ASSESSMENT OF THE CONTRIBUTION OF NON-TIMBER FOREST PRODUCTS TO HOUSEHOLD FOOD SECURITY AND INCOME AROUND BAGA CATCHMENT FOREST IN LUSHOTO DISTRICT, TANZANIA

TWAHA ABEID SHEMNGA

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF SCIENCE IN MANAGEMENT OF NATURAL RESOURCES FOR SUSTAINABLE AGRICULTURE OF SOKOINE UNIVERSITY OF AGRICULTURE. MOROGORO, TANZANIA.

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ABSTRACT

A study was carried out to assess the contribution of Non-Timber Forest Products (NTFPs) to household food security and income generation in villages surrounding Baga catchment forest in Lushoto District, Tanzania. Specifically, the study aimed at assessing the common NTFPs utilized by households in the study area, examining socio-economic factors influencing household members accessibility to NTFPs, evaluating the contribution of NTFPs to household food security and income. The study used a sample size of 120 respondents selected randomly from Mziasaa, Sagara, Baga and Malomboi villages. A structured questionnaire was administered for primary data collection. Secondary data of NTFPs collection and crop production were collected from District Forest Office and District Agricultural Office respectively. Data analyzed by using SPSS software. Descriptive and inferential statistics were determined. Inferential statics were employed whereas linear regression analysis was used to determine the socio-economic factors influencing collection of NTFPs and pair t test were used to compare various income from NTFPs and other sources Results showed that: there was significant increase of NTFPs collection in the villages which surround Baga catchment forest over the period. Results also showed that there was positive relationship between collection of NTFPs and some socio-economic variable including household size, age, education, occupation and duration in years of staying in the area. Non-Timber Forest Products accounted for 100.0% of all respondents in the villages; however they also engaged in other production activities. It also indicates that NTFPs are utilized either directly or indirectly as solution to food insecurity and low incomes among the households. Results further showed that income from selling NTFPs is higher than from other sources such as selling agricultural produce, selling livestock, business, labour wages and employment in the study area. The study recommends that the government should employ more forest officers and provide education on direct economic importance of NTFPs.

DECLARATION

I, Twaha Abeid Shemnga, do here by declare to Senate of Sokoine University of Agriculture that this dissertation is my own original work and that it has neither been submitted nor being concurrently submitted for a degree award in any other institution.

_____ _____

Twaha A. Shemnga Date

(MSc. MNRSA)

The above declaration is confirmed

_____ _____

Prof. J.F. Kessy Date

(Supervisor)

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DEDICATION

This valuable work is dedicated to my beloved parents, Mr. Abeid S. Shemnga and Ms Zaina M. Kiluwa who tirelessly laid the foundation of my education with a lot of sacrifices and efforts, also to my wife and children for their tolerance during my long absence from home.

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LIST OF ABBREVIATIONS

NTFPs	Non- Timber Forest Products
NBS	National Bureau of Statistics
DAICO	District Agricultural, Irrigation and Cooperative Officer
DED	District Executive Director
DNRO	District Natural Resource Officer
FAO	Food and Agriculture Organization of the United Nation
FGDs	Focus Group discussions
VECL	Village Environment Committee Leaders
DFO	District Forest Officer
KGS	Kilograms
LDC	Lushoto District Council
PCs	Pieces
LTR	Litre
SNAL	Sokoine National Agricultural Library
SPSS	Statistical Package for Social Sciences
SD	Standard Deviation
SUA	Sokoine University of Agriculture
TZS	Tanzania Shillings
URT	United Republic of Tanzania
VEO	Village Executive Officer

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background information

Non-timber forest products (NTFPs) constitute an important source of livelihood for millions of people across the world. In India alone it is estimated that over 50 million people are dependent on NTFPs for their subsistence and cash income (Ahmed, 2013). Forest-based activities in developing countries, which are mostly in NTFPs area, provide an equivalent of 17 million full-time jobs in the formal sector and about 30 million in the informal sector. In addition it provides 13-35% of all rural non-farm employment (Duong, 2008). The NTFPs form alternative sources of livelihood, contribute to poverty alleviation through generation of income, and foreign exchange earnings (Brian *et al*, 2011).

More than 800 million people worldwide live in or near tropical forests and savannas, and rely on these ecosystems and their services and welfare benefit such as fuel, food and income (Kajembe *et al.*, 2014). For example, it is estimated that more than 15 million people in Sub-Saharan Africa earn their income from forest-related enterprises such as fuel wood and charcoal sales, commercial hunting, and handicraft production (Brian *et al*., 2011). In rural areas of Nigeria NTFPs contribute significantly to household income and food security and thus; play an important role in income generation (Jimoh, 2006). In Tanzania, rural households largely depend on agriculture or NTFPs as their main source of income (NBS, 2009). In Tanzania, direct dependence on NTFPs is high; 92% of rural households use firewood as their main cooking fuel, whereas over 50% of the urban population uses charcoal (NBS, 2009). Many people living in and around forests harvest a range of products from forests for trade or

consumption as compared to timber, due in large measure to less expensive extraction technology and ease of access (Schaafsma, 2012).

Nambiza and Lyatura (2013) found that the integrity of forests is vital to household food security, mostly because of the dependence of the poor on forest resources. The collection of Non-Timber Forest Products (NTFPs) for house construction and household use is also widespread. This is mainly driven by poverty and household food insecurity caused by lack of means to invest in better quality housing and non-wood substitute products (World Bank, 2009).

1.2 Problem statement and Justification of the study

NTFPs are available in many catchment forests in Tanzania and contribute to household livelihoods (Makawia, 2003; Mbwambo *et al*., 2014). They also contribute to poverty alleviation through generation of income, provision of food, medicine and foreign exchange earnings (Chikamai *et al.,* 2000). It has been argued that the value of NTFPs contribution to the existing low value woodlands in Tanzania can have quite a substantial addition to the national economy (O'Kting'ati and Monela, 1990).

Several studies (Kessy, 1998, Katriina, 2000, Kimaro and Lulandala, 2013; Kajembe *et al.,* 2014) have shown that catchment forests support rural livelihoods through provision of NTFPs. NTFPs in Lushoto district including Baga catchment forest are generally available in the forests managed by the government. However, the extent to which NTFPs contribute to household food security and income is little known and not well documented in Lushoto district. Therefore, this study is intended to fill this gap by generating information that will lead to sustainable use of NTFPs. It has been argued that the importance of NTFPs to household food security and income equals or surpasses; that of other products (i.e. non- NTFPs) yet their worth and potential are rarely quantified (Chidumayo and Gumbo, 2013).

The findings from this study will add input for research, development institutions and policy makers in planning relevant interventions in order to promote the use of NTFPs for better contribution to household food security and poverty alleviation.

1.3 Objectives of the study

1.3.1 Main objective

The main objective of this study was to assess the contribution of NTFPs to household food security and income generation in villages around Baga catchment forest in Lushoto.

1.3.2 Specific objectives

The specific objectives of the study were to:

i. assess the common NTFPs utilized by household in the study area
ii. examine socio-economic factors influencing household members accessibility to NTFPs
iii. evaluate the benefit of NTFPs to household food security and income

1.4 Research questions

i. Which non-timber forest products are commonly utilized by the household in the study area?
ii. Are NTFPs equally accessible to all members of the community?
iii. To what extent do the NTFPs contribute to food security and income generation to the households in the study area?

1.5 Conceptual frame work

Catchment forests provide various products including NTFPs which contribute to rural livelihoods communities which live in or around catchment forests globally. It is assumed that rural communities which surround the catchment forests are exploiting the products which are based on income generation and food activities. Income based activities include selling fire wood, selling building materials, selling wild vegetables, selling medicinal plants, selling wild fruits, selling honey. Food based activities include hunting wild animals, collecting honey, collecting wild fruits, collecting wild vegetables.

Both activities of income and food based contribute direct and indirect to household food security and income to the communities living around the catchment forest. The collection of various products from the catchment forest influenced by socio-economic characteristics such as age, sex, education level, household size and occupation of the communities.

The conceptual framework in Fig. 1, describes diagrammatically the relationships and implications of NTFPs collection and household livelihoods in Lushoto District from the concept that, socio economic characteristics have influence in the collection of NTFPs which in turn increases household food security and income. Variables presented include age, sex, education level, family size and household income stands as independent variables which implicate the level of collection of NTFPs (dependent variables) by causing household food security and income.

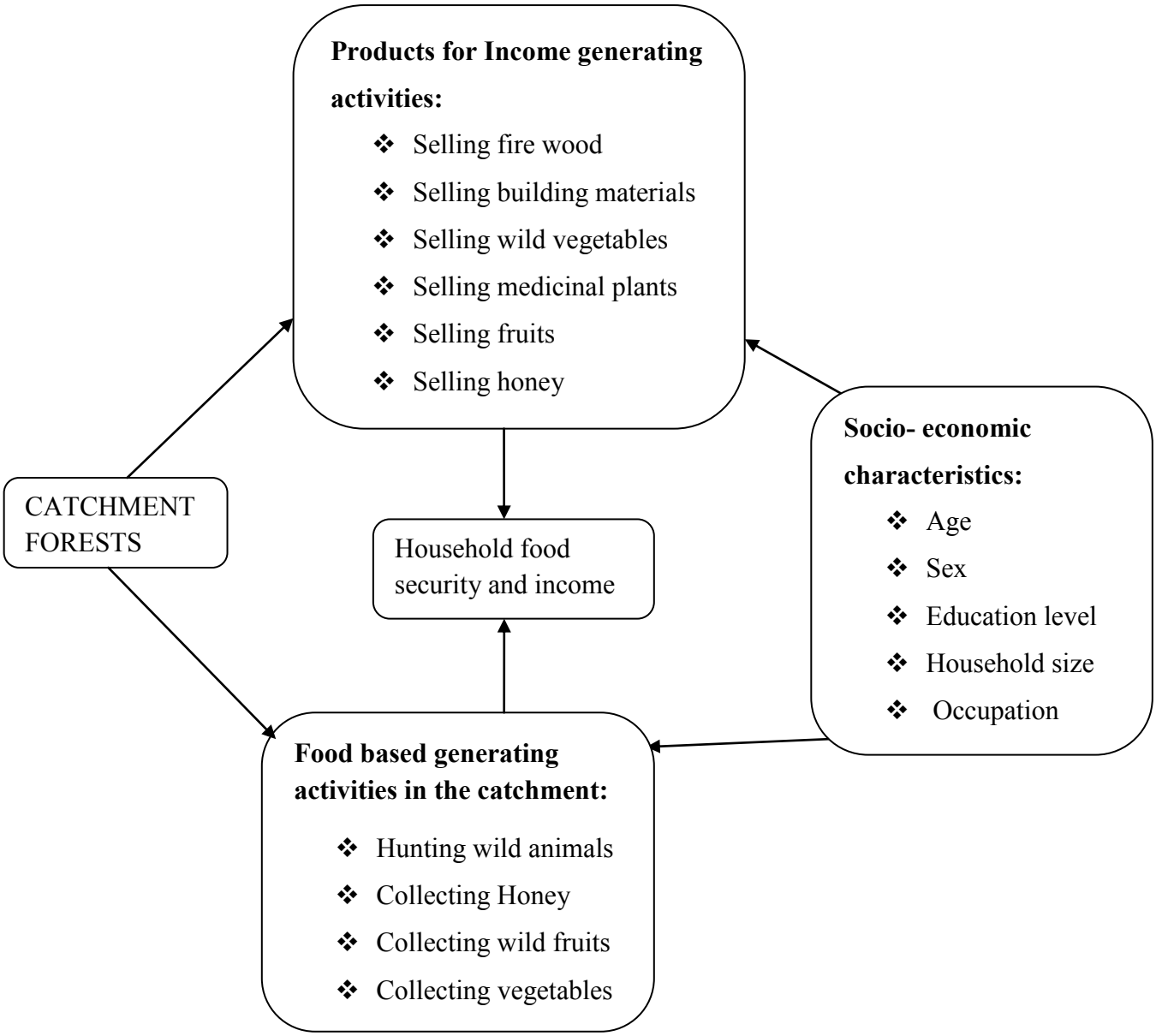


Figure 1 Conceptual framework

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Overview of non-timber forest products

FAO (2010) defines NTFPs as: "products of biological origin other than wood derived from forests, other wooded land and trees outside forests". They may be gathered from the wild, or produced in forest plantations, agroforestry schemes and from trees outside forests. Non-timber forest products (NTFPs) include forest plants and mushroom products, fruits, charcoal, vegetables, honey, firewood, building materials and services. NTFPs are also goods of biological origin other than timber derived from the forest or associated ecosystems.

NTFPs are goods of biological origin other than timber derived from the forest or associated ecosystems which are consumed directly as food, medicine or which contribute non-consumptive values to human welfare (FAO, 2008). The non-consumptive uses may include microclimatic amelioration, soil and watershed protection and conservation as well as aesthetic and cultural values (Brian *et al.*, 2011).

2.2 Catchment forests and NTFPs

Tanzania is endowed with forest and woodlands resources. Catchment forests occupy a total of 2.8 million hectares in Tanzania. This is about 8% of the total forested land in Tanzania. Catchment forest offer direct and indirect NTFPs which support both rural and urban communities (FAO, 2001). Non-Timber Forest Products (NTFPs) include wild fruits, poles, fodder, honey, firewood and vegetables, medicinal plants. Thereby, NTFP collection provides an important source of income for poor households and a temporary safety net in times of food or income scarcity (Brian *et al.,* 2011).

