NGONG FOREST DEPENDENCE AND HOUSEHOLD WELFARE

Mwera Dorothy K, Dr. Wilfred Nyangena and Dr. Kamau Gathiaka

AJP

NGONG FOREST DEPENDENCE AND HOUSEHOLD WELFARE

1*Mwera Dorothy K.
Post graduate student, University of Nairobi

2Dr. Wilfred Nyangena
Lecturer, School of Economics
University of Nairobi

3Dr. Kamau Gathiaka
Lecturer, School of Economics
University of Nairobi

Abstract

Purpose: This study attempted to examine the economic contribution made by Ngong forest to rural households that surround it.

Methodology: The study area that the sample was drawn from was the Kibiko Holding Ground with a population of 1,025 and 199 households. The study population was 199 households as households were the study unit. A sample size of 55 households was identified through systematic random sampling.

Results: indicated that the forest resources that are mostly extracted by the households are firewood, followed by honey, poles, vegetables and finally medicinal herbs. Study results also revealed that only the count of livestock and the quintile income mattered in the extraction of forest resources. The rest of the socioeconomic factors (gender, literacy, years of education, age, family size, family composition, sickness shocks) did not matter for forest resource extraction.

Conclusion and Recommendation: The study concluded that poorer households are more resource dependent than the rich. In addition, forest income contributes significantly towards household welfare. Hence, an effort to balance between environmental concerns and sustainable livelihoods should ensure that families living in the area are paid an equivalent KES 5,309 per month to alleviate their suffering in case they were to be translocated to other non-forest areas.

Key Words: *Forest Income, Quintiles, Forest Resources, Household Income*

1.0 INTRODUCTION

1.1 Background of the Study

Natural resources provide rural people with food, medicines, meat, honey, gums and resins, condiments and other goods that are exchanged or used for secondary processing, and contribute greatly to rural subsistence economies (Kaimowitz, 2003). In sub-Saharan Africa, forests provide rural people with timber, wood, pulp and foodstuffs, which are further processed into manufactured goods such as lumber, paper and pharmaceuticals.

It is estimated that more than 15 million people in sub-Saharan Africa earn their cash income from forest-related enterprises such as fuel wood and charcoal sales, small-scale saw-milling, commercial hunting and handicraft. In addition, between 200,000 and 300,000 people are directly employed in the commercial timber industry Oksanen and Mersmann (2003) and in some countries, the forestry sector is an important foreign exchange earner.

The problem of lack of data on forest and other natural resources is more acute in Africa than in other regions (Cavendish 2000, Fisher 2002). In spite of the wealth of literature on the contribution of forests to poverty alleviation and food security (see Peters *et al.,* 1989; Hegde *et al.* 1996; Godoy *et al*. 2000; Hegde & Enters 2000; Pattanayak & Sills, 2001) the value of forests in household welfare is hardly integrated into national planning processes.

One of the reasons for the low profile of forests is the lack of quantitative micro-level research on forests contribution to household welfare (Cavendish, 2000). Micro level analyses of the uses to which households put forests resources provides insights on the importance of the resources. These analyses help to devise policy interventions for sustainable use of forests. From this perspective, it is important to quantify forest contributions to household welfare so that these contributions can be entered into policy debates with a view to enhance forest conservation without compromising household welfare.

Micro-level quantitative analysis of household's use of forest resources is important from policy, economic and ecological perspectives.

The goods and services that are derived from Ngong forest by the households that live around the forest are not clearly understood. There is a lack of appreciation of the economic potential of this forest to poor households' welfare, and as a result, Ngong Forest is being lost to make way for other development activities. This study looks at households' use of this forest's

resources and attempts to put values to these resources in order to shed light on their impact to household consumption, income and general welfare

1.2 Statement of the Research Problem

Rural households depend on freely-provided forest goods and services for their welfare. Forests provide both productive inputs and consumption goods. Since this forest resource uses are classically omitted from standard household budget surveys there is a substantial gap in our quantitative understanding of rural household incomes (Dasgupta, 1993; Vedeld *et al.,* 2004).

In total value terms, forest resources account for a significant portion of income of households that neighbor the forests. Household budget surveys do not incorporate forest income and as a result their impact to household income, consumption and general welfare is misunderstood. A clear analysis of their importance is needed to bridge this gap.

