

**FACTORS INFLUENCING EXPLOITATION OF NON TIMBER  
FOREST PRODUCTS AND THEIR CONTRIBUTION TO  
HOUSEHOLD INCOME AMONG COMMUNITIES ADJACENT TO  
SINGORE FOREST, ELGEYO-MARAKWET COUNTY**

**BY**

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MANAGEMENT**

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## DECLARATION

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## ABSTRACT

Non-Timber Forest Products (NTFPs) is a major source of income for many households. Large amount of NTFPs are harvested and traded every year in Keiyo North District. Due to limited information, inadequate cooperation and co-ordination among stakeholders, there are many challenges in NTFPs exploitation, use and sale. This research was carried out with the specific objectives of; finding out the number of households that participate in NTFPs harvesting, estimating the amount of household income derived from the Non Timber Forest Products and to investigate the factors influencing the harvesting of Non Timber Forest Products. The study was carried out in Singore forest, Keiyo North District in Elgeiyo Marakwet County. Primary data was collected through group discussion, key informant survey, questionnaire survey and direct field observation. Secondary data was collected from population census, Forest Department records, annual reports from Ministry of Agriculture and Annual reports for local NGOs among others. The quantitative data was analyzed using appropriate statistical tools like percentage, mean and summaries accordingly. The Cragg Tobit alternative model was used to examine the probability of a household to derive income from NTFP business activities, and determinants of the level of contribution of NTFPs to household income in Singore area. Results showed that among NTFPs, firewood was the most common source of income, with 63% of households engaged in NTFP business activities having reported income from firewood harvesting and sale. Following firewood was broom grass, sun grass, weaving reeds, wild vegetables, medicinal plants, wild honey and game meat respectively. Income from firewood activities also represented the highest share of income (37%) followed by broom grass (19%), sun grass with a contribution of 12% while wild vegetables are the next with 8% of total household income. Weaving reeds, wild honey and game meat follow with 11%, 7% and 2% respectively. Overall, NTFPs collectively contribute about 28% to total household income amongst those households that reported income from this source. In order to determine the relationship between poverty and dependence upon NTFPs, households were categorized into four income quartiles according to total household income. The results showed that the wealthiest (top 25%) households depended less on NTFPs than the poorest (bottom 25%). However, in terms of their contribution to household income, NTFPs constituted a higher proportion of household income for the poorest quartile (45%, compared to 29% for the richest quartile), suggesting that the rural poor are relatively more dependent upon natural resources for their livelihoods. Therefore, since NTFPs seem to play an important part in supporting rural household livelihoods, rural residents should be made to understand that the continued availability of NTFPs depends largely, on the integrity of the forests.

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**LIST OF ACRONYMS**

ANOVA	Analysis of variance
APE	Average Partial Effects
CAPE	Conditional Average Partial Effects
DFID	Department for International Development
FAO	Food Agricultural Organization
KFS	Kenya forest service
LR	Log Likelihood Ratio
NFPP	Natural Forest Protection Program
NTFPs	Non timber forest products
PCS	Production to Consumption System
SL	Sustainable Livelihoods
SLCP	Sloping Land Conversion Program
UAPE	Unconditional Average Partial Effects
UNESCO	United Nations Educational, Scientific and Cultural Organization

## CHAPTER ONE

### INTRODUCTION

#### 1.0 Introduction

This chapter presents the background information, problem statement, hypotheses, and objectives of the study. Limitations of the study and the Justification of the study are presented as well.

#### 1.1 Background Information

Non-timber forest products (NTFPs) are defined as goods of biological origin other than wood, derived from forests, other wooded land and trees outside forests (FAO, 1999); they include products used as food and food additives (edible nuts, mushrooms, fruits, herbs, spices and condiments, aromatic plants, game), fibers (used in construction, furniture, clothing or utensils), resins, gums, and plant and animal products used for medicinal, cosmetic or cultural purposes. Non-timber forest products have long been an important component of the livelihood strategies of people living in or adjacent to forest areas. Several million households world-wide depend heavily on these renewable resources for subsistence and/or income, and the FAO estimated that eighty percent of the population of the "developing" world use NTFPs to meet some of their health and nutritional needs (FAO, 1997). However, NTFPs are seldom the primary source of household income, since their supply is largely seasonal.

A study by Jansen *et al.*, (1991) showed that nearly 6000 species of rain forest plants in Southeast Asia and Africa have economic uses. While over 150 NTFPs worldwide

have been identified as significant commodities in international trade (the most important tropical products are rattan, brazil nuts, gum arabic, bamboo and spices) it is more difficult to quantify national trade, which may be very substantial (Tropenbos International (2005)).

NTFPs have attracted considerable interest as a component of sustainable development initiatives in recent years due to their ability to support and improve rural livelihoods while contributing to environmental objectives, including biodiversity conservation. The eco friendly and people-friendly connotations associated with NTFPs have supported some products to fill in a niche in international trade: the small, but rapidly growing fair-trade market.

However, despite this positive image, there is no guarantee of a beneficial outcome and the utilization of NTFPs requires the same measure of planning and control that is required for timber in order to be sustainable. Decisive factors in the use of NTFPs include government involvement, the ability of local people to claim and enforce use rights (NTFPs are in most cases openly accessible), market transparency and access, and pressure on the resource (Tropenbos International(2012)). Higher value is often associated with higher harvest levels and more intensive management. Unlike the larger number of less valuable NTFPs, those with a high market value are often not harvested in a benign way, and many are lost to the poor as other stakeholders take over control.

Domestication of NTFPs can be a way to intensify production (through higher yields, improved and/or more consistent quality, and control over timing of harvest), secure producer rights and reduce pressure on wild resources. Its risks are that domestication of

wild-harvested products can lead to genetic homogenization, reduce the economic value of wild systems (up to the point where natural forest land is being cleared to grow domesticated NTFPs on a larger scale) and lead to transfer of benefits from one group of stakeholders to another (Belcher, 2003).

## **1.2 Problem Statement**

Forests in the world over are facing very serious problems of degradation. There is overwhelming consensus that within the last few years, the levels of illegal logging and general deforestation have been on the increase. Manifestations include: illegal charcoal burning and transportation (estimated at 50% of the area under forests), illegal harvesting of forest products, including logging and indiscriminate/uncontrolled selective cutting of rare tree species (estimated at 15% of area under forest) and other malpractices that injure forest wellbeing (e.g. Illegal harvesting of non-timber forest products (NTFP), illegal excision of forest land, illegal cultivation, poaching of game, setting forest fires).

As population increases, more land is required for settlement and cultivation. Due to these demands, deforestation is rapidly increasing. In Kenya, the area under forest cover declined from about 30% in 1895 to about 1.76 % currently (KFS 2010).

Most of the neighboring households to Singore forest don't engage in sustainable use of forests. It's evident from their conduct as indicated in the report by KFS (2011) Keiyo branch; that parts of the forest are slowly being degraded. The households around forests have often exploited forests. A sustainable use of forests is the harvest of Non Timber Forest Products (NTFPs). As discussed earlier, NTFPs include edible nuts, mushrooms,

fruits, herbs, spices and condiments, aromatic plants, game), fibers (used in construction, furniture, clothing or utensils), resins, gums, and plant and animal products used for medicinal, cosmetic or cultural purposes. These NTFPs are consumed by households and can also be sold thereby becoming an important source of livelihoods. The local forest becomes the main source of income, for large number of poor household, due to lack of employment opportunities and lack of capital required to start an independent business. Most of the locals living around Singore forest are largely dependent on the forest for fuel.

Apparently, the role of NTFPs in the improvement of household welfare of surrounding communities is not well known and has also not been documented in Kenya and in Elgeyo-Marakwet County in particular.

This research therefore investigated the contributions of NTFPs to the household's income and the factors affecting its harvesting in Singore forest, Keiyo North district.

### **1.3 Objectives of the Study**

#### **1.3.1 Broad objective**

The general objective of the study was to determine the factors influencing exploitation of NTFPs among the forest adjacent communities of Singore forest, Elgeiyo-Marakwet County.

#### **1.3.2 Specific objectives**

The specific objectives of the study were:

- i. To assess the dependence on NTFPs from Singore forest.
- ii. To estimate the amount of household income derived from the Non Timber Forest Products per household.
- iii. To investigate the factors influencing the exploitation of Non Timber Forest Products.

#### **1.4 Hypotheses**

- i. There is no significant difference in incomes of households exploiting NTFPs compared to those without.
- ii. Socioeconomic characteristics (age, sex, size of household etc) do not significantly influence exploitation of NTFPs.

#### **1.5 Justification of the Study**

The decision to focus the analysis on the district of Keiyo North for the fieldwork was motivated by the following considerations. First, Keiyo North adopted the strict sustainable use of forest products program in 1993 and has become one of the leading areas in Kenya in implementing policies to do with forests on a wide scale. This permitted the impact of forest sustainability on various outcomes on the contribution of NTFPs to the household incomes.

Secondly, most of the people being low income earners, they therefore mostly participate in the harvesting of Non Timber Forest Products to increase their incomes. Therefore there was need for this research to be carried out so as the estimated contribution of NTFPs to the household income is known.

## 1.6 Limitations of the Study

Less limitations where met in the survey area. Most significant where as follows:

- i. Reliance on recall by respondents since they didn't keep records on how much NTFPs they harvest, the quantity for sale and those for household consumption.
- ii. Lack of time series data and therefore relied on cross-sectional survey of few months.
- iii. A few households were uncooperative but were assured that information collected was confidential and will not be disclosed to anyone.

However, all measures were taken to ensure that the information obtained was as accurate as possible.



## **CHAPTER TWO**

### **LITERATURE REVIEW**

#### **2.0 Introduction**

In this chapter, both theoretical and empirical literature that informs the study is presented. The conceptual framework guiding the study is also presented.

#### **2.1 Theoretical Literature**

The analysis of literature and current debate surrounding the conservation and development potential of NTFPs highlights many issues pertinent to this study beyond merely the provision of context. By identifying past constraints and omissions, similar mistakes can be mitigated.

Firstly, however, NTFPs must be grounded in the wider context of conservation initiatives, indicating reasons for their initial enthusiasm. Salafsky and Wollenberg (2000) summarized the linkages between livelihoods and conservation. Protected areas (with no link between conservation and livelihoods) were common until the 1970s; plagued by social and economic limitations (weak management, inadequate resources) a search for alternatives began. Modifications led to a core protected area and a buffer zone (as in UNESCO Biosphere reserves) decreasing reliance on biodiversity and substituting other livelihood activities, such as plantations. However, its indirect linkage has led to problems including continued use of prohibited areas and encroachment from successful rural development initiatives in the buffer zone, damaging the habitat it aimed to conserve.

During the 1990s recognition of many local people's economic reliance on biodiversity and the incentive this created for individuals to protect the area from external threats, thus reducing costs of protective regulations, fostered the development of directly linked strategies, balancing conservation with development. It is this latter area that NTFPs are found and discussions over potential contributions continue.

Peters (1989) study in Mishana, Peru, concluded that 'sustainable exploitation of non-wood forest resources represents the most immediate and profitable method for integrating use and conservation' (Peters 1989: 656). Likewise Balick and Mendelsohn's (1992) study of medicinal plants in Belize, generated forest values for harvesting that compared favourably with other land uses.

However, initial hopes among funders, researchers and environmentalists, that NTFPs would be the 'panacea' for rainforest conservation and development have been tempered and a more complex and context specific relationship has developed. Peters has been criticized for ignoring harvesting methods where palms are killed to collect fruit (Bodmer 1990).

Economically, Southgate (1996) suggests that extractors realize few of the revenues from NTFPs themselves; instead benefits accrue at the top of a chain of middlemen. Others criticize Peters for suggesting long-term unrealistic, hypothetical calculations that dismiss the harvesters' penchant for maximizing short-term returns, this in turn relates to land tenure (Phillips 1993).

Balick and Mendelsohn's discussion assumes absolute ownership of land making long-term investment more fruitful, however under common property (user's are a specified group) or open access (all can use) there is incentive to take as much as possible immediately (Tremaine 1993, Hodson *et al* 1995, Abraham *et al* 2001).

