve

The results in Figure 7 revealed that, 43.3% of household respondents said that, for not accessing CNR, people are faced with high price to obtain the same benefits from other sources, 31.7% of household respondents said that, people are faced with variety of costs such as high price, inadequate supply of good quality timber and firewood, and illegal

activities in CNR, 23.3% mentioned only inadequate supply of quality timber and 1.7% of respondents mentioned illegal human activities only. The study findings revealed that, it is highly costing to obtain forest products because of restrictions since CNR has been upgraded. Although they are regarded as basic needs in the study area, the results revealed that, firewood is inaccessible benefits as reported by 53.3% of household respondents, construction materials as reported by 22.5% of respondents, fodder as reported by 10% of respondents, NTFPs such as wild fruits, vegetables etc as reported by 9.2% of respondents, other benefits by 3.3% of the respondents, and local medicines accounts as reported by (1.7%) of respondents. These benefits obtained from individual woodlots whereas those who haven't woodlots purchased from others with and sometimes attempt illegal firewood collection from CNR. The study revealed that, firewood ranked the highest basic need, followed by construction materials and local medicines ranked the lowest basic need that obtained outside nature reserve. Firewood is ranked the highest because is the major energy source in the study area.

The findings are supported by MNRT (2000), Doggart (2005), Joroge *et al.* (2011), and APP (2013). MNRT (2000) reported that, reduction of fuelwood supplies has significantly increased costs of living and has influenced women and children spend more of their productive time in fuel wood gathering. Doggart (2005) posited that, costs include; additional expenses of establishing and running a nature reserve relative to a forest reserve for both central government and the local communities; and also, reduced access to forest resources for communities. Whereas, Joroge *et al.* (2011) argued that, implications of shifting of a forest status to a nature reserve need to be taken into consideration when assessing the costs and benefits as the cost of maintaining the status quo includes potentially losing significant areas of the forest and the ecological services that it provides.

APP (2013) posited that, surging demand for limited resources is driving what some commentators describe as a commodity super cycle, keeping price high MNRT (2006); MNRT (2013); TFS (2013); and URT (2013) posited that, given the pressures on local livelihoods, there is much illegal exploitation of timber, poles, firewood and minor forest products such as bush meat. This implies that, restriction into CNR has raised the price and cause difficulty to local communities to obtain benefits outside CNR. Thus, illegal activities are still a threat to CNR because some of the adjacent local communities practiced it as a coping strategy for not accessing benefits in CNR. Furthermore, both government and adjacent local communities are faced with the impacts caused by upgraded CNR; management of CNR will have to incur more costs of managing the resources whereas local communities will incur the costs of not accessing the resources.

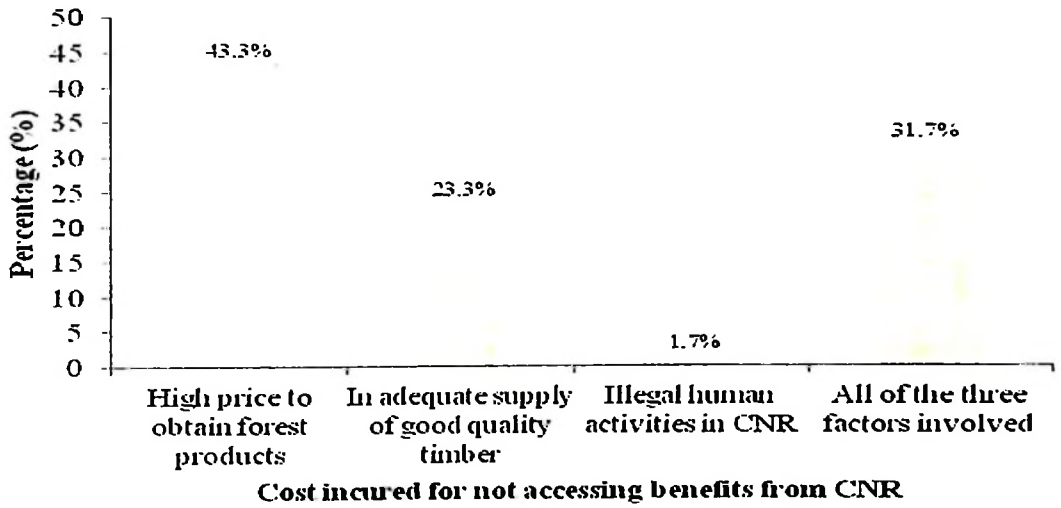

Figure 7: Costs incurred to get benefits not accessible in CNR (n = 120)

4.2.2.1 Stresses/impacts due to restricted activities in Chome nature reserve

Table 13 shows types of stresses faced by adjacent local community after being restricted from CNR.

The results revealed that, the majority of household respondents (51.7%) mentioned inadequate supply of high quality timber, (22.5%) of respondents mentioned inadequate supply of firewood, 13.3% of respondents unemployment and economic declining, (7.5%) of respondents mentioned high price to obtain construction materials and firewood, (3.3%) of respondents are not clear with information about upgraded CNR, and (1.7%) of respondents do not feel any stress. The study revealed that, the main stresses faced by local communities from being abandoned to CNR are inadequate supply of quality timber for construction, inadequate supply of firewood, and unemployment which led to economic decline. Inadequate information on regime change of nature reserve also is a burning issue in the study area.

The results concurred with MNRT (2009); Masozera (2002); MNRT (2009) posited that, communities around CNR are faced with a number of problems which if not addressed might impact the management of the reserve. The author mentioned the following problems; inadequate alternative source of income, inadequate supply of fire wood, and over dependency on the reserve to earn their living. Masozera (2002) argued that, human dependence upon forests is a multifaceted phenomenon due to the fact that forests provide a diverse stream of benefits to humans. Salafsky and Wollenberg (2000) as cited by Masozera (2002) posited that, in countries where remote populations endure social and economic inequalities, protected areas have further restricted their livelihoods options. In an attempt to reconcile human needs and conservation goals, conservationists have been searching for innovative solutions. This implies that, once the nature reserves are established or upgraded socio-economic issues related to nature reserves are direct affected by the changes. Assessment on the impacts to be caused by upgraded nature reserves should be put into consideration.

Table 13: Types of stresses faced by local communities restricted in CNR (n = 120)

Stresses/impacts	Percent (%)
Inadequate supply of high quality timber	51.7
Inadequate supply of firewood	22.5
High price to obtain construction materials and fire wood	7.5
Unemployment/economic decline	13.3
Regime change is not clearly understood	3.3
Not applicable	1.7
Total	100

4.2.2.2 Inaccessible benefits accrued in CNR

Table 14 shows the results on the benefits accrued in CNR the community which are not allowed to access. 53.3% of household respondents mentioned firewood, 22.5% of respondents mentioned construction materials, 10% of respondents mentioned fodder, 9.2% of respondents mentioned NTFPs and 3.3% of respondents mentioned others.

Table 14: Inaccessible benefits (basic needs) from CNR (n = 120)

Benefits	Percent (%)
Firewood	53.3
Local medicines	1.7
Construction materials (poles and sawn timber)	22.5
Fodder	10
Non Wood Forest Products (wild fruits, vegetables etc.)	9.2
Others	3.3
Total	100

Table 15 shows the other sources household respondents used to obtain inaccessible benefits from CNR. The results revealed that, benefits from individual woodlots were reported by 63.3% of household respondents, while benefits purchased from others were reported by 36.7% of household respondents. The study revealed that, firewood and construction materials are obtained from individual woodlots and for those who doesn't have woodlots used to purchase from the colleagues with woodlots.

