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Socio-economic predictors of dependence on Non-timber forest products: lessons from Mabira Central Forest Reserve Communities

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Abstract

Resource user surveys were conducted in 14 villages of Mabira central forest reserve. The study was intended to assess factors that encourage dependency on non-timber forest products (NTFPs). Understanding NTFP dependence is instrumental in guiding plans of forest use. The study was based on the hypothesis that forest income is more important to poor than wealthier households. Stratified random sampling was used to select NTFP users in different use categories per village. Information on household income of NTFP users was obtained using semi structured questionnaires and relative NTFP income was calculated. Binary logistic regression was used to analyse factors that influence NTFP dependence. 277 respondents used and sold a variety of products including; charcoal, firewood, fodder, construction materials, secondary products of NTFPs, medicinal and wild edible plants. Relative NTFP income was highest (53%) for poor households. 56% of households surveyed were dependent on NTFPs. Age, other income, household head, wealth quintile and distance from the forest significantly affected NTFP dependence. The high dependence on NTFPs is critical in development of management strategies that enhance conservation of the forest by focusing on women and the poor to avoid negative impact on their wellbeing.

Keywords: Socio economic, predictors, NTFP, dependence, Mabira Central forest reserve

1. Introduction

It is estimated that 90% of the world's poor depend on forests for at least a portion of their income (Scherl, Wilson, & Mcshane, 2004; United States Agency for International Development [USAID], 2006). In Africa 600 million people (67%) have been estimated to rely on forests and woodlands for their livelihoods (Anderson, Benjamin, Campbell, & Tiveau, 2006).

In most parts of Sub-Saharan Africa, forests are considered important for rural livelihoods as sources of food, medicine, shelter, building materials, fuels and cash income (Mulenga, Richardson, & Tembo, 2011). More than 15 million people in Sub-Saharan Africa earn their income from forest based enterprises such as fuel and charcoal sales, small scale saw milling, commercial hunting and handicraft production (Kaimowitz, 2003). Thus forests are a source of many products on which households depend for both subsistence consumption and income generation.

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NTFPs provide a variable source of income that contributes to meeting domestic expenditure (Cavendish, 2002; Kristensen & Balslev, 2003) and serves an insurance function in times of crisis like crop failure(Angelsen & Wunder, 2003) . By acting as a source of income, forests are tools for poverty alleviation among rural households (Angelsen & Wunder, 2003; Cavendish, 2000; Fisher, 2004; Sunderlin et al., 2005; Vedeld, Angelsen, Bojo, Sjaastad, & Berg, 2007). The role and potential of NTFPs to contribute to household income helps to uplift households that depend on forests out of poverty.

A large proportion of rural population of Uganda depends on forests for basic subsistence needs(Shepherd, Kazoora, & Muller, 2012).Though a body of knowledge exists on the relationship of people with forests the value derived has not been exhaustively estimated. In Uganda previous studies have documented NTFPs (Oryema-Origa, Katende, & Kakudidi, 2001) and medicinal plants (Oryema-Origa, Katende, & Kakudidi, 2003; Stangeland, Alele, Katuura, & Lye, 2011; Tabuti, Dhillion, & Lye, 2003). The contribution of forest resources to the rural household economy has often been overlooked. This needs to be assessed in the different geographical regions in order to understand how different social economic settings of households influence dependence on forest based income. Understanding the extent of dependence on forest income by rural households may act as an aid in drafting policies for conservation given that public forests often suffer the problems of non-rivalry and non-excludability leading to unsustainable harvesting practices.

Understanding the socioeconomic contribution of NTFPs to rural livelihoods necessitates identification of factors that affect dependency levels on NTFPs by the local people. Several socioeconomic conditions that affect NTFP dependency have been identified as access to forest and markets, wealth status, gender, education level and seasonality (Timko, Waeber, & Kozak, 2010). Rural people's dependence on forest resources may be influenced by proximity to the forest (Kamanga, Vedeld, & Sjaastad, 2009). Studies done on forest valuations in Uganda have focused on macro scope and missed disaggregated data on the extent of forest dependence for sustaining livelihoods of forest adjacent communities (Emerton & Muramira, 1999; Howard, 1995). Appreciation of forest income dependence is instrumental for guiding plans of forest use at both local and national levels. In view of this, the study was undertaken to answer the hypothesis that forest income is relatively more important for poor than wealthier households. The study aimed at estimating the relative NTFP income in resource users' households and assessing the factors that influence this dependence. The dependence of households on forest based income was measured by determining the relative income of forest based income to total income of households.