The current study aimed to understand why there is a general lack of appreciation of the economic potential of Ngong forest. The study aimed to shed more light on the goods and services that are derived from Ngong forest by communities living adjacent to it. Past valuation studies on the forest have focused only on goods that have a market value as a requirement of standard household budget surveys. The current study aimed to value all goods and services that are consumed by households in order to understand their impact on household income, consumption and general welfare.

1.3 Objectives of the Study

Identify the socio-economic characteristics of the households that use various types of forest resources and their impact on forest dependence.

2.0 LITERATURE REVIEW

2.1 Theoretical Literature Review

Forests provide a wide range of benefits for poor households. They prevent poverty by supplementing income and may also help to improve the standard of households that are able to enter into the high-return forest occupations. There are three distinct roles of forests: safety nets, support of current consumption (coping strategy) and a pathway out of poverty through household income sustainability. The safety net role refers to the role that forests can play during periods of hardship (such as to cushion against unexpected income shortfalls due to say family illness, natural disasters etc.) and depends on household vulnerability. The second role

sees forests not only as a gap-filler (complementing other incomes especially when there are seasonal food shortfalls) but also as a source of regular subsistence use (Cavendish, 2003, Vedeld *et al.,* 2004; Angelsen & Wunder, 2003; Fisher, 2004). The poverty reduction role is through diversification and specialized forest strategies adopted by households, but also provision of important environmental services which benefit local, regional, national and even global stakeholders (Vedeld *et al.,* 2004; Angelsen & Wunder, 2003).

Forest dependence and thus environmental income is relatively more important for the poor and therefore forest degradation and overuse will hurt the poor more than the non-poor. Most of the households that live next to the forests are poor households and they rely more on the forests for their survival as opposed to the rich households who are at the end of the value chain and benefit from the finished forest products and have other sources of income to rely on (Vedeld *et al.,* 2004). The authors contribute to the literature that forests and other common pool resources contribute significantly to rural incomes and towards poverty reduction. In addition, the current study agrees with the concept that rich households extract more forest resources in absolute terms than poor households. However, the author failed to estimate the local prices of both marketable and non-marketable forest products and also failed to underscore the determinants of forest extraction by households. In particular, the author did not show the effect of shocks on the extraction of forest resources. The current study addressed this gap by employing rigorous and systematic methods of estimating local prices of both marketable and non-marketable forest products and also established the determinants of forest extraction by households

Forests resources are important natural capital to the economy. Past development efforts have primarily focused on building natural capital in general but not equal attention has been paid to how forests are used in combination with other natural assets and other livelihood assets to sustain livelihoods. This has resulted in gaps in our understanding of the contribution of forest products to sustainable livelihoods and thus poverty reduction. More efforts are needed in this area in terms of studies to show how important these natural assets are important to households and their contribution to the general economy as a whole (DFID,

1999). The study helps to understand the importance of forest resources to the economy and poverty reduction strategies. It therefore helps in coming up with appropriate policies that help to sustainably conserve forest resources for the poor. The study had various gap, in particular,

the use of desk study methodology to assess the importance of forest resources in poverty reduction implies that the methodology was not econometric and nether was it rigorous. The present study bridged this methodological gap by adopting a series of econometric techniques to show the contribution of forest resources to household income. The study also had a contextual gap as it failed to reveal the extent to which forest resources are extracted by residents of Ngong Forest.

Forest and tree stocks provide a reserve upon which people can fall back for subsistence and income, especially in times of crop failure, unemployment and other kinds of hardship, or to meet exceptional needs. Forest and tree foods are most extensively used to help meet dietary shortfalls during particular seasons in the year. Energy-rich tree foods such as roots, tubers, leaves, rhizomes and nuts are especially important during emergency periods such as floods, famines, droughts and wars. In addition to food, forests and trees outside forests play often a significant role in meeting the needs of the rural poor, including those related to shelter (building material) and health (medicinal plants) (FAO, 2000). The study contribution to the issues at hand is revealed by the conclusion that forests and trees outside forests play often a significant role in meeting the needs of the rural poor. However, the study failed to reveal the determinants of forest resource extraction. The study also employed a desk study methodology which is not econometric. The current study addressed these two issues by employing an econometric methodology in establishing the determinants of forest resource extraction. The current study was also specific to Kenya Ngong Forest.

Forests assist households in generating income directly through different ways namely employment in formal forest industries, small informal forest-related businesses and sale of several forest products. In addition, they assist households indirectly by providing inputs for non-forest income-generating products e.g. source of fertility for agricultural products or fodder for livestock.