2.2.1 Global perspectives

Catchment forests play an important role in improving rural and urban livelihood through provision of NTFPs. In india over 50 million people depend on NTFPs from the catchment forest to sustain their life as source of food and income (Ahmad, 2013). In Nigeria rural communities depend on NTFPs as sources of livelihood including food and income on 13- 35% (Duong, 2008). Brian *et al*, (2011) reported that in Zambia NTFPs form alternative sources of livelihood, contribute to poverty alleviation through generation of income, and foreign exchange earnings. This indicates that catchment forest supports many household families in the world.

2.2.2 The situation in Tanzania

Tanzania is endowed with forest and woodlands resources. Forest resource statistics in Tanzania have been reported by various catchment forests. According to FAO (1992) forest resources amount to 33.5 million ha. Furthermore, FAO (2002) provide estimates of 38.5 million ha; Malimbwi (2003) estimate catchment forest to be 34 million ha. According to Monela and Abdallah (2007) conservative estimates indicate that Tanzania has forests and woodlands occupying a total of 33.5 million hectares of the land area. These catchment forests provide various NTFPs which collected and utilized by households direct and indirect in rural and urban communities. These NTFPs include firewood, vegetable, wild fruits, bushmeat and poles. Others are honey, weaving materials, fodder, and ropes, mushroom (Chettleborough *et al*., 2000). The catchment forest provide various products including NTFPs but they are under pressure of exploitation due to high the high rate collection of NTFPs influenced by various socio-economic characteristics (FAO,2008). Many of these NTFPs are important sources of income and employment for rural people and some are even traded at the international level (Brian *et al,* 2011). In Tanzania, direct dependence on NTFPs is

high; 92% of rural households use firewood as their main cooking fuel, whereas over 50% of the urban population uses charcoal (NBS, 2009).

2.3 Non-timber forest products and rural livelihoods

NTFPs are an important tool in addressing poverty issues for marginalized, catchment forest dependent communities, by contributing to livelihood outcomes including food security, health and wellbeing and income (FAO, 2001). In many parts of the world these resources are critical especially for rural poor and women, and may provide them the only source of personal income (FAO, 2010).

Jimoh and Haruna (2007) reported that the NTFPs have potential to contribute around 68% of total monthly household income within Onigambari Forest Reserve, Nigeria. Developing countries including Tanzania, majority of rural household depend on NTFPs such as wild fruits, vegetable, bushmeat, firewood to meet some parts of their construction material, health, food and income from selling these products (FAO, 2001). In economic bases the NTFPs play an important role in of income generation to rural household in developing countries (FAO, 2001). NTFPs also offer an expanding livelihood options and accumulation of wealth and assets required to reduce livelihood problems in rural areas such as food and income (Dewees, 2013). The NTFPs used as copping strategy during bad weather when the intended crops fail in rural areas in developing countries (Dewees, 2013).

2.3.1 Livelihoods framework

A livelihood is a means of making a living. It encompasses people's capabilities, assets, income and activities required to secure the necessities of life (FAO, 2005). According to Anand *et al*. (2005) and, Martha and Sen (2003), capability refers to ability human

being to make a good life, and that, living a good life is the opportunity rather than the accumulation of resources; thus, accumulations of resources doesn't matter for an individual to have good life except that, he or she get opportunity for transforming resources into well-being.

Livelihood is also defined as adequate stocks and flows of food and cash to meet basic needs. Three fundamental attributes of livelihoods are the possession of human capabilities such as education, skills, health; access to tangible and intangible assets; and the existence of economic activities (Chambers and Conway, 1991). Interaction between these attributes defines the livelihood strategy a household will pursue (Carney *et al.,* 1999). Livelihoods are not localized phenomena, but connected by environmental and other processes to wider national and global arenas. Agriculture is the dominant sector in the Tanzanian economy that sustains livelihoods by providing food security and household income to over 80% of the population (Jomoh and Haruna, 2007). NTFPs can increase house hold food security and income in many families (Dewees, 2013). A livelihood will only be sustainable when it can cope with and recover from external stresses and shocks (Carney, 1998).

2.3.2 NTFP and community welfare

Catchment forests provide several NTFPs such as firewood, wild fruits, vegetable which play roles of improving livelihood of rural and urban communities (Chettleborough *et al*., 2000). These NTFPs extracted by the community members living in or around the catchment forest and these NTFPs utilized directly by the family or indirectly by exchange by sale and buy food. Direct and indirect consumption of NTFPs contribute to household food security and income and resulting to welfare of households and communities (Kajembe *et al.* 2014). NTFPs are known to be a particularly important component of household subsistence especially food

consumption (Anyinde *et al.,* 2013). It is estimated that 80% of the people in the developing world use NTFPs for health and nutritional needs (FAO, 2010).

The annual world market of wild plant products is estimated at US$ 60 billion, and this market continues to grow by nearly 20% each year caused by rapid urbanization, resulted in big cities becoming centres of demand for NTFPs from outlying rural areas and across national boundaries (Van Andel, 2006). NTFPs tend to provide an important non-financial supplement to the livelihoods of rural people. In Tanzania NTFPs utilization tend to be of low intensity and rarely provide significant incomes (Anand *et al*. 2005).

2.3.3 The focus on income and food security

Between the mid-1970s and the 1990s, there was a paradigm shift in thinking about how to address food security. Much of the initial thinking had focused on national food supplies, self-sufficiency and price. Physically available food comes from forests and trees, valuable sources of wild and domesticated foods; rights of use and access to trees and forests mediate whether or not these resources are economically available; wild and domesticated foods from trees and forests have well-documented nutritional values; food from forests and trees have an important safety net function that can be harmed by forest loss and land conversion (Chidumayo and Gumbo, 2013).

According to Dewees (2013) there is a catalogue of less direct but equally important links between forests, trees, and food security: forests and trees play an important role in regulating water supplies and in maintaining the health of watersheds, and so are a critical link in maintaining farming systems that depend on these; food security and access to firewood are closely linked, because the ability to cook food increases the

extent to which it can be consumed in a way that improves its nutritional value; income from forests and trees can be significant and increases the capacity of households to buy food.

The poor households are likely to sell the NTFPs as among the few assets able to sell to the wealthier households with the aim of generating income and use that income for satisfying basic needs such as in their household (Debela *et al*., 2012). The utilization of NTFPs touches both classes of people in terms of economic status of poor and wealthy whereas wealthier households tend to use the NTFPs such as firewood, charcoal to substitute for kerosene, while poor households both used firewood and sold it to generate income (Malimbwi and Zahabu, 2008).

2.3.4 Food security

Food security defined as when all people, at all time, have physical and economic access to sufficient, safe and nutrition's food to meet their needs and food preferences for an active and health life. Food security depends on food availability (production, distribution and exchange), food access (affordability, allocation and preference) and food utilization which include nutritional value, social value and food safety (FAO, 2001). It is these three facets of the food system that all need to be met in order for food security to be realized. Each of these facets can be contributed by NTFPs collected from the forest (Dewees, 2013). Not only NTFPs are important to household food security as a widely consumed as food but also important in a nutritional point of view because many foods are mixed by some NTFPs including wild vegetables with cereals when cooked to improve nutrition and increase quantity of food per meal (Katriina, 2000). Food insecurity remains one of the most visible dimensions of poverty and is generally the first sign of extreme hardship. Fighting poverty; ensuring food and

nutrition security while protecting the environment still remains as a major challenge facing the global development practitioners (Ayinde *et al.,* 2013).

2.3.5 Household income

The ability to obtain food at the household level is related to purchasing power, which in turn depends on the household income level (Lusambo, 2002). Household in the other hand it implies more availability of labour collecting, processing and Marketing of NTFPs (Makonda, 1997).

Income is widely used as a welfare measure because it is strongly correlated with the capacity to acquire many things that are associated with an improved standard of living such as food, clothing, shelter, health care, education and recreation (Morris *et al.,* 1999). In rural areas household is the main source of income. However, income earned through different activities such as selling NTFPs, selling crops, business, selling livestock, labourer activities, employment and other related activities. All of these cannot suffice to obtain adequately family food especially when households have not other alternatives to increase income such as NTFPs which could contribute to household income (Makonda, 1997).

CHAPTER THREE

3.0 METHODOLOGY

3.1 Description of the Study Area

3.1.1 Geographical location

The study was carried out in Lushoto District (Fig. 2) specifically in Mziasaa, Sagara, Baga and Malomboi Villages. Choice of the study area was selected randomly from the villages surrounding Baga catchment forest. Lushoto District is among the eight Districts of Tanga Region which are: Lushoto, Korogwe, Muheza, Handeni, Kilindi, Pangani, Mkinga and Tanga. Lushoto District is located at the north eastern part of Tanga Region, between between latitude $4^{o}22'$E and $5^{o}08'$N and between longitude $38^{o}5'$ E and $38^{o}38'$N covering an area of 3 500 km^2 (LDC, 2013).

3.1.2 Climate and altitude

The district forms part of Western Usambara Mountains which are under the Eastern Arc Mountains. It lies between 300 – 2100 m.a.s.l, and the lowlands lie between 300 – 600m.a.s.l. The slopes are moderately steep to very steep and there are many narrow valleys as well as rock outcrops in the terrain. The Mountains and their lower slopes occupy about 90% of the total land of Lushoto district. Temperatures range between 18^{0}C – 23^{0} C and the district receives rainfall of between 800- 1500mm per annum for the high altitude and 500- 800mm per annum for the lower altitude (LDC, 2013).

3.1.3 Population

According to the 2012 Tanzania National Population Census (URT, 2013), Lushoto district had a population of 492,441 people of which 230,236 were the males and 262,205 were females. The intercensal growth rate for Lushoto District was 4.7% which is higher than the national annual average growth rate of 2.7%. The overall sex ratio is 88 males for every 100 females. High population growth rates above national

level are caused by: high rate of immigrants looking for fertile soil and high fertility rate due to low practice of family planning (LDC, 2013).

3.1.4 Vegetation

The forests of the area are diverse and range from sub-montane to upper montane in type. The vegetation is woody with luxuriant growth of trees where as the canopy is differentiated in to strata which is a characteristic of high forests. The sub-montane cover the vegetation of trees which have height of 10-15 m dominated by *Annona senegalensis, Brachystegia boehmii, B. spiciformis, Combretum molle, Diplorhyncus condylocarpon, Markamia optusifolia* and *Pterocarpus angolensis*. The upper montane cover the trees which are evergreen forest with *Brachylaena huillensis* as dominant vegetation (Ruffo *et al,* 2002).

The highest montane the trees canopy height ranging between 10 and 15 m of an evergreen understorey and larger trees up to 30 m. The dominant tree species are *Breonardia salicina*, *Albizia* c.f. *gummifera, Anthocleista grandiflora, Erythrophloeum suaveolensis, Ficus Thonningii, Sorindeia madagascariensis* and *Sterculia appendiculata*. The woody climber *Entada pursaetha* is common in the canopy (Ruffo *et al,* 2002).

3.1.5 Socio-economic activities

The main economic activities in Lushoto District are farming, livestock keeping, and business. The major crops grown are maize, banana, yams, paddy, Irish potatoes, sweet potatoes, cassava and legumes, while cash crops are tea, coffee, vegetables, cardamon, fruits. Livestock kept includes cattle, sheep, goats, chicken, duck, guinea fowls, pigs and rabbit (LDC, 2013).