2. Methods

2.1. Study Area.

The study area was villages of the Mabira Central Forest Reserve (CFR). Geographically the reserve is located 20 km north of Lake Victoria shoreline immediately to the west of Victoria Nile. The Forest Reserve is lies partly in Buikwe, Mukono and Kayunga districts and occupies an area of 306km^2 with an altitudinal range of 1070 – 1340 m above sea level. It is situated between latitude 0^o 22' and 0^o 35'Nand between longitude 32^o 56'and 33^o 02'E (Moyini & Masiga, 2006).

The reserve occupies gently undulating country characterised by numerous flat-topped hills and wide shallow valleys (Howard, 1995). The soils are generally ferralitic sandy clay loams, with black waterlogged clays in the valley bottoms. The climate is tropical with two rainfall peaks from April to May and October to November and annual amounts ranging between 1,250 – 1,400 mm. Annual mean temperature range, minimum: 16-17° C, maximum: 28-29° C (Langdale-Brown, Osmaston, & Wilson, 1964).

Mabira is an important ecosystem in Uganda and a watershed for Lake Victoria basin and Lake Kyoga. There is pressure on the forest for subsistence use and commercial farming of sugar cane and tea. This presents conflictinginterests among different stakeholders. The recent threat was the interest of government to degazatte a third of the forest for sugar cane growing in 2007 and later in 2011 amidst protests from conservationists. The forest is unique because it consists of 27 human settlements that resulted from heavy encroachment in 1970's and early 1980's. The encroachment was reversed between 1988 and 1989 when all encroachers were evicted and a re-afforestation programme to rehabilitate the forest started. About 21% and 26% of the reserve has been designated as strict nature reserve and buffer zone respectively and the forest in these areas is recovering following extensive cultivation of native species.

Nevertheless the forest reserve is a source of NTFPs to the surrounding communities. Over 90% of households around the reserve satisfy their subsistence needs from the forest (Ministry of Water Lands and Environment [MWLE, 2002]). The extensive use of forest resources is attributed to increasing population in the 27 villages of Mabira (235 people per km^2) that exerts pressure on the land and also on the forest for extraction of both timber and non – timber forest products (Isabirye, Isabirye, & Akol, 2010). Education and income levels of local people residing in the forest communities are low (Agea & Fungo, 2009), conditions that increase dependence on the forest for NTFPs (Cavendish, 2000; Mamo, Sjaastad, & Vedeld, 2007).

2.1.1. Study sites

NTFP user survey was conducted in 14 out of the 27 human settlements (villages) of Mabira and Shown in figure 1.