Table 15: Sources other than CNR used to obtain inaccessible benefits (n = 120)

Other source	Percent (%)
Purchasing from other people	36.7
Individual woodlots	63.3
Total	100

4.3 Coping Strategies for Not Accessing Nature Reserve in the Study Area

Table 16 shows coping strategies devised by households against stress for not accessing CNR. The results revealed that, 40% of households mentioned agriculture for both food and cash production, 29.2% of household respondents mentioned tree planting for both conservation and forest products, 14.2% of household respondents mentioned off - farm activities (hired labour, quarrying, shops, restaurant, nature activities such as beekeeping, fish farming, eco-tourism etc.), whereas, 10.3% of household respondents mentioned alternative source of energy and energy server stoves and construction materials, and last but not least 2.5% of household respondents mentioned illegal exploration of natural resources. The study revealed that, the people in study area especially those who were forest nature reserve dependency decided to switch to the activities shown as coping strategies to remove stresses brought about by restrictions from nature reserve. The study by Paumgarten *et al.* (2011) in South Africa revealed that, increased use and sale of NTFPs is a common manifestation of the safety-net function. Delacote (2009); McSweeney (2004) reported that, included in the range of possible coping strategies was the use and sale of NTFPs. However, poor households had fewer options with the increased use or sale of NTFPs being the second most commonly adopted strategy. On the other hand, Shahabuddin and Ghate (2009) reported the adverse impacts due to socio-economic and cultural constraints that forest-dependent people face in re-establishing, particularly when people are on transitioning from a forest-dependent lifestyle to an agricultural livelihood. Such constraints are heightened in situations where basic agricultural infrastructure is not fully developed and the alternatives inadequate.

The role of forests and trees providing economic alternatives and support to other sectors is also being recognized. This has necessitated the shift of objectives and priority needs from traditional forest management for provision of timber and fuel wood to multiple trees and forest management (MNRT, 2010).

Table 16: Coping strategies for not accessing Chome nature reserve (n = 120)

Strategy	Percentage (%)
Promote agriculture for both food and cash crops production	40
Tree planting for both conservation and forest products	29.2
Practicing off farm activities apart from forestry (trade, hired labour, beekeeping, fish farming, eco-tourism etc.)	14.2
Use of alternative source of energy and construction materials	10.3
Illegal exploration of natural resources	2.5
All five above	4.2
Total	100

4.3.1 Promote agriculture for both food and cash crops

The results revealed that, 40% of households mentioned agriculture for both food and cash crops production (Table 16). Since the cultivated land has remarkably lost of its fertility and led to the poor crop yield and the short cuts to sustain life through illegal exploitation in CCFR has been reduced by the upgraded CNR. The high percentage indicated for both food and cash production in the study area revealed that, the communities living around CNR decided to promote ginger crop as a coping strategy for income generation compared with other cash crops in the study area (Table 17). The study results revealed that main food crops produced are maize, bananas, beans, potatoes and vegetables while cash crops are ginger, maize, vegetables and banana which are grown by most of households for income generation. Promotion of agriculture in commercial basis was also prioritized during PRA (Appendix 9).

The results concurred with MNRT (2009) and SDC (2013). Both authors suggested that, the land in the study area is under intensive cultivation, with cash crops such as coffee,

sugarcane, cardamom, ginger and timber trees in certain villages. Food crops include bananas, beans, maize, rice, potatoes, and cassava. Vegetables like onions, cabbage and *Solanum nigram (Mnavu)* are common in irrigated agricultural fields.

Table 17: Main crops produced in the study area

Crops	Percent (%)
Maize, Ginger, beans and cassava	25.8
Ginger, Maize, bananas and Beans	13.3
Maize, Ginger, Potatoes and beans	40.8
Maize, Ginger, Bananas and Potatoes	10.8
Vegetable, Maize and Beans	5.8
Vegetables and Spices (Ginger inclusive)	3.3
Total	100

Based on these crops distributions, ginger is mostly crop grown in the study area for income generation compared to maize, vegetables, banana, coffee and other spices. The finding are in line with the record given by SDC (2013) which shows that ginger were highly cultivated in comparison to other crops as indicate by annual crop increment per year i.e. Maize (27.69%), paddy (2.01%), beans (2.63%), sorghum (0.22%), cassava (36.93%), sweet potatoes (3.1%), round potatoes (1.81%), coffee (8%), ginger (327.4%), cotton (2.2%) and lablab (62.3%) and banana (25.59%).

Furthermore, the results was supported by SDC (2013); Masozera (2002); MNRT (2009); Lusambo (2009). SDC (2013) posited that, about 80% of the inhabitants of Same District depend entirely on the agriculture and livestock sectors for their living while the rest derive their income from different off-farm activities including retail shops, craft, marketing and small business. Masozera (2002) reported that, agriculture income and access to outside markets can reduce forest dependency. MNRT (2009) suggested that, the local communities living around the forest reserve are agrarian societies whereby agriculture plays an important role. The author argues that the agricultural activities are

favoured by irrigation systems due to permanent river flows from CNR; agriculture is common in valleys and along river courses.

Efforts to improve the rural agricultural infrastructure in the landscape to improve productivity are vital. APP (2014) reported that, agricultural conditions in Africa are different. Yet Africa desperately needs the scientific innovations in drought-resistant seeds, in higher-yielding varieties and in water use, fertilizer and pesticide that helped to transform agriculture in other regions. The author argues that, returns on investments in these key areas will be diminished if deep-rooted policy failures are not tackled. These range from exorbitant transport costs for farm produce to underinvestment in storage and marketing infrastructure and barriers to intraregional trade.

This implies that although people in the study area have decided to shift into ginger production for commercial basis, they are faced with many challenges which need intervention from government and non- governmental actors on agricultural infrastructure improvement, awareness raising among farmers, supply of agricultural inputs at the right time and ensured markets.

Plate 1: Onions growing in the study area

Plate 2: Ginger crop production in the study area

4.3.2 Tree planting for conservation and forest products

The results revealed that 29.2% of household respondents mentioned tree planting for both conservation and obtaining forest products (timber, poles and firewood) as a coping strategy (Table 16). The result concurs with those of MNRT (2009).

MNRT (2009) reported that, seven villages out of 27 which are adjacent to CNR were having tree nurseries and has been supplied with inputs such as polythene tubes and tree seeds. The author posited that, annual target is 10,000 seedlings per village. Species

raised include:- *Croton megalocarpus, Trichilia emetica, Ficus spp* and *Grevillea robusta.* Out of 10,000 seedlings, some of them were planted in the reserve to fill the gaps, some were used in establishing the village woodlots and some were sold to contribute to income generation for the local communities. The study conducted by Lusambo (2009) suggested that, majority of tree species planted are not those preferred for fuel wood, thus, giving a signal that tree planting is not primarily for wood fuel only, but for some other socio-economic use. The results imply that, there is a big room for tree planting in the study area. People should be capacitated on this. However, according to The CNR Conservator, in the 2011/2013 communities managed to produce 63,040 seedlings of different species as mentioned earlier.

Plate 3: Tree nursery belonging to KIKIMIMISA group in the study area

4.3.3 Off-farm activities

Engagement in off-farm activities was mentioned and ranked the third coping strategy by 14.2% of household respondents. The strategy comprises income generating activities or small scale entrepreneurship such as beekeeping, fish farming, butterfly farming, and eco-tourism, selling of tree seedlings and other non-wood forest products within or outside nature reserve, hired labour, food venders etc.

MNRT (2009) reported that, some of households used to practice fish farming for income generation as well as household food. SDC (2013) posited that, fish farming is carried out in the district as one of reliable source of income especially in the upper land by individual farmers, groups, schools and NGO's. Furthermore, MNRT (2009) reported that, NTFPs such as mush rooms, wild fruits and vegetables are available in CNR and highly promoted. However, the author lamented that, poor marketing channels have hampered the developing of the industry. MNRT (2008) reported that, CNR have high potential of eco-tourism. CNR (2012) reported that, there a number of excellent hiking trails through the forest reserve. Currently two camping sites have been established to allow camping. Entrance fees are charged per head per day as camping and orienteering fee.