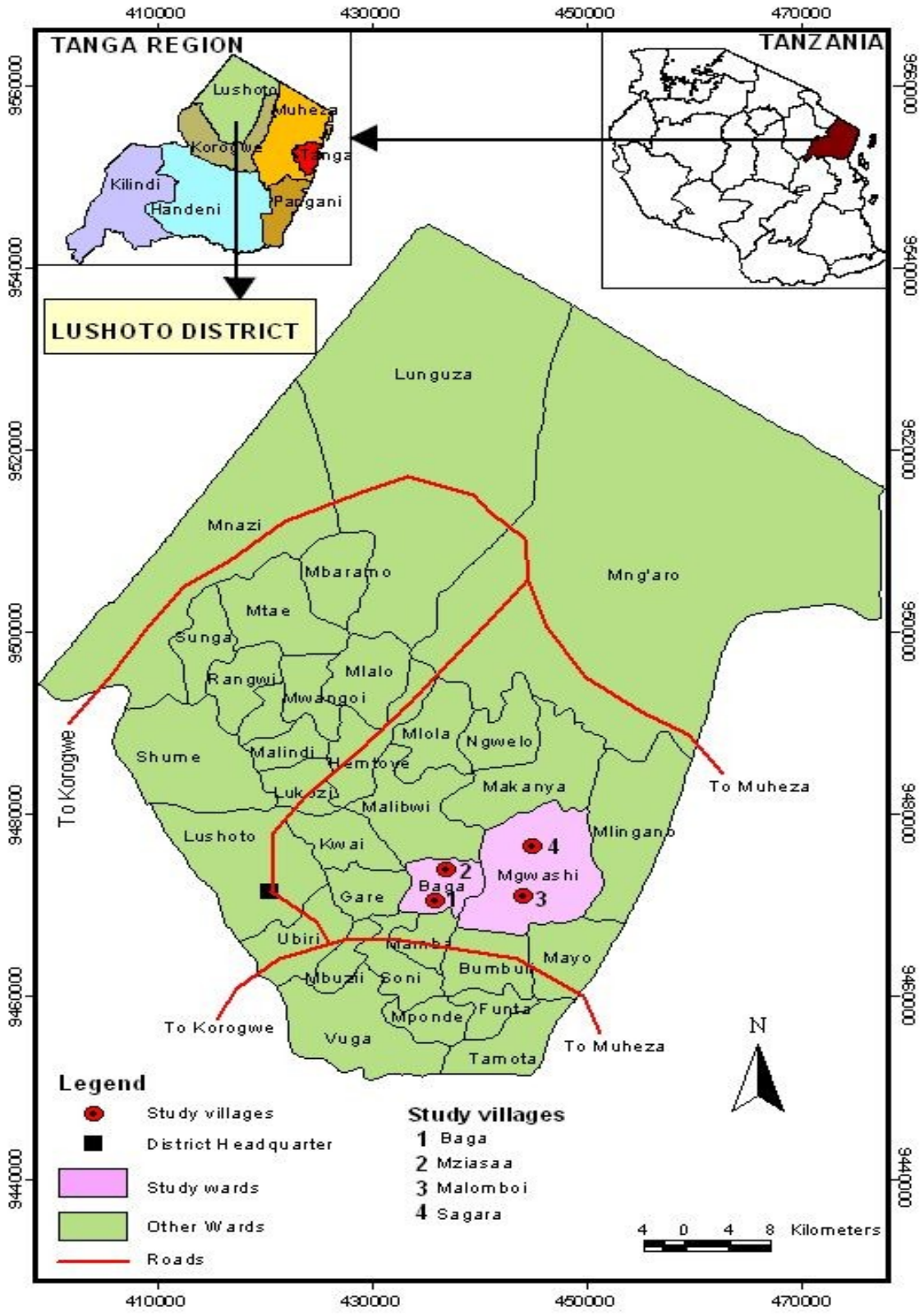


Figure 2: The map of Lushoto District showing the study villages

Source: Remote Sensing and GIS Laboratory at SUA (2015)

3.2 Research Design and Sampling Procedures

A cross-sectional research design was applied in this study whereby data were collected at single point in time (Kothari, 2006). This design was favorable because of time and resources limitations. Two wards (Baga and Mgwashi) were selected randomly for conducting the study. Further, four villages (Mziasaa, Sagara, Malomboi and Baga) were also selected randomly for study. From each village, thirty households were selected randomly from the village register by assigning unique number of the household, also calculator was used by pressing Random Number key. When the assigned number appears then that household marked and the procedure continued to all villages to form sample size of 120 respondents. Matata *et al*. (2010) argued that, a sample size of 80-120 is adequate for social studies in Sub-Saharan Africa. Hence, in this study, 30 respondents were picked randomly from each of the four villages to make a total of 120 respondents and 9 key informants from four villages. Key informants which included one Village forest officer, four village executive officers (VEOs), one leader of Village Environmental Committee, District Agricultural, Irrigation and Cooperative Officer (DAICO) and District Forest officer (DFO) were selected purposively for discussion.

3.3 Data Collection

Both primary and secondary data were collected in order to address the specific objectives of the study. Primary data were collected through household interview, Focus Group Discussion and Researcher observation. Secondary data were collected though documentary review where by various documents related to the study including journal, articles, books, reports from government offices and electronic sources from the Internet and published and unpublished documents were used.

3.3.1 Primary data

3.3.1.1 Household interview

Primary data were collected according to specific objectives. Primary data that address objectives 1, 2 and 3 were collected by using structured questionnaires which were directed at household respondents as in (Appendix1) while a checklist was directed to key informants as in (Appendix 2). Also to increase data validity and reliability, household member interviewed by the researcher and experienced selected officers using a structured questionnaire developed by the researcher.

The interview was conducted to collect information direct from 120 respondents by administering a structured questionnaire, whereby, data on common Non-timber forest products available in the study area, socio-economic characteristics, types of NTFPs collected, quantity collected, quantity consumed, and sold and household income from different sources and uses of money after selling NTFPs were collected. Moreover, questions related to sources of food for household family, sources of household income, accessibility to NTFPs. This work was done by researcher with assistance of a team of trained enumerators to conduct individual household level person interview.

According to Yin (1994), reliability and validity of indicators are very important for any research work; hence, it is important to assess them before carrying out the actual study. Due to this then, a pilot study was conducted prior to the main study to pre-test the questionnaire whereby, 10 respondents were interviewed to be certain of the time planned for completing the interview and to observe reactions of respondents to certain questions and also make all necessary corrections and modification of the questionnaire.

3.3.1.2 Focused group discussion (FGDs)

The focused group discussion was conducted in order to get general information on the study variables whose information would not have been exhaustively covered through household interview with a questionnaire. According to Mathew and Ross (2010), a focus group is a semi-structured facilitated discussion with a small group of people. Focus groups are used to gather data which are generated in a discussion between group members with the help of a facilitator. A focus group usually consists of between 5 and 12 participants plus the facilitator and often a recorder or note taker.

In this study Focused group discussion involved the use of checklists of things designed for key informants and FGDs to collect relevant information. Thus FGDs was done deliberately to supplement the qualitative information obtained from the administered questionnaire. Qualitative data are data which describe items in terms of some quality or categorization (Dodge, 2003). In this study only one FGDs consisting of 6 participants was held for each village whereby village government offices were used as places for discussion. Through the FGDs the participants were free to expose their thoughts on the common NTFPs available, collection, uses and sells and food security and income in the study area at the same time as the Researcher coordinated the discussion.

3.3.1.3 Researcher's observation

Field observation is described as the one who seeks to go beyond outward appearances and explore the beliefs, motives, values, perceptions and attitudes of the people studied (Mafupa, 2006).

According to Mafupa (2006), field observation is always essential to keep one's eye open when visiting community and to check what you are told against what you see. Hence, in this study, the researcher tried to be part of the community in order to see

collection of NTFPs in the study area. Field observation helped the researcher to see different NTFPs collected, consumed at the household and sold for earning money.

3.3.2 Secondary data

Secondary data were collected through documentary review where by various documents related to the study including journal, articles, books, reports from government offices, libraries and electronic sources from the Internet and published and unpublished documents were be used.

According to Dodge (2003), secondary data are the data that are collected by someone else or for the purpose other than the current one. Vogler *et al.* (2008) defines secondary data as the data which have been collected and already analyzed, but still available for other researchers to use and explore their own research questions. For this study, secondary data collected from Lushoto District Forest office (LDFO) and Lushoto District Agriculture office. Other secondary data sources included published and unpublished information collected from various such as Sokoine National Agricultural Library (SNAL) and internet searches.

3.5 Data Analysis

3.5.1 Descriptive statistics

Descriptive analyses involved determination of means, frequencies and percentage, whereby descriptive statistics such as mean, frequencies, maximum, minimum, standard deviation and coefficient of variation. According to Amaza *et al.* (2009), descriptive statistics are used to examine the socio-economic characteristics of the respondent's household. Statistical Package for Social Science (SPSS) software) was

used for analysis of common NTFPs utilized in the household, uses of each NTFP, NTFPs most preferred, seasons NTFPs are most available and who collect NTFPs.

3.5.2 Linear regression Analysis

Linear regression analysis (equation 1) was used to determine the factors influencing household members in collection of NTFPs. NTFPs collected per year in terms of (bundles, kg, liters, bunches and pieces) was regressed on those socio-economic variables in order to estimate their effects on the NTFPs collection .The analysis was performed in SPSS software.

$$Y = \beta_0 + \beta_{i1}X_{i1} + \beta_{i2}X_{i2} + \beta_{i3}X_{i3} + \ldots\ldots\ldots\ldots\ldots\ldots + \beta nXn \qquad \text{eqn (1)}$$

Where: Y= the NTFPs collected from the forest;

β0 =Constant term of the model without the independent variables;

β1, β2...β5 = The Estimated influences of the specified independent variables;

X1, X2, to X5 = Independent variables

X1= Age of respondent in years

X2= Sex 1=male, 2=female

X 3= Education level 1= Adult 2=Primary 3=Secondary 4=college 5= University

X4= House hold size

X5= Occupation

Analysis of the relative importance of socio-economic factors influencing household members to collect NTFPs was conducted using linear regression model variables as

presented by equation 1. In this analysis, the linear regression model was a tool that used to estimate the contribution of socio-economic factors on collection of NTFPs. Multiple regression analysis was done to assess independent variables which significantly contributed to collection NTFPs. The explanatory power of the regression was assessed by its coefficient of determination (R^2). The coefficient of determination showed the strength of relationship between dependent and independent variables. This procedure was selected because of its wide use in the social and natural sciences research, and that it's easier to handle (Chianu and Ajani, 2008) cited by (Hatibu, 2010).

The hypotheses tested were that:

Null hypothesis (Ho): NTFPs do not contribute to household food security and income.

Alternative hypothesis (Ha): NTFPs contribute to household food security and income.

A paired t-test was performed to ascertain whether the NTFPs contribution to household income was effective or not.

The null hypothesis (Ho) was accepted when $p< 0.05$ while it was highly significant when $p< 0.01$.

3.5.3 Content analysis

Content analysis technique was employed to analyze qualitative data and information from the discussion with key informants. Content analysis is a set of methods for analyzing the symbolic content of any communication with an intention to reduce the total content of communication to some set of categories that represent some characteristics of research interests (Singleton *et al*. 1993). According to Stemler (2001), it is a systematic, replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding. It is a technique for making

inferences by objectively and systematically identifying specified characteristic of massages. Thus information collected through verbal discussions with the key informants and from PRA groups was broken down into smallest meaningful units of information (Kajembe, 1994).

3.6 Limitations of the Study

The researcher faced several limitations in the study area during the period of conducting research. One of the limitations was that, much of the primary information depended on individual's memory whereby respondents rarely kept records of their activities. Therefore, there were some difficulties for the respondents to give answers on questions which demanded income generated from NTFPs; amount of NTFPs collected per year; amount of NTFPs consumed in the household and sold. Hence, the researcher resolved this by making careful probing which enabled the respondents to disclose and remember more information about the subject matter.

The study also conducted during election of local government leaders in the villages and hamlets, during that period majority of people involved in the political campaign. Hence, the researcher resolved this by making appointment with the respondents concerning the right time of meeting in order to interview them others said come early morning and others said follow me to the farm.

The study moreover was conducted during the time when farmers were preparing their farms for crop production; therefore, many of the respondents were not available to provide information during the morning hours, its solution was to get hold of the best time for the respondent to be interviewed by contacting respondents on their best desired time and sometimes interviewing them while they were on their farms.

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

This chapter presents findings and discussions of the study on the contribution of NTFPs to household food security and income around Baga catchment forest in Lushoto District. Section 4.1 describes the different NTFPs available in Baga catchment forest while sections 4.2 to 4.9 describe the major findings of the study.

4.1 NTFPs available from Baga catchment forest

The findings from the study area shown that NTFPs extracted from the catchment forest were vegetable, firewood, medicinal plants and poles. Others were ropes, fruits, wild tubers, weaving materials, honey, bushmeat, mushroom, spices, fodder and oil. Results further showed that the identified NTFPs in the study area contribute to household livelihood. In order to capture all these, various methods were employed like individual interviews, key informants were involved and observations by the researcher and results have been presented in Table 1.

Table 1: Distribution of respondents across NTFPs available in the forest.

Data were collected by using household individual interview questionnaire, focus group discussion and key informants and researcher observation various NTFPs were mentioned including vegetable, firewood, medicinal plants, poles, ropes, wild fruits, honey and fodder results presented in table 1 below.

Variable	Categories	%response (n)	
Vegetable	No	12.5	(15)
	Yes	87.5	(105)
	Total	**100.0**	**(120)**
Firewood	No	28.3	(34)
	Yes	71.7	(86)
	Total	**100.0**	**(120)**
Medicinal plants	No	33.3	(40)
	Yes	66.7	(80)
	Total	**100.0**	**(120)**
Poles	No	28.3	(34)
	Yes	71.7	(86)
	Total	**100.0**	**(120)**
Ropes	No	18.3	(22)
	Yes	81.7	(98)
	Total	**100.0**	**(120)**
Wild fruits	No	60.8	(73)
	Yes	39.2	(47)
	Total	**100.0**	**(120)**
Honey	No	60.0	(72)
	Yes	40.0	(48)
	Total	**100.0**	**(120)**
Fodder	No	65.8	(79)
	Yes	33.8	(41)
	Total	**100.0**	**(120)**

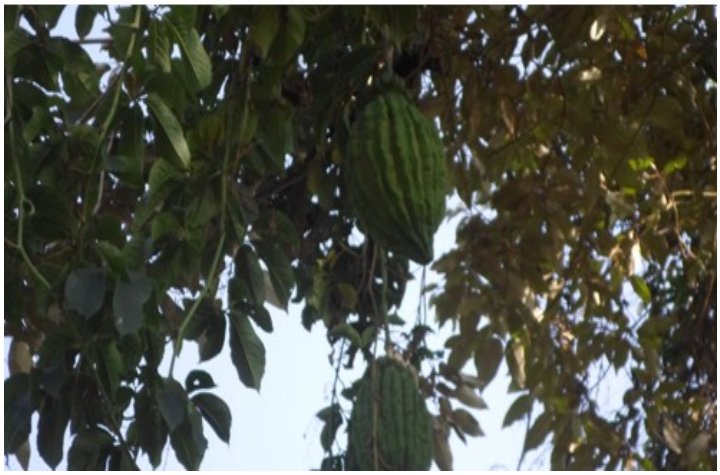
4.1.1 Vegetable

Table 1 show that 87.5% of respondents were engaged in collection of vegetable from the forest respectively while 12.5% of respondents were not collect. The findings revealed further that the wild vegetable include *Celosia schweinfurthiana* (mchicha pori), Bassila alba (ndelema), *Bidens pilosa* (mbwembwe) and *Solanum nigram* (mnavu), Galinsoga parviflora (kihindoo or ngereza), *Solanum schumannianum* (njujui or ngae), *Amaranthus spinosus* (Bwache), Cymphomandra betaceae (Magoghwe). The

findings of this study is similar to Katriina (2000), who reported that the most vegetable are collected and used in four days a week on average.