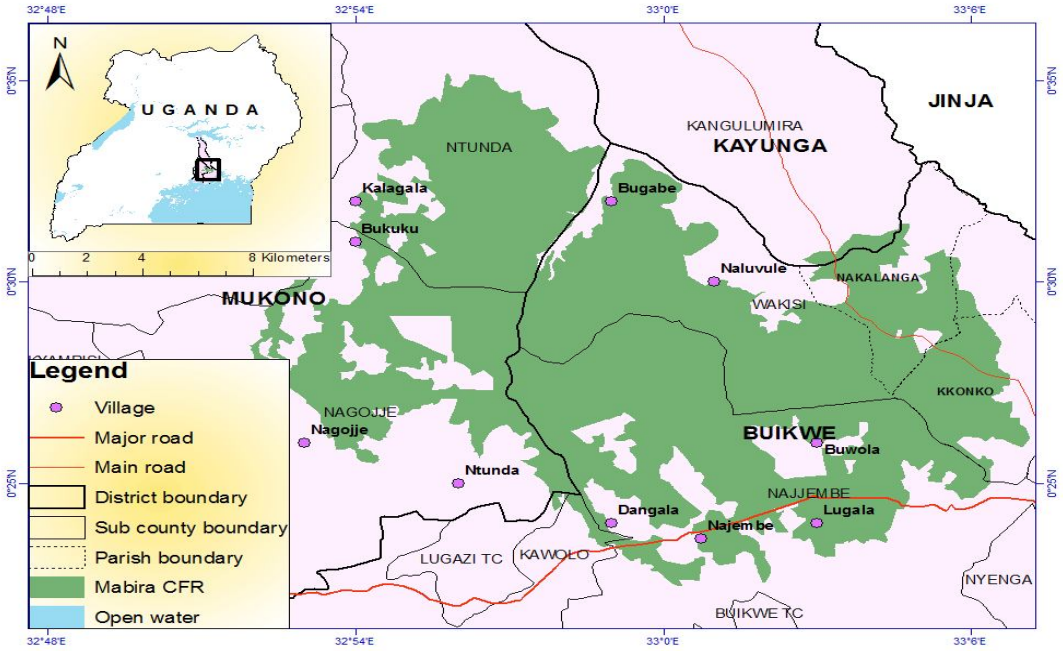


Figure 1: Map of Mabira CFR showing the study sites and its location in Uganda.

2.2. Rapid Rural Appraisal

Rapid Rural Appraisal (RRA) was conducted in each of the 27 villages of Mabira CFR to assess key economic present. Consequently, 14 villages that heavily depend on Mabira CFR for NTFP extraction were selected for resource user survey. An introductory meeting was held in each of the selected villages in which resource users were introduced to the research team by the Local Council 1 chairperson of the village. During the inception meeting, the objectives and significance of the study were discussed. During the meeting lists of collectors of NTFPs were generated to form a sampling frame for each village. Also a check list of all NTFPs utilized by the local people was also prepared. NTFPs users in each village were then stratified according to product used and the number of users of each NTFP use category in the selected villages were established.

2.2.1. Sample selection

Fieldwork was conducted between August 2013 and June 2014. Stratified random sampling was used to select at least 10% of resource users in different use categories per village (Roscoe, 1975). The technique ensured that the target population was divided into different homogeneous strata (NTFP use categories) and each strata was represented in the sample in a proportion equivalent to its size in the population (Amin, 2005; Sekaran, 2003). The strata included firewood, charcoal, medicinal plants, wild edible plants, construction materials, fodder and secondary products processed from NTFPs such as mats, baskets, racks and stools.

A total of 277 resource users were interviewed using semi structured questionnaires from villages of Bugabe, Bukuku, Buwoola, Nakalanga, Kalagala, Lunya, Najjembe, Nagojje, Dangala, Khonko, Lugala, Ntunda, Ssese and Naluvule but only 273 users provided usable data. NTFP users in each product category were arrived at by considering the NTFP from which the user obtained the highest value or that on which many members of the household depended. The composition of the 271 users was charcoal (37), firewood (77), medicinal plants (26), Baskets (14), Mats (23), construction materials (52, skewers (11), mingling sticks and tool handles (20), wild foods (9), Rattan (2) and Racks (2).

2.2.2. Data collection

Field data was collected with the help of a Research Assistant who was first introduced to the objectives, design and data collection methods. Verbal prior informed consent was obtained from respondents before interviews. Semi structured questionnaires were used to collect data on NTFP use, household income and expenditure and socio economic data of NTFP users. Data on household characteristics included number of people in a household, age, gender and education level of resource user. Socio economic data included wealth quintile of the household, land ownership, residence time, distance from the forest and total income from non-forest activities.

In order to determine the contribution of NTFP income to the total income of users' households, engagement of resource users in activities like collection, harvesting, processing, packaging and sale of NTFP's and incomes they derive from these activities was calculated. Both consumption and cash income were calculated for the different NTFPs extracted and material expenditures incurred in the process of extraction, processing and trade subtracted to obtain the net revenue.

2.3. Data analysis

Descriptive statistics were used to present the characteristics of NTFP users' households using frequencies and means. Binary logistic regression was used to determine factors that influence households' dependence on non-timber forest products.

2.3.1. Calculation of income of NTFP users' households

Each user's dependence on Mabira CFR for extraction of NTFPs was calculated as a ratio of annual income from NTFPs and related activities to total annual income of the user's household. This highlighted the relative importance of forest based income compared to other income sources (Mamo et al., 2007; Vedeld, Angelsen, Sjaastad, & Berg, 2004). Households were categorized in three classes according to their dependency levels as highly dependent where NTFPs contributed more than 60% of total annual income, moderately dependent (40-60% contribution) and less dependent (<40% contribution)(Singh, Bhattachaya, Vyas, & Roy, 2010).