Flexibility of income from forest/tree products is a positive feature for the rural poor. Income generation can be either "lumpy" (e.g. through sales of mature trees planted at the period), as an opportunity for investment in building up assets); or staggered (e.g. fruit trees) which helps in making ends meet and/or fulfilling social obligations (FAO, 2000). The literature brings out a wide range of benefits which shows the importance of forests towards the rural poor. The study emphasizes that without forests the poor do not have a safety net to fall back on during

times of hardship and therefore there is need to conserve the forests.   Globally, there is a long tradition of concern about household welfare and forest dependence. The prospect of more than 300 million people the world over, especially the poor, depending substantially on forest gathering for daily subsistence and survival, cannot be a matter for policy indifference. Forest dependence can be linked to socio-economic and cultural consequences. On the economic front, there are some associated costs and benefits from using forests. The potential benefits include: daily subsistence and survival from forest product gathering, and income redistribution and poverty reduction. The potential costs include: increase in global warming emanating from carbon emissions caused by forest use and displacement and destruction of natural habitats of important ecosystem species. Socioculturally, the benefits may include fresh water, recreational facilities, firewood, timber, medicine and the role of forestry in the local traditions and customs of the people (Fonta *et al.,* 2010). The wide range of forest benefits highlighted by Fonta *et al*. enriches the current study.

2.2 Empirical Literature

In their case studies, Cavendish (1997) and Campbell et al (2002) drew out some experiences on rural households and their use of forest resources. They found that households that use forest resources have livelihoods characterized by formal and informal activities. These studies also found that forests offer rural households a wide range of resources whose uses are seasonal. They are also of small market value compared to other non-forest activities. Cavendish and Campbell et al (2002) using household data from rural Zimbabwe found that woodland-based resources are important in mitigating poverty but not in lifting people out of poverty.   The current study addressed this contextual gap by focusing on the Ngong Forest Area.

Using purpose-collected panel data from Zimbabwe, Cavendish (1999) finds that environmental resources make a significant contribution to average rural incomes. Poorer households depend heavily on these resources, which contribute 40 percent to their incomes. However, richer households use greater quantities of environmental resources in total. He also found considerable differentiation in the economic characteristics of environmental goods. Cavendish shows that the dependence of households on environmental income decrease as their average income rise. Although the poor tend to get more of their total income from the environment, the rich still make heavy use of natural products for income (Cavendish, 2000). The results demonstrate the economic significance of environmental resources to rural

households. Surveys which ignore the contribution of environmental resources to rural households' incomes therefore miscalculate the incomes and welfare. The literature greatly contributes to the fact that the poor are more natural resource dependent   than the rich, though the absolute benefits for the poor are lower. The results of the study will greatly contribute to the current study in terms of the effects of different income levels on forest resource extraction. The main difference to the current study is the observation that while Cavendish uses panel data, the current study is strictly crossectional in nature as it addresses the contribution of forest resources to household income for residents living near Ngong Forest. The study by Cavendish (2000) also fails to establish the determinants of forest resource extraction, a gap that is addressed by this study.

To explore the role of forest in household welfare in Kenya, Kabubo-Mariara and Gachoki (2008) used primary household data collected from Nakuru district and supplemented by a community survey. Their results suggest that forests play an important role as safety nets that cushion households during periods of hardship. The results also suggest that forests play an important role as a gap-filler (complementing other incomes especially when there are seasonal food shortfalls), a source of regular subsistence and in poverty reduction. The results further suggest that both the poor and the less poor derive a substantive share of incomes from forest activities and that forests are not necessarily poverty traps for rural households. They concluded that forest policies need to take into account tradeoffs between forest extraction and forest degradation and also consider targeting of households in forest use and management depending on household heterogeneities in both current and permanent incomes.

Kabubo-Mariara and Gachoki (2008) and Hedge and Bull (2005) noted that environmental resource use may be positively and significantly influenced by gender. Particularly, femaleheaded households may collect significantly less environmental products than the maleheaded households. More established households may also tend to extract more environmental resources than younger families.   Older families may tend to have a greater knowledge and familiarity with the geography, seasonality, and quality and quantity of resource availability in their surroundings, and as a result will be in a better position to extract resources. Similarly, the probability of young families participating in the sale of environmental products may also be less. Size of household, number of household members below 16years and above 65 years, number of disabled adults, and migration may also positively affect the use and sale

of environmental resources. The shock variable for sickness, from a hypothetical point of view may be found to significantly increase environmental resource use.