Mensah *et al.* (2013) suggested that, unlike conventional tourism, ecotourism thrives in relatively untouched natural environments commonly found in rural areas and does not make huge demands on investments in facilities and infrastructure. It was reported from focus group discussion and participatory rural appraisal that, there is an agreement between villages and management of CNR on distribution of benefits accrued from eco-tourisms. The study findings revealed that households in the study area are practicing other business apart from those related to natural resources such as small shops, tea cafes, and hotels/restaurants, crushing/quarrying and selling of gravels, small scale credits association such as SACCOS, VICOBA were also reported in the FGD and PRA. This implies the existence of other opportunities to generate income in an environmental friendly manner among the households in the study area. Capacity building on these coping strategies is important for better and big results.

Plate 4: Women in one of the study village quarrying/crushing the rocks

4.3.4 Alternative source of energy and construction materials to firewood and timber

The results reveled that 10.3% of household respondents mentioned alternative source of energy and energy server stoves and construction materials (Table 16). Alternatively to restricted benefits from CNR, people forced to purchase timber from other sources such as individual woodlots or from small scale forest products venders within the villages. Also, the study found that, people in the study area have shifted from using indigenous tree species for fire wood and construction to the planted tree (exotic) species previously termed as inferior due to their lower calorific and durability value. However, since the income poverty is a big problem in the study area, most of household have quitted from house construction, furniture making and wood working in general. Moreover, the study findings revealed that, alternative sources of energy as well as economic energy technologies are hardly used in the study area. According to the respondents, the study revealed that, estimated firewood consumption at household in the study area is one head-load per 3 – 4 days (10 head-loads per Month = $1m^3$). Firewood is sold within the villages in the study area at the price of 2000/=TZS and 3000/= TZS x 10 = 25,000TZS.

These findings concurred with those of Ishengoma and Ngaga (2000); Mwihava (2010) who reported that, the overall purchase capacity in rural areas is very low and energy issues are in most cases given low priority when ranked with other needs. The authors posited that, in rural areas, about 90% of the households use traditional tree stoves with no thermal efficiency. Ishengoma and Ngaga (2000) argue that, wood fuel is forecasted to increase partially due to unavailability of appropriate alternative sources of energy both physically and financially. The authors suggested that, reduction of fuel wood supplies has significantly increased costs of living and has influenced women and children spend more of their productive time in fuel wood gathering. MNRT (2008) reported the following problems; inadequate alternative source of income, inadequate supply of firewood, over dependency on the nature reserve to earn their living and inadequate knowledge on the conservation of biodiversity resources.

Furthermore, Yanda (2010) suggested that, increased poverty among rural and urban communities significantly exacerbate energy scarcity due to the inability of most rural communities to adopt alternative energy sources. Mwihava (2010) reported that, biomass meet 90% of energy needs; 96% cooking needs of rural population. The author posited that, even if alternatives are provided, additional issues may arise from fact that many people will not be able to afford the costs of the alternatives. Joroge *et al.* (2011) argue that, Socio-economic value of forests can be recognized where wood for fuel and other uses are harvested from man-made forests, while natural forests are protected. The findings revealed that, although the household respondents reported the alternative energy source as well as using energy saver stoves but very few are practicing the options. Ishengoma and Ngaga (2000) argue that, the competitive nature of wood fuel markets in Tanzania appears to play a major role in the levels of consumption. For example, most of the charcoal used is coming from un-reserved natural forests whose area is diminishing

fairly fast. The author suggested that, this makes the environmental impact high especially in locations serving charcoal from catchment areas close to urban centers. These observations imply that, there is no application of an alternative source of energy apart from firewood, also, economic energy stoves are not used as they are highly costing compared to the people's income. Capacity building is highly needed on these as well as alternative activities to generate income so as to stop forest dependency for energy.

4.3.5 Illegal exploitation of natural resources

The results revealed illegal exploitation of natural resources from CNR for livelihood sustenance as reported by 2.5% of the household respondents (Table 16). The study findings revealed that, some people in study area exploited various benefits from CNR illegally. For example, respondents mentioned illegal timber harvesting, green firewood collection, grazing, and mining. The results concurred with those of MNRT (2008); CNR (2012) and TFS (2013). MNRT (2008) reported that, some of households in the study area involved themselves in illegal harvesting of timber of valuable tree species regarded by local communities as a means to earn their living. The author continued that, the recent problem of illegal mining along river banks pollutes water by chemicals used during mining. CNR (2012) posited that, among the nature reserve facts was the threats on forest fire, illegal tree felling and illegal gold mining (Plate 5).

Plate 5: Illegal wood working in Kambeni village

However, TFS (2013) suggested that, low awareness among forest stakeholders on forest policy and law has resulted into illegal forest activities such as forest fires, forest encroachments, illegal logging and trade of forest products, overgrazing and mining in forest reserves. This implies that, illegal activities in CNR are still practiced although the reserve has changed its status. Real involvement of adjacent communities through JFM is a vital to stop the illegal actions as these are done by communities themselves.

4.3.6 Challenges facing adopted coping strategies

According to the respondents, adopted coping strategies in the study area are faced with the following challenges; costs in agricultural inputs, costs involving equipments and inputs for tree seedlings production and planting, costs involving training and awareness rising to enable adoption of legal and friendly coping strategies, costs involving improvement of social service infrastructures.

4.3.7 Potentials from each adopted coping strategies

Adopted coping strategies expected to increase commercial agricultural productivity, tree seedlings production and tree planting, improve social services and reduce illegal activities in all environmental sensitive areas.

4.4 Perception of local communities on nature reserves' impacts

The section presents and discusses the perception of local communities towards the socio-economic impact (well-being) brought about by upgraded CNR to its adjacent local communities with respect to their socio-economic factors. Socio-economic factors here refer to income, distance from homestead to CNR, activities (occupations), household size (number of family members), age, education level, social classes and sex which were used as an independent variables influencing well-being livelihoods in Logistic Regression model. Table 18 presents logistic regression results of socio-economic factors influencing the perceptions of local communities on livelihoods impacts of upgraded CNR to adjacent communities in the study area.

4.4.1 Socio-economic factors enhancing the well-being impact of CNR to its adjacent local communities

Table 18: Socio-economic factors enhancing or constraining livelihood impact of CNR to adjacent communities

Variables (X_i)	β	S.E	Wald	Df	Sig	Exp (B)	95% C.I	
							Lower	Upper
Sex	-0.324	0.423	0.587	1	0.0444**	0.723	0.316	1.656
Land owning	0.927	0.571	2.633	1	0.0105**	2.526	0.825	7.739
Education	-1.146	0.674	2.893	1	0.0089*	0.318	0.085	1.191
Age	-0.405	0.412	0.967	1	0.0325**	0.667	0.298	1.495
Members	-0.454	0.427	1.133	1	0.0287**	0.635	0.275	1.466
Activities	-0.134	0.617	0.047	1	0.0828***	0.874	0.261	2.93
Distance	0.453	0.436	1.079	1	0.00299*	1.574	0.669	3.702
Income	0.899	0.445	3.077	1	0.0043*	2.456	1.027	5.877
Constant	0.169	0.491	0.118	1	0.0732	1.184	-	-
Tests:			χ^2	df	P			
Model evaluation			145.029	8	0.001			
H-L statistic			6.521	8	0.589			

*** Statistically significant at α = 0.1
** Statistically significant at α = 0.05
* Statistically significant at α = 0.01
Notes: Cox & Snell R^2: 0.116; Negelkerke R^2: 0.157; Sample size used in the analysis (n) = 120.

The results show further that the model performance is statistically significant (χ^2 (8 d.f) = 145.029, $p < 0.01$). The inferential test for goodness – of- fit, the Hosmer & Lemeshow (H-L) statistic, indicates that the model fits the data well (χ^2 (8 d.f) = 6.521, $p > 0.05$). The descriptive measures of goodness- of-fit also supports that the model fits the data well (Cox & Snell $R^2 = 0.116$ and Negelkerke $R^2 = 0.157$).