Household annual income was calculated as a summation of income from all sources available to households. Household annual income = $\sum$ (income from agriculture + Employment income + Business income + NTFP income). Information on forest income was obtained from NTFP users about the collection and sale of NTFPs. NTFP income was calculated by summation of subsistence and cash income from NTFPs. Cash income was calculated by multiplying the quantities of NTFPs sold by their market prices while subsistence income was obtained by multiplying quantities of NTFPs consumed by the market price of the product if traded or their substitutes if not traded. Agriculture income consisted of income from cultivation of crops and rearing of animals for both home consumption and selling. Monthly income from agriculture was gathered from users through questionnaires. Income from employment and business was based on the monthly earnings of NTFP users from salaried jobs and businesses.This was converted into annual values.

2.3.2. Calculation of wealth quintile of households

From the data collected on the type of housing and assets owned a wealth index was calculated for each resource users' household (Uganda Beaurea of Statistics [UBOS]& Marco International Inc, 2007). The household assets used and type of housing were scored as indicated in table 1. A wealth index scale ranging from 0.5 to 65 was created by summing up scores for each characteristic and household possessions of the resource users households. Four wealth classes were constructed from the index depending on total scores for each users household as lowest (0.5 -13), second (14 – 25), third (26 – 36) and highest (40 -65). Such an asset index has proved reliable in Uganda (Cortinovis, Vella, & Ndiku, 1993; UBOS & Marco International Inc, 2007). The lowest quintile comprised of households regarded as the poorest and the highest quintile comprised households that were wealthier.

Table 1: Scores of household assets used to calculate the wealth index

Wealth indicator	Score			
	0.5	1	2	3
Nature of main house				
Walls		Plastic sheeting	Timber and Mud	Bricks
Floor		Not cemented	Cemented	Tiles
Roofing		Thatch	Iron sheets	Tiles
Window frames		Wood	Metallic	
Household goods		Radio	Television	Motor vehicle
		Bicycle	Motor cycle	
Livestock	Chicken	Goat	Cow	
		Pig		

2.3.3. Forest dependency model

Binary Logistic regression was used to analyse household's dependence on NTFPs (Gujarat, 1995). Dependence was calculated as the ratio of annual income earned from the forest (collection of primary non timber forest products and labour income from NTFP related activities) to the total annual income from other sources (agriculture, off-farm employment and the forest).Forest dependency was recorded as 1 and non-dependency as 0. Households were regarded as dependent on the forest if their ratio of NTFP income to total income was equal or more than 40% and not dependent if less than 40%. The model used to estimate NTFP dependency was as follows;

$$\ln\left(\frac{Pi}{1-pi}\right) = \beta_0 + \beta_1 X_1 + \ldots\ldots\ldots\ldots\ldots\ldots \beta_n X_n$$

where i = i th observation, P_i = Probability of dependence on the forest, β_0 = Intercept which is the estimation of probability of dependence on the forest when X = 0, β_1 to β_n = Coefficients associated with explanatory variables, X_{i-n} = independent variables

NTFP users household dependency on the forest was regressed by independent variables namely; age(age), education level (educlev), gender(gender), residence time (period) and occupation of resource user (occupation), number of people (nopeople), total non-forest income(totalother), wealth quintile (wealthq), land ownership (landho) and household head of resource users household (hhead) and distance of resource users home from the forest (distance).

3. Results

3.1. Dependency of resource users' households on NTFP income

273 NTFP users (99%) out of 277 provided usable data for this analysis. The survey revealed various NTFPs used to include firewood, charcoal, medicinal plants, wild foods, poles for construction, thatch grass, palm leaves, fodder, skewers and raffia strings among others. The forest was also a source of raw materials used to produce secondary products like mingling sticks, tool handles, mats, baskets, racks and stools.

The survey revealed that 40% of the households were highly dependent on NTFP income, 16% moderately dependent and 44% less dependent. The distribution of households per dependency level within different wealth quintiles is summarized in table 2.

Table 2: Number of resource users' households in different NTFP income dependence levels within different wealth quintiles.

Wealth quintile of household	NTFP dependency level		
	Highly dependent	Moderately dependent	Least dependent
Highest	6 (0.05%)	1(0.02%)	10(0.08%)
Third	15(14%)	6(14%)	18(15%)
Second	43(39%)	19(44%)	49(41%)
Lowest	46(42%)	17(40%)	43(36%)
	110	**43**	**120**

Table 2 shows that households that are better off depend to a less extent on NTFPs compared to poor households. About 81% of households that are highly dependent on NTFPs are found in the lowest and second wealth quintiles. The average dependency levels for households in the third and highest wealth quintiles were 49% and 28% respectively. 30 households in the lowest quintile were 100% dependent on the forest and 16 households had NTFP dependency levels greater than 60%. Out of 273 households, 23% solely depended on NTFPs.