Kabubo-Mariara and Gachoki (2008) and Hedge and Bull (2005) methodology is in line with the current study by using descriptive statistics and econometrics to assess the share of forest income to the total income. They further divide the households into quintiles to show the level of dependence among various income groups towards forest resource extraction.   The gaps found in Kabubo-Mariara and Gachoki (2008) and Hedge and Bull (2005) that this study addressed is the use of a more detailed identification of forest products. While the two reviewed studies classify the forest products in less than 4 categories, the current study used a more detailed approach of capturing all the individual forest products

According to Fonta and Ichoku (2010), many rural households in Nigeria depend on forest extraction for daily sustenance yet, very little is known about the impacts of forest income on the distribution of household total income, and hence, on poverty in general. He carried out a study using Gini and poverty decomposable techniques, and found out that forest income reduces both income inequality and poverty in rural Nigeria. Further, Heckman's 2-step estimation of the determinants of forest income indicated that the decision to participate in forest extraction increases with more access to community forest areas; larger and poorer households; membership in forest management committees, and decreases with higher educational attainment and higher transfer income earnings. Likewise, forest income was found to be positively and significantly related to male-headed households, poorer heads of household and households that have more access to forest resources outside the community forestry areas. Furthermore, simulations revealed that poverty and income inequality can be reduced in rural Nigeria through policies that can; stimulate increased earnings from minor forest resources, assist households to earn income from alternative sources such as agriculture and commerce other than forest gathering. The study differs with the current study in its methodology and approach as it uses Gini and poverty decomposable techniques to access the impacts of forest income on the distribution of household total income, and hence, on poverty in general. Fisher (2004) used a monthly survey of 99 households conducted in three villages in southern Malawi between June 1999 and August 2000. All of the sample households used firewood for cooking and heating, and 75% engaged in forest occupations including sales of firewood and charcoal and employment by the logging industry. Homeconsumed firewood and earnings from forest-

based occupations constitute substantial shares of household income. On average, sample households earned about 30% of their income from forests. For the sample households the Gini coefficient was computed and decomposed by six income sources: farm, forest, wage-work, self-employment, transfers, and remittances. The analysis shows that forest income reduced measured income inequality by 12% during the year of the study. This reflects a pattern in which firewood collected from adjacent forests represents an important input to household income for all sample households. The main policy implication of the study is that forests may have a role in poverty alleviation in Malawi, but to reduce economy-environment tradeoffs, careful targeting and a mix of forestbased and other approaches to poverty alleviation is necessary. The study differs in approach from the current study towards its focus on poverty alleviation and income inequality across households.

Jodha's work on village commons in India in 1986 Jodha (1986) based on data from 82 villages, found that poor rural households on average derived 9 to 26% of their income from common property natural resources, while rich households derived 1 to 4% of their income from this source. Jodha's study suggested that the commons in India, however degraded, were important to the livelihoods of the poor. The study agrees with the current study in its concept of comparing forest resource use with income levels.

Two other recent studies provide us with a sense of the continued contribution of environmental income. Chettri-Khattri (2007) undertook a micro study of two villages in the forested middle hills of Nepal. He found a wide difference in environmental income, in his case defined as income from non-timber forest products, based on the type of property rights held over the commons. In one village, where there was a community management user group, environmental income contributed some 2% of income to the poorest (lowest quartile) and 1% of income to the richest households. In another village, where there was no formal user group but looser informal rules over the commons, 20% of the income of the poor (and 14% of the income of the richest households) came from the commons. While other reasons, such as access to markets and employment, may contribute to this significant difference in environmental income, Chettri-Khattri argued that rules of access were the most important factor. The current study borrows greatly from Chettri-Khattri in terms of environmental income contribution across quintiles.

Kamanga, Vedeld and Sjaastad (2008) did a study in Malawi among rural dwellers in one of the densely populated districts called Chiradzulu. The study found out that out of 160 households interviewed forest income constitutes around 15% of total income, non-farm income contributed 47% and agriculture contributed 28%. People were found to be extremely poor with 97% having incomes less than one dollar a day. The poorest segment depends more on forest income than the least poor group, but the medium income group exhibits the highest dependence. Fuel wood constitutes the major source of such income followed by fodder. The incomes mainly support current consumption. People with better access to the forest reserve have higher total income, forest income, and relative forest income. As revealed through a Gini-coefficient analysis, forest resources have an important income equalizing effect across rural households. A particular group of resource poor farmers (8.1% of sample), with little access to agricultural land and a high representation of female heads, derives an average of 65% of their income from the forest. An important policy lesson is that restricting people's access to forest resources can have substantial effects on household livelihoods and welfare, and would serve to increase income inequalities in the area. Livelihood researchers should now recognize the substantial income from forest resources. The results of this study greatly enrich the current study with regards to the level of forest extraction among the various income groups but differs in its use of Gini-coefficient analysis which looks at the effect of forest resources in reducing income inequalities across households.