The descriptors which are statistically significant enhancing the livelihoods and conservation impacts of CNR are:- distance from household to CNR ($p < 0.01$), income ($p < 0.01$), land owning ($p < 0.05$) and education ($p < 0.01$).

4.4.1.1 Distance from household to CNR

Table 18 indicated that, the distance from the household to CNR is significant enhancing the livelihoods of the adjacent communities at ($P < 0.01$) and positive regression coefficient $+\beta$ as it was expected. The study revealed that the positive relationship between distance and effectiveness impact of CNR has mainly emanated from closeness of the local community to the boundaries of Nature Reserve which indicates that their livelihoods and the health of Nature Reserve have close relationship (4.1.6). The study revealed that, communities adjacent to CNR are recognized as key stakeholders in management and protection of the reserve and thus, they have high advantages to access benefits accrued from reserve and conserve them for sustainable well-being livelihood compared to those who are far away.

The result is supported by TFS (2013). The author revealed that, local people or the local community who live in within or directly next to forests are the primary target group for JFM. Their historical relationship with the forest and their practical proximity makes them the logical group of citizens best able to keep sustained and effective management role over the forest.

According to Sapkota and Oden (2008) the distance and time to reach particular forest resources impose a natural limit on how much the adjacent local communities can extract at any one time and possibly over all time. Logically, increased distance from homestead to the forests increases transaction costs of resource collection and vise versa (Fisher and Shively, 2005). The increase the distance to the source of resources, the higher the costs of obtaining the forest and non-forest products, and the fall the net benefits, and thus, reducing incentives to engage in forest activities (Fisher and Shively, 2005). Communities being adjacent to CNR have significant role to play in the management of the reserve. However, the involvement of local communities is still passive: a situation which renders inadequate participation in the management through instruments to facilitate community participation does exist.

However, Masozera (2002) argues that, households near the Nature Reserve who have hard time to meet their basic survival needs are unlikely to care for conservation. This is because the needs of local communities living around the protected areas are not recognized; protected area managers have relied upon law enforcement approaches to resolve problems associated with local people. However, the success is very limited, for that case, Masozera (2002) suggested that, understanding the dependency and conservation attitudes of local people towards protected areas surrounding them is of great important to formulate new or modify existing conservation strategies. This implies that, there is a close relationship between distance and local community dependency on forest resources for both conservation and utilization, a unit decrease in a distance from homestead to the Nature reserve boundaries increases the local community dependency on forest resources and thus, they are responsible for resources' management and protection and vice versa. Government and non-governmental actors should create awareness on sustainable forest management among communities adjacent to forests.

4.4.1.2 Income

The increase in income of the household respondents is significantly ($p < 0.01$) enhancing the livelihoods impact as the Table 18 shows income at household level has positive regression coefficient ($+\beta$). The positive relationship between income of the household respondents and effectiveness of upgrading CNR has mainly emanated from increased household income although not in a promising extent from other sources apart from extraction of forest resources in restricted CNR (4.1.1.4). This is because restricted access into CNR has forced and encouraged the communities in the study area to change their attitude from depending on CNR and concentrating much on on-farm and friendly off-farm activities as the coping strategies for income generation so as to meet their basic needs (Table 16). The study findings revealed that there is a gradual increase in income at the household since CNR was upgraded.

The results concurred with Gunatilake (1998) who observed that, involvement of communities in non-forestry and off-farm employment, increased agricultural income due to higher agricultural productivity and possibly the incorporation of local communities into the outside markets can reduce dependency on forest resources. This is supported by Anderton (2000) and Ishengoma and Ngaga (2000) who posited that, there is a fall in demand when consumers react to an increase in their income by purchasing products which are perceived to be of better quality (switch from firewood to gas/electricity or timber for construction to metal or iron material). Again, restriction in supply of forest products from Nature Reserve leads to a price rise and thus, leads to a fall in demand for forest products and switch for coping strategies. However, Ishengoma and Ngaga (2000) lamented that, high prices of these alternative energy sources have been a restrictive hindrance to their effective use by rural communities. According to Barham *et al.* (2010) the average household income determines the level of dependency and access to forest

resources in nature reserve. This implies that, the communities adjacent to CNR can increase income from alternative friendly sources as well as when are incorporated into outside markets rather than depending on extraction of forest products. Therefore, the adjacent communities to CNR should be capacitated in improving alternative coping strategies such as on-farm and nature-activities entrepreneurships.

4.4.1.3 Wealth category (Land ownership)

Land ownership by the household respondents was found positively regression coefficient (+β) and statistically significant influencing the livelihoods impact from CNR at ($P < 0.05$) (Table 18). Wealth status among the communities in the study area was categorized with respect to the assets owned at the household, whereby the household owning a big number or size of animate and inanimate assets recognized wealthier in the study area. The study findings revealed that, inanimate assets particularly land ownership was identified as highly recognized wealth value whereby majority had less than 1 ha of land and very few own more than 2 ha (Figure 3). The household owning a big size of land perceived as a wealthier compared to others and vice versa (4.1.1.1). This is supported by Kijazi (2007) who posited that wealth is associated with farm size whereby a household with large farm is relatively withier.

The positive relationship between wealth category and effectiveness of livelihoods and conservation impact of CNR emanated from the fact that majority of the household respondents were poor and characterized with very small or without land for production but together with their highly dependency on benefits accrued from CNR although were inaccessible, majority were just used as labour force to remove harvested timber from the forest to landing sites or stores for small amount of money paid as wages sometimes illegally.

This increases the odds of household members to engage themselves and improve on-farm activities particularly in ginger production and friendly off-farm activities such as nature–activities (fish farming, beekeeping, ecotourism etc), others are hired labour, quarrying, restaurant and establishment of community credits association e.g. VICOBA and SACCOSS as a coping strategy to earn more income to meet basic needs such as food, school fees and so on. However, Masozera (2002) argued that, families with more land are likely to earn more income from their own land and therefore, depend less on forest resources from reserve at the same time creating employment opportunities to others. Thus, land size is expected to be inversely related to forest dependency. Also, this was observed during PRA whereby agriculture activities were ranked the first as an impact of upgraded CNR (Appendix 8). This implies that, although most of households in the study area are having small size of land or without were used as unskilled labour during exploitation of timber in CNR, have changed and designed to promote commercial agriculture activities especially production of ginger and vegetables as well as other friendly off-farm activities for income generation and food production. Therefore, more support needed to boost the efforts of adjacent communities related to the practiced coping strategies as well as awareness on land ownership in the study area.

4.4.2 Socio-economic factors constraining well-being impact of CNR to its adjacent local communities

4.4.2.1 Education level

Education level of household respondents was indicated negatively regression coefficient ($-\beta$) correlated with the effectiveness of livelihood impact from CNR although was found statistically significant at ($P < 0.01$) (Table 18). The results revealed that, education (Figure 5) in the study area is ineffectively utilized in the essence of wise use of natural resources particularly in CNR.

This suggests that, although literacy levels the communities having in the study area, the livelihoods and conservation are constrained as people decide to quit from their traditional activities in assumption of acquiring better job than agriculture or other activities related to conservation.

The results concurred with Masozera (2002) and Andrade *et al.* (2012). Masozera reported that, high educated people have greater off-farm employment opportunities than the less educated people. In general education opens up diverse and better employment opportunities. As such people tend to move away from subsistence agricultural and gathering activities. The authors hypothesized that, forest dependency is inversely related to the education level of the members of the family. On contrary, Andrade *et al.* (2012) reported that, there is some evidence suggesting that local communities are more likely to comply and to commit themselves to long-term conservation strategies when their knowledge and opinions are incorporated into Nature Reserve decision-making processes. The findings imply that, as much as literacy level increases through modern knowledge, people tend to quits from indigenous knowledge as well as traditional activities such as on-farm and gathering activities related to conservation of natural resources. However, if the knowledge weather modern or indigenous incorporated in conservation and wise use of natural resources can play a big role in improving the livelihoods. It is vital that resource wealth is used not just to lift people out of poverty today, but to finance the investments in human capital needed to create hope for future generations (APP, 2013). Therefore, mainstreaming of indigenous knowledge with modern is a vital for sustainable management and wise use of benefits from CNR.