These criticisms do not dismiss wholesale the contribution of NTFPs, they simply highlight the diverse factors that one must consider during research; land tenure, market access, product type, alternative income opportunities. For example Shanley (2002) suggests forest management for local trade may be more beneficial than aiming for unstable distant export markets. Southgate (1996) suggests strengthening markets for NTFPs could raise incomes and sustainable use but not protect large areas of forest. It is therefore difficult to generalize as only a small segment of variation between cases is documented and the majority of this in Amazonia (Nepstad 1992). Although it is impossible to address all aspects of this multidimensional structure in this study it is possible to include and consider the complexities to prevent arriving at simplified conclusions that do not account for the diverse influential factors concerning NTFP use in conservation.

Despite more than a decade of research and targeted development projects, systematic understanding of the role and potential of NTFPs in conservation and development (i.e. how to enlarge its benefits for rural communities and the environment) remains weak. This is especially true for China where research and development efforts have only recently addressed the issue of sustainable utilization of NTFPs. The rich variety of non-timber forest products in Southwest China, many of which have been used by people for

centuries, has been well-documented by Pei (Pei, 1985; 1996 ), and Zu and Jiang (2001) to name just a few.

Zu and Jiang (2001) point out that more than 6000 plant species growing in China are being used for medical purpose, among which more than eighty percent grow wild in the forest. However, the fast process of modernization, urbanization and globalization not only increasingly adds more entries to the list of extinct species (i.e. rapidly reduces biodiversity), but also leads to the gradual and irretrievable loss of indigenous knowledge on the uses of medicinal plants and other NTFPs.

Among the many non-timber forest products that are being extracted by rural households from natural and planted forests and plantations in Kenyan forests including: mushrooms and medicinal plants (both in many species and varieties), as well as walnuts, pine nuts, wild vegetables, eucalyptus oil and honey play an important role in the household economy. Examples exist for institutional arrangements aimed at the sustainable utilization of NTFPs in communal forests for those products that are valuable (and thus threatened by over-exploitation), such as honey. These are good examples to learn from and improve upon and as emphasized in FAO's State of the World's Forests (2003):

“if benefits are to be provided on a sustainable basis to local communities and to countries at large, more effective controls may be required to maintain populations of NTFPs at productive levels. The means to accomplish this will vary, but they must be built on sound economic and ecological principles, and often on traditional institutions”.

Since enacting a logging ban in all natural forests in Kenya (unless licensed) under the Natural Forest Protection Program (NFPP) in 2000, people that traditionally use forest

products (i.e. wood and non-timber products) for subsistence and income needs, have seen their resource base diminish substantially. The Sloping Land Conversion Program (SCLC; enacted in 1998) has further reduced upland farmers' production options as SLCP land cannot be used to grow other crops in-between the trees, even when trees are young and leave plenty of space for intercrops. However, the use of NTFPs in natural or planted forests is normally not restricted so that they have been increasingly exploited without a long-term view towards their sustainable use.

Elgeyo marakwet county's forests has become of particular research interest in recent years because the mountain watersheds harbor great biological and cultural diversity, and is one of just a few places in Kenya having a large dam that provides water to the one of the largest counties (Uasin Gishu county) in Kenya.

Forest ecosystems are also an important grazing habitat for livestock, and provide local populations with food, fuel, medicines, building materials, and valuable non-timber forest products (NTFPs).

Based on case studies conducted in Northwestern Yunnan, Xu and Wilkes (2004) conclude that biodiversity loss in the region is mainly driven by land use and land cover change and that market driven loss is currently a major threat, especially for NTFPs. Cross border trade with the Southeast Asian neighbors plays a significant role. Xu and Wilkes (2004) observe this as indicative of what is occurring in many global biodiversity hotspots.

They point out that market information is primarily supplied by outsiders who engage in collection or procurement of local produce and who are unconcerned about sustainability of harvesting. However, buyers and traders are in many cases the only link for rural communities (especially in remote areas) to the market. Xu and Wilkes (2004) also point out that NTFPs are liable to agricultural product tax, but enforcement is difficult.

## **2.2 Empirical literature**

Arnold and Ruiz Pérez (2010) reviewed the reasons why non-timber forest products (NTFPs) have attracted so much attention during the last couple of decades. Drawing on a number of seminal works they outline three propositions central to the idea that NTFPs might contribute to rural development and forest conservation objectives. These were that NTFPs make important contributions to the livelihoods of forest adjacent communities; that increasing harvests of NTFPs could increase the perceived value of forest resources and hence provide incentives to conserve forested land; and that the exploitation of NTFPs provided a more sustainable base for forest management (Arnold and Ruiz Perez 2001: 438).

This paper sets out to look at the first two propositions and revisit the prospects NTFPs hold for sustaining the livelihoods of people living close to forests and for promoting conservation through the ‘use it or lose it’ philosophy (Freese, 1997).

During the period that Arnold and Ruiz Pérez consider, there have been other changes to the way in which the conservation and development community view household livelihoods, family incomes and forest valuation methods.

More nuanced understandings of the condition of rural and forest margin communities have emerged at the same time as there has been a renewed focus by many donor agencies on the alleviation of poverty (Arnold 2001; DFID 1997 2001; Forsyth *et al.* 1998; Lipton and Maxwell 1992; Maxwell 2001). Application of a pro-poor focused 'livelihoods approach' to examining and understanding individual or household economies and the ways in which poor groups of people are able to improve their standards of living, has emphasized the fact that natural resources (including NTFPs) are only one set of capital assets available to, and used by the poor as part of their livelihood strategies (Carney 1998; 1999; Farrington *et al.* 1999; Scoones 1998). This has forced conservationists, forest managers and development practitioners to move away from sectoral perspectives towards a much broader approach in their understanding of the importance of the various economic activities that make up the livelihoods.

Important too, has been the parallel promotion of the concept of livelihood diversification, which is inherently linked to the livelihoods approach and ideas concerning livelihood vulnerability and resilience. Whilst Ellis (2000) identifies an increasing trend in livelihood diversification as either a considered or forced response to socio-economic stress, Barrett *et al.* (2001) suggest that livelihood diversification is essentially a normal condition of life in rural Africa and has always played some part in providing a 'pathway' out of poverty for poorer groups of people.

Whether livelihood diversification has always been important, or whether diversification is a contemporary response to changing economic, social and ecological conditions continues as a subject of debate. However, in terms of NTFPs relatively little research

attention has been focused on the groups of forest adjacent people that are most likely to diversify their livelihood strategies and activities. These are not necessarily the more remote and very rural forest dwelling people, but those living and migrating close to forests in areas where the opportunity exists to access labour, land, and product markets. Whilst some might consider these circumstances as important requisites for the use of NTFPs as part of rural development.

### **2.3 Conceptual Framework**

To investigate the research problem, the study used Sustainable livelihood (SL) and Production-to-consumption system (PCS) concepts. These concepts form a combined interrelated framework within which the research objectives of this study were investigated. Although the SL approach provides a sufficient platform for achieving and analyzing livelihood development outcome, it lacks the market aspects of NTFPs and related livelihoods. On the other hand, PCS focuses more detail on NTFP market aspects analyzing the livelihoods of all stakeholders and processes involved starting from production of NTFP to its final consumption. Therefore, the two concepts were used to strengthen the research framework in order to answer the research objectives of the study focusing on the contribution of NTFPs to household income.

An operation framework used in the study is presented in figure 2.1 below. In this framework, both the PCS and SL have influence and significance in the exploitation of NTFPs. PCS is the entire set of actors, materials, activities and institutions involved in growing and harvesting a particular raw material, transforming the raw material into higher-value products and marketing the final products. The system includes the



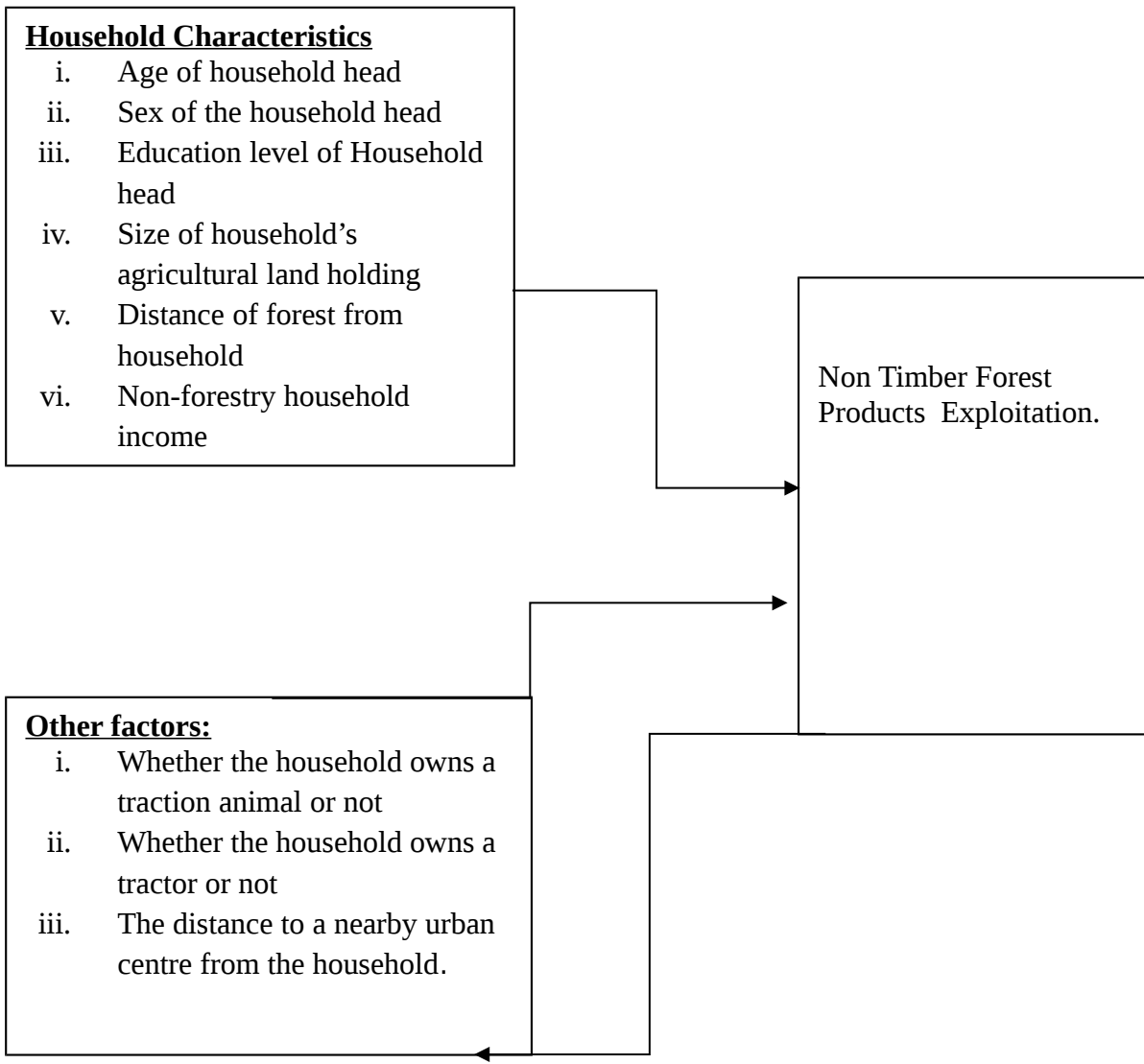
technologies used to grow and process the material, as well as the social, institutional and economic environments in which these processes operate.

A livelihood comprises the capabilities, assets (including both material and social resources) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks and maintain or enhance its capabilities and assets both now and in future, while not undermining the natural resource base.

**Independent Variables**

**Dependent**

**Variable**



**Fig 2.1: Conceptual Framework**

**Source: Author's Own Conceptualization, 2014**

## CHAPTER THREE

### RESEARCH METHODOLOGY

#### 3.0 Introduction

This chapter presents the area of study, sources of data and model of data analysis.