Hegde and Bull (2006) did a study in Mozambique to look at the economic shocks and *Miombo* woodland resource Use. The household level study in environmental resources from the *miombo* woodlands make significant contributions to household economies in rural Africa. The results demonstrate that environmental resources act as a crucial safety net against income shocks, related to health shocks and fire damage. This highlights the need for incorporating the *miombo* woodlands as part of poverty reduction strategies in Africa. Linkages between income levels and *miombo* resource use are complex. Poorer households tend to use *miombo* resources for subsistence, while richer households use them for cash income. There is a lot of emphasis on female-headed households in rural Africa, in view of their vulnerability to hardships. They had anticipated that, owing to limited resources and alternatives, female-headed households would extract more environmental resources in relative terms than male-headed households, in view of limited requirements of capital and skills for extraction of environmental resources. But it turned out to be the opposite case in GNP area. It re-emphasizes the vulnerability of

female-headed households to hardships given that limited social security measures are in existence in the developing world and highlights the need for increased livelihood security to female-headed households. The findings of the study are very useful to the current study as it analyses the effect of household characteristics on forest resource extraction. The empirical model used in the study is borrowed to enrich the current study. In addition, the level of resource extraction between poor and rich households' analysis used in the study also enriches the current study. The use of income quintiles to analyze the level of forest resource extraction between various income groups is also useful to the current study.

Kajembe, Mwenduwa, Mgoo and Ramadhani (2000) studied the role of gender-based local knowledge in utilization of wild foods and other non-wood forest products for household food security in Tanzania. The study aimed at generating useful knowledge for advocacy, policy making and training. The specific objectives of this study were firstly, to assess issues of accessibility and dependency on wild foods and other non-wood forest products for household food security in the country, secondly, to examine the difference between women's and men's local knowledge with regard to collection, processing and utilization of wild foods and other non-wood forest products, and thirdly, to identify potentials and problems/threats with regard to availability of non-wood forest products for household food security. The study revealed that there exists ascribed local knowledge between men and women on selection, preparation, utilization, storage and even consumption of wild foods. Furthermore, the study has revealed that non-wood forest products are of vital importance as tools for coping with food shortage and famines. The nutritive value of most wild foods is good and sometimes better than domesticated expensive foods. The study differs in methodology as it focuses only on gender as a factor that affects forest resource extraction while the current study incorporates additional socio-economic variables in addition to gender.

Jumbe, Bwalya and Husselman (2005) in their report analyze the extent to which dry forests contribute to rural livelihoods and the national economy in Zambia. They used data collected from a household survey conducted in eight sites in three of the nine provinces, and secondary data from the Central Statistical Office and the Forestry Department. They learnt that forest products contribute on average 20.6% of total household income (subsistence and cash) in the eight sites, and are the second or first ranked source of income in five of the eight sites. There are large differences among poor and not so poor in total income and in forest income share.

Several products contribute significantly to rural livelihood and the national economy. Most notably, charcoal and firewood provide 70% of the country's energy needs. There are possibly a quarter of a million honey producers in the country deriving an income from forests. A wide range of wild foods are common in rural diets, providing essential vitamins and minerals; more than ten leafy vegetable species, 25 mushrooms and 35 caterpillars. Forests provide revenue for the government from taxes, fees, royalties and other charges levied on forest-based activities although the relative importance is small given that the majority of forest users extract low-value products from forests mainly for subsistence uses and only a small part of the trade is recorded. From their analysis, they find that forests are recognized to have an important poverty mitigation function but are not a means alone to get people out of poverty. The methodology used in this study is similar to the current study however, the focus on poverty alleviation of forest resources is not done in the current study. Similar aspects on this study and the current study include the analysis of forest income share among various income groups.