1a *Solanum schumannianum*

1b *Basella alba*



1c Kweme

Plate 1: Vegetable collected from the forest in Malomboi village

4.1.2 Firewood

The findings revealed that 71.7%, 40.0% and 28.3% of respondents in the study area were collecting 3 head loads of firewood per day from the forest which is equivalent to 21 loads per week. This implies that firewood is the major source of cooking fuel in the study area. This could probably be due to the reasons that firewood is the only cheaper, available and affordable primary source of energy in this area. Lusambo (2009) reported that Tanzanian energy balance is dominated by biomass-based fuels, particularly wood fuel (firewood and charcoal) which account for > 90% of primary energy supply. The findings also are similar to Giliba *et al*., (2010) who reported that 92% of NTFPs collected from the forest were firewood in Mbulu and Babati Districts. The findings also are similar to Msalilwa (2013) who reported that 98% of people in Kilolo district use firewood as the main source of energy. Furthermore the findings similar to Malinski (2008) who reported that in Malawi 97.0% of rural households use firewood as the major source of cooking fuel.

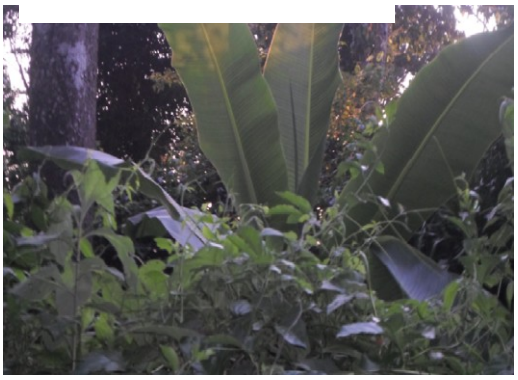
Plate 2: Women collecting firewood in the forest in Baga village

4.1.3 Medicinal plants

In the study area it was observed that 66.7 % of respondents reported that they are collecting medicinal plants from the forest while the majority (33.3%) was not collecting. This implies that there is high demand on medicinal plants from the forest in the study area due probably to the fact that most of the people attend to the dispensary

when they are sick. During Focus Group Discussion and individual interview the respondents mentioned some plants used as used medicine include *Annona senegalensis, Asystasia gangetica, Crossopterix febrifuga, Dichrostachys glomerata and Diplorynchus condylocarpon. Warburgia salutaris* (mdee), *Millettia dura* (Mhafa), *Vernonia myriantha* (mhasha), *Myrica salicifolia* (Mshegheshe),*Indigofera swaziensis, Bidens pilosa* (Mbwembwe) (Mshushulambuzi). Furthermore, during discussion with respondents they reported that these medicinal plants treat diseases such as pneumonia, coughing, teeth, malaria, backbone and abdominal pains, stroke, wound healing, coughing and hernia. The findings are similar to observation done by Mogaka (1992) who reported that plants from forests have significant proportion of the medicine value that can be useful to surrounding populations.

3a *Ensete ventricosum*



3b *Dracaena mannii*

Plate 3: NTFPs used for medicinal purposes in Mziasaa village

4.1.4 Poles

The findings in the study area show that 71.7% of respondents collect poles and 28.3% do not collect poles. This implies that people in the study area collect many poles as source of building materials, also many houses constructed by poles and plastered by mud. Average 250 poles are needed for an average-sized rural house, which last for 3 years. Monella *et al.,* (1993) reported that most villagers have a good knowledge of tree species important for house construction. The average of poles used for construction per household yearly is lower compared to results of other researchers because in the study area houses are pole constructed. Paulo (2007) observed that 97% of the respondents in Kilwa District are involved in poles collection. The variation in poles utilization could probably be due to the difference in number of poles consumed domestically.

4.1.5 Ropes

The findings revealed that 81.7% of respondents collect ropes from the forest while 18.3% were not collect ropes. This implies that majority of people in the study area were engaged in collection of ropes which used as tying materials during building houses. The findings concur with Monella *et al*., (1993) who reported that most villagers have a good knowledge of tree species important for house construction.

4.1.6 Wild fruits

In the study area fruits were observed to be collected on seasonal bases by children or both male and female especially during food shortage periods.

The findings show that 60.8% of respondents collect wild fruits from the forest while 39.2% do not collect fruits. This implies majority of people collect fruits from the forest help them to supplement household food security. The fruits collected include *Passiflora edulis* (Makaa), *Eriobotrya japonica* (Msambia), *Rubus apetalus* (Mshaa),

Deinbollia kilimandscharica (Mkunguma), *Ampelocissus africana* (Ghoe) and *Ampelocissus africana* (mtoye). According to Ruffo *et al*., (2002) argued that the edible wild plants have multiple uses, that is to say one plant can be used as fruits, medicine or firewood. Kilonzo (2009) also observed that 85% of respondents interviewed in Nyanganje Forest reserve, Morogoro reported to collect and utilize wild fruits as main food during famine.

4a. *Passiflora edulis*

4b. *Ampelocissus africana*

Plate 4: Wild fruits in Baga Catchment forest

4.1.7 Honey

The study revealed that 60% of respondents do not collect honey from the forest while 40% of respondents collect honey from the forest. This implies that collection of honey from the forest is low due to the fact that collection of honey is difficult activity which

engages few of people. The findings are similar to Giliba *et al*., (2010) who reported that 40% of NTFPs collected from the forest was honey in Mbulu and Babati Districts. Also the findings differ from Singh *et al*., (2010), who reported that collection of honey from the forest was 15 – 20% in Sundarban Mangrove Forest Dwellers in India.

4.1.8 Fodder

The findings reveal that 65.8% of respondents do not collect fodder from the forest while 33.8% of respondents collect fodder from the forest. During discussion with respondents said that fodder species include *Commelina beghalensis* (Wondering jew), Ngovai (*Fabacea spp.)*, *Galinsoga parviflora* (Kihindoo). According to Franzel and Wambugu (2007), reported that, throughout the region there has been considerable adoption of the use of fodder shrubs such as *Calliandra calothyrsus* to provide dairy cows with protein. The finding differ by Giliba *et al.,* (2010), who reported that 60% of NTFPs collected from the forest catchment in Mbulu and Babati districts were fodder.

4.2 Socio-economic factors influencing collection of various NTFPs

The frequency of people visiting to the forest to extract NTFPs is mainly determined by social economic factors such as age, sex, education level, household size, occupation (Lorbach *et al.,* 1999). The results of how socio-economic factors influence the collection of vegetable, firewood, medicinal plants, poles, ropes, honey and fodder are presented in the Appendix 4,5, 6,7, 8, and 9.

4.2.1 Age

Age of respondents has positive correlation on collection of wild vegetable ($\beta = 0.110$) and highly statistically significant ($p= 0.000$), hence the model high predictive capability (Cohen *et al.*, 1983). The positive correlation indicated that as age of

household members increases the more the increase collection of vegetable from the forest catchment.

A probable explanation behind this is that as the age of household member's increases people tends to engage to the collection of vegetables from the forest since he or she knows that he/she is going to get benefits from vegetable. This implies that, the collection and use of vegetable is easy to access in terms of weight and carrying compared to bundles of firewood that is the reason causing the increase in age increases the use of vegetable from the forest. Age is determinant of many activities in the society to perform various development activities. Young people are mostly involved in collection of NTFPs compared to other group of people, however they lack enough experience of practicing indigenous knowledge (Mandara, 1999). Older people especially farmers are more skilled, hence they contribute more effectively to the information on NTFPs utilization and availability in their proximity (UNDP, 2001).

According to Sumbi (2004), who argued that the old age groups, above 55 years are considered an open minded with the interest of conserving the forest for future generation. Age in most cases influence awareness on traditional institutions since elders in the community tend to safeguard traditional ways of life as reported by Kajembe *et al*. (2002).

The age of respondents showed negative correlation (β = -0.259) and statistically significant (p= 0.021) to the collection of firewood. Negative correlation implies that the collection of firewood decrease as increase the age of respondent. The plausible explanation is that as increase the age the low amount of fuel wood collection due to reduced the number of frequencies of collecting firewood from the forest. This

resulting to the old people to please the youngs to help to bring even one bundle of firewood.

According to Sumbi (2004), that the old age groups, above 55 years are considered an open minded with the interest of conserving the forest for future generation. Age in most cases influence awareness on traditional institutions since elders in the community tend to safeguard traditional ways of life as reported by Kajembe *et al.* (2002).

Age of respondents has positive correlation ($\beta = 0.031$) and statistically significant ($p=0.025$), to collection of medicinal plants. Positive correlation implies that the collection of medicinal plants increase as increase the age of respondent. The plausible explanation is that as increase the age the higher amount of medicinal plants collection due to the fact that as increase of age people believe negatively of hospital medicine resulting on self-encouraged collecting medicinal plants**.** Age in most cases influence awareness on traditional institutions since elders in the community tend to safeguard traditional ways of life as reported by Kajembe *et al.* (2002).

There was negative correlation ($\beta = -0.\ 139$) and statistically significant ($\rho =0.025$) between age of respondents and the collection of poles. Negative correlation implies that the collection of poles decrease as the age of respondents increase. The plausible explanation is that as increase the age the decrease collection of poles due to low ability of old people to move to the forest to collect poles. Paulo (2007) observed that 97% of the respondents in Kilwa District are involved in poles collection. The variation in poles utilization could probably be due to the difference in number of poles consumed domestically.

The age of respondents was negatively correlated (β = -0.105) and statistically significant (ρ =0. 034) by the collection of ropes. Negative correlation implies that the collection of ropes decrease as the age increases. The plausible explanation is that as increase the age the small amount of ropes collection from the forest due to people fail to collect and sell ropes in large quantity hence little money obtained after selling also fail to meet the households livelihood. Kilonzo (2009) in Nyanganje forest reserve observed that collection of wild vegetable, honey and poles decrease as one moves from age class 18-30 years, through age class 30-60 years, to the age class above 60 years. These results imply that adults have a lot of experience on sources of wild vegetable, honey, ropes and pole species and are able to distinguish between poisonous and non-poisonous species of wild vegetables.

4.2.2 Sex

Sex of respondents indicated statistical significance (p=0. 016) on the collection of vegetable and positively correlated (β = 0.264) with collection of vegetable in the study area. Positive coefficient indicates that sex have positive attitudes towards collection of vegetable from the forest. A plausible explanation is that usually both women are mostly engaged in collection vegetable from the forest. The findings concur with the study conducted in East Usambara by Kessy (1998), who reported that collection of wild vegetables in East Usambara is done by women when collecting firewood in the forest reserves. Furthermore, the author argued that men were found to be the ones who are mostly involved in collection and use of vegetable and traditionally, men are responsible for honey harvesting, hunting bushmeat, and collection building materials but the collection of vegetable touches all household members.

The sex has positive correlation (β = 0.379) with collection of firewood and highly statistically (p= 0.000). The positive correlation implies that the use of firewood increases as the different sex involved in collection of firewood from the forest. A plausible explanation is that usually women are the ones who are mostly involved in collection and use of firewood from the forest. The findings concur with that of Kessy (1998) who argued that collection of firewood in East Usambara done by women in the nature reserve.

The collection of medicinal plants has positive correlation (β = 0.352) with sex of respondents and highly statistically (ρ=0.001). The positive correlation implies that the collection of medicinal plants increases as the different sex involved in collection of medicinal plants from the forest. A plausible explanation is that usually men are the ones who are mostly involved in collection of medicinal plants from the forest.

The collection of poles has positive correlation (β = 0.277) with sex of respondents and statistically significant (ρ = 0.011). The positive correlation implies that the collection of poles increases as the different sex involved in collection of poles from the forest. A plausible explanation is that usually men are the ones who are mostly involved in collection of poles from the forest for house building and women collect firewood. The findings concur with that of Kessy (1998) who argued that collection of firewood in East Usambara done by women in the nature reserve.