#### 3.1 Area of Study

Elgeyo-Marakwet is one of the forty seven counties (47) in the Kenya. It is bordered by Uasin Gishu County to the West and Baringo County to the East. It extends from Latitude 0° 10" to 0° 52" North and Longitude 35° 25" to 35° 45" East. The total area of the County is approximately 5439.30 Sq. km. The following are the areas bordering the area of study.

***Table 3.1: Administrative Units, Area and Population Size and Density***

Division	Area in Sq km	Population	Population density	Location
Kamariny	210.5	37,773	179	5
Tambach	330.8	18,676	56	4
Chepkorio	312.9	42,129	135	6
Metkei	206.2	24,933	121	6
Soy	378.9	20,354	54	5
<b>Total</b>	<b>1,439.30</b>	<b>143,865</b>	<b>100</b>	<b>26</b>

***Source: County Headquarters Office***

The survey was carried out in Singore forest, Keiyo north district. The forest is situated along the Iten- Marakwet road, surrounding Singore Secondary School stretching on a 12 km radius.

#### 3.2 Data Types and Sources

The study was based on both primary and secondary data. Secondary data sources included the population census, Forest Department records, annual reports Ministry of Agriculture, and Annual reports for local NGOs among others.

Primary data sources included direct observation, use of questionnaires and interviews which covered sampled households living around the forest.

### **3.3 Survey Design and Data Analysis**

As indicated earlier, the objectives of this study were to examine the factors influencing exploitation of non timber forest products and their contribution to household income among the households that participate in business activities associated with NTFPs. One hundred households (100) were targeted for this research in finding out the actual contribution of NTFPs to their income and factors affecting their harvesting. Strata sampling was chosen for the survey, whereby the study area was divided into 5 strata's each strata being a village. These villages include: Chebaror, Mindiliwo, Kapkonga, Kapchekumet and Kapil villages. About 20 households' were picked at random in each stratum for the survey.

Household income was used as a measure of welfare, which permits the use of statistical analysis to estimate the determinants of household participation in NTFP-related activities and the income earned from those activities. The determinants of household income typically include: Human capital, physical assets, locational characteristics, and other social and institutional assets.

Human capital and socio-demographic variables may include household characteristics such as the age and sex of the household head, level of education, and the size of the household. Physical capital variables include total land holdings and productive assets owned (such as tractors, ploughs, wheel barrows, and traction animals). Social and institutional assets included community characteristics related to population, remoteness, and access to markets. The data analysis was based on the following:

### **3.3.1 Methodology of specific Objective 1**

Objective 1 was analyzed by descriptive statistics such as mean, standard deviation, variance, graphs etc. was used.

T-tests, F-tests b-values and correlations were used to test if the various characteristics were significantly different for different variables in the area of study.

The t-tests are given by the formulae:

$$t = \frac{\bar{x} - \mu}{\frac{s}{\sqrt{n}}}$$

### **3.3.2 Methodology of Specific Objective 2**

In this objective, there were two stochastic processes namely (1) participation in business activities related to NTFPs and (2) the share of household income generated by participating in these activities. A household was defined as participating in NTFPs if any of its members earned income from business activities related to NTFPs in the last 12

months prior to the survey. Only gross income from cash and non-cash sales of NTFPs was considered; the value of NTFPs consumed within a household was not included in income due to data limitations. The modeling of these two processes in a two-stage model is described below.

The first stage of the two-stage model was concerned with participation in NTFP activities, and has an equation of the following form:

$$D_i = \begin{cases} D_i^* & \text{if } D_i^* > 0 \\ 0 & \text{otherwise,} \end{cases} \quad D_i^* = \gamma X_i + \mu_i \dots \dots \dots (1)$$

Where  $D_i^*$  is a latent variable taking a value of 1 if a household derived income from NTFPs

(Participated) and 0 otherwise.  $X_i$  is a vector of explanatory variables postulated to influence a household's decision to participate in NTFPs income generating activities,  $\gamma$  is a vector of parameters and  $\mu_i$  is the error term.

The second stage of the model was concerned with the level of income earned by participating in NTFP business activities, which was measured by the share of income derived from NTFPs to total household income ( $y_i$ ), and had an equation of the following form:

$$Y_i = \begin{cases} y_i^* & \text{if } y_i^* > 0 \text{ \& } D_i^* > 0 \end{cases}$$

$$Y_i^* = \beta X_i + v_i \quad (2)$$

{0 otherwise,

Where  $y_i$  was the observed proportion or share of household income derived from NTFPs,  $X_i$  is a vector of predictors that influence NTFPs income share of total household income,  $\beta$  is a parameter vector, and  $v_i$  is the error term.

The Tobit alternative (two-stage) model was used in the estimation of parameters in each of the two stages. The model is a parametric generalization of the Tobit model, in which two separate stochastic processes determined both the decision to participate in an activity and the degree of participation. Cragg Tobit alternative model assumes independence between the error terms  $\mu_i$  and  $v_i$  with this assumption, the model is equivalent to a combination of univariate probit and truncated regression models.

The Cragg Tobit alternative model has extensively been used in other contexts such as employment participation and technology adoption. The approach has rarely been used in studies of household participation in particular business activities, such as the extraction and sale of forest products. In this context, Tobit models and similar approaches would assume the processes of participation in a business activity and the level of income earned are based upon the same set of determinants. The Cragg model estimates the processes separately, and its flexibility allows for a more comprehensive understanding of the role of the activity in overall household welfare, and its results may shed light on the relative dependence of rural households on NTFP for their livelihoods.

The Cragg Tobit alternative model is specified as shown below:

$$P(D_i=1 | X_1) = \gamma X_1 + \mu_i \text{ (Stage 1)}$$

..... (3)

$$Y_i = \beta X_2 + v_i \text{ (Stage 2)}$$

..... (4)

Where  $D_i$  is the participation decision variable, which takes the value 1 if the household decides to participate in NTFPs income generating activities.  $Y_i$  is the ratio of NTFPs' income to total household income;  $X_1$  and  $X_2$  are the vectors of factors postulated to influence participation and level of NTFPs' contribution to household income, respectively;  $\gamma$  is the vector of coefficients associated with  $X_1$  in the first tier (participation equation);  $\beta$  is the vector of coefficients associated with  $X_2$  in the second tier (level of contribution of NTFPs to household income); and  $u_i$  and  $v_i$  are the error terms for each of the empirical equations.

### 3.3.3 Methodology of specific Objective 3

For specific objective 3, ordinary least squares (OLS) regression analysis was used. The model was specified as follows:

$$\text{Amount of NTFPs} = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9) \dots \dots \dots$$

(v)

Where:

$X_1$  = Age of the household head

$X_2$  = Sex of the household head



$X_3$ =Non-forestry income

$X_4$ = Distance of the household from the forest

$X_5$ = Distance to an urban centre

$X_6$ = Size of agricultural land holding

$X_7$ = whether household has a tractor or not

$X_8$ =whether household has a traction animal (oxen or donkey)

$X_9$ = Level of Education of the household head.

This model only applied to those households that harvest NTFPs. The objective was to help understand the important policy variable that influences the harvesting of Non timber forest products. More details on the variables are presented in table 3.2

The model was further specified as follows:

$$\text{Amount of NTFPs Income} = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9$$

Where the parameters  $\beta_0$ ,  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ ,  $\beta_4$ ,  $\beta_5$ ,  $\beta_6$ ,  $\beta_7$ ,  $\beta_8$  and  $\beta_9$  were estimated, these parameters therefore helped to explain the magnitude of factors affecting harvesting of NTFPs which therefore determined the amount of NTFP contribution to the households income surrounding Singore forest, Elgeyo-Marakwet County.

### 3.3.4 Description and Measures of Variables

**Table 3.2:** Description and measures of variables

<b>Variable</b>	<b>Description</b>	<b>Measure</b>	<b>Expected sign</b>
$X_1$	Age of the household head	Number of years	+
$X_2$	Sex of the household head	1=Male, 0=Female	+
$X_3$	Non-forestry income	Kenyan shillings	-
$X_4$	Distance of household from the forest	In kilometers	-
$X_5$	Size of the family landholding	Acres	-
$X_6$	Level of education	Number of years in formal education	-

X <sub>7</sub>	Number of Tractors	Number in count	-
X <sub>8</sub>	Number of traction animals	Number in count	+
X <sub>9</sub>	Distance to the nearby urban centre	Kilometres	+

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**Source: Authors Own Compilation, 2014**

The hypothesized relationships were:

Age, which was expected to have a positive relation to income from NTFPs because age is proxy for wealth. Older people have accumulated wealth over time. Sex of the household head was expected to have a positive relationship since men have more wealth than women.

Non forestry income; was expected to have a negative relationship since any other person may not have to participate in NTFPs harvesting if he or she has other income sources.

Distance of the household from the forest, was expected to have a negative relationship to NTFPs income. If far from the forest, the household chooses not to travel far and spend expensive transport to and from the forest.

Size of the family land holding was expected to be negative. Households with more land acreage may not participate in NTFPs harvesting as compared to those with smaller sized land.

Level of education expected to have a negative relationship given that learned household members get employment to earn income and not participate in NTFPs activities.

Distance to a nearby urban centre was expected to have a positive relationship to NTFPs income contribution to household income. Either far or near, households has to access the urban centre for NTFPs exploitation for income.

## **CHAPTER FOUR**

### **RESULTS AND DISCUSSIONS**

#### **4.0 Introduction**

In this chapter, the factors affecting the exploitation of NTFPs in Singore forest adjacent communities are discussed. Section 4.1 presents the socio-economic characteristics of households, 4.2 presents types of, collection and use, 4.3 presents NTFP income contribution to household economy and influencing factors, 4.4 presents factors influencing exploitation of NTFPs, 4.5 presents NTFP income and dependence, 4.6 presents existing NTFP market characteristics in Singore forest areas, 4.7 presents market constraints and 4.8 presents Cragg Tobit alternative model results on influencing factors of house hold probability of NTFP participation and NTFP share of income.

#### **4.1: Socioeconomic Characteristics of Sample Households: A Descriptive Analysis**

Understanding the socio-economic attributes associated to the collection of NTFPs is relevant in the debate on the contribution to the household income. This improves our understanding of NTFPs contribution to household economy and would provide insights into factors that regulate NTFPs extraction. The following explains some relevant socioeconomic characteristics.

##### **4.1.1 Sex and Age of the Household Head**

The results show that the majority (89.6%) of the sampled households were headed by men. This is because the community cherishes or approves marriage as the norm. Thus it is not easy to find households headed by women.

Therefore this is a region dominated by men in leadership and decision making. Most of the female headed households engage in NTFPs collection both for sale and subsistence. Male headed household also engage in NTFP collection but they delegate the duties to their spouses. Therefore, it means that women also do the most work when it comes to household economic activities. Men mostly participate in collection of complex NTFPs such as wild honey and game meat which needs a lot of man power. Women are left with the harvesting of broom grass, sun grass, medicinal plants and wild vegetables.

The age of the respondents ranged from a minimum of 18 years to a maximum of 71 years with a mean of 39 years with the average number of schooling years being 9. The majority (98.1%) were in their productive working age of up to 65 years, while only 1.9 % of the households were headed by men older than 65 years.

According to the Kenya bureau of statistics 2009, approximately 28% of households are female headed in Kenya and a majority being in urban areas.

#### **4.1.2 Household Size**

Most families in the study area were medium sized. From the response, 63% of the households have between 5-8 members. About 7% of the households have a big number of family members of between 9-14 members which includes extended family members.

At least 29% of the households have between 2-4 members and most of these households are made up of members who work with government institutions and have higher education levels. The average household size measured in this survey is 6 members.

Those households having large number of members tend to participate more in harvesting NTFPs. Most of these NTFPs are used for subsistence such as firewood, wild vegetables, game meat and sun grass. At least 48% of the firewood is sold by these households to earn income for other requirements. Broom grass and sun grass are mostly sold for income. Most of these are used as cattle feeds.