4.4.2.2 Household size

Household size indicated with negative regression coefficient (–β) of -0.454 as predicted (Table 18).

This means that increase in the household size increases the high dependency on forest resources and other natural resources thus, increased odds of encroachment for illegal exploitation of timbers and other natural resources to supplement the income needs. Although there is a statistically significant ($P < 0.05$), the negative correlation suggests that increase in the household size (Table 8) tend to decrease the health of nature reserve but the variable (Table 18). The study revealed that, household with large family members has a negative impact to the forest health and thus, constrain livelihood and conservation of resources. The larger the household size the higher the demand for resources while the opportunities to increase resources are limited thus making them vulnerable to environmental degradation.

The results concurred with those of Kingazi (2002); Gutanilake (1998); Masozera (2002); and SDC (2013). Kingazi (2002) reported that the estimated household size was 6.3 members which reflected high population pressure in the highland areas around the forest reserve. Moreover, Gutanilake (1998) reported that, families with more labour tend to extract more forest resources. The authors suggest that large families require more resources to meet their subsistence needs, therefore, have a higher prosperity to extract resources from the reserve. This implies that, there is clear evidence that, increase in population rate increases forest dependency for the basic needs around the Nature Reserve and thus, a threat to conservation and livelihood well-being. Well-designed social welfare programmes can protect vulnerable households from shocks, support health and education, and contribute directly to economic growth.

4.4.2.3 Age

Table 18 shows that age of household respondents have negative coefficient regression ($-\beta$) as predicted at (-0.405) constrain the livelihoods impact of adjacent communities as

well as nature reserve. However, the variable is statistically significant at ($P < 0.05$). The negative correlation between age of the household head and effectiveness of improved livelihoods impact from CNR emanated from the fact that previously household headed by elders with age above 56 years (Table 7) were included in conservation and uses of natural resources, forests in particular. Recently, the odds of the household headed elders to participate in decision-making on conservation and uses of natural resources in the study area have decreased as in the most cases the elders are not involved in decision making.

The results concurred with Masozera (2002) who reported that, age is an important variable in determining forest dependency. Forest dependent activities in protected forests are labour intensive because people have to walk a long distance to reach and search for forest resources. The author suggested that forest dependent activities are often prohibited in protected forests, therefore, elderly people may not take a risk of going into the forest to do illegal activities.

Therefore, forest dependency is inversely related to the age. These observations imply that the majority of household respondents in the study area belong to the most potential and active age groups in decision making as well as in the production aspects and are the ones who are risk takers, thus, threaten the health of nature reserve as well as well-being livelihood in the study area. Therefore, modern and indigenous knowledge as well as experience in conservation of biodiversity and watershed management need to be induced among all stakeholders in the area concerned by involving all age groups potential in harmonizing the sustainable forest management for sustainable economic development.

4.4.2.4 Sex of household head

Sex of the household respondent found to be negatively correlated to the effectiveness of socio-economic well-being impact of upgraded CNR as it was expected with regression coefficient (-β) of -0.324 (Table 18). The study reveals that, female headed household have difficulty in obtaining benefits from CNR than the male headed household (4.1.2). Again, the results reveals that, male headed households significantly participated more in diverse forest activities and other socio-economic activities that insure socio-economic well-being at household than female headed households which participate mostly in on-farm activities. Masozera (2002) reported that, nature collection and use of forest resources depend on the sex of the individual. For example, men carry out activities such as hunting, and mining. The author continued that, collection of wild vegetable and thatching grass is exclusively carried out by women. Furthermore, the author suggested that, cultivation and firewood collection are joint collection. MNRT (2008) suggested that, forest contribution, demands and preferences can be different even at individual household level. For instance, while a key priority for women is firewood for cooking, heating and non-wood products, men are more in need of wood products like timber and building materials. Moreover, the author continue that, because forest dependent activities are labour intensive and prohibited in the nature reserve, men are more likely to take the risk relative to women to enter the forest. Furthermore, Women and children walk too long distances in search for fuel wood. Some families have even changed their cooking habits by cooking fewer meals, cook light foods, to serve fuel wood, thus, affecting their health and the labour force to other productive ventures. These findings imply that, between two sexes one (female) is vulnerable not only to effectively access benefits accrued in nature reserve but also in the coping strategies, and thus, household with males headed have a greater dependency on forest than households with females headed. Therefore, gender mainstreaming is of great importance in order to achieve sustainable forest management for sustainable socio-economic development.

4.4.2.5 Occupations

Table 18 shows that occupations has a negative regression coefficient (-β) of -0.134 as predicted. This means that, ineffectiveness and inefficiency of activities conducted by household (on-farm and off-farm activities) as the coping strategies (Table 16) for not accessing nature reserve increases the odds of encroachment to nature reserve while the effect was not statistically significant. The study revealed that, shifting from forest dependency to on-farm or off-farm activities (4.3), haven't yet give the big change as the household respondents realized low returns from those activities, thus they fail to meet their basic needs including benefits not accessible in CNR.

The results concurred with SDC (2013) reported that, the majority of the rural populations are small scale farmers and agro-pastoralist, their semi traditional farming system is characterized by low use of farm inputs. Therefore, the agricultural production is technically below the average obtainable levels leading to poor crop yielding making the forest vulnerable to encroachment and illegal exploitation of valuable timber tree species which regarded by local communities as a means to earn their living. However, Gunatilake (1998) suggested that, involvement in non-farm and non-forestry employment, higher agriculture productivity, higher agriculture income and possibly the incorporation of local communities into the outside markets can reduce dependency on forest resources extraction of forest resources and vice versa. The author posited that people from farm-dependent villages depend less on forest resources. Thus, the forest dependency is inversely related to on-farm and off-farm activities.

APP (2014) argued that Africa's farmers and fishers are equal to the challenge, but they need the opportunities, African governments must now scale up the appropriate infrastructure and ensure that financial systems are accessible for all. The author posited

that, when farmers access finance: credit, savings, and insurance, they can insure themselves against risks such as drought and invest more effectively in better seeds, fertilizers and pest control. With access to decent roads and storage, farmers can get their harvests to market before they rot in the fields. This implies that productivity from occupations conducted by the community after being restricted from CNR is not enough. Activities which are allowed in CNR as the coping strategies are not seriously undertaken and thus, they are of less beneficial to livelihoods. Again, although agriculture is practiced by the majority of households and referred as national economic backbone, it has not given priority as far as economic growth is concern. Therefore, government through TFS should make sure that all key stakeholders and actors get together to support the adjacent communities through capacity building so as to improve agriculture production and other environmental friendly activities carried out as coping strategies.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

5.1 Conclusions

This study concludes that, more than half of household respondents (52.5%) responded that, water, firewood, and NTFPs are the benefits accrued and accessible. Water is obtained unconditionally, whereas, firewood and some of NWFPs (e.g. traditional medicines) need special permits and conditions from relevant authorities. On the other hand, 43.3% of household respondents bear the costs for not accessing forest resources accrued in CNR: 56.7% specified the costs as: high price to purchase forest produces from other sources, long walk distance to obtain the said forest produces, inadequate supply of good quality timber and firewood of high calorific value, high rate of firewood consumption due to the low calorific value, illegal activities in CNR and other sensitive areas such as rivers and so on. As a result, management of CNR under TFS faced with threats of encroachment for illegal timber harvesting, and other illegal activities and thus, bear almost all costs of managing and protecting the reserve.