3.2. NTFP income as a share of household income

NTFPs income was compared with income from other livelihood activities like agriculture, business and wages from casual and formal employment. This facilitated the determination of NTFP relevance in households in the total view of household income. The annual contribution of NTFP income to total household income was 40% and in the range of $21- 6,276. Contribution of various income sources to household income per village is illustrated in Table 3. The table shows variation in the mean annual income from different sources. Average annual income of resource user's households from various sources revealed that agricultural income contributed 50% of household income, NTFP income at 40%, employment income at 3%, business income at 4% and income from causal labour at 3%. This signifies the importance of NTFPs and related activities to rural people around Mabira CFR.

Table 3: Average annual income (USD) from various sources per village

Village	NTFP income	Agriculture income	Employment	causal labour	Business
Bugabe	1,257±370	1,387 ± 340	-	1,066 ± 355	-
Bukuku	579 ± 178	729 ± 196	-	1,184 ± 0	-
Buwoola	401 ± 93	1,424 ± 223	-	1,321 ± 611	750 ± 142
Dangala	541 ± 116	872 ± 320	-		2,369 ± 0
Kalagala	1,083 ± 200	1,454 ± 517	-	1,006 ± 59	1,421 ± 0
Khonko	932 ± 314	1,038 ± 320	1,026 ± 79	237 ± 0	592 ± 0
Lugala	516 ± 123	975 ± 271	71 ± 0	711 ± 0	1,421 ± 0
Lunya	764 ± 167	2,799 ± 920		284 ± 189	1,421 ± 0
Nagojje	1,010 ± 206	2,531 ± 1,101	1,895 ± 0		4,264±237
Najjembe	839 ± 107	1,816 ± 800	1,087 ± 298	948 ± 0	1,658±237
Nakalanga	852 ± 180	1,072 ± 172	1,480 ± 631	948 ± 362	
Naluvule	1,142 ± 345	1,605 ± 409	-	-	189 ± 0
Ntunda	1,083 ± 265	739 ± 196	-		
Ssese	655 ± 94	1,031 ± 198	710 ± 0	-	2,369 ± 0

Exchange rate: 1USD = UGX 2,533

3.3. Value of different NTFPs from Mabira CFR.

On average NTFPs and forest related activities contribute 40% of total income of NTFP users' households. In this way the forest contributes to the livelihoods of households that depend on it for extraction of NTFPs. This is mainly through subsistence consumption and sale of various NTFPs like firewood, charcoal, furniture, craft materials, fruits, construction materials, and medicinal plants among others. Table 4 shows the total annual household value from the different

NTFPs and the proportion of NTFP income to total household income. Construction materials comprised of poles, thatch grass, tying materials and reeds.

Individually, construction materials and charcoal ranked highly each contributing 9% of total household income (Table 4).Other NTFPs that contributed highly to total household income were mats, medicinal plants and firewood. Most of the households in the study area were built using mud and wattle justifying the high value of construction materials in form of poles, reeds and fewer houses were roofed using thatch grass. Rattan contributed the least annual value of $ 133 a fact that was attributed to its availability deep into the forest and thus being collected by only few users.

Table 4: Contribution of NTFP income to total income of resource user's households

NTFP	Annual value (USD)	Contribution to total income (%)
Construction materials	54,649	9.4
Charcoal	49,640	8.6
NTFP related activities	40,678	7.0
Mats	21,526	3.7
Medicinal plants	20,034	3.5
Firewood	13,395	2.3
Baskets	9,137	1.6
Skewers	6,861	1.2
Fodder	6,035	1.0
Brooms	5,953	1.0
Wild foods	4,186	0.7
Rattan	133	0.02
Total NTFP income	232,227	40.1
Agriculture income	289,801	50.0
Income from casual work	16,865	2.9
Income from formal employment	14,938	2.6
Business income	25,298	4.4
Total non-forest income	346,902	59.9
Total annual income	579,129	100.0

Exchange rate 1USD = Shs 2,533 (Bank of Uganda Monetary statements)

3.4. Relative income of NTFPs for households in different wealth quintiles.

An analysis of the mean annual NTFP income of households in the different wealth quintiles is summarized in Table 5.