Small families don't participate largely in harvesting of NTFPs. Most of them use NTFPs for household consumption. About 33% of the small families undertake bee keeping at their household sanctuaries. Approximately 73% of the honey is sold and the rest is stored for household consumption. Only 23% of interviewed households did honey processing and value addition before selling it at higher price.

Larger households tend to plant more own farm trees. There are two main reasons to this—larger households have larger requirements for forest products such as fruits, fuel wood and medicinal plants. This could make it more prudent and economical for such households to establish own farm forests. The second is that tree planting is labour-intensive and larger household are capable of using own labour to accomplish the tasks involved. Diversification of livelihood sources to meet the subsistence needs of a large family may provide an alternative explanation.

A study conducted by Olsen, 1998 in Nepal revealed that the size of households influence the amount of collected NTFPs species. The larger the family size the more they collect.

#### **4.1.3 Education Level of the household head**

Level of education in the study area is almost normally distributed. About 9% of the interviewed household heads have a degree, 21% have diplomas and certificates, 43% only reached secondary level, 22% only have primary level or elementary level and 4% said they never went to school. Most of those who never went to school were the old age group.

The households headed by the most learned participate less on NTFPs harvesting or not at all. Approximately 7% of the households said they never participated in any active NTFPs harvesting while 43% collected but for consumption and not for sale.

The low education level of the household head is a contributor to their inability to secure more remunerative employment opportunities elsewhere, thereby resorting to collecting NTFPs. Education increases household's off-farm employment opportunities. Furthermore, highly educated members of the household tend to look for other sources of income in off-farm activities. This is because of the traditional nature of farming activities within the region which many people view as not competitively rewarding compared to non-farming activities.

Therefore, those households whose heads have work elsewhere or work with the government, don't engage in NTFPs harvesting. Those households whose heads have no jobs engage in NTFPs harvesting and supplement it with farming and other practices to earn more income to support their families.

#### **4.1.4 Ownership of a Traction Animal by the Household**

Approximately 94% of households in the region owned a traction animal either an ox or a donkey. Most households prefer having these animals to help them mostly for transportation and ploughing purposes. Almost 83% of the households interviewed who engage in active collection of NTFPs reported that having donkeys and oxen help them a lot during transportation since they save a lot of transportation costs.

A research conducted by Tropenbos International (2005) found that the more the assets the family has the richer the household is. Family assets include land, traction animals, furniture, machinery and equipments etc. Therefore the ownership of a traction animal among households is a great treasure for the family economy.

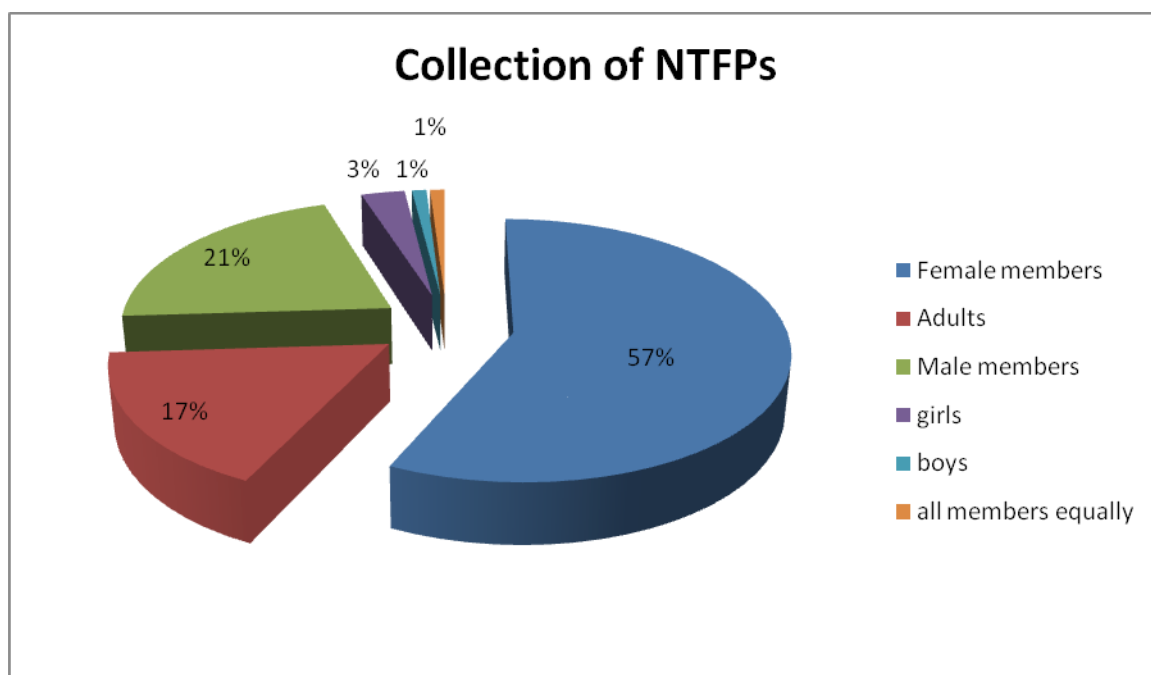
#### **4.1.5 Ownership of a Tractor by the Household**

Only 6% of the respondents owned a tractor. These are households that own huge tracts of land somewhere else and live on between 10-30 acres of land as their residence. Most of these households do not engage in NTFPs harvesting since they earn more income from agriculture and other sources. The only NTFPs these households use is the wild honey and the medicinal plants for household consumption. They also collect broom grass for roofing their calf sheds and sun grass for their animal feeds.

#### 4.2 Types of NTFPs, Collection and Use

Although all members of the households contribute to collecting NTFPs, the female members do most of the collection. Adult females appear to collect about 66% of the NTFPs, whereas adult male members tend to collect about 30%. Children also contribute in collecting NTFPs for their households, although girls are much more engaged with NTFP collection than are boys.

The figure below shows the respective harvesting behavior of various household members.



**Figure 4.1: Household Collection of NTFPs**  
**Source: Field Survey, April-July, 2013**



Results showed that most of the NTFPs are collected from the natural part of the forest (which was mostly degraded but not managed) followed by the plantation side of the forest. However, the collection of NTFPs from managed forests is negligible, as there are very few initiatives focusing on managing and restoring degraded forests by supplementing them with enrichment plantation and/or by integrating tree plantations with agricultural crops as it is observed in agro forestry practices. Moreover, a large amount of NTFPs is collected from residential sites surrounding the households and wetlands near the households and villages.

Of the lands where NTFPs are collected, about 6% is privately owned, 51% is state-owned (under forest department), and 43% is community-owned. However, in practice, people from different communities (clans) collect NTFPs from all these lands irrespective of their own ownership of the lands. Further, about 13% of NTFP collection takes place on private lands where only owners collect NTFPs and to which outsiders are not allowed access. In less than 4% of the collection cases, NTFPs are collected from state-owned forests where anybody can collect NTFPs. Whatever the ownership status of the land, there is medium to low enforcement of the rules; therefore, villagers collect NTFPs from wherever they can, even if illegally, especially when they are in need of food for the households.

#### **4.2.1 Time Spent in collecting NTFPs**

Exploring the amount of time spent by the household members to collect different NTFPs is important for future initiatives. Results showed that each household spends an average of about 380 hours per year collecting NTFPs. This suggests that each household on

average spends more than one hour every day collecting some sort of NTFP either for subsistence or cash income. However, a one-way ANOVA reveals that this collection time varies significantly ( $p < .001$ ) between different types of NTFPs. Households spend the most time collecting wild vegetables (average 155 hours/year) followed by weaving reeds (average 144 hours/year) and sun grass (average 108 hours/year). Households spend comparatively little time collecting broom grass (which is seasonally harvested and available only between December and February), wild honey, and medicinal plants. According to the research done by Pattanayak et al., (2004); households face a lower opportunity cost of time and may be more likely to collect NTFPs.

#### **4.2.2 Uses of NTFPs**

Most households depend on NTFPs, particularly wild vegetables and honey for food. Significant non-edibles are weaving reeds, medicinal plants, broom grass, sun grass, as well as some other types of NTFPs that are used for household subsistence and cash income.

Results showed that 63% of the NTFPs are collected by households mainly for household consumption. Weaving reeds, though, was mainly used to construct houses, in agricultural and household implements, for weaving crafts. Medicinal plants are mainly used to prepare herbal medicines, whereas broom grass and sun grass were mainly used for preparing brooms for house cleaning and house thatching, respectively. Both of them were also used as cow feed during the dry seasons of the year. On the other hand, about 37% of the NTFPs are collected mainly for cash sale. According to Edward, 1994;

Hertog, 1995; Karki, 1996; Sharma, 1996, NTFPs species are often overexploited for the above named purposes.

### **4.3 NTFP Income Contribution to Household Economy and Influencing Factors**

#### **4.3.1 Income from NTFPs**

NTFPs can provide both subsistence and cash income to households. Although most of the NTFPs are used for subsistence, about one-third of the surveyed households reported selling NTFPs for their cash income as well. Households ranked the three most important wild NTFPs for sale as firewood, broom grass and wild vegetables. Among the other wild NTFPs, sun grass, weaving reeds, medicinal plants, wild honey and wild fruits are also significant for their sale value.

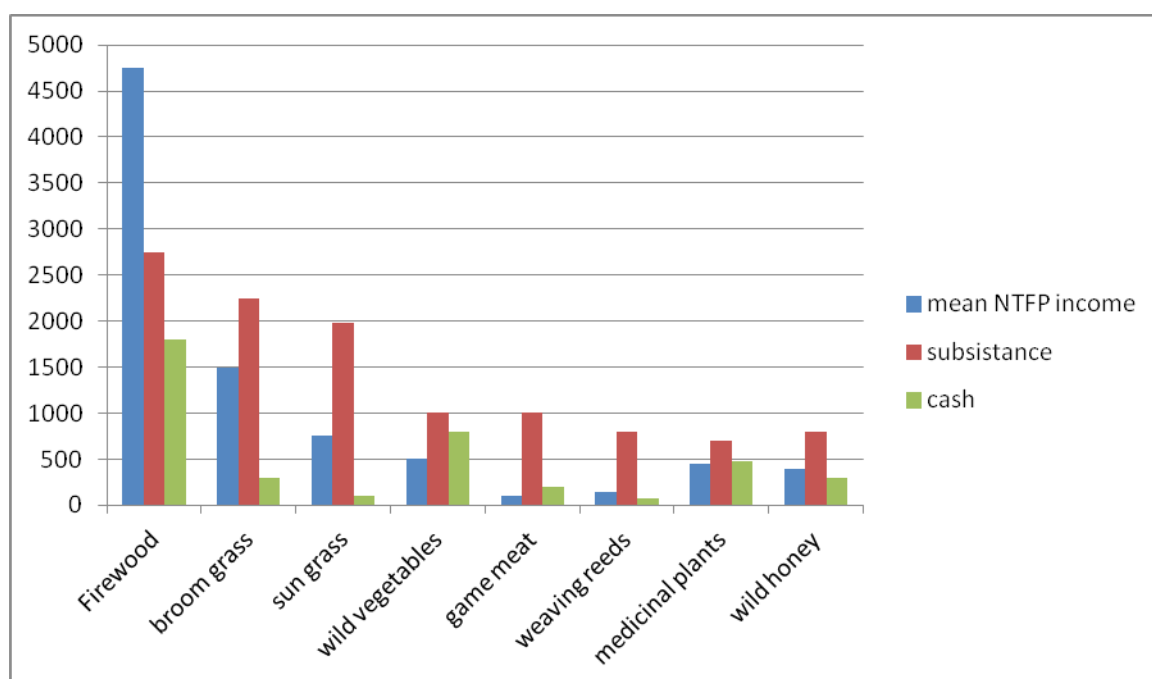
However, few households receive income from honey harvest, as only a few (3%) of the households had the direct connections with traders or middlemen that are necessary to realize income from this precious commodity.

NTFP-related yearly household income data analysis from the area also showed that firewood provides the highest income followed by income from broom grass and sun grass (see fig. 3).