Furthermore, the study findings revealed that, the costs or stresses for not accessing restricted CNR, had led the adjacent communities into coping strategies whereby 40% of household respondents mentioned agriculture for food and commercial (ginger and vegetable crops was adopted as an alternative source of income), 29.2% mentioned tree planting for conservation, forest products and commercial, 14.2% mentioned off-farm activities (such as hired labour, quarrying, shops, food venders (restaurant), beekeeping and fish farming, establishment of community credit organizations such as VICOBA and SACCOSs so as to reduce income poverty), 10.3% mentioned alternative source of energy and energy server stoves and construction materials, and 2.5% mentioned illegal

exploration of natural resources. Although in a decreasing rate and the people around CNR still characteristically poor, the household income has increased (35,929TZS to 41,500TZS per month) from the adopted coping strategies.

Lastly the study concludes that, socio-economic variables which are; distance from homestead to CNR ($p < 0.01$), income of households ($p < 0.01$) and land ownership ($p < 0.05$) were perceived statistically significant enhancing the livelihoods and conservation of CNR. However, other variables which are; sex, education, age, household size and occupations were perceived constraining the livelihoods and conservation of upgraded CNR.

5.2 Recommendations

In order to enhance net benefits for both conservation of CNR and livelihoods, it is recommended that government (TFS in particular) in collaboration with other stakeholders should strongly involving communities in management of CNR. Also, a guideline by the government on responsibilities to be undertaken by the communities with expected benefits from CNR should be operationalized although it was not established in a participatory manner.

Also, so as to enhance long-term economic development and biodiversity conservation, it is important to understand how people use natural resources in their area and factors affecting this use including their adopted coping strategies. Again, the government should seek the mechanism from international conventional to compensate financially as a payment for environmental services. These funds will help the government to empower local communities in improving identified friendly coping strategies for economic growth, improved livelihoods and conservation of nature reserves for sustainable development.

Socio-economic variables: distance from households, income and land ownership which perceived to enhance the livelihoods and conservation should be improved and variables which constrain should be considered and internalized accordingly in the strategic management planning for socio-economic well-being and conservation of CNR for sustainable development.

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APPENDICES

Appendix 1: Questionnaire for household
Name of Enumerator: .....

A. BASIC INFORMATION
1. Village name: .....

2. Ward name: .....

3. Division name: .....

4. District name: .....

5. Household ID No: .....Date.....

6. Household head): Sex: Codes: (1= Male; 2=Female) .....

7. Age: .....Years

8. Ethnic group: .....

B. DEMOGRAPHIC INFORMATION
9. How many are you in your household?

Members & Age	Male	Female	Relation to HH	Education level	Total
< 15 years					
15- 45 years					
46- 60 years					
>61					

Codes for education level: 1= Illiterate; 2= Primary; 3= Secondary; 4= College; 5= University

10. For how long have you lived in this area?
Codes: (1= >5 yrs; 2= 5-10yrs; 3= <10yrs)

C. SOCIO-ECONOMIC STATUS
10. What are your occupations? Codes: (1= farming, 2= livestock keeping, 3= Trade- specify, 4= Other- specify).....

11. Is your current occupation (s) related to Chome nature reserve? Codes: (0 = No; 1 = Yes)

12. If yes, what are those occupations? i)..... ii).....iii).....

13. How much do these occupations contribute to your household income? i).....ii).....iii).....

14. Can you please mention types of your household asset?
Animate: i).....ii).....iii).....
iv).....v).....vi).....

Inanimate: i).....ii).....iii).....

15. How big is the size of your land?
Codes: (1= < 5acres; 2= 5-10 acres; 3= > 10acres)

16. How did you obtain your land (land tenure)?
Codes: (1= inherited, 2= allocated by village council, 3= Bought, 4= Rented, 5= Borrowed, 6= Others- specify)

17. How do you use your land?
Codes: (0= None; 1= Farming; 2= Grazing, 3= Tree Planting; 4= Others (specify)...

18. What main crops do you grow and what was the average production (kgs) in 5 years back (2009/2013?

Crop										
Kgs										

19. Which crops produced was for either commercial or food consumption (2009/2013)?

Year	Crop	Food consumption (indicate if purchased)	Quantity (Kg)	Commercial	Quantity (Kg) & Price (TZS)
2009					
2010					
2011					
2012					

20. Livestock keeping in 2009/2013

Year	Type	Number	Grazing place	Type of grazing	Sold number	Price	Revenue
2009	Cattle						
	Goat						
	Sheep						
	Pig						
	Chicken						
	Bees (beehives)						
	Others (specify)						
2010	Cattle						
	Goat						
	Sheep						
	Pig						
	Chicken						
	Bees (beehives)						
	Others (specify)						
2011	Cattle						
	Goat						
	Sheep						
	Pig						
	Chicken						
	Bees (beehives)						
	Others (specify)						
2012	Cattle						
	Goat						
	Sheep						
	Pig						
	Chicken						
	Bees (beehives)						
	Others (specify)						
2013	Cattle						
	Goat						
	Sheep						
	Pig						
	Chicken						
	Bees (beehives)						
	Others (specify)						

21. How is division of labour in your household (main activities)?
Men: i).....ii).....iii).....
Women: i).....ii).....iii).....
Children: i).....ii).....iii).....

22. i) Are you involved in community decision making? Codes: (1= Yes, 2= No)
ii) If yes, how? .....
iii) If no, why? .....

23. How do you get information concerning your village? Codes: 1= Suggestion box: 2= Meetings: 3= No

24. How do you contribute your opinions or advice concerning the village development? Codes: (1= Suggestion box, 2= Meetings, 3= No)

25. If the answer on Q.24 is No; why? .....

D. The costs and benefits of CNR to its adjacent local communities

26. i) Are you aware of legal status change from Chome catchment to Nature reserve? Codes: 1= Yes; 2= No.

ii) If yes, how did you become aware? .....
iii) If No, why? .....

27. What is the difference between the two managements since changes has taken place? .....

28. How far is your homestead from Chome nature reserve? Code: 1= > 5km; 2= 5- 10 km; 3= < 10km)

29. i) How is Chome Nature Reserve used in your surrounding community? Codes: 1= Over-exploited; 2= Friendly and sustainable; 3 Others (mention). i)..... ii) .....
iii).....

30. What are socio-economic benefits accrued from the natural forests?

Products/Services	During Chome Catchment FR				Chome Nature Reserve			
	Prod/Ser	Qty/Mon	Obtain	Price	Prod/Ser	Qty/Mon	Obtain	Price

31. i) Are you accessing the benefits accrued from CNR? Codes: (1=Yes, 2= No)
ii) If the answer for Q30 (i) is yes, how do these benefits obtained? .....
iii) Which of these benefits are obtained for the basic needs?
a) Tangible benefits: i).....ii)..... iii).....
b) Intangible benefits: i).....ii)..... iii).....

iv) How can these benefits being measured in monetary terms?
a) Tangible benefits: i).....ii).....iii).....
b) Intangible benefits: i).....ii).....iii).....

v) Where do these benefits allowed in CNR? Codes: (1= Inside: 2=Buffer zone: 3= Outside)

32. If the answer for Q 30 (i) is no, where else do you get those benefits apart from CNR?
i).....ii).....iii).....

33. Can you please explain what is the cost to obtain the benefits outside Chome Nature Reserve (in monetary term)?
a) Tangible benefits: i).....ii).....iii).....
b) Intangible benefits: i).....ii).....iii).....

34. i) Are you involved in management of Chome Nature Reserve? Code: (0= No. 1= Yes)
ii) If the answer is yes, how? .....
iii) If the answer is no, why? .....
iv) What are the costs do you think can be incurred in managing CNR (in monetary term)? .....

35. i) Are you aware that there is a cost-benefit sharing related to CNR management? Codes: (1= Yes; 2= No)
ii) If yes, how do local communities involved in cost-benefits? .....
iii) If no, why? .....
iv) What do you think can be the best cost-benefit sharing mechanism (s) that can be developed on CNR and local communities can appreciate? .....