The collection of ropes has negative correlation (β = -0.456) with sex of respondents and highly statistically significant (ρ = 0.000). The negative correlation implies that the collection of ropes decreases as the different sexes of people involved in collection of ropes from the forest. A plausible explanation is that usually men are the ones who are mostly involved in collection of ropes from the forest for house building which used as

tying materials. The findings concur with that of Kessy (1998) who argued that collection of firewood in East Usambara done by women in the nature reserve. Mhapa (2011) also observed that in Njombe District male respondents were dominant in collection, processing, transportation and marketing of NTFPs. Robinson and Kajembe (2009) reported from studies conducted in Nguru South Mountain in Morogoro that bush meat, honey, udaha (black pepper), charcoal, poles and ropes are collected by male.

The sex has negative correlation (β = -0.371) in collection of honey and highly statistically (p= 0.000). The negative correlation implies that the collection of honey increases one group of sex deny collecting honey from the forest. A plausible explanation is that usually men are the ones who are mostly involved in collection of honey from the forest. Other factors including such as age, education level, household size and occupation of respondents do not have significant difference with collection of honey from the forest in the study area. The findings concur with that of Kessy (1998) who argued that collection of honey in East Usambara done by women in the nature reserve.

The sex and household size have negative correlation (β = -0.251) with collection of fodder and highly statistically (p= 0.001). The negative correlation implies that the collection of fodder decreases as the different sex involved in collection of fodder from the forest. A plausible explanation is that usually women are the ones who are mostly involved in collection and use of firewood from the forest. The findings concur with that of Kessy (1998) who argued that collection of different NTFPs including fodder in East Usambara done by women in the nature reserve.

4.2.3 Education level

Education indicated positive correlation (β =0.019) between collection of vegetable and education level of respondents and statistically significant (p =0.042). Positive correlation implies that people with more education tend to have a positive attitude towards use of vegetable from the forest. This caused by people loving natural vegetable compared to those planted in their farms which contaminated by poisons which used to control plant pests and diseases which resulting to affect their health as accumulate within the body. This is due to the fact that an increase in education tends to increase people's awareness on the importance of natural resources conservation for sustainable livelihood and also increases their willingness to participate in conservation and management of natural resources. As argued by Onu (1991) cited by Sumbi (2004) education level is vital in terms of natural resources preservation and exploitation and in setting up and monitoring interventions. Education level of an individual has influence on attitude and adoption of different forest management approaches. The findings harmonize with those of Kajembe and Luoga (1996) who argue that increase in education tend to increase people's awareness on the importance of natural resources conservation for sustainable livelihood. Agarwal (2010) and Coleman and Mwangi (2012) found that literacy, education and practical skills related to income generation or employment increased women's social status and Self-confidence, thereby increasing the effectiveness of their participation in community forest user groups.

There was positive correlation (β =0.104) between collection of firewood and education level of respondents and not statistically significant (p =0.295). Positive correlation implies that people with more education tend to use firewood as the major source of cooking fuel towards from the forest. This could probably be due to the reasons that firewood is the only cheaper, available and affordable primary source of energy in this

area, however people have education but they do not have other alternative source of cooking fuel. In rural areas the use of firewood is high as major cooking fuel about 92% and in the urban the use of charcoal is high 50% (NBS, 2009). As argued by Onu (1991) cited by Sumbi (2004) education level is vital in terms of natural resources preservation and exploitation and in setting up and monitoring interventions. Education level of an individual has influence on attitude and adoption of different forest management approaches. The findings harmonize with those of Kajembe and Luoga (1996) who argue that increase in education tend to increase people's awareness on the importance of natural resources conservation for sustainable livelihood.

There was negative correlation (β = -0.008) between collection of medicinal plant and education level of respondents and statistically significant (ρ=0.043). Negative correlation implies that as the number of educated people increase there is decrease of collecting medicinal plants from the forest. The plausible explanation is that, although most of respondents have basic education but when sick attend to the dispensary or hospital to get health services rather than using medicinal plants.

Studies on traditional medicinal plants have shown that about 1000 plant species are used in traditional medicinal practice in Tanzania which represents 10% of the country's flora (Kajembe *et al.,* 2000). (Kilonzo, 2009) observed related few plant species and parts of plants used in Nyanganje Forest Reserve.

There was negative correlation (β = -0.115) between collection of poles and education level of respondents. Although the variable indicate no statistical significance (ρ =0. 270). Negative correlation implies that increase of education level of respondents tend to decrease the collection of poles from the forest. This is due to the fact that educated people use burnt bricks for building houses rather than using poles. The plausible explanation is that, as the education level of respondent increase, the decrease the

collection of poles from the forest. This is differ to Elikana (2013) observed that sex of respondent, education level and household size was statistically significant and influenced extraction and use of NTFPs in Masasi district.

There was negative correlation (β = -0.101) between collection of ropes and education level of respondents and statistical significance (ρ=0.031). Negative correlation implies that increase of the education level of respondents tend to decrease the collection of ropes from the forest. The plausible explanation is that, as the education level of respondent increase, the decrease the collection of ropes from the forest. This is due to the fact that educated people use of nails or wires as part of tying materials during house building or construct building by burnt bricks or blocks. The findings concur with Monella *et al*., (1993) who reported that most villagers have a good knowledge of tree species important for house construction.

4.2.4 Household size

Household size indicated positive correlation (β= 0.064) to collection of vegetable and highly statistically significant (p =0.000). Positive correlation implies that household with larger family size have more positive decision towards collection of vegetable from the forest catchment. A plausible explanation is that as household size increases the more the household members collect vegetable from the forest.

In addition to that, households with large families are not attracted with the activities which take long time therefore usually tends to find easy way of getting money including collection of vegetable from the forest which use or sold and get money to buy other household needs. The findings concur with that of Kessy (1998) who argued that development pressures over resources particular forest resources is caused by increasing human population.

Household size is positively correlated (β = 0.190) to the collection of firewood and statistically significant (p=0.050). Positive correlation implies that increase household size affect significantly the collection of firewood. (Kilonzo, 2009) revealed that, increase in household size from 1-6 members, increases collection of bush meat, wild fruits, wild mushrooms, poles and medicinal plants but the increase is not significant. A plausible explanation is that as household size increases the more the household members collecting of firewood for the household consumption. The findings concur with that of Kessy (1998) who argued that development pressures over resources particular forest resources is caused by increasing human population.

There was negative correlated (β= -0.058) between household size and collection of medicinal plants from the forest and highly statistically significant (ρ =0.000). Negative correlation implies that household with larger family size have negative collection of medicinal plants from the catchment forest. A plausible explanation is that the collection of medicinal plants in the household depend the sickness of people in the family. (Kilonzo, 2009) revealed that, increase in household size from 1-6 members, increases collection of bush meat, wild fruits, wild mushrooms, poles and medicinal plants but the increase is not significant.

Household size has positive correlation (β= 0.186) to the collection of poles from the forest and statistically significant (ρ = 0.050). Positive correlation implies that as household family increase the engagement of poles collection increase from the forest. A plausible explanation is that the collection of poles in the household depends on number of people in the family, if the family size is small the collection of poles become small quantity. This similar to (Kilonzo, 2009) revealed that, increase in

household size from 1-6 members, increases collection of bush meat, wild fruits, wild mushrooms, poles and medicinal plants but the increase is not significant.

Family size is positive correlated (β= 0.057) with collection of ropes. Although the variable indicates no statistical significance (ρ =0.570). The positive correlation suggests that increase in the family size tend to increase the collection of ropes in from the forest. A plausible explanation is that as family size increases the collection of the forest products including ropes for house construction compared to households with small family size. Furthermore, increase in household size, which also indicates increase in population may results into increased demand of using ropes for house building. The findings concur with that of Kessy (1998), who argued that development pressures over resources particular forest resources is caused by increasing human population. This is because increased human population increases demand for different products from the forest (Mayeta, 2004). WRI *et al*. (1992) reported that increased demand for resources, which emanate from increased human population, has made resource use in rural areas unsustainable.

4.2.5 Occupation

Occupation of respondent is negative correlation (β = -0.028) to the collection of vegetable from forest and indicate no statistical significance (p= 0.785). Negative correlation implies that with many occupations of the household members tend to have more negative attitudes towards collection of vegetable. A plausible explanation is that as having many activities tend to ignore others which are most important which could enable to satisfy the household needs such as collection of vegetable from the forest for improving household livelihood.

Occupation of respondent has negative correlation (β = -0.073) to the collection of firewood from forest and indicated no statistical significance (p= 0.458). Negative correlation implies that with many occupations of the household members the collection of firewood from the forest decreases. A plausible explanation is that as having many activities tend to ignore others which are most important which could enable to satisfy the household needs such as collection of firewood from the forest for improving household livelihood.

There was positive correlation (β =0.065) between occupation of respondents and collection of medicinal plants from forest. However, occupation of respondents indicated no statistical significance (ρ =0.508). The positive coefficient indicated a positive attitude towards the collection of medicinal plants as occupation of respondents' increases. This is due to the fact that as the occupation increases the use of medicinal plants increases. The findings are similar to (Cruzet *et al.,* 2013), who reported that there was no significant relationship between occupation and the collection of medicinal plants.

The occupation of respondent is negative correlation (β = -0.080) to the collection of poles from forest and statistically significant (ρ = 0.049). Negative correlation implies that with many occupations of the household members tend to have negative attitudes towards collection of poles. A plausible explanation is that as having many activities which act as alternative sources of income tend to ignores collection of poles from the forests.

Occupation of respondent has positive correlation (β = 0.029) to the collection of ropes from catchment forest. However occupation of respondent did not indicate statistical

significance ($\rho = 0.766$). Positive correlation implies that people who have many occupations in the study area have positive attitude to the collection of ropes from the forest. This is due to the fact that an individual who collect ropes is assumed to have other activities such as farming, livestock keeping and labour wages which enable them to meet their livelihood needs.

4.3 Various sources of food security and income in Lushoto District

In the perspective of this study, economic activities contributing to food security and income generation have been grouped into six categories namely agriculture, NTFPs collection, livestock, business, and employment and Labourer activities. as presented in the table below.

Table 2. Sources of household food security

Source of household food	**%response (n)**	
Agriculture	42.5	(51)
NTFPs	38.3	(46)
Livestock keeping	7.5	(9)
Business	2.5	(3)
Employment	4.2	(5)
Labourer activities	5.0	(6)
Total	**100.0**	**(120)**

The findings indicate that average agriculture is the major source of household food supply 42.5% in the study area, NTFPs contribute about 38.3% and livestock keeping contribute about 7.5%, labourer activities contribute about 5.0%, employment contribute about 4.2% and business contribute about 2.5%. The results might be reflecting to most respondents are primary educated who lack formal employment therefore engaging in agriculture as the main source of food and income generating

activity. NTFPs collection and trading is done to supplement agriculture income as NTFPs are common pool resources which can be accessed by everyone in the village. However, NTFPS indicated to be the most (78.3%) source of household income followed by agriculture (15.3%), livestock keeping (0.7%), business (0.11%), labourer activities and employment. Other researchers have observed various contributions of NTFPs on household income. Robison and Kajembe (2009), reported NTFP value accounted for an average of 12% of household annual wealth surveyed in villages around Nguru forest Morogoro. Schaafsma et al. (2011), observed NTFPs contribute about 13% to household income in Eastern Arc Mountains (Morogoro and Tanga). The two observations are higher than that estimated by census statistics (NBS 2007), which is around 5percent, and may be a reflection of the proximity of our sample households to forest areas. Mhapa (2011) observed that only 2percent relied on sole NTFPs trade for income generation in Njombe Township less than that observed by NBS on contribution of NTFPs.

4.3.1 Agriculture

Agriculture is the main source of food for household members in order to sustain their daily life. However, most of the households depends more than one source of food in the study area. In this study agriculture captured 42.5% of all respondents as the major source of household food. The results indicate that agriculture plays a very important role in providing food and income for the majority of the households (FAO, 2002). Also it accounts for an average of 45% of Gross Net Product and 60% of total export earnings (Majule, 2008). However agriculture remains as the major source of household food but is dominated by smallholder farmers, who depend mostly on rain fed agriculture and also it is subsistence, therefore need for supplement products from other sources to sustain the household food security (Mongi *et al.,* 2010).

4.3.2 NTFPs

NTFPs are the second 38.3% source of household food security from the forest in the study area. NTFPs contribute to household food security direct or indirect. Direct consumption is that picked and eaten while indirect is that picked and processed and eaten or sold and money available used to buy food for household uses. The results indicate that if the failure of crop production or bad weather (dry season) NTFPs used to provide household food security through supply of various products from the forest as an alternative sources (Chikamai *et al*., 2000).

The findings of this study are similar to Kessy (1998) who argued that, the importance of forest and farm tree resources with regard to household food security is based on the understanding that these resources serves to supplement existing food resources and income, fill in seasonal shortfalls of food and income as well as provide seasonally crucial agricultural inputs. Therefore, the importance of NTFPs in the study area cannot be overemphasized to household food security in the study area due to the fact that NTFPs collected from forests save the daily life of the households living surrounding Baga catchment forest.

4.3.3 Livestock keeping

The findings of the study show that livestock contribute to household food security about 7.5% in the study area. This indicates that respondents depend on livestock as source of food security whereas they sell them then money obtained used to buy food and other household needs. The findings of this study are similar to Bashir *et al.,* (2012), who found that, both large (cows and buffalos) and small (goats and sheep)

livestock assets significantly improve food security. Therefore, livestock contribute to household food security in the study area.