Dhakal (2001) in his paper on the study of Chitwan National Park in Nepal found that the access of forest resource to the poorest of the poor and poor group is lesser than those who are medium and elite group. A significant number of respondents reported that they have no access of sufficient firewood, timber and grass for construction purposes. Women are found to extract more forest resources that the males and children, so they should be oriented how, when and in what volumes can they use the forest product. The study by Dhakal (2001) is similar to the current study by focusing on the level of forest extraction across the various income groups.

The basic economic rationale for conserving Mount Kenya Forest is that it provides a stream of goods and services, which generate economic benefits and support economic activities that accrue to the global community, the Kenyan economy and the livelihoods of the people who live around the forest. The total quantified gross benefits of conserving Mount Kenya Forest are worth US$ 77 million a year composed of local forest utilization, local cultivation of forest land under shamba system arrangements, other licensed utilisation of timber and nontimber forest products, tourist and recreational values, government revenues and watershed catchment protection benefits. Together these economic benefits support a range of employment, income and subsistence opportunities at local, national and international levels (Emerton, 1999).
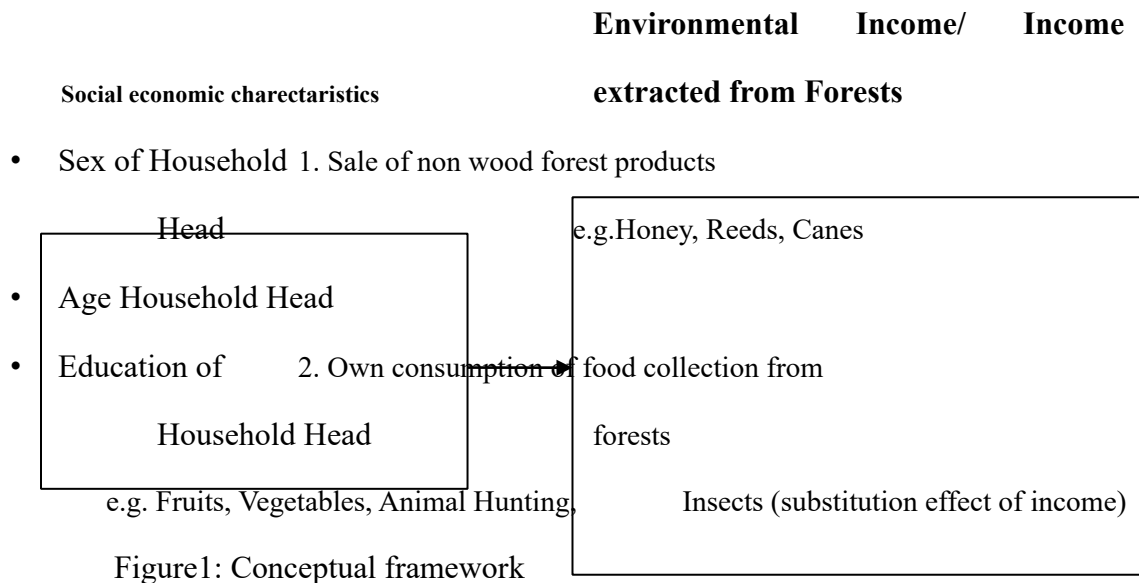
2.4 Conceptual Framework

Environmental Income/ Income extracted from Forests

Social economic charectaristics

- Sex of Household 1. Sale of non wood forest products

     Head   e.g.Honey, Reeds, Canes

- Age Household Head

- Education of   2. Own consumption of food collection from

     Household Head   forests

          e.g. Fruits, Vegetables, Animal Hunting,   Insects (substitution effect of income)

Figure1: Conceptual framework

3.0 METHODOLOGY

The data for this study was collected from Ngong forest neighbors. Ngong forest was chosen because of communities living adjacent to it. The focus of the survey was to study the extent to which households extract forest resources. Quantitative data was collected using a structured questionnaire. The questionnaires were administered through face-to-face interviews to households living adjacent to Ngong forest. It was established during the pilot study that all households extract resources, however during the main study, 20% of households (11 households) interviewed did not extract forest resources from Ngong forest.

The study involved a household survey of households living next to Ngong forest. This study narrowed down to the enumeration areas of Kibiko Area (Kibiko Holding Ground) and involved a random sample of 55 households. The study area that the sample was drawn from was the Kibiko Holding Ground with a population of 1,025 and 199 households. Household questionnaires were administered which were modified from the Income, Consumption and Expenditure (ICE) type. Questionnaires integrated quantitative environmental resource use data with household economic data in the research. The questionnaires were designed to cover a period of 3 months (January to March 2012) to ensure the best recall period of forest and non-forest incomes that were gained by the households for resources that were seasonal or small. The total value of a resource was arrived at by summation of all reported prices of households' extraction of a particular resource. The quantity of a resource was arrived at by summation of

all households reported quantity of that resource. The study used the contingent valuation approach to value goods that were non-makerketed. The study adapted the model by Hedge and Bull.