36. i) How does Chome Nature Reserve impact on local people's livelihoods? Codes: (1= Improvement; 0= detriment)
ii) If the answer is improvement, how?
Social: .....
Economical: .....
Cultural: .....
iii) If the answer in is detriment, how?
Social: .....
Economical: .....
Cultural: .....

37. i) How is the status of Environment in your entire community? Codes: (1= Improved; 2= Degraded)
If improved, how? .....
If degraded, how? .....
ii) Is there any Institution Program of managing the natural resources in your village or community? Codes: (1= Yes; 2= No)
iii) If yes, mention them.....
iv) How do you participate to the program in conserving the natural resources such as water, forest, wildlife etc? .....
v) How does these Institution Program connected to CNR? .....

38. i) Is there any conflict (s) in your village related to CNR? Codes: (1= Yes; 2= No)
If yes, what are they? Socially: .....
Economically: .....
Culturally: .....

If no, how? .....
ii) How do you resolve the identified conflicts in your villages? .....

iii) I s the way of resolving the identified conflicts effective? Codes: (1= Yes; 2= No)
If yes, how? .....
iv) If no, why? .....
v) What do you think is the best way of resolving the identified conflicts for sustainable Forest Management? i).....ii).....
iii).....

D. Copying strategies for not accessing CNR

39. Does the changes in the legal status from Chome catchment reserve to nature reserve has led to total ban of all human activities within and around NR? Codes: (1= Yes; 2= No) If the answer is yes, what are those activities? .....

If the answer is no, can you please, explain the difference between normal catchment forest reserve and nature reserve?.....

40. Does these changes cause any stress/impacts to local communities? Codes: (1=Yes; 2=No)
i) If yes, what are these stresses and how caused? .....

ii) If no, how do you manage your life without accessing CNR? .....
iii) From Q 40 (i), how do you cope with the situation to remove those stresses/impacts?
iv) What do you think are the best coping strategies that can be adopted for sustainable socio- economic development as well as biodiversity conservation? .....

v) Can you please, explain the costs and benefits of each of the best coping strategies to be adopted? .....

41. How can you measure the costs and benefits of these coping strategies (in monetary terms)? .....
42. How can these coping strategies influence socio-economic impacts and distribution of socio-economic well-being among different groups.....

43.i) How do you use your surrounding natural resources? .....

ii) What are the driving forces for the use of these natural resources? .....

44. What is the overall income per month in your household in the absence of CNR accessibility? .....

45. Does this income differ from that obtained before you were abandoned from CNR? Codes: (1= Yes; 2= No) If yes, how? .....

46. Is there any resources development activities in or outside nature reserve practiced by local communities or outsiders so as to resolve financial problems? Codes: (1=Yes: 2=No) If yes, what are they? .....

If no, what opportunities are available in or outside CNR for resources development that can create environmental friendly industries with huge benefits for local communities and CNR? i).....ii).....iii).....

E. Perceptions of adjacent local communities on nature reserve

47. i) It is said that, values and perceptions of nature reserves are not static with circumstances, how can you determine the values of nature reserve in your study area or community? Indirect economic benefits .....

Directly economic benefits .....

ii) Can you please, explain how these benefits originated and their responsible actors?

Indirect economic benefits: .....
Directly economic benefits: .....

48. What are the socio-economic impacts from nature reserve?
Positives: i).....ii).....iii).....

Negatives: i).....ii).....iii).....

49. How might those impacts be valued in the context of community attitudes?
i).....ii).....iii).....

50. How important are the socio-economic impacts of the nature reserve likely to be?
Positives: i).....ii).....iii).....
Negatives: i).....ii).....iii).....

51. What are your suggestions on the best way of facing these impacts?
i)..... ii).....iii).....

52. What are your opinions on the management of CNR?
i).....ii).....iii).....

53. What are your recommendations on the distribution of benefits accrued and costs to be incurred to CNR among the key adjacent stakeholders?
Benefits: i).....ii).....iii).....
Costs: i).....ii).....iii).....

Appendix 2: Checklist for key informants (experts)
A. Identification variables
Date of Interview: .....

Title of Respondent: .....

Sex of Respondent: .....
Organization: .....

B. Socio-economic status

1. What is the present livelihood situation of local communities adjacent to CNR?
Socially: .....
Economically: .....
Culturally: .....

2. How does the status change of catchment/normal forest reserve to a nature reserve impacts socio-economic of adjacent local communities?
Positive impact: i).....ii)..... iii).....

Negative impacts: i).....ii)..... iii).....
3. What is the history of the change in legal status of Chome Nature Reserve from normal Catchment Forest Reserve? .....

4. i) Based on institutional framework, how CNR does differs from Chome Catchment Forest Reserve? .....
ii) Are the local communities involved in management of CNR? Codes: (1= Yes; 2= No)
If yes, how? .....

If no, why? .....

iii) What are the challenges do you face in collaborative management of CNR?
.....

iv)What are the management strategies established to overcome the identified challenges?
.....

5. How Chome Nature Reserve can improve the socio-economic well- being of the adjacent loca communities? .....
6. i) Is there any cost-benefit sharing mechanism in the respect of collaborative management of CNR? Codes: (1= Yes; 2= No) If the answer is yes, can you please tell us
.....
ii) How effective is the cost-benefit sharing mechanism? .....
iii) If the answer is no, how does the adjacent local communities benefits from CNR?
.....

C. Copying strategies for not accessing CNR

7. i) Is the legal change of CNR avoids an accessibility of local community into NR? Codes: (1= Yes; 2= No)

ii) If yes, what are the differences in adaptations in local communities for not accessing CNR? .....

iii) What are the copying strategies established for the local communities for not accessing CNR? .....

iv) If no, what benefits accrued from CNR are accessible by local communities? .....

v) What is present level of services in the community from nature reserve? .....

8. How can the copying strategies influence the socio-economic impacts to local communities? .....

9. What is the current distribution of socio-economic well-being among the different groups? .....

10. i) Is there any resources development activities in or outside nature reserve practiced by local communities or outsiders so as to resolve financial problems? Codes: (1=Yes; 2=No)

ii) If yes, what are they? .....

iii) If no, what opportunities available in or outside CNR for resources development that can create environmental friendly industries with huge benefits for local communities and CNR? i).....ii).....
iii).....

11. i) What are the local communities' use of natural resources in the area? .....

ii) What are driving forces that affect this use and their responses to the inaccessibility to CNR? .....

D. Perceptions on Chome nature reserve

12. What is your opinions regarding management of the Chome nature reserve?
i).....ii).....iii).....

13. What are the socio-economic impacts from nature reserve?
Negatives: i).....ii).....iii).....

Positives: i).....ii).....iii).....

14. How do these impacts are evaluated in the context of community attitudes to nature reserve? .....

15. What are your recommendations on the management of CNR in relation to livelihoods of its adjacent local communities? i)..... ii)..... iii).....

Appendix 3: Checklist survey for NGOs/CBOs dealing with environmental issues

A. Identification variables

Date of Interview: .....

Title of Respondent: .....

Sex of Respondent: .....

NGO/CBO.....

B. Socio-economic status

1. What are the main objectives of your project?

i).....ii).....iii).....

2. What activities are mainly done and their contribution to the local communities' livelihoods and management of Chome Nature Reserve? i)..... ii).....iii).....

3. What are the costs incurred by the adjacent local communities for not accessing CNR?

i).....ii).....iii).....i v).....

.....v).....vi).....

4. What are the benefits accrued from the nature reserve by the adjacent local communities to CNR? i).....ii).....iii).....

5. Does the status change from catchment/normal forest reserve to a nature reserve affect adjacent local communities? Codes: (1= Yes: 2= No)

If yes, how? i).....ii)..... iii).....

If no, how local community benefit from the CNR? i)..... ii).....iii).....

6. Are the adjacent local communities involved in the management of Chome Nature Reserve?

Codes: (0= No: 1= Yes)

7. If no, Why? i).....ii).....iii).....

8. If yes, How? i).....ii).....iii).....

C. Copying strategies for not accessing CNR

9. What are the copying strategies established for the local communities for not accessing CNR? i).....ii).....iii).....

10. What do you think are the best coping strategies that can be adopted for sustainable socio-economic development as well as biodiversity conservation? i).....ii).....iii).....