4.3.4 Business

The business contributes to household food security in the study area about 2.5%. This indicates that people conduct petty businesses and spend the profit obtained to buy food for household consumption. If the business did not get profit the household members suffer food shortage, the business used as supplement. Other household engaged in urban agriculture as the business of crops such as vegetable to supplement business to increase food security. The findings of this study is similar to Brian *et al.,* (2011), who reported that, in terms of food security from salaries/wages, the NTFPs-participant households had significantly less food security from this source than their counterpart, perhaps an indication that NTFP participant households engage in low paying employment activities or have few employment opportunities and thus, turn to NTFPs to supplement off-farm income.

4.4.5 Employment

The findings show that employment contributes to household food security about 4.2% of people in the study area. They use part of their salary to buy household food, however supplement from other sources such as crop production the farm. Respondents who are employees reported that the salaries not enough for buying food for the family in a whole year, this cause the employees to use low quality food in order to push the days of years. Therefore, employment as source of food contributes to household food security in small amount.

4.3.6 Labourer activities

The findings indicate that 5.0% of respondents get their food through performing labourer activities to sustain their household members. The findings of this study are similar to Brian *et al.,* (2011) who reported that, in terms of food security from salaries/wages, the NTFPs-participant households had significantly less food security from this source than their counterpart, perhaps an indication that NTFP participant households engage in low paying employment activities or have few employment opportunities and thus, turn to NTFPs to supplement off-farm income.

Table 3. Sources of income in Lushoto District

Sources of income	N	Mean	SD	t-value	Sig
NTFPs	120	1.183	1.402	9.245	.000*
Other sources	120	0.903	0.975	5.278	.000*

*Statistically significant at 0.05 and 0.01 level of significance, ns = not statistically significant at 0.05 level of significance, t = test statistics

4.4 NTFPs contribution to household income

The findings from the study area show that NTFPs contribute to household income in the study area. The mean income from NTFPs (M = 1.183, SD = 1.402, N= 120) was significantly greater than zero, t (119) = 9.245, two-tailed p = 0.000, providing evidence that the NTFPs are effective in contributing household income than other sources. This implies that most of people in the study area obtain more income from NTFPs. Furthermore, this implies that poorer households are relatively more dependent on income from extraction and sale of natural resources such as NTFPs in the study area. The findings of this study are similar to CIFOR (1999) research done in six communities in Tanzania found that farmers were deriving up to 58% of their cash

income from the sale of honey, charcoal, fuel wood, wild fruits and vegetables. Pimentel *et al*. (1997) cited by Brian *et al., (*2011) found that the integrity of forests is vital to world food security, mostly because of the dependence of the poor on forest resources.

4.5 Quantity of NTFPs collected, marketed and consumed per year in the study area

The annual quantity of firewood collected per year in the study area was found to be 25 377 bundles collected from the forest. The average quantity of wild vegetable harvested in the study area per year was estimated to be 42 204kg per year. Results of this study estimated the average amount of medicinal plants harvested in the forest per year in the study area to be 16 727 kg. Poles collected from the forest in the study area estimated to be 105 360 per year. The average estimate of ropes harvested per year in the study area to be 180 880 pieces per year from the forest. Wild fruits collected per year in the study area estimated to be 47 048kg. Fodder collection from the forest in the study area estimated to be 11 728bundles per year. The quantity of honey harvested from the forest in the study area estimated to be 4 516liters per year.

The quantity of key NTFPs harvested from Baga Catchment Forest is shown in the table below.

Table 4. NTFPs collected, marketed, consumed and contribute to household food security.

NTFPs collected in (bundle, kg, ltr, pcs	Total quantity/year	Quantity consumed	Quantity sold	% consumed	% sold	Total %
Firewood	25 377	14 352	11 025	56.6	43.4	100.0
Medicinal plant	16 727	9 210	7 517	45.0	55.0	100.0
Wild vegetable	42 204	33 256	8 948	78.8	21.2	100.0
Wild fruits	47 048	32 735	14 313	69.6	30.4	100.0
Ropes	180 880	147 365	33 515	81.5	18.5	100.0

Poles	105 360	91 211	14 143	66.6	33.4	100.0
Fodder	11 728	5 510	6 218	47.0	53.0	100.0
Honey	4 516	2 952	1 564	65.3	34.7	100.0
Total	**433 840**	**336 591**	**49 415**	**77.6**	**11.4**	**100.0**

4.5.1 Firewood

The annual direct firewood consumption rate were 14 352 bundles equals to 2 812m^3 in the study area. The quantity of firewood is equal to 56.6% of the total quantity collected per year. In addition the highest consumption of firewood in the study area caused by the absence of alternative sources of fuel energy. Schaafsma *et al.* (2011) observed that in the EAM, a total annual quantity of firewood collected is approximately 72 million head loads. Also (Ishengoma and Ngaga, 2000) observed that 90% of the people of Africa relies upon fuel wood. Zugman (1995), observed "people will use the forests to provide for their needs; how they use these forests positively or negatively will depend on economic development" state reached by the community.

4.5.2 Medicinal plants

The quantity of medicinal plants collected for household use in the study area was 16 727 kg, whereas 9 210kg about 55% were consumed by the household members in the study area. The quantity of 7 517kg which is about 45% were sold during local market days specified in the week. The quantity consumed in the household indicate that majority of people in the area attend to hospitals when they sick and also use medicinal plants to cure them (CITES, 2000). During Focus Group Discussion and individual interview the respondents mentioned some plants which used as medicine. The plants include *Bidens pilosa* used as wound healing and when eaten increase blood volume in the body, *Dracaena mannii* used as stomach curing, *Parinari excels* used to increase body power, *Zanthoxylum chalybeum* used to reduce the large amount of gall liquid to normal in the body (Ruffo,2002).

4.5.3 Wild vegetable

The study show that the total quantity of wild vegetable collected per year was 42 204kgs and 33 256kgs which is about 78.8% were direct consumed in the households and also 8 948kgs which is about (21.2%) were sold. The respondents in the study area mentioned some species of vegetable consumed and sold during household respondent interview and Focus Group discussion such as *solanum nigrum* (mnavu), *Bidens pilosa* (Mbwembwe), *Basella alba* (ndelema), *Galisoga parviflora* (kihindoo or ngereza), *Amaranthus spinosus* (Bwache), *Cyphomandra betacea* (mgoghwe), *Sonchus luxurians* (mshunga) and *Solanum schumannianum* (njujui or ngae). The findings of this study is similar to Katriina (2000), who reported that the most species of vegetable are collected and used in four days a week on average and also many species collected for sale. Therefore, vegetables consumption serves as buffer food supplies during the recycling periods of food shortage. On the other way in severe food shortage, the wild vegetables form complete meals where the staple is not present.

4.5.4 Wild fruits

The findings of this study show that the quantity of 47 048 kg of wild fruits was collected per year from the forest in the study area. The quantity of 32 735kg which is about (69.6%) was consumed direct in the household because fruits are used as food, beverages while 14 313kgs which is about 30.4% were sold hence contribute indirectly to the household food security. The quantities of fruits sold from the forest in the study area because people want to get other household needs to improve their livelihoods. The study revealed that the fruits species available and consumed in the study area include *passiflora edulis* (mkakaa), *Eriobotrya japonica* (msambia), *Rubus apetalus* (mshaa), *Deinbollia kilimandscharica* (mkunguma), *Ampelocissus africana* (Ghoe) and *Ampelocissus africana* (mtoye). According to Ruffo *et al.,* (2002) argued that the edible

wild plants have multiple uses, that is to say one plant can be used fruits, medicine or firewood. Kilonzo (2009), who observed that 85% of respondents interviewed in Nyanganje Forest reserve, Morogoro reported to collect and utilize wild fruits as main food during famine.

4.5.5 Ropes

The study showed that the quantity of ropes collected per year was 180 880 pieces. The quantity consumed was 147 365 pieces which is about 81.5% while 33 515 pieces which is about 18.5% was sold. The large quantity of ropes of ropes used in the study area probably because many houses in the study area constructed by poles and ropes used as tying materials. The results relate with Rovero (2007), observed that 600 poles can be used to construct a two rooms house in Mazumbai, Tanga, Tanzania. Household members engaged in trade of non-timber forest products (NTFPs) because of low capital requirements and relatively easy entry to markets.

4.5.6 Poles

The findings of the study shows that 105 360 pieces were collected per year from the forest and 91 211 pieces which is about 86.6% were consumed per year in the study area from forest while 14 149 pieces which is about 13.4% were sold. The poles used as building materials in the study area due to the fact that many houses in the study area constructed by using poles and plastered by mud. However people build the houses once but collection of poles still continue because done as business whereas people sell poles to the near villagers who still need poles to construct their houses. Paulo (2007) also observed that 97% of the respondents in Kilwa District are involved in poles collection. The results relate with Rovero (2007), observed that 600 poles can be used to construct a two rooms house in Mazumbai, Tanga, Tanzania. Household members

engaged in trade of non-timber forest products (NTFPs) because of low capital requirements and relatively easy entry to markets. The amount of money obtained improve livelihood of people through bought food for household consumption and poverty alleviation ((Richardson, 2010).

4.5.7 Fodder

The findings of the study revealed that 11 728 bundles of fodder were collected per year from the forest whereas 5 510 bundles which is about 47% were consumed in the household by feeding their livestock while 6 218 bundles equals to 53% were sold and contribute indirect to household food security and increase income. The study further revealed that the species of fodder collected from the forest include *commelina beghalensis* (wondering jew), Guatemala and Ngovai (Fabaceae *spp.*), *Galinsoga parviflora* (Kihindoo). According to Franzel and Wambugu (2007) reported that, throughout the region there has been considerable adoption of the use of fodder shrubs such as Calliandra calothyrsus to provide dairy cows with protein. The findings differ by Giliba *et al.,* (2010), who reported that 60% of NTFPs collected from the forest catchment in Mbulu and Babati districts were fodder.

4.5.8 Honey

The findings from the study area showed that the quantity of honey harvested from the forest was 4 516litres per year. About 2 952litres which is about 65.4 % were consumed as food in the household and 1 564litres which is about 34.6%were sold. Honey obtained from the forest did not collect from the made beehives but from big trees which have holes where bees come to initiate the habitat as the beehives then prepare honey.

4.6 Number of trips per day in collection of NTFPs from the forest

During individual interview most of the respondents said that said that they go to collect NTFPs from the forest more than twice per and others responded that they collect twice per day and few responded that they collect twice per day. The results are presented in the table below.

Table 5..Number of trips per day in collection of NTFPs from the forest

Category	% responses (n)
Once per day	1.7 (2)
Twice per day	32.5 (32)
More than twice per day	65.8 (79)
Total	**100.0 (120)**

Results of the study revealed that majority (65.8%) of respondents in the study area collect NTFP from the forest more than twice per day while (32.5%) collect NTFPs twice per day and few (1.7%) enter to the forest to collect NTFPs once per day. The results imply that majority of people collect large quantities of NTFPs per day. The recommended days by the Village Environment Committee were two days and no anybody allowed entering in the forest with bush knives; axles as the Village Environment Committee Leaders (VECL) said during key informant interview but compared to individual interview majority of people go even a whole week to collect NTFPs. The findings further reveal that Village Environment Committees did not work properly as others said the government should provide us enough working equipments.

Table 6. Price for collected NTFPs per bundle/bunch/kg/liter/piece

Average price	%response (n)
300 - 1500 TZS per bundle, kg, Liter, piece, bunch	75.8 (91)
1501 - 2701 TZS per bundle, kg, liter, piece, bunch	13.3 (16)
2702 - 3902 TZS per bundle, kg, liter, piece, bunch	4.2 (5)
3903 - 5103 TZS per bundle, kg, Liter, piece, bunch	4.2 (5)
5104 - 6304 TZS per bundle, kg, Liter, piece, bunch	2.5 (3)
Total	**100.0 (120)**

4.7 Average price of collected NTFPs from the forest

Findings of this study shows that majority 75.8% of respondents sold different NTFPs from the forest in average price which is between 300 and 1 500 TZS per bundle, kilogram, liter or piece and bunch while 13.3% sold NTFPs on price between 1 501 and 2 701 TZS per bundle, kilogram, liter or piece and 4.2 % sold the collected NTFPs collected from the forest in price between 2702 and 3902 TZS per bundle, kg, liter, piece, bunch and very few 2.5% sold the collected NTFPs in price between 5104 and 6304 TZS per bundle, kg, Liter, piece, bunch. This implies that majority of respondents in the study area sale their NTFPs at the price which ranges the price of 300 to 1 500 due to the fact that the products such as wild vegetable sold in a price of 800 TZS per kilogram while the bundle of firewood sold in the price 1 000 TZS per bundle. The results further reveal that respondents who were few deal with collection of NTFPs like honey, building materials that collected in large quantity and capture high price, for example the price of honey 2 500 TZS to 4 500 per lire. Schaafsma *et al.* (2011) observed that in the EAM, a total annual quantity of firewood collected is approximately 72 million head loads with annual values of TZS 16 000 to the annual household budget and the flow of benefits is in total TZS 36 billion per year (USD 25 million). Therefore, NTFPs contribute to household food security and income due to

the price of NTFP attract majority of people to engage in more collection and also depending easily NTFPs collected, that is collection of vegetable for sale is ease compared to collect building materials, honey and bushmeat from the forest however the price is high but frequencies was low compared to who collect vegetables however the price is low.