Table 5: Mean annual NTFP income per wealth quintile

Wealth Quintile	Mean annual NTFP income USD	Minimum (USD)	Maximum (USD)
Lowest (n=106)	665 ± 81	21	4,575
Second (n =111)	879 ± 95	21	6,276
Third (n =39)	1,053 ± 156	47	4,642
Highest (n = 17)	1,225 ± 274	90	4,464

1USD = UShs 2,533 (Bank of Uganda Monetary Statements)

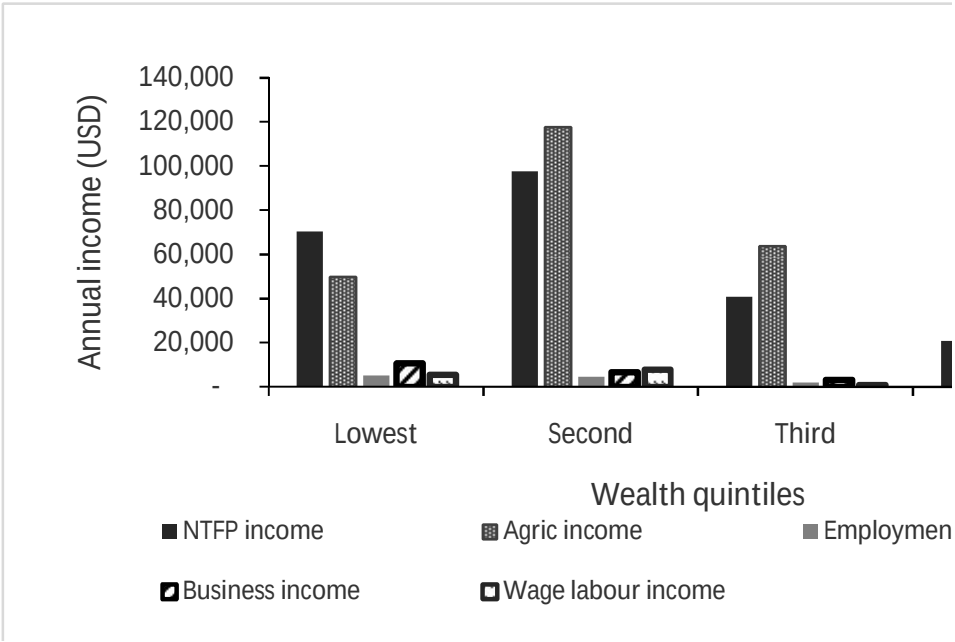
In absolute terms the mean NTFP income for households in the highest wealth quintile was the highest at $ 1,225 p.a compared to that of other wealth classes. This implies that the rich obtain the highest absolute value from the forest compared to the poor. The rich are able to invest more capital in NTFP harvesting activities in order to obtain high volumes which translate into higher values. Users from wealthier households were more involved in commercial harvesting of forest products. Commercial collection of NTFPs involves extraction of high volumes of NTFPs. The rich used advanced harvesting techniques like use of power saws in harvesting timber for firewood and charcoal that translates into short harvesting time but high volumes of products obtained. The share of NTFP income for households in the lowest quintile was relatively higher (53%) compared to that of households in the highest quintile (28%). This means that poorer households are relatively more dependent on NTFP extraction. The difference in the mean annual NTFP income per household between the poorest and richest households across the 14 villages was $ 560. This shows a significant variations in the extent to which forest dwellers depend on the forest resource. This is further illustrated by the income per capita of households in different wealth quintiles (Table 6).

Table 6: Income obtained from different sources by wealth quintiles

Income source per capita ($/No. of people in HH)	Household Wealth Quintiles			
	Lowest	Second	Third	Highest
NTFP income	21,939(53%)	22,460 (42%)	14,136 (49%)	5,234 (28%)
Agricultural income	12,664 (30%)	26,460(50%)	13,016 (45%)	11,676 (62%)
Employment income	1,236 (3%)	1,140(2.1%)	379 (1.3%)	730 (3.9%)
Business income	4,453 (0.1%)	1,417 (2.7%)	1,113 (3.9%)	556 (3.0%)
Wage labour	1,242 (2.9%)	1,465 (2.7%)	118 (0.4%)	473 (2.5%)

(Numbers in parentheses represent % contribution of NTFP income to household income for a particular income source).