11. How can the copying strategies influence the socio-economic impacts? i).....ii).....iii).....

12. How can the copying strategies influence the distribution of socio-economic well-being among different groups? .....

13. What are present services in the community from nature reserve? i).....ii).....iii).....

14. What kind of jobs can be created by Chome Nature Reserve for the local communities? i).....ii).....iii).....

15. What are the impacts that can be brought about by identified coping strategies?
Positive impacts: i).....ii).....iii).....
Negative impacts: i).....ii).....iii).....

D. Perceptions on Chome Nature Reserve

16. What are the socio-economic impacts from Chome nature reserve?
Positive: i).....ii).....iii).....

Negatives: i).....ii).....iii).....

17. What are your opinions on the nature reserves management? i).....ii).....iii).....

10. What are your recommendations on the distribution of benefits accrued and costs to be incurred to CNR in relation to livelihoods of its adjacent local communities? i).....ii).....iii).....

Appendix 4: Checklist survey for Village Natural Resource Committees (VNRCs)
A. Identification variables
Date of Interview: .....
Title of Respondent: .....
Sex of Respondent: .....
Village: .....

B. Socio-economic status
1. Are you aware of forest regime change related to Chome nature reserve?
Codes: (0= No: 1= Yes)

2. If yes, what is the history of the change in legal status of Chome nature reserve? .....

3. What are the socio-economic impacts of the status change of catchment/normal forest reserve to a nature reserve on adjacent local communities?
i).....ii)..... iii).....

4. What are the costs incurred by the adjacent local communities for not accessing CNR?
i).....ii).....iii).....

5. What are the benefits accrued from the nature reserve by the adjacent local communities to CNR?
Tangible benefits: i).....ii).....iii).....
Intangible benefits: i).....ii).....iii).....

6. Are you involved in the management of Chome nature reserve? Codes: (0= No: 1= Yes)

8. If no, why? i).....ii).....iii).....

7.If the answer is yes, how are you involved?
i).....ii).....iii).....
10. What benefits accrued by being involved in the management of CNR?
i).....ii).....iii).....i

11. How is cost-benefit sharing mechanism in your area related to natural resources management? .....

12.What do you think is important to the quality of life in this community?
i).....ii).....iii).....
C. Copying strategies for not accessing CNR

12. What are the copying strategies established for the local communities for not accessing CNR? i).....ii).....iii).....

13. How can the copying strategies influence the socio-economic impacts?
i)..... ii).....iii).....

14. What are the best coping strategies for the local communities for not accessing CNR?
i).....ii).....iii).....

15. What kind of jobs can be created by Chome Nature Reserve for the local communities? i).....ii).....iii).....

16. What challenges can be faced by the identified coping strategies? i) .....
ii).....iii).....

D. Perceptions on Chome Nature Reserve

17. What are the socio-economic impacts of Chome nature reserve?
Positive:
i).....ii).....iii).....

Negative: i).....ii).....iii).....

18. What are your opinions on the nature reserve management? i).....
ii).....iii).....

19. What are your recommendations on the distribution of benefits accrued and costs to be incurred to CNR in relation to livelihoods of its adjacent local communities?
i).....ii).....iii).....
iv).....v).....vi).....

Appendix 5: Checklist for village council

- **Demographic information:**
  What is the size of your village?
  What is the population size?
  How many HHs are there?
  What is the population of livestock?
- **Socio-economic information:**
  What are the main social activities?
  What are the main economic activities?
  What activities related to CNR?
  What is the average income of the HH per month?
- **Regime change:**
  How did you receive changes in legal status of CNR management?
  What is the difference between CCFR and CNR management?
  What are the benefits accrued from CNR?
  Are the local communities involved in management of CNR?
  How is the local communities benefit from being involved?
  Is there any cost-benefit sharing mechanism?
  Institution program of managing natural resources in the village
  Status of VNRC in management of natural resources in village
- **Socio-economic impacts of CNR:**
  Positive and negatives ones
  Products/Services accrued from CNR

Products/Services	CCFR	How obtained	CNR	How obtained

- **Coping strategies:**
  What strategies established to resolve the stress from inaccessibility to CNR?
  What do you think are the best strategies?
  What opportunities can be identified in CNR for socio-economic development?
- **Perceptions:**
  How is the quality of life since regime change of CNR management?
  What do you consider important to the quality of life in this community?

- **Recommendations:**

Appendix 6: Checklist for focus group discussion
Regime change:

- ✓ Are you aware of legal status change of CCFR to CNR? How did you become aware?
- ✓ What is the history of the CNR?
- ✓ According to the institutional framework, how CNR and CCFR differ?

Socio-economic impact:

- ✓ How does the status change of CFR to NR impacts the socio-economic aspects of your community (Positive and Negative)?
- ✓ What do you consider important to the quality of life (e.g., clean air and water, good jobs, arts and culture, security and safety, good relations with neighbors) in this community?
- ✓ Do you think the quality of life has improved or worsened since the legal change of CNR? Why?
- ✓ Do you belong to or know of any particular group (e.g., low-income, minority, farmers, and elderly) that feels that their quality of life is disproportionately affected by CNR development in the community?

The costs and benefits of NR:

- ✓ What benefits accrued from NF?

Goods/Services	CCFR	How obtained	CNR	How obtained

- ✓ What costs do you think can be incurred in the presence of CNR (By the government and community) to ensure real benefits from CNR?
- ✓ Are you involved in management of CNR?
- ✓ How is the cost-benefit sharing mechanism in your area?

Perception on NR

- ✓ What do you predict as an ideal future for this community related to CNR?

Appendix 7: Socio-economic benefits accrued from Chome Natural Forests

Products/Services	During Chome Catchment FR				Chome Nature Reserve			
	Prod/Service	Qty/Month	How obtained	Price	Prod/Service	Qty/Mon	How obtained	Price
Timber	✓		No		✓		No	
Firewood	✓		Special permit		✓		Special permit	
NTFPs	✓		Free		✓		Special permit	
Water	✓		Free		✓		Free	
Regulated climate (e g rainfall)	✓		Free		✓		Free	
Forest soil (e g humus)	✓		Free		✓		No	
Hunting (bush meat)	✓		Free		✓		No	
Fodder	✓		Yes		✓		No	

Appendix 8: Matrix Scoring and Ranking Impacts of upgraded Chome Nature Reserve to its adjacent local communities in the study villages

Impacts	Increased agriculture	Off-farm activities	Environment improved	Forest products decreased	Income decline	Scores	Ranks
Increased agriculture		IAA IAA IAA	IAA IAA IAA	FPD FPD FPD	IAA IAA IAA	9	1
Off-farm activities			OFF OFF OFF	FPD FPD	OFF OFF OFF	6	2.5
Environment improved				EI EI EI	EI EI EI	6	2.5
Forest products decreased					ID ID	5	4
Income decline						2	5

Key:

EI Environment improved
IAA Increased agriculture activities
ID Income decline
FPD Forest product decreased
OFF Off-farm activities increased

Appendix 9: Matrix Scoring and Ranking of coping strategies against inaccessible benefits accrued in Chome Nature Reserve

Coping strategies	Agriculture activities	Off-farm activities	Illegal activities	Purchase forest products	Tree planting	Scores	Ranks
Agriculture activities		AA AA AA	AA AA AA	AA AA AA	AA AA AA	12	1
Off-farm activities			OFF OFF OFF	FPP FPP FPP	OFF OFF OFF	6	2
Illegal activities				IA IA	IA IA	4	3
Purchase forest products					TP TP	3	4
Tree planting						2	5

Key:

AA Agriculture activities
OFF Off-farm activities
IA Illegal activities
PFP Purchase forest product
TP Tree planting