Among these three NTFPs, firewood yields almost double the income of broom grass or sun grass. Broom grass and sun grass tend to provide similar yearly income to households. Although firewood contributes significant cash income to the households,

broom grass and sun grass are collected principally for subsistence rather than for sale. However, subsistence income from firewood is still more than that of broom grass and sun grass. Among the other NTFPs, income from wild vegetables, game meat, weaving reeds, medicinal plants and wild fruits are worth mentioning. Wild vegetables and game meat make equally important and distinct contributions to the households: wild vegetables provide mostly cash income, whereas game meat is more extensively used for subsistence.

Similarly, medicinal plants and wild fruits contribute little in terms of income. Medicinal plants provide more cash income than wild fruits, which are mostly used for subsistence.



**Figure 4.2: Mean NTFPs incomes, Amount of subsistence and Cash sales**

*Source: Singore forest household survey (April-July), 2013*

Sampled respondents are of the view that the three most important subsistence and cash income NTFPs to their households (as stated at the beginning of this section) are Weaving reeds, wild vegetables, and broom grass; yet, NTFP household income survey data validate the first two NTFPs, but rank sun grass as third largest income provider to households, placing broom grass fourth for this purpose. This could be because although sun grass provides more income than does broom grass, the latter is more extensively collected by many households for their important cash income. Similarly, many more households gather weaving reeds than game meat; thus the former given current practice is of greater importance to the households. Medicinal plants and wild honey were also, therefore, considered important because of their cash contribution to the households. In addition, households tend not to regard the NTFP-based subsistence as income; therefore, they placed less importance on it in comparison to cash income from NTFPs.

Income survey data results also showed that among all the types of NTFPs directly collected from the forest by household members, considerably more income accrues from NTFPs than from timber and poles combined. On the other hand, income from processed forest products, which comprise mostly reed-made items, was too low to be a viable means of making money for households when other options are available in comparison to raw NTFP income.

**Table 4.1: Forest-related annual mean incomes of households**

Types of forest products	Mean household income	Subsistence income	Cash income
NTFPs	14,400	9900	4500
Timber and pole	7700	2880	4820
Timber and pole	22980	13540	9440
Timber and pole	840	360	480

Source: Field survey, April- July, 2013

To compare subsistence versus cash income for different forest products including NTFPs, the results also showed that households collected NTFPs mainly for subsistence, and this was also the case for almost all the NTFPs collected from the forest. On the other hand, in the case of timber and poles, the households collected or harvested the timber products mainly for cash income rather than for household uses. Reed-made baskets and other processed products are also usually sold rather than reserved for household use. Overall, the households collect the vast majority of the raw forest products for subsistence. Though modest, the cash income from selling the forest products constitutes a very important source of money for the households, affording them the means to purchase the necessities of daily life.

Moreover, for the households, more subsistence income comes from NTFPs followed by firewood and timber respectively. About 63% of collected NTFP-related household income is for subsistence, and the rest is for cash. On the other hand, among the total raw forest income, the households realized the most cash income from timber and poles, with NTFPs following, and firewood third.

#### **4.3.2 Dependence of households on NTFPs and all other forest products**

Households in the study area depended on NTFPs to a large extent. Income data analysis also showed that NTFP income increases with increased household total income but relatively less. The richer the household, the lesser the income they got from NTFPs for subsistence and cash. Although this pattern does not precisely reflect the extent of dependence of the households in various income groups (based on 5 income quintiles

arranged in ascending order from poor to rich) on NTFPs, it suggest that NTFPs make an important contribution to total household income.

According to Browder (1992); Karki (1995) and Thomas, (1996), poor households are usually more involved in NTFP collection than wealthier households because of landlessness, absence of alternative income sources and low capital required in the NTFPs collection process.

**Table 4.2:** Comparison of absolute and relative NTFP and forest income with household incomes (N=87)

Income quintile(poor to rich)	N	Mean NTFP Income	Mean forest income	Mean household income	Relative NTFP income %	Relative forest income %
1	18	6300	12940	39400	16	33
2	17	9350	16280	56780	16	29
3	17	10890	19200	70500	15	27
4	17	10930	18950	90530	12	21
5	18	12340	47780	145650	9	33

*Source: Field Survey, April-July 2013*

If we focus on the NTFP income patterns for the different groups, the results showed that households in the lower-income quintile groups realize relatively higher proportion of their income from NTFPs than do those in the higher-income groups. The table also shows that there were very little differences in the income dependence of households in the three lowest-income groups, and in the higher-income groups, dependence on NTFPs gradually declines as household income increases.

Similar to the households NTFP dependence patterns, households in the lowest-income groups are more dependent on the forest, and the forest income of all the households gradually decreases with the increasing trend of household income up to the fourth income quintile. However, in the case of the richest-income quintile group, households' relative income from forest products increases as they have more income from timber and poles and from the bulk sale of some of the economically valuable NTFPs such as weaving reeds.

The extent to which the households were dependent on NTFPs in particular and on forests in general was clarified by presenting data that focused on the relative contribution of different income sources to the households, including NTFP income and total household economy. We considered annual total household income as an indicator of the households' economy, total forest income (that includes income from raw and processed forest products) was about one-third (29%) of total household income; only income from agriculture was higher (37%). Moreover, income data analysis also showed that about half of the total forest income of the households comes from NTFPs.

#### **4.3.3: Average Annual household income and income contribution from various sectors per household (N = 87)**

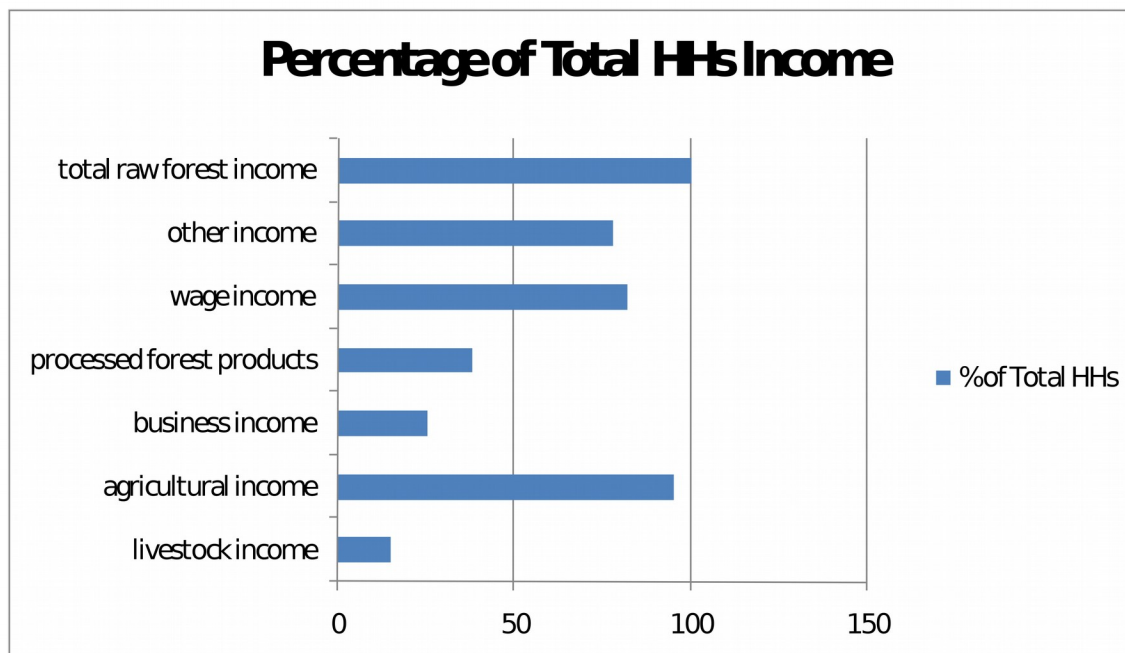
*Table 4.3: Average annual household income from various sectors per household*



<b>Household income sectors</b>	<b>Annual household income (Shs)</b>	<b>%total annual household income</b>
Total raw forest income	26,000	32.00
Processed forest products income	2720	3.35
Wage income	16190	19.93
Business income	7650	9.42
Agricultural income	28900	36.56
Livestock income	950.00	1.18
Other income	2100.00	2.58
<b>Total household income</b>	<b>81,245</b>	<b>100</b>

*Source: Field Survey April-July, 2013.*

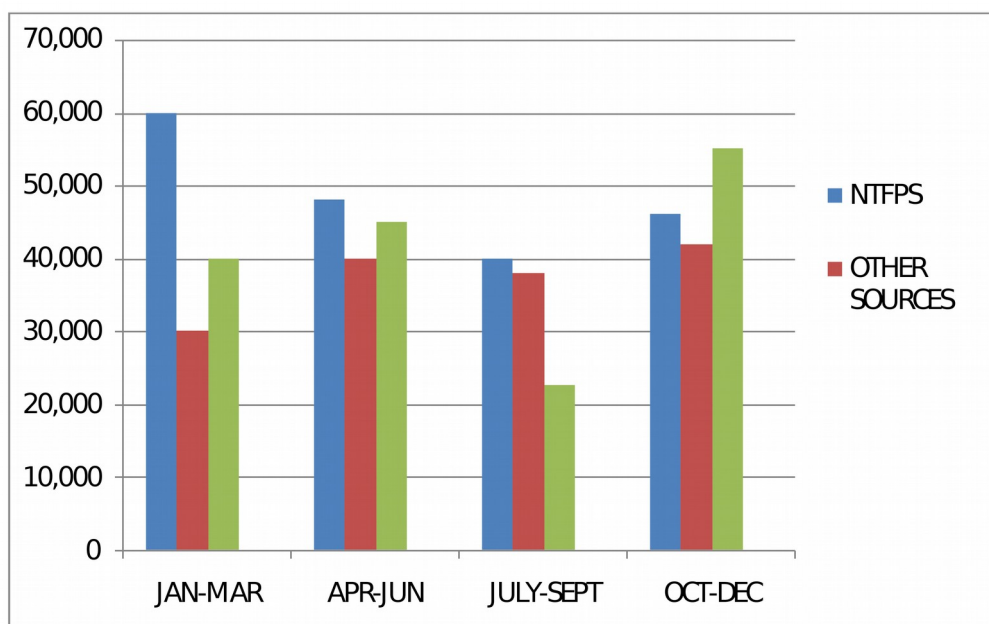
Among the surveyed households, all the respondents reported having income from raw NTFPs and other forest resources. However, only 3.36% of households realize income from processed forest products; those that did were engaged in weaving reed-based products, such as baskets and mats, for their household use as well as for cash income. Since about 98% of the households in the study sites were engaged in making money from agricultural work and more than 82% had wage incomes for their livelihoods, the NTFP incomes along with other forest incomes complemented these two major income sources in sustaining the livelihoods of the forest-adjacent communities. The figure below shows the percentage of total households income from different forest products.



**Figure 4.3: General Mean Level of Incomes from Different Sectors per Household**  
*Source: Field Survey, April-July, 2013.*

In terms of the households seasonal pattern of income dependence on different types of forest products (see figure 5) the data showed that NTFP income as highest in the first quarter (the mainly dry period of January to March), becoming gradually lower through the second quarter (the warm and rainy period of April to June), and then the third quarter (the predominantly rainy season of July to September). In the fourth quarter (the mainly cool and start of dry season of October to December), NTFP income tends to rise again. This income pattern applies to all NTFPs, mainly for firewood. Income realized from timber and poles follows a similar pattern in the first two quarters, but declines sharply in the third quarter. In the fourth quarter, the quarter following the rainy season, though, the income from timber and poles is much higher than it is during the other quarters.

In the first three quarters, NTFP income is much higher than timber and pole income; it is also higher than firewood income. But in the fourth quarter, timber and pole income surpasses NTFP income. Overall, total forest income tends to be lowest during the third quarter, followed by the second quarter; it is highest in the first and fourth quarters.



**Figure 4.4: Seasonal variation in income dependence of the households from different types of forest products (N = 87)**

*Source: Field Survey, April-July, 2013*

#### **4.4 Factors Influencing Exploitation of NTFPs**

Exploitation of NTFPs is evident in the study area and in this section we discuss what influences exploitation such as the education level of the household, the distance to the forest travelled by the household members and others. These are discussed below.