Agricultural income represented the second highest contributor to the total household income in the lowest quintile. The share of income from business and formal employment increases from the lowest quintile through to the highest quintile. The contribution of employment income was low in the range of 1.3% - 3.2% of mean annual household income. It was also noted that both wealthier, better educated, resource rich and the less educated, resource poor groups venture in forest resources business. The difference is that the resource richer households were involved in commercial activities like logging timber, commercial charcoal burning and harvesting firewood and construction materials for commercial purposes. On the contrary, the poorer group participated more in gathering dead wood, fruits, medicines, small animals. Figure 3 shows variation in annual income of NTFP users' households from different sources.Variation of relative income from different income sources was analysed using Two way ANOVA revealed a significant variation in income from different sources between wealth quintiles ($F= 13.967$, df 4, $P <0.05$), but the variation was not significant within the same wealth quintile ($F= 2.545$, df 3, $P>0.05$).



3.5. Determinants of forest income dependence

Several reasons exist why households with different socioeconomic and demographic characteristics depend of NTFPs differently. These are related to consumption motives and responses to different challenges households encounter. In order to assess the likelihood of resource users to depend on the forest for NTFPs, logistic regression was performed where dependency on NTFPs was regressed by several independent variables. The binary nature of the dependent variable suggests that the Logit model was appropriate. The independent variables used in the model included age, education level, gender and occupation of the resource user, residence time of the resource user in the village, number of people in resource users household, total non-forest income, wealth quintile, household head and land ownership of the resource users household plus distance of the resource users home from the forest. The impact of these factors was estimated based on information provided by resource users.

Results of the model explaining forest dependency are presented in Tables 7 and 8. The likelihood ratio test shows that the regression model is significant at 99% with Chi-Square statistics of 155.55, P =0. This indicates that the explanatory variables in the model are significantly related to forest dependency. Results show that model predictions are correct 42% (R^2) most of the time indicating that the explanatory variables can be used to specify the dependent variable, in discrete terms (1,0), with a moderate degree of accuracy.

Logistic regression model	Number of obs	271
	LR chi2(11)	155.55
	Prob > chi2	0
Log likelihood = -108.05466	Pseudo R2	0.4185

Five independent variables which were significant in this model at 10% confidence level included age of resource user; total of non-forest income, wealth quintile, household head of resource user's household and distance of resource users home from forest. This implies that their coefficients for log odds of dependency on Mabira CFR cannot be equated to zero with 10% level of significance. The other variables of number of people in the resource users household, education level, gender and occupation of the resource user plus the land ownership of the users household and residence time of the resource user were not significant. However the coefficient for these variables shows how a change in one explanatory variable changes the probability of being forest dependent. The regression coefficients for education level, land holding, gender and occupation were negative meaning that an increase in one unit of each of these variables is likely to reduce dependency on the forest for NTFP extraction.

On the other hand the regression coefficient for number of people in the household was positive an indication that the larger the size of a household the more likely is the increase in probability for its dependence on the forest. The relationship between the significant variables and dependency on forests can be explained using logistic regression results in Table 7 (Coefficients) and Table 8 Odds ratio).

Age: Age of the resource user negatively affected the odds of dependency on the forest for NTFPs extraction. An increase in one year in the age of the user decreases the log-odds of dependency on forests by 0.023 (table 7) and thereby multiplying the odds ratio by 0.977 (table 8), hence age of the resource user is inversely related to dependency on forests. In other words, the higher the age of the resource user the lower the likelihood of dependency on forests taking all the other factors constant. This relationship was significant with 95% confidence ($P>|Z| = 0.012 << 0.05$, $Z=-2.52$). This is because as individuals grow old they lack enough physical strength to engage in NTFP collection and leave the activity to the young energetic people. In the current study however older people were found to possess superior knowledge especially on the various medicinal plants and were more involved in NTFP use as traditional healers. This implies that age may affect NTFP income either negatively or positively depending on the type and purpose of NTFP collected. However the contribution of medicinal plants to household income was lower than that from charcoal, construction materials and weaving mats.

Total of non-forest income: An increase of one dollar of non-forest income, decreases the log of odds ratio of dependency on forests by -9.16E(-7) and changes the odds ratio by 0.999, therefore non-forest income is negatively related to dependency on forests taking all the other factors constant. As non-forest income increases, dependency on forests decreases. This relationship is significant with 99% confidence. ($P>|Z| = 0.000 << 0.01$, $Z=-7.12$).