Following Hedge and Bull (2005) the model for environmental income can be written as:

$Y_i = f(X_i, Z_i, e)$

Where

(Y_i) is Environmental income

(X_i) is socio-economic characteristics

(Z_i) is Shocks

(e) is error term

The explicit linear model can be written as follows;

$Y_i = b_0 + b_1 X_i + b_2 Z_i + e$

4.0 RESEARCH FINDINGS AND DISCUSSION 4.1 Descriptive Statistics:

Demographic and Socio-Economic Characteristics of Households around Ngong forest

The study inquired into the demographic characteristics of the respondents with an aim of describing their composition in the data set. The socio-economic characteristics of all sampled households are presented in Table 1. The data reveals a rather high ratio of female headed households, at 49% of all household in the sample.

The statistics also indicate that the mean age of household heads was 55.1 years; a figure that is not far from the legal retirement age. More than half (56%) of household heads indicated that they were literate. However, the average years of education was 5.1 which implies that majority of the household heads had primary level of education. The average years of education reported in this study are less than the average years reported in Kabubo-Mariara and Gachoki (2008) of 7.42 years but higher than the one reported in (Hedge & Bull, 2005).

A high proportion (90%) had the intention of participating in sale of forest products. The shock variable indicated that each household got sick and visited the doctor 2.1 times in the last three months. On average, each household had 6.2 members which is higher than 5.39 reported in Kabubo-Mariara and Gachoki (2008) and 5.75 in (Hedge & Bull, 2005).

The mean livestock holding was 51.7. However, owing to the high skewness of this variable, the median of 14 heads of livestock was a better measure of livestock holding than the mean.

Table 1: Descriptive Statistics of Sampled Households

n=55 households	Mean	Median	Std. Deviation	Skewness[1]	Min	Max
Head of household (Yes=1, No=0)	.65	1.00	.480	-.668	1	2
Male or female headed Household (Yes=1, No=0)	.51	1.00	.505	-.037	1	2
Age head of Household	55.1	52.0	19.3	0.2	24	98
Literacy of head of household (Yes=1, No=0)	.56	1.00	.501	-.264	1	2
Household Head years of education	5.1	4.0	5.3	0.6	0	16
Family size	6.2	5.0	4.0	2.3	1	25
Family members less than 16 yrs	2.3	2.0	2.6	2.3	0	15
Family members over 65yrs	0.7	0	0.8	1.5	0	4
Count of family members with disability	0.1	0	0.3	3.4	0	1
Count of family members migration	0.2	0	0.6	4.4	0	4
Count of number of times sick	2.1	0	3.5	1.9	0	12
Count of livestock	51.7	14.0	150.3	6.3	0	1,085
Intention of Selling food products (Yes=1, No=0)	0.9	1.0	0.3	(3.4)	0	1

Source: Survey Data 2012

4.2 Correlation Analysis

Correlation analysis is important in identifying multicollinearity issues. The study first conducted a Pearson bivariate correlation analysis so as to see which social economic characteristics were significantly correlated to each other. Age of household head was negatively but significantly correlated with absolute forest income.

Variables that had a correlation coefficient of above 0.5 were identified to suffer from multicollinearity. The literacy of head of household and head of household years of education were collinear as indicated by correlation coefficient. Family members less than 16yrs and family size were highly correlated and therefore were collinear. Family members over 65 yrs

and age of head of household were also collinear as indicated by a correlation of 0.515. The implication of multicollinearity is that it distorts the significance of individual variables.

4.3 Regression Analysis

Linear regression method was used to investigate the socio-economic characteristics of the households.

Table 2: Regression Analysis

Variables [2]	Coefficients of Regression
Male Headed Household	538.27 (0.76)
Age of Head of Household	-9.91 (0.85)
Family Members over 65years Literacy of Head of Household Years of Education (Household head)	432.55 (0.81)

The regression equation eliminated multicollinearity by excluding Family Members less than 16 years as it was highly correlated with family size.   The equation also excluded family members with over 65 years as it was highly correlated to Age of Head of Household. Furthermore, Household Head Years of Education was also excluded as it was highly correlated to Literacy of Head of Household.