#### **4.4.1 Education level**

Many socioeconomic variables at the household level influence the NTFP income of the households. One-way analysis of variance (ANOVA) of the survey data shows that households shows no significant differences in their NTFP income depending on different education levels of the household heads. However, the analysis also suggests that households that have heads with an elementary education or less tend to have higher NTFP income than do households that have heads with no education or with secondary education. Also worth noting is that the few female-headed households appear to have higher NTFP income than do male-headed households, but the degrees of freedom are insufficient for significance. Households that collect firewood from forests have more NTFP income than those that do not do so, but there is no significant difference in their overall NTFP incomes. Discussions with respondents also indicate that in most cases, those who collect firewood gather any available NTFPs from the forest areas where they collect the firewood. Hedge et al. 1996, Uma Shaankar et al 2004, Shone and Caviglia-Harris 2006, found that education and cash income generated through activities other than NTFPs collection are negatively associated with cash income generated through the sale of NTFPs.

#### **4.4.2 Distance travelled by the household in collecting NTFPs**

The collection amount, type, and sale of the NTFPs depend on different socioeconomic and biophysical conditions, the uses of the NTFPs, and respective value. The survey results show that most of the households that collect NTFPs have to go further away than they used to go few years ago to collect the products. According to the survey

respondents, the average harvesting distance of the NTFPs from the sampled households is approximately 2.4 Km, and it takes about 44 minutes on average for the household members to reach the forests or other sites where they collect NTFPs. For almost all the major NTFPs, household members usually walk 1 to 4 km in order to collect them. In particular, weaving reeds are the farthest, with households obliged to walk more than 4 km in order to collect them. Almost as far as the average distance for firewood and broom grass, which is a little less than 2 km in most cases. For sun grass, the villagers walk about 1.5 km, whereas for wild vegetables and medicinal plants, the average distance is slightly above and below 2 km respectively.

**Table 4.4: Effects of household-level socioeconomic categorical variables on NTFP income (N=87)**

<b>Explanatory Variables</b>	<b>N</b>	<b>Mean NTFP income/ household/year</b>	<b>F-value</b>	<b>p-value</b>
Education of household head				
No education	4	9,800		
Elementary	14	12,200	.370	.689
Secondary	44	10,200		
Tertiary	25	6,400		
Sex of household head				
Female	8	14,400	1.348	.346
Male	79	8,100		
Birth of the household head in the village				
NO	42	11,200	.132	.734
YES	45	9,600		
Household collects firewood				
NO	8	7,400	.441	.518
YES	79	11,800		

*Source: Field Survey, April-July, 2013.*

Again bivariate correlation between the NTFP income of the households and various socioeconomic interval variables was carried out, and the analysis presented. It is worth

noting that although there was no significant correlation between wage income and NTFP income of households, household incomes from NTFPs increase as the wage incomes of households increase. This could be because households that depend more on daily wage labor are most likely to lack a secure income source, and they collect NTFPs when they don't have any wage labor in agriculture or another employment. Moreover, the more agricultural income households have, the lower their NTFP income, but this is a non-significant correlation. The negative correlation between households' agricultural income and NTFP income suggests that households with higher agricultural income have less dependence on NTFPs although there is no sufficient evidence to make that conclusion.

**Table 4.5: Test of Significance on NTFP Income influencing factors**

<b>Variables</b>	<b>Bivariate relationship with Ln ( NTFP income) (r-value)</b>
Education of the household head	-0.056
Sex of the household head	-0.109

Age of the household head	-0.034
Hours per week firewood collected by household	0.097
Wage income	-0.019
Agricultural income	0.196**
Household total income	0.072
Average livestock end value	0.015
Distance of household from forest	0.091
Distance to forest products market	0.066
Ownership of traction animal	0.071
Total forest areas of household	0.100
Number of members in household	0.168*
Total value of household implements and Furniture	-.179**

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*\*Significant at the 0.05 level; \*\*Significant at the 0.01 level*

*Source: Computed from the survey data April-July, 2013.*

Further, total household income is significantly positively ( $p < .001$ ) related to the NTFP income log. This suggests that the higher the total household income, the more the households earn from NTFP sources. Similarly, significantly ( $p < .05$ ) positively correlated with the NTFP log is total number of household members indicating that more member of households can gather more NTFPs. Moreover, the total value of the households' implements and furniture are significantly ( $p < .001$ ) negatively correlated with the log suggesting that households that possess more implements and furniture (could be a sign of rich or well off family) are less dependent on NTFPs. Similar observation was made during the field visits to the household.

Since different types of capital such as natural, physical, financial, human, and social capital constitute and influence rural livelihoods (details in conceptual framework), a linear regression analysis to predict the NTFP income of the households from the estimates of 5 variables representing the above-referenced 5 types of household capitals. More specifically, the total forest land areas of the households represent the natural

capital, the number of people in a household represents its human capital, the total value of the household's implements and furniture represents physical capital, number of years the household has been in existence represents social capital, and the household's net savings represents financial capital.

**Table 4.6: Bivariate Correlation analysis results**

Independent variables	Bivariate correlations	Initial model		Final model	
		b-value	Part. Corr.	b-value	Part corr.
Total forest areas of HH	0.10	.000175	.083		
Number of people in HH	0.161*	-	.156	.06867*	.087
Total HH ownership of a tractor and implements	-.174**	0.0000211** -.0003784	-.194	-.0.0000215*	-.093
Size of family land holding	.066	.0003674	.0082	*	
Constant		9.123***		9.224***	
Multiple R		.293*		.238**	
R-square		.075*		.073**	

**\*Significant at the 0.05 level; \*\*Significant at the 0.01 level; \*\*\*Significant at the 0.001 level**

**Source: Computed from Survey data, April-July, 2013.**

Bivariate correlation analysis showed that the number of members in a household is significantly positively correlated with the household's log of NTFP income, whereas the total value of the implements and furniture owned by the household is significantly negatively correlated with it. The initial regression model, which considers all 5 variables representing 5 different capitals for the households, shows a significant b-value for only the number of members of the households and the total value of implements and furniture. Once the non-significant variables have been discarded one by one (and also following stepwise method) the final regression model consists of only two independent variables showing a significant b-value.



#### **4.5 NTFP income and dependence**

In Singore forest catchment areas, there was a slight difference observed between households' views of the relative importance of specific NTFPs and the ranking of NTFPs based on household income survey data. In the households' view, the three most important NTFPs for sale are firewood, sun grass, and broom grass, whereas survey income data from the households showed that households get the most income from firewood, wild vegetables, and sun grass, followed by broom grass and other NTFPs.

The difference was in regard to third ranking between sun grass and broom grass as reported by households and ranked through household income data analysis respectively. Although sun grass appeared to provide more total NTFP income (both subsistence and cash) than broom grass, the cash income from broom grass was much higher than that provided by sun grass. On the other hand, medicinal plants provided a little more cash income than did wild vegetables; however, households spent more time and collected wild vegetables more frequently than medicinal plants, and, therefore, most households preferred selling wild vegetables over selling medicinal plants.

Findings also suggested that the importance of any given NTFP to the households depend on that NTFP's current ability to provide cash income as well as how extensively the majority of households collected it for both subsistence and cash income. Policy and development initiatives, thus, would entail focusing on NTFPs in terms of their ability to

provide cash income, specialization of livelihoods, household-market linkages, and the intensity of households' NTFP use.

Assessing households' relative dependence on NTFPs for their livelihoods is a primary prerequisite for initiating any NTFP-based intervention. Singore households appeared to depend on NTFPs and other forest resources to a large extent. Although the NTFP income of the households increased as total household incomes increase, relatively poor households depend on NTFPs more than richer households do. A similar pattern of dependence has been observed in regard to forest-adjacent communities' dependence on forest income; this was with the exception of the very richest group of households, who depend on the forest primarily for income from timber and other bulk sale of NTFPs. This was an interesting site-specific finding, although some of the studies have claimed that overall forest dependence declines as household income increased. Another important finding is that for the households in the study sites, forest income is their second largest income. In addition, all the households are involved in collecting forest products all year round. It is probable then that forest-adjacent communities depend on NTFPs and other forest resources to a great extent, and any forest-based development interventions should be designed to improve income and facilitate NTFP conservation. The goal would be to reduce poverty by providing alternative ways to generate income as poor people are more dependent than are wealthy people on NTFPs and other forest resources. Certainly, it is necessary that pro-poor groups receive adequate consideration in economic development and resource conservation initiatives.

Households' NTFP income tends to be influenced by varied socioeconomic factors; but these influences could be site-specific and are not necessarily generalizable to all socioeconomic conditions and geographic locations. Nonetheless, for a specific site, households' NTFP income could be estimated from the measures of the socioeconomic variables that represent different capital of the households. Therefore, understanding both seasonal variations in NTFP-dependence and the different socioeconomic factors that play a role in such is crucial to designing future conservation and income development initiatives.

#### **4.6 Existing NTFP market characteristics in Sing'ore forest areas**

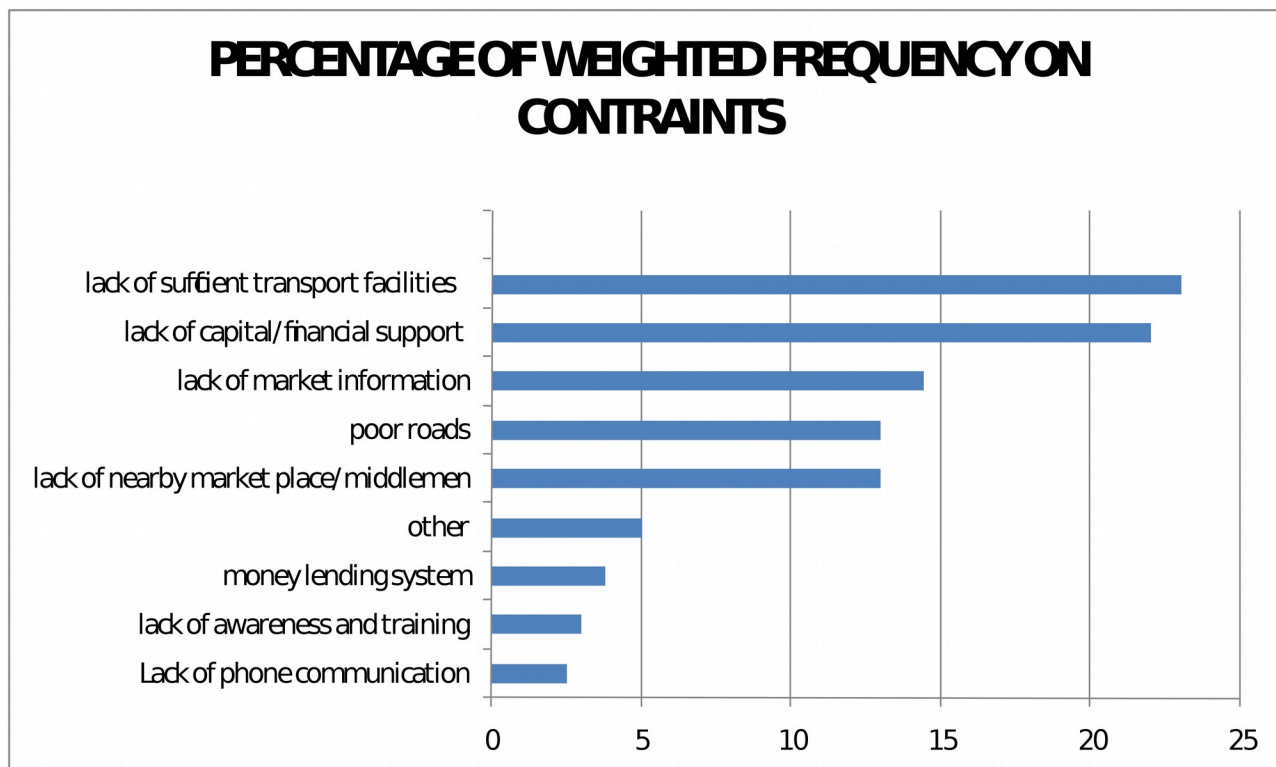
NTFP markets in Singore area comprise formal and informal structures, activities, and processes. Most formal markets, that usually comprise physical structures such as shops and/or arrangement of buyers and sellers at a particular place, are located road- or riverside near villages or at local and district markets such as at Iten which is the Elgeyo Marakwet county head quarters, Singore centre and others. NTFPs are collected from forests, semi-processed (sorted, bundled, seasoned etc.) and carried to the nearby markets. In some cases, the raw NTFPs are directly sold to the markets. Depending on the type of NTFP and the scale of the household collections, these products are sold in markets on either a retail or wholesale basis. With the exception of roadside markets, every local or district market has specific market days, usually twice weekly. Households carry the NTFPs to market and sell there on these particular days. In many cases, households go to market with a dual purpose: to sell the NTFPs they have gathered and to

buy the commodities they need. Having sold their NTFPs for cash, many households buy other commodities with the money.