Table 7: Amount of money earned after selling NTFPs per year

Amount of money (TZS)	%response (n)
150 000 – 500 000 TZS per year	31.7 (38)
500 0001 TZS per year – 1Million TZS per year	16.7 (20)
1.1 Million TZS per year – 3Million TZS per year	13.3 (16)
3.1Million TZS per year – 6 Million TZS per year	10.8 (13)
6.1Million TZS per year – 10 Million TZS per year	9.2 (11)
10.1 Million TZS per year - 15Million TZS per year	6.7 (8)
15.1Million TZS per year - 20Million TZS per year	5.0 (6)
20.1Million TZS per year - 25Million TZS per year	3.3 (4)
25.1 Million TZS per year - 30 Million TZS per year	1.6 (2)
>30 Million TZS per year	1.6 (2)
Total	**100.0 (120)**

The findings of this indicates that 31.7% of respondents in the study area obtain the amount of money after sold NTFPs from the forest between 150 000 and 500 00TZS per year while 13.3% of respondents in the study area obtain the amount of money between 500 0001 TZS and 1Million TZS per year after selling NTFPs from the forest. Further the study revealed that 10.8% of respondents obtain the amount of money between 3.1 and 6 Million TZS per year after selling NTFPs, 9.2% of respondents obtain money between 6.1 and 10 million TZS per year after selling NTFPs from the forest and very few 6.7% obtain the amount of money between 10.1 and 15 Million per year after selling NTFPs from the forest. Further the study revealed that 5.0% obtained

the amount between 15.1 and 20Million TZS per year, also the finding revealed that 3.3% obtained the amount between 20.1Million and 25Million TZS per year and 3.2% obtained the amount between25.1 and 30Million TZS per year. The findings imply that majority of people get money from forest products to improve their livelihood ranges from 150 00 and 500 000TZS. This implies that NTFPs plays a major role for household food security and income direct and indirect.

The findings of this study are similar to CIFOR (1999) research done in six communities in Tanzania found that farmers were deriving up to 58% of their cash income from the sale of honey, charcoal, fuel wood, wild fruits and vegetables.

A study done by Kilonzo(2009), in villages around Nyanganje Forest Reserve, Morogoro reported that annual present value of poles estimated to be about TZS 2,337,000 (USD 1 798). A study done by Msemwa (2007), in Kilosa District, Morogoro reported that the annual present value of poles estimated to be TZS 6.2 billion (USD 5.6 million). Therefore, NTFPs is the major saver of the communities living around the forests for sustaining their livelihood due to collection of various NTFPs.

Table 8.The uses of money after selling NTFPs

Variable	**%responses (n)**
Paying tuition fees	11.7 (14)
Buying house utensils	15.0 (18)
Buying food for family uses	65.0 (78)
Paying treatment services to the hospital	5.8 (7)
Saving for future expenditure	2.5 (3)
Total	**100.0 (120)**

4.8 Uses of money after selling NTFPs

The findings of this study indicate that 65.0% of money used to purchase food for family uses in the household while 15.0% of money used to purchase house utensils. Further the study reveals that 11.7% of money used to pay tuition fees while 5.0% of respondents in the study area use money for health services and few 2.5% of respondents in the study area save their money for future expenditure. This implies that most of money used to buy food for household uses; NTFPs still contribute to household food security and income in the study area. This differ with other researchers on the uses of money after selling NTFPs.

Foppes and Ketphanh, (2004), who reported that NTFPs are estimated to contribute 40-50% of cash income of Lao rural households. A similar amount of 50% of average household cash income is used to buy rice (more for the poorer families). Therefore, NTFPs plays a significant role in the protection of the livelihood safety net of the near forest dwellers in the study area.

4.9 Problems associated with collection of NTFPs

There were problems associated with collection of NTFPs and the respondents mentioned them including biting by snakes and scorpion, chased by forest officers, accident during carrying NTFPs, injured by wild pigs and injured by thorn trees as presented in the table below.

Table 9: Distribution of respondents on problems associated with collection of NTFPs

Problem		%response (n)
Biting by snakes and scorpion	Yes	13.3 (16)
	No	86.7 (104)
	Total	**100.0 120)**
Chased by forest officers	Yes	21.7 (26)
	No	78.3 (94)
	Total	**100.0 (120)**
Accident during carrying NTFPs	Yes	95.8 (115)
	No	4.2 (5)
	Total	**100.0 (120)**
Scared by wild pigs	Yes	65.0 (78)
	No	35.0 (42)
	Total	**100.0 (120)**
Injured by thorn trees	Yes	1.7 (2)
	No	98.3 (118)
	Total	**100.0 (120)**

4.9.1 Biting by snakes and scorpion

The findings indicate that 13.3% of respondents get problems of being bitten by snakes and scorpion while 86.7% of respondents were not being bitten by snakes and scorpion.

4.9.2 Chased by Forest Officers

The findings shows that 21.7% of respondents get problem of being chased by forest officers and 78.3% of respondents were not being chased by forest officers. This implies that there are no enough forest staffs in the study area. Therefore, the government ought to increase the number of staffs for forest management.

4.9.3 Accident during carrying NTFPs

The findings further revealed that 95.8% of respondents in the study area get accident during carrying NTFPs while 4.2% did not get an accident. This is due to high slopes of the forest slippery of legs during walking.

4.9.4 Scared by wild pigs

The findings also indicate that 65.0% of respondents in the study area were scared by wild pigs while 35.0% were not injured by wild pigs. This implies that the presence of wild pigs in the forest.

4.9.5 Injured by thorn trees

The results revealed that respondents in the study area were 98.3% of respondents were injured by thorn trees and 1.7% was not injured by thorn trees. This implies that people collect NTFPs in the forest without fearing lost of their equipment.

4.10 Measures that can be taken for sustainable use of NTFPs in the area

The respondents gave their opinions on measures to be considered for sustainable use of NTFPs from the forest. Those opinions were practicing participatory forest management, the government employing enough staffs; provide education to the villagers living around the forest on importance of forest to daily life, good governance, and presence of good strategies on use of NTFPs and encouraging people on planting trees outside the forest as presented in the table below.

Table 10: Distribution of respondents on suggestions for sustainable use of NTFPs

Measures	Category	%response (n)
Participatory	Yes	42.5 (51)
Forest	No	57.5 (69)
Management	**Total**	**100.0 (120)**
Employ enough	Yes	6.7 (8)
staffs	No	93.3 (112)
	Total	**100.0 (120)**
Provision	Yes	55.0 (66)
education	No	45.0 (54)
	Total	**100.0 (120)**
Good governance	Yes	80.8 (97)
	No	19.2 (23)
	Total	**100.0 (120)**
Good strategies	Yes	9.2 (11)
on use of NTFPs	No	90.8 (109)
	Total	**100.0 (120)**
Encourage people	Yes	51.0 (61)
on tree planting	No	49.0 (59)
	Total	**100.0 (120)**

4.10.1 Participatory Forest Management

The findings show that 42.5% of respondents suggesting the villagers to participate in forest management while 57.5% of respondents did not suggest participate forest management. Participatory forest management system involves a high degree of participation of villagers in all stages of forest management planning, implementation, monitoring and evaluation and also in sharing of benefit (Bromley and Ramadani, 2006). Participation of communities to forest management enables sustainable flow of forest products which improves the livelihoods of communities surrounding the forest through creating awareness to them (Iddi, 2002). According to Kessy (1998), recommended approaches in participatory forest management vary from one locality to another depending on group interests.

Also it is sometimes argued that local community interest in participatory management of the forests is influenced by the need for forest products, by cultural factors and in the option of using forests as a source of household food security and income or employment (Kessy, 1998).

4.10.2 Employing enough staffs

The findings further indicate that 6.7% of respondents in the study area suggested that when the government employ enough forest staffs sustainable use of NTFPs in the study area while 93.3% were not suggested the government to employ enough forest staffs. This imply that respondents do not want forest officers due to the fact that most of NTFPs collected done illegal, so they fear to be chased during collection.

4.10.3 Provision of education

The findings in the study area show that 55.0% of respondents suggested the government to provide education about sustainable use of NTFPs in the study area while 45.0% did not suggest the government to provide education for sustainable use of NTFPs. This implies that education on importance of NTFPs to household food security and income is needed in order to ensure sustainable use of NTFPS in the study area. Kajembe and Luoga (1996) who argue that increase in education tend to increase people's awareness on the importance of natural resources conservation for sustainable livelihood.

4.10.4 Good governance

The findings shows that 80.8% of respondents in the study area suggested the presence of good governance for sustainable use of NTFPs in the forest while 19.2% were not suggested the presence of good governance. Natural resources' good governance is definitely about getting governance right, but since the right way is largely shaped by the cultural norms and values of each particular society or organization, universal templates for good governance have limited credibility. Good governance and Institutional accountability are important contributors to sustainable natural resource management in the community. In the study area respondents said that Village

Environment Committee leaders (VECL) when caught people from the forest receive corruption and left those people to continue with activities of collecting NTFPs illegally in the forest (Shemdoe,2003). There was no transparency, accountability, rule of law. Also Shemdoe (2003) reported the existence of governance structures with cultural background (informal local governance structures) and those with political background (formal local governance structures) in his study villages around Lake Manyara National Park Tanzania. Therefore, good governance is needed in order to enable the community to utilize NTFPs from the forest in a sustainable way.

4.10.5 Good strategies on use of NTFPs

The findings in the study area revealed that 9.2% of respondents in the study area suggested the presence good strategies on use of NTFPs from the forest in order to sustain for the future generation, example of good strategies include participation of community in forest Management, Village leaders, Village Environment Committees ought to work properly and reinforcement of rules and Regulation and By-laws concerning with forest management and everyone see forest as the owner. Participation of religion leaders while 90.8% of respondents were not suggested the presence of good strategies in the use of NTFPs from the forest. An understanding of the significance of forest products to the rural communities contributes substantially towards working out possible strategies for involving these communities in the management of the forests. This implies that majority of people need to collect NTFPs from the forest without control which resulted forest degradation.

4.10.6 Encourage people on tree planting outside forest

The findings revealed that 51.0% of respondents in the study area suggested that encouragement of people to plant trees outside the forest while 49.0% of respondents

were not suggested encourage people on tree planting outside the forest. Tree planting outside the forest is important to avoid natural forest degradation due household demand of NTFPs such as firewood which is the major cooking fuel in rural areas (Ayele, 2008). According Ayele (2008), who reported that there is a statistic difference between tree growing and non-tree growing households in both sites.

CHAPTER FIVE

5.0 CONCLUSIONS AND RECOMMENDATIONS

This Chapter presents conclusions and recommendations on the basis of the study objectives.

5.1 Conclusions

Based on this study it is concluded as follows:

There were various NTFPs available in the forest which collected by the households members living around the forest which contribute to their livelihood. Those NTFPs are wild vegetable, firewood, medicinal plants, poles, ropes honey and fodder.

About 87.5% of people in the study area collect wild vegetable from the catchment forest, where as 71.7% of people collect firewood, 66.7% of people in the study area engaged in collection of medicinal plants. Furthermore 71.7% of people in the study area collect poles from the catchment forest, 81.7% of people also collect ropes from the catchment forest. Also in the study area it was observed that 60.8% of people engaged in collection of wild fruits from the forest, also it was observed that 40% of people engaged in collection of honey from the catchment forest and 65.8% of people in the study area engaged in collection fodder from catchment forest.

There was correlation between NTFPs collection from the catchment forest and socio-economic characteristics (age, sex, household size, education level and occupation).

Age of respondents has positive correlation on collection of wild vegetable and medicinal plants ($\beta = 0.110, 0.031$) and highly statistically significant ($p= 0.000, 0.025$) also the age of respondents showed negative correlation ($\beta = -0.259, -0. 139, -0.105$) and statistically significant ($\rho = 0.021, 0.025, 0. 034$) to the collection of firewood, poles and ropes.

Sex has positive correlation (β= 0.264, 0.379, 0.352, 0.277) and statistically significant (ρ=0.016, 0.000, 0.001, 0.011) on collection of wild vegetable, firewood, medicinal plants and poles. Also sex has negative correlation (β= -0.456,-0.371, -0.251) and statistically significant and non significant (ρ=0.000, 0.000, 0.001) on collection ropes, honey and fodder in the study area.

Education level has positive correlation (β=0.016, 0.104, 0.143) and statistically significant (ρ=0.042, 0.295) on collection of wild vegetable and firewood. Also there are negative correlation **(**β=-0.008, -0.115, -0.101,) statistically significant and non significant (ρ= 0.043, 0.270, 0.031, 0.174) on collection of medicinal plants, poles, ropes and fodder.

Household size has positive correlation (β=0.064, 0.190, 0.186, 0.057) and statistically significant and non significant (ρ = 0.000, 0.050, 0.050, 0.570) on collection of wild vegetable, firewood, poles and ropes. Household size has negative correlation (β=-0.058, -0.156) and statistically significant and non significant (ρ= 0.000, 0.137) on collection of medicinal plants and fodder.