5.0 DISCUSSION CONCLUSIONS AND RECOMMENDATIONS 5.1 Discussions

The study concluded that socioeconomic factors (gender, literacy, years of education, age, family size, family composition, sickness shocks) displayed insignificance or the unexpected signs hence age and sex of the household head do not seem to matter for resource extraction.

5.2 Recommendations

The monthly extraction of forest resources per household was KES 5,309. This shows that forest income is quite significant and contributes towards household welfare. Hence, an effort to balance between environmental concerns and sustainable livelihoods should ensure that families living in the area are paid an equivalent KES 5,309 per month to alleviate their suffering in case they were to be translocated to other non-forest areas.

Poorer households rely more on the forest and should therefore by aided by the Government to diversify their income generating activities in order to avoid their reliance on Ngong Forest thereby preserving the ecosystem.

5.3 Areas of further study

Further areas of study should include a comparative study with other forests areas. For instance, studies on the contribution of Mau Forest to the households should be conducted so as to inform government policy on how to compensate the evictees of the Mau Forest. In addition, similar studies should be conducted on Aberdare Forest and the Mt Kenya forest owing to the environmental and sustainable livelihoods.   Other forests around the country that have a larger number of rural populations such as Kakamega Forest and Cherangany Hills should be targeted for similar studies.

REFERENCES

Angelsen, A., and Wunder, S. (2003). "Exploring the forest-poverty link: key concepts, issues and research implications" CIFOR Occasional Paper No. 40, Bogor, Indonesia: Center for International Forestry Research.

Campbell, B. Mandando, N., Nemarundwe, W., Jong, M., Luckret, and Matose, F., (2001).

"Challenges to proponents of common property resource systems: despairing voices from the social forests of Zimbabwe", *World Development* 29: 589-600.

Campbell, B., Clarke, J., Luckert, M., Matose, F., Musvoto, C. and Scoones, I. (1994). Local level economic valuation of savanna woodland resources: village cases from Zimbabwe. Mimeo, University of Zimbabwe, Harare.

Cavendish, W. (2000). "Empirical regularities in the poverty-environment relationship of rural households: Evidence from Zimbabwe". *World Development, 28*, 1979–2003.

Dasgupta, P. (1993). An inquiry into well-being and destitution. Clarendon Press, Oxford. DFID (1999). Access to Natural Resources Sub-Programme, Working Paper 33

Emerton L. (1999). Mount Kenya: The Economics of Community Conservation. Discussion Paper No.4.

FAO (2000). Forest Resources of Bangladesh, Country Report. Working Paper 15. Rome, Italy.

FAO. (1997). Issues and opportunities in the evolution of private forestry and forestry extension in several countries with economies in transition in Central and Eastern Europe. FAO publication W7170/E, Rome.

Fisher, M. (2004). "Household welfare and forest dependence in Southern Malawi" *Journal of Environment and Development Economics* 9: 135-154

Fonta W., Ichoku, E.H. and Ogujiuba, K.K. (2010). *Forest Extraction Income, Poverty and Inequality.* CEEPA, Discussion Paper. No. 48, CEEPA, University of Pretoria, South Africa.

Godoy, R. and Bawa, K.S. (1993). "The economic value and sustainable harvest of plants from the tropical forest: assumptions, hypotheses and methods". *Economic Botany* 47(3), 215-19.

Hegde, R. and Bull, G. (2005). Economic Shocks and *Miombo* Woodland Resource Use: A Household Level study in Mozambique. Dept. of Forest Resource Management, University of British Columbia.

Kabubo-Mariara, J (2008). "Forest dependence and household welfare: empirical evidence from Kenya" CEEPA Discussion Paper No 41, Centre for Environmental Economics and Policy in Africa, University of Pretoria.

Kaimowitz, D. (2003). Forest law enforcement and rural livelihoods. *International Forestry Review* 5(3).

Pattanayak, S. and Sills. E., (2004). Economics of Tropical Deforestation. *Economics, Acada Books*

Vedeld, P., Angelsen, A., Berg, G.K., and Sjaastad, E. (2004). Counting on the Environment. Forest Incomes and the Rural Poor: A study for the World Bank. Paper no. 98. Environment Development Papers. The World Bank, Washington D.C., USA. World Bank 1996 *Understanding poverty and human resources in Zimbabwe.*