At informal markets, traders or middlemen go to the households and purchase NTFPs with cash or order a future supply. Once the NTFPs have been gathered and the households are stocked with them, middlemen then carry them as a bulk load using locally arranged labor and transport to supply them to local, regional, or national market traders.

#### **4.7 NTFP Market Constraints**

Households identified many NTFP market constraints that deprived them of opportunities to make income. Three major NTFP market constraints were lack of sufficient transport facilities, lack of capital and/or financial support, and lack of market information. Other significant market constraints included lack of a nearby marketplace and middlemen linkages, poor road, the informal money lending system, and lack of awareness and training about the kind of NTFPs that have better markets.



**Figure 4.5: Market constraints for the NTFPs (N=87)**

*Source: Field Survey, April-July, 2013*

Lack of capital or financial support is a market constraint common to all NTFPs; however, there are also constraints that are specific to particular kinds of NTFPs. Weaving reeds, wild vegetable, and firewood markets are characterized by constraints such as lack of sufficient transport facilities, lack of capital or financial support, and poor road and/or water communication systems. For medicinal plants, broom grass, and honey, the major market constraints are lack of market information and lack of capital or financial support. However, although the lack of a nearby marketplace and the lack of middlemen linkages constitute major market constraints for medicinal plants, they generally have little effect on the broom grass market. Lack of sufficient transport facilities appears to be a market constraint common to all NTFPs, except for medicinal plants.

#### **4.8 Cragg Tobit alternative model results**

Households earn income from a variety of sources, including NTFPs, agricultural production, and wage employment. Table 4.7 presents the mean contribution of the primary income sources to total household income, by quartiles of household income, for those households reporting income from NTFPs.

The results revealed that the highest income quartile (wealthiest 25%) derives the least income from NTFPs than the other three quartiles in absolute terms and its share total income (28.4%) is relatively less than for the poorest households in the lowest income quartile (45%). This implied that poorer households are relatively more dependent on income from extraction and sale of natural resources such as NTFPs than wealthier households.

**Table 4.7:** Income Sources by Income Quartiles for NTFP Households (KSHS)

Income source	Sub-sample of NTFP Households	Household income quartile			
		0-25%	25-50%	50-75%	75% and above
Total income		11	19	23	34
per capita NTFP income	28.4%	2	5(26.38	3(13.04	9(26.47
per capita Agriculture income	38.8%	(18.18%) 4(36.36	%) 8(42.11	%) 11(47.83	%) 19(55.88
per capita Employment income	9.3%	3(27.27	1(5.26%)	3(13.04	2(5.88%)
per capita Trading income	21%	1(9.09%)	3(15.79	4(17.39	2(5.88%)
per capita Others income	2.5%	1(9.09%)	2(10.53	2(8.70%)	2(5.88%)
income sources			%)		

**Values in parentheses represent mean contribution to household income from a particular source.**

**Source: Calculated from survey data, April-July, 2013.**

Agricultural income represents the second highest contribution to total household income for the lowest income quartile (poorest 25%), but it is the highest contributor for the second and third quartiles. The wealthiest quartile earns more income from wage employment. However, agriculture is the leading contributor, overall, indicating that

agriculture is still the dominant economic activity in this area. It is important to note that share of trading income increases from the lowest income quartile all the way to the highest, perhaps an indication that participation in other business activities increases with household income, presumably due to availability of capital. Employment and other sources ranked lowly in terms of contribution to total household income in all the quartiles. Employment contribution ranges from 5.88-18.18% with the highest (18.18%) being for the highest income quartile.

Table 4.8 presents the mean contribution of each NTFP to household income for households that reported income from NTFPs. The results indicated that firewood is the highest contributor (37%) followed by broom grass (19%). Following broom grass is sun grass with a contribution of 12% while wild vegetables are the next with 8% of total household income. Weaving reeds, wild honey and game meat follow with 11%, 7% and 2% respectively.

**Table 4.8:** Mean contribution of each NTFP to household income

NTFPs	Average share of total household income
Firewood	37%
Broom grass	19%
Sun grass	15%
Wild vegetables	8%
Weaving reeds	11%
Wild honey	7%
Game meat	2%

**Source:** Calculated from survey data Singore-Chekumet forest. Elgeyo Marakwet County. April-July, 2013



In order to reduce households' reliance on firewood as an income source, there is need to promote the extraction of other NTFPs such as wild honey, wild vegetables, broom grass and weaving reeds which have negligible ecological impacts, as these have the potential to contribute substantially towards household income.

The first step of the analysis in estimating determinants of participation in NTFPs and their contribution to household income consisted of testing the Tobit model against the two-stage.

Cragg Tobit alternative model. The results of the formal log-likelihood ratio (LR) test between the Tobit and the Cragg (1971) two-stage model confirm the superiority of the Cragg model and the rejection of the Tobit model; that is, the test statistic exceeds the critical value of the  $\chi^2$  distribution (p-value <0.01). This suggests that the decision to participate in NTFPs and the level of NTFPs' contribution to household income may be governed by different processes.

Table 4.9 presents results of the Cragg Tobit alternative model of household participation in NTFPs. Stages 1 and 2 are maximum likelihood coefficients of the determinants of probability of engagement in NTFPs and the contribution of NTFPs to total household income, respectively. For easier interpretation, the coefficients for the first stage were presented as the marginal effects in the fourth column; coefficients for the second stage were presented as average partial

effects (APE) in the last two columns. Test of significance for the average partial effects for the second stage was done using the bootstrap method in Stata with 50 replications.

**Table 4.9: Determinants of Household Probability of NTFP Participation and Share of NTFP Income**

Variable	Stage 1		Stage 2		Marginal effects					
	Coeff.	Signf.	Coeff.	Signf.	Probit	Signf.	CAPE	Signf.	UAPE	Signf.
Intercept	0.2837		1.1188	***	n/a		n/a		n/a	
Household head age(yrs)	-0.0071	***	0.0028		-0.0008	***	-0.0008	***	-0.0003	**
Sex of HH head	0.1522		-0.0344		0.0217		-0.0083		0.0027	
HH head education level	-0.0356	***	-0.0071		-0.0019	***	-0.0032		0.0024	
Household size	-0.0021		-0.0358	*	0.0002		-0.0123		0.0012	
landholding size (ha)	-0.0453	***	0.0365	**	-0.0036	***	0.0201	**	-0.006	
Logofvalueofasset sowned(shs)	-0.1201	***	-0.0862	***	-0.0201	***	-0.0443	***	-0.0062	***
Dist. to urban centre(Km)	-0.0064	***	-0.0001		-0.0006	***	-0.0003	***	-0.0002	***
Distance to the forest(Km)	0.0019	***	-0.0021	***	0.0002	***	-0.0006		0.0002	

*N= 87, \*, \*\* and \*\*\* refer to statistical significance at 10%, 5% and 1%, respectively.*

*Source: Computed from Survey data, April-July, 2013.*

The fourth column (Probit) in Table 4.9 above, presents marginal effects of the independent variables on a household's likelihood (probability) of participating in NTFPs. The eighth column, conditional average partial effects (CAPE), indicates the effect of each independent variable on a household's share of NTFPs income in total household income (level of contribution), but only for the subsample comprising households that reported income from NTFPs. The tenth

column, unconditional average partial effects (UAPE) shows the expected overall effect of each independent variable on household's share of NTFP income in total household income, taking into account both the probability of participating in NTFPs and the share of NTFPs income to total household income, for those that depend on NTFPs. This column is of particular importance for policy interpretation as it provides information on overall effect of each variable on the contribution of NTFPs to household participation and income.

The regression results showed that age of the household head is negatively associated with both the probability and level of contribution of NTFPs to household income. This suggests that households with older heads are negatively associated with both the probability of engaging in NTFP business activities and with the share of income from NTFPs. Younger heads of households may obtain a higher share of their household income from NTFP activities because of their relatively greater physical capacity for strenuous labor.

Educational level of the household head has a negative effect on the probability of participation in NTFP business activities. Households with higher levels of educational attainment are less likely to participate in NTFPs, implying that higher levels of education are associated with a lower likelihood of dependence on forest products.

Education expands the possibilities for labor and employment, whereas households with lower levels of education may be more economically vulnerable, and thus, more likely to extract forest resources for income. Education has no significant effect on the share of income from NTFPs.

The effects of wealth on NTFP participation and income can be estimated by examining the value of household assets. The negative and significant APEs for the log of the value of household assets (columns eighth and tenth), implies that households with more valuable assets are less likely to participate in NTFPs and for those who do participate; assets are negatively associated with NTFPs' contribution to household income. If assets are used as a measure of overall wealth, these results imply that poorer households may be relatively more dependent upon NTFPs as a livelihood, and reinforce previous assertions of the association between poverty and NTFP participation. This may be an indication that poorer households turn to NTFPs to cushion their vulnerability to economic shocks and crop variability, and as such NTFP participation may be seen as safety nets, especially for poor, rural households.

In terms of access to markets, rural areas are mostly characterized by sparse population and the relatively weak purchasing power of rural households, which may limit the scope of rural markets for forest products. The regression results indicate that population of household

density is positively and significantly associated with participation in NTFP business activities, suggesting that households residing in areas of relatively higher population density are more likely to engage in NTFPs. This is possibly because higher populations provide greater market opportunities for trade in NTFPs.

The land holding size is negatively and statistically significant in explaining the probability of participation in NTFPs. On the other hand, square of landholding size is positively and significantly associated with extent of NTFPs' contribution to household income for those that are already engaged in NTFPs. The negative sign of landholding size (column six) suggest that initially, an increase in landholding size leads to increased probability of participation in NTFPs; however, further increase in landholding size is associated with a lower likelihood of participation. This has implications for policy as measures that would ease access to land for rural households could reduce participation in NTFP business activities and could be used to control extraction of NTFPs to ensure sustainability of the resources. For those already engaged in NTFPs, an increase in landholding size is positively and significantly associated with higher share of NTFPs income. Distance to district town was used as a proxy for market access. Overall, the distance from the homestead to the district town is negatively and significantly related with likelihood of participation in NTFPs and extent

of NTFPs' contribution to household income. This implies that the farther away a household is from the market, the lower the likelihood to participate in NTFPs and the less dependent a household is on income from NTFPs. This underscores the relevance of improving market access in order to encourage rural smallholder households to diversify into NTFP business activities and increase their income.

In order to capture the effect of difference in location on NTFP participation and NTFPs' contribution to household income in the model, a location dummy variable was used, represented by villages. This was postulated to capture the effects of variations in local market conditions, availability of alternative household income generating activities, inter-village abundance and distribution of forests, and any other spatial differences across the 5 villages. The location dummy was found to be jointly significant in explaining both participation in, and contribution of, NTFPs ( $p$ -value = 0.000) following a joint F-test. Thus, differences in location, in terms of villages, are important in explaining a household's participation in NTFPs and contribution of NTFPs to household income presumably because of greater forest cover in some villages, and easier access to forests by households in some villages.