Occupation has positive correlation (β= 0.065, 0.029, 0.010) and statistically significant and non significant (ρ=0.508, 0.766, 0.927) on collection of medicinal plants, ropes and fodder. Also occupation has negative correlation (β=-0.028, -0.073, -0.080) and statistically significant and non significant (ρ = 0.785, 0.458, 0.049) on collection of wild vegetable, firewood, poles.

Various sources of food and income including NTFPs, agriculture, Livestock keeping and selling, business, employment and Labourer activities contributed to household food security and income. Agriculture contribute to household food security and on 42.5%, NTFPs contribute on 38.3% to household food security, livestock keeping contribute to 7.5%, labourer activities contribute to 5.0% to household food security

while employment contribute to 4.2% for household food security and 2.5% contributed to household food security.

The quantity of NTFPs collected per year from the catchment forest including firewood is 25 377 bundles, medicinal plants is 16 727kg, wild vegetable is 42 204kg, wild fruits is 47 048kg. Others are ropes is 180 880 pieces, poles 105 360pieces, fodder 11728 bundles and honey 4 516 liters. About 75.8% of people responded that average price of sold NTFPs is 300 – 1 500TZS per bundle, kg, and liter piece and bunch.

About 31.7% of People get 150 000 – 500 000 TZS per year after selling various NTFPs, money obtained after selling NTFPs used to improve the livelihood whereas 65.0% used to buy food for the household members.

5.2 Recommendations

In a view of the findings of this study, the following recommendations are put forward:

Since it was found that NTFPs available in the forest whereas 87.5% of people collect wild vegetable, 71.7% collect firewood, 66.7% collect medicinal plants, 71.7% collect poles, 81.7% collect ropes, 39.2% collect wild fruits, 40.0% collect honey which contribute to their livelihood in the study area, it is therefore recommended that the relevant authorities (Government and NGOs) must make deliberate efforts in designing and implementing mass education programmes geared towards sustainable utilization of NTFPs from the catchment. This should specifically focus on planting trees outside the forest in order to minimize the routes of people to the forests while they get firewood, vegetable, poles, honey, fodder and fruits and reinforce participatory forest management rules and regulations.

Since there is positive and negative correlation between collection NTFPs from the catchment forest and socio-economic characteristics (age, sex, household size, education level and occupation). Age of respondents has positive correlation on

collection of wild vegetable and medicinal plants (β = 0.110, 0.031) and highly statistically significant (p= 0.000, 0.025). Sex has positive correlation (β= 0.264, 0.379, 0.352, 0.277) and statistically significant (ρ=0.016, 0.000, 0.001, 0.011) on collection of wild vegetable, firewood, medicinal plants and poles. Household size has positive correlation (β=0.064, 0.190, 0.186, 0.057) and statistically significant and non significant (ρ = 0.000, 0.050, 0.050, 0.570) on collection of wild vegetable, firewood, poles and ropes.

Thus it is recommended that, Government, NGOs and other stakeholders design and implement education programmes towards sustainable exploitation of NTFPs from the catchment forest for the future generation. Provide more education on implementing various agroforestry systems such as agrosilvopastoral system whereas people get crops, trees (firewood), get fodder and meat or milk from animals and manure, therefore reduce the dependence of NTFPs from the forest for various products.

It was found that NTFPs contribute to household food security on 38.3%, agriculture 42.5%, livestock keeping 7.5%, labourer activities 5.0%, employment 4.2% and business 2.5%. The quantity of NTFPs collected per year in the study area include firewood 25 377 bundles, medicinal plants 16 727kg, wild vegetable 42 204kg, wild fruits 47 048kg, ropes 180 880 pieces, poles 105 360 pieces, fodder 11 728 bundles and honey 4 516 liters. About 31.7% of People get 150 000 – 500 000 TZS per year after selling various NTFPs, money obtained after selling NTFPs used to improve the livelihood whereas 65.0% used to buy food for the household members.

Therefore it is recommended that the Government and NGOs should set good strategies and properly implementing from lower level to higher level of management on sustainable draw on of NTFPs from the catchment forests and to improve agriculture as the major source of food and income in the study area.

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APPENDICES

Appendix 1: Household questionnaire on the contribution of NTFPs on food security and income

A. Background information

1. Date of interview …….
2. Village …….
3. Age of Respondent ……...
   1. 18- 30 years 2. 31- 41 years 3. 42- 60 years 4. Above 60 years
4. Sex ……
   1. Male ( ) 2. Female ( )
5. Education level …….
   1. Adult ( ) 2. Primary ( ) 3. Secondary ( ) 4. College ( ) 5. University
6. What is your occupation *(Please fill in the space provided below)* ……
7. For how long have you been in this area *(Years)*? ……
8. Family size
   (1) Up to 5 people (2) 6-10 people (3) > 10 people

B. Common NTFPs utilized by household

9. Do you collect NTFPs?
   1. Yes ( ) 2. No ( )
   If yes,
10. What are the different types of NTFPs found in your village?

S/N	Types of NTFPs	Species	Local names
1			
2			
3			

11. How long did you collecting NTFPs in this area?

S/N	Types of NTFPs	Year of collection	Remarks
1			
2			
3			

12. At what season are the NTFPs are most available for collection?

S/N	Types of NTFPs	Collection season	Remarks
1			
2			
3			

13. What are the uses of collected NTFPs?

S/N	Types of NTFPs	Uses	Remarks
1			
2			
3			

14. What are the most preferred NTFPs?

S/N	Types of NTFPs	Remarks
1		
2		
3		

15. Who collect NTFPs from the catchment forest?

S/N	Types of NTFPs	Collectors	Remarks
1			
2			
3			

16. What are the constraints do you face during NTFPs collection?

S/N	Type of constraint faces	Remarks
1		
2		
3		

C. Profit to household food security and income

17. What is source of food for your family?
    1. Selling NTFPs ……
    2. Agriculture (crops) …….
    3. Agriculture (livestock)……
    4. Business …….
    5. Employment …….
    6. Labourer activities ……
18. What are sources of your income?
    1. Collecting NTFPs ……
    2. Agriculture (crops) ……
    3. Agriculture (livestock)…….
    4. Business ……..
    5. Employment ……
    6. Labourer activities ……
19. Specify amount of income generated on each of the mentioned source on the household income (TZS per year)
    1. Selling NTFPs …….
    2. Agriculture (crops) …….
    3. Agriculture (livestock)……
    4. Business ……
    5. Employment ……
    6. Labourer activities …….

20. Can you explain the quantity of NTFPs collected, Marketing and how much consumed and contribute to household food security in your area?

NTFPs collected	Unit (bundle, bunch, kg, liter	Time in days/week	Price/bundle, bunch, kg, liter	Actual amount collected per year		Total cost
				Own use	Trade	
Firewood						
Charcoal						
Medicinal plants						
Wild vegetable						
Mushroom						
Wild fruits						
Bushmeat						
Honey						
Wild tubers						
Ropes						
Poles						

21. What are the problems do you face during collection of NTFPs in your area?

1. …….
2. …….
3. …….
4. …….
5. …….
6. …….
7. …….

22. Can you suggest any measures that can be taken for sustainable use of NTFPs in your area?

……..

THANK YOU FOR YOUR TIME

Appendix 2: Key informants

1. Background information
Village …….. Name ……. Gender: Male …….. ( ) Female … ( )
2 Age of respondent ……. Years
Occupation ……
Marital status …….
Education level
1. Adult 2. Primary 3. Secondary 4. College 5. University

3. Which user group collects the NTFPs?

s/n	NTFPs	Collectors	Remarks
1			
2			
3			
4			

4. What are the uses of collected NTFPs?

S/n	NTFPs	Uses	Remarks
1			
2			
3			
4			

5 (a) Do people sell the NTFPs/ Yes/ No
If yes which NTFPs are potential for providing income at household level?
(b) Where the NTFPs are sold and why?
6. Please give information about marketing of types of NTFPs in your area?

S/n	Type of NTFPs	Amount collected/year	Amount sold/year	Marketing price	Remarks
1					
2					
3					

7. Can you explain the NTFPs collected and how much contribute to household food security in your area?

S/n	Products	Quantity consumed/year	Percent
1			
2			
3			

8 What measures can be taken for sustainable use of NTFPs in your area?

……

……

……..

THANK YOU FOR YOUR TIME

Appendix 3: Checklist of questions for focus group discussion

Village …….. **Ward** …… **District** ……

1. Do you collect non-timber forest products?
2. What kinds of non-timber forest product do you collect?
3. How do you use of different kinds of non-timber forest products?
4. Do you sell those non-timber forest products?
5. If yes in Q.4 above, give information about marketing of types of NTFPs in your area?
6. What are NTFPs collected and how much contribute to household food security and income in your area?
7. How many times do you to collect NTFPs per week?
8. Are there any measures taken to develop NTFPs in your area?

THANK YOU FOR YOUR TIME

Appendix 4: Socio-economic factors influencing collection of vegetable

Socio- economic factors X	Coefficients β	R^2 = 86% S. E	t	Sig.(p value)
Age of a respondent	0.110	0.057	0.940	0.000*
sex of a respondent	0.264	0.073	2.435	0.016*
Education level of a respondent	0.019	0.115	0.181	0.042*
Family size	0.064	0.069	0.606	0. 000*
Occupation	-0.028	0.079	-0.273	0.785 ns
(Constant)		0.300	2.315	0. 022

Dependent Variable: vegetable(Y) SE =Standard error of the estimate. *Statistically significant at 0.05 and 0.01 level of significance, ns = not statistically significant at 0.05 level of significance, β = Beta weight

Appendix 5: Socio-economic factors influencing collection of firewood

Socio- economic factors X	Coefficients β	R^2 = 71.6% S. E	t	Sig.(p value)
Age of a respondent	-0.259	0.073	-2.341	0.021*
sex of a respondent	0.379	0.093	3.714	0.000*
Education level of a respondent	0.104	0.148	1.053	0.295 ns
Household size	0.190	0.088	1.920	0.050*
Occupation	-0.073	0.102	-0.744	0.458 ns
(Constant)		0. 385	0.292	0.771

Dependent Variable: firewood (Y) SE =Standard error of the estimate. *Statistically significant at 0.05 and 0.01 level of significance, ns = not statistically significant at 0.05 level of significance, β = Beta weight

Appendix 6: Socio-economic factors influencing collection of medicinal plants

Socio- economic factors X	Coefficients (a)	R^2 = 20.7%		
	β	S. E	t	Sig.(p value)
Age of a respondent	0.031	0.076	0.287	0.025*
sex of a respondent	0.352	0.096	3.486	0.001*
Education level of a respondent	-0.008	0.153	-0.085	0.043*
Family size	-0.058	0.091	-0.595	0.000*
Occupation	0.065	0.105	0.664	0.050*
(Constant)		0.398	2.278	.025

Dependent Variable: medicinal plants (Y) SE =Standard error of the estimate. *Statistically significant at 0.05 and 0.01 level of significance, ns = not statistically significant at 0.05 level of significance, β = Beta weight

Appendix 7: Socio-economic factors influencing collection of poles

Socio- economic factors X	Coefficients (a)	R^2 = 71.7%		
	β	S. E	t	Sig.(p value)
Age of a respondent	-0.139	0.077	-0.194	.025*
sex of a respondent	0.277	0.098	2.587	.011*
Education level of a respondent	-0.115	0.155	-1.108	.270 ns
Family size	0.186	0.092	-1.788	.050*
Occupation	-0.080	0.107	-0.776	.049*
(Constant)		0 .403	3.375	0.001

Dependent Variable: Poles (Y) SE =Standard error of the estimate. *Statistically significant at 0.05 and 0.01 level of significance, ns = not statistically significant at 0.05 level of significance, β = Beta weight

Appendix 8: Socio-economic factors influencing collection of ropes

Socio- economic factors X	Coefficients	R^2 = 18.5		
	β	S. E	t	Sig.(p value)
Age of a respondent	-0.105	0.331	0.944	0.034*
Sex of a respondent	-0.456	0.063	-4.452	0.000*
Education level of a respondent	-0.101	0.127	-1.019	0.031*
Family size	.057	0.076	0.570	0.570 ns
Occupation	.029	0.087	0.298	0.766 ns
(Constant)		.331	2.905	.004

Dependent Variable: Ropes (Y) SE =Standard error of the estimate. *Statistically significant at 0.05 and 0.01 level of significance, ns = not statistically significant at 0.05 level of significance, β = Beta weight

Appendix 9: Socio-economic factors influencing collection of fodder

Socio- economic factors X	Coefficients β	R^2 = 8.0% S. E	t	Sig.(p value)
Age of a respondent	-0.051	0.046	-0.489	0.626 ns
sex of a respondent	-0.251	0.057	-2.666	0.001**
Education level of a respondent	0.143	0.104	1.367	0.174 ns
Family size	-0.156	0.072	-1.498	0.137 ns
Occupation	0.010	0.062	0.092	0.927 ns
(Constant)		0.255	1.179	0.241

Dependent Variable: fodder (Y) SE =Standard error of the estimate. *Statistically significant at 0.05 and 0.01 level of significance, ns = not statistically significant at 0.05 level of significance, β = Beta weight