With Chekumet village as the benchmark, the results indicated that being in Kapkong'a is positively and significantly associated with participation in NTFP business activities, while being in Chebaror

village is negatively and significantly associated with participation in NTFP business activities. The other village location dummy variables (Kobil and Mindilliwo) had insignificant coefficients.

#### **4.9 Hypothesis Testing**

Hypothesis 1 postulated that there is no significant difference in incomes of households with NTFPs compared to those without. The regression results rejected the hypothesis ( $\beta=0.301$ ;  $p\text{-value}=0.001$ ).

Hypothesis 2 predicted that socio economic characteristics (age, sex, size of household etc) do not significantly influence exploitation of NTFPs. This hypothesis was also not supported by the results ( $\beta=0.740$ ;  $p\text{-value}=0.0183$ ).

## **CHAPTER FIVE**

### **SUMMARY OF FINDINGS, CONCLUSION AND**

### **RECOMENDATIONS**

#### **5.1 Introduction**

This chapter of the study presents the findings, conclusions and recommendations of the study. Suggestions for further research are also given.

## **5. 2 Summary of Findings**

This study examined the characteristics of households that participate in business activities related to non-timber forest products in communities adjacent to Singore forest. The estimated contribution of NTFPs to household income and determinants of households' participation in NTFPs in the households shows that NTFPs contribute 34% to household income, on average.

Generally, the results show that poor households rely more on NTFPs than the wealthy as indicated by NTFPs contribution (45%) to the incomes of the poorest and 25% for the wealthiest. The significant and negative relationship between values of assets owned and participation in NTFPs also reinforces the finding that the poor tend to be more reliant on NTFPs than the rich.

In terms of absolute value of income earned from NTFPs, the wealthy recorded higher incomes from other sources as compared from NTFPs indicating that the wealthy households extract less volumes of NTFPs than the poor, or maybe they sell their products at higher prices than the poor. The poor households derive about 16% of their total household incomes from NTFPs. The average households obtain about 15% of their income from the NTFPs whereas the rich households obtain about 9% of it.



The location was also found to be an important determinant of participation in NTFPs, with NTFPs being more important in Chekumet, Kapkonga, and Chebaror villages majorly for income earning. Thus, interventions aimed at improving rural incomes through extraction and sale of NTFPs should be intensified on these villages.

Human capital factors, particularly, age and educational level of the head of household were also significant determinants of households' participation in NTFPs and the level of NTFPs' contribution to household income. *Ceteris paribus*, an increase in these variables is associated with a decline in household participation in NTFPs and their contribution to household income. The results also show that access to markets was crucial for households' participation in NTFPs. The nearer to the market, the more do the households tend to sell more of the harvested NTFPs as compared to those who live far from an urban centre or market. Furthermore, most households that live far from the market areas use a larger percentage of the NTFPs for household consumption e.g broom grass and sun grass for animal feed, roofing purposes and sell a smaller percentage.

Another important finding of this study was that an increase in household size leads to increased likelihood of households to participate in NTFPs; however, increasing population density leads to declining contribution of NTFPs to household income for participating households. Increased population density may also lead to overexploitation of forest resources, which highlights the need to ensure sustainable harvesting of NTFPs while also considering the important role of NTFPs in household income.

The Cragg tobit regression results show that age of household head, education level, value of household assets, land holding size and distance of the household from the district headquarters are negatively associated with both the probability and level of contribution of NTFPs to household income.

The distance from the homestead to the district town is negatively and significantly related with likelihood of participation in NTFPs and extent of NTFPs' contribution to household income. This implies that the farther away a household is from the market, the lower the likelihood to participate in NTFPs.

In terms of the households seasonal pattern of income dependence on different types of forest products, the data show NTFP income as highest in the first quarter (the mainly dry period of January to March), becoming gradually lower through the second quarter (the warm and rainy period of April to June), and then the third quarter (the predominantly rainy season of July to September). In the fourth quarter (the mainly cool and start of dry season of October to December), NTFP income tends to rise again. This income pattern applies to all NTFPs, mainly for firewood. Income realized from timber and poles follows a similar pattern in the first two quarters, but declines sharply in the third quarter. In the fourth quarter, the quarter following the rainy season, though, the income from timber and poles is much higher than it is during the other quarters.

### **5.3 Conclusions**

The study has demonstrated that truly NTFP harvesting contributes to household income. The collectors are mostly local forest adjacent households who are actively involved in harvesting the NTFPs in order to make a living. They principally collect the naturally growing NTFPs from the forests near their households.

Several conclusions emerge from this research from this study. First, firewood is the highest contributor to household income (37%) followed by broom grass (19%), sun grass (12%) and wild vegetables (8%). The rest include weaving reeds, wild honey and game meat.

Secondly, poorer households are highly dependent on income from extraction and sale of natural resources such as NTFPs and others. Thirdly, there is seasonality on income derived from the different forest products, the results show that NTFPs income in the first quarter of the year is high, tends to lower in the second and the third quarter of the year and rises again in the last or the fourth quarter of the year. The pattern applies to all NTFPs but in particular for firewood.

The results reveal that the highest income quartile (wealthiest 25%) derives the least income (about 9% of their total household income) from NTFPs than the other two quartiles (50% average class) in absolute terms and its share total income (28.4%) is relatively less than for the poorest household in the lowest income quartile (45% of total household income) of which they derive about 16% of their income from NTFPs.

## 5.4 Recommendations

The findings of this survey suggested that there is a positive relationship between poverty and reliance on NTFPs and this is in line with most literature on natural resource dependence and poverty. It is, therefore, crucial that both forest management policies and rural development strategies take into account the central role NTFPs play in the livelihoods of the rural poor, because of the economic vulnerability that drive poorer households to NTFP extraction.

Improving rural infrastructure, such as feeder roads, could ease access to marketing outlets and increase the contribution of NTFPs to the incomes of the rural poor that rely on them. However, careful policy considerations are required to strike a balance between rural household welfare improvement and forest resource sustainability. Programs that build capacity for alternative livelihoods or offer incentives for the conservation of forest resources could be effective at reducing pressure on ecological systems. Additionally, the results suggest that improving rural households' access to adequate land could help diversify sources of rural household income and maintain the integrity of forest systems.

Generally the extraction and trade of NTFPs by households may have negligible ecological impacts, with the exception of firewood.

Other NTFPs contribute quite substantially to household income, and if flanked by appropriate interventions, these other products could contribute even more to household incomes. Demand side strategies that could reduce the dependence on charcoal and firewood as an energy source, such as the promotion of improved/efficient charcoal

braziers, should be explored. With regard to demand for firewood as an energy source in rural areas, strategies such as rural electrification may reduce rural household demand for firewood.

The opportunity to gather open access resources such as NTFPs, and convert them into marketable products provides a source of income and safety net for rural households in Singore forest adjacent communities, as indicated by the results, where NTFPs contribute 34% of total household income for participating households. It is, therefore, evident that rural households will continue to rely on NTFPs for a long time to come. Since NTFPs seem to play an important part in supporting rural household livelihoods, rural residents should be made to understand that the continued availability of NTFPs depends largely, on the integrity of the forests.

NTFPs can, therefore, act as incentive for more sustainable use of forest resources. Caution also needs to be exercised with regard to clearing of forest land for agricultural purposes as continued excessive clearing may threaten access by rural households to forests for alternative income generating activities.

### **5.5 Suggestions for Further Research**

The present research mainly focuses on NTFPs, excluding major animal products. In future, however, animal products can also be included. Research can also be conducted on other social aspects of forest communities. No doubt, the forest has an important role in the life of forest communities, but the action is not always one way. Forest communities' activities also manipulate the forest environment. There are several socio-

cultural practices among forest communities. In general, these practices are not related to forest directly, but in broad sense, there might be associations.

Therefore, forests and particularly those in which people live should not be studied only from the aspect of forestry, but at the same time, forest adjacent communities should receive equal priority. For the overall improvement of forest resource management and marginal forest dwellers' socio-economic circumstance, research is needed that combines historical, development, economics, environmental and policy making perspectives. The discovery of the historical aspects of human-environment interactions and the study of contemporary socio-economic issues related to forest and forest products harvesting can be considered to be important features in terms of future substantial policy making. This research intended to combine different geographic aspects to present an overall idea about organized natural resource harvesting and marginal livelihoods in terms of NTFPs, available in the adjacent communities to Singore forest.

The basic problems in the case of sustainable natural resource harvesting and management are quite similar to other countries of African continent. Thus, the findings generated from this research might be also useful for the socio-economic improvement of deprived communities, who are involved in the production of other natural resources.

In terms of research implications, the literature on non-farm/off-farm income generation often distinguishes between casual participation (for example, those who participate in NTFP harvesting and sale as a safety net in the off season or during periods of weak crop yields) from entrepreneurial participation (for example, commercial sun grass producers or others who engage in such activities regularly as a business). Panel data could be used

to better understand household participation over time (as opposed to a one-time snapshot).

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## **APPENDICES: QUESTIONNAIRE**

**Bernard Kemboi .K.**

**P.O BOX 662,**

**ITEN**

**Research Respondent.**

**Dear Sir/Madam**

**RE: Research Questionnaire Response**

I am a postgraduate student at Moi University in the Department of Agricultural Economics and Resource management, school of business and economics.

I am carrying out a research on factors influencing exploitation of NTFPs and their contribution to household income among the forest adjacent communities of Singore forest, Elgeyo-Marakwet County. The information I am collecting is for academic purpose and will be treated with confidentiality and privacy it deserves. The research is part of my course work and will contribute to my masters' degree and I promise to share the remits with you.

Your assistance will be highly appreciated.

Yours faithfully,

Bernard Kemboi K.

### GENERAL INFORMATION

1. Name of the Household head and Gender:  
.....
2. Name of the Village.....
3. Household size:.....
4. Education level of the household head .....
5. The farm size belonging to the household (acres).....
6. The age of the household head.....
7. Do the households owns a tractor?.....
8. Do the household have any traction animal?(oxen or donkeys).....
9. No. of male/female/Children:

Male	Female	Children

10. (a) Primary occupation of Household.....
- (b) Income sources (fill where applicable)
  - (i) Agriculture.....
  - (ii) Employment income.....
  - (iii) Trading income.....
  - (iv) Other sources.....
11. Total monthly household income: .....

12. Percentage of household income obtained from

NTFP.....

**Collection:**

13. Which are NTFPs s/he collects and in which time/season of the year?

S. no	Items	Season	How many hours a day	Days per season		
				Dry season		Rainy season

14. How far s/he goes to collect and Methods of extraction (For each item):

No.	Items	How far s/he walks to collect	Who else in the family goes with	Time taken to reach	Methods of extraction/harvesting (Manual or machine use). State the method you use.	Major Problems in collection. (Distance/Reducing Resources/Problem s with FD/any other
1.						
2.						
3.						
4.						
5.						

15. After collection how are the items used?

Item	Household Consumption (qty)	Selling (qty)	Selling price

**Storage:**

16. Whether storage is done, if yes, why and which items?

Items	Quantity (unit)	Stored for (Days)	Season	Major problems in storage	Additional cost incurred

**Processing:**

17. Whether processing is done, if yes, why and which items? Items

Items	Why s/he does processing	Quantity	Time taken for processing	Other resources used for processing	Major problems in processing

18. How processing is done for each item?.....

**Value addition:**

19. Whether value addition is done or not, if yes, why?

Items	Quantity	Time taken for value addition	Individualy/ in group	Cost incurred	Major problems in Value addition	How much additional income it provides

### Transport

20. Where s/he transports the items to

sell?.....

Items	Mode of transport	Quantity transported at a time	Distance being transported	Cost involved	Major problems in transport

### **MARKET INFORMATION**

21. Where is the market? How far? .....

22. Whom does s/he sell the items to?.....

a) Small trader .....

b) Middle man .....

c) Any other.....

23. How does s/he identify the potential buyer?.....

a) Personal contacts.....

b) From fellow sellers.....

c) Any other source.....

24. How often they go to the

market?.....

25. Price Information:

Item	Unit of selling (kg/any other)	Current Price/unit	Quantity sold at a time	Major problems in marketing