Wealth quintile of resource users household: This was positively related to dependency on Mabira CFR for NTFPs. The higher the wealth quintile, the more likely the user depended on the forests. A change from a lower wealth quintile to a higher wealth quintile increases the log-odds of dependency on forests by 0.766, thereby changing the odds ratio by 2.152. This relationship is significant with 99% confidence ($P>|Z| = 0.006 << 0.01$, $Z=2.75$). The model shows that households that are well off derive more NTFPs from the forest than the poor households. This was prominent in the extraction of charcoal, construction materials and firewood for commercial purposes.

Household head of resource user's household: Household head of resource user's household and dependency on forests were negatively related. Male headed households were less dependent on the forest than women headed households. The analysis showed a decrease inthe log-odd of dependency on forests by 0.734 in male headed households, thereby changing the odds ratio by 0.480. The relationship was significant with 99% confidence ($P>|Z| = 0.001 << 0.01$, $Z=-3.27$). Women headed households tended to be poorer than male headed households and this increased their dependence on the forest for NTFP extraction as a means of survival.

Distance of resource user's home from forest: Distance of resource user's home from forest and dependency on forests was positively related taking all the other factors constant. The faraway the user's home was from the forest, the more likely the user depended on the forest. An increase of one kilometer away from the forest increased the log-odds of dependency on forests by 0.515, thereby changing the odds ratio by 1.674. This relationship was significant ($P>|Z| = 0.054 < 0.1$, $Z=1.92$). This is surprising because people living closer to the forests are expected to heavily depend on it because of easy access.

To further understand the relationship with in categories of the categorical independent variable, a similar model was run while controlling the categorical variables to expose the inter category relationships (appendix 1).

Table 7: Logistic model of dependency on the forest for NTFPs (reporting coefficients*)*

Depend	Coef.	Std. Err.	z	P>|z|	[95% Conf. Interval]		[99% Conf. Interval]	
Age	-0.0234329	0.0093156	-2.52	0.012	-0.04169	-0.00517	-0.04743	0.000563
nopeople	0.013673	0.057555	0.24	0.812	-0.09913	0.126479	-0.13458	0.161925
totalother	-9.16E-07	1.29E-07	-7.12	0	-1.17E-06	-6.64E-07	-1.25E-06	-5.85E-07
wealthq	0.7663367	0.2786324	2.75	0.006	0.220227	1.312446	0.048627	1.484046
Hhead	-0.7344644	0.2249045	-3.27	0.001	-1.17527	-0.29366	-1.31378	-0.15515
educlev	-0.0062013	0.0174071	-0.36	0.722	-0.04032	0.027916	-0.05104	0.038636
Gender	-0.2213097	0.3509967	-0.63	0.528	-0.90925	0.466631	-1.12542	0.682798
occpation	-0.1105972	0.1492698	-0.74	0.459	-0.40316	0.181966	-0.49509	0.273896
Period	-0.0667913	0.0476393	-1.4	0.161	-0.16016	0.02658	-0.1895	0.05592
Landho	-0.4193506	0.3057613	-1.37	0.17	-1.01863	0.179931	-1.20694	0.368238
distance	0.5149271	0.2677654	1.92	0.054	-0.00988	1.039738	-0.17479	1.204645
_cons	4.664128	1.169679	3.99	0	2.3716	6.956656	1.651235	7.677021

Table 8: Logistic model of dependency on forests (reporting odds ratio)

depend	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf. Interval]		[99% Conf. Interval]	
age	0.9768396	0.0090999	-2.52	0.012	0.959166	0.994839	0.953679	1.000563
nopeople	1.013767	0.0583473	0.24	0.812	0.905623	1.134825	0.874084	1.175772
totalother	0.9999991	1.29E-07	-7.12	0	0.999999	0.999999	0.999999	0.999999
wealthq	2.151869	0.5995804	2.75	0.006	1.24636	3.715251	1.049829	4.410756
hhead	0.4797623	0.1079007	-3.27	0.001	0.308736	0.74553	0.268802	0.856288
educlev	0.9938179	0.0172994	-0.36	0.722	0.960484	1.028309	0.950242	1.039392
gender	0.8014684	0.2813128	-0.63	0.528	0.402826	1.594613	0.324517	1.979408
occpation	0.8952993	0.1336412	-0.74	0.459	0.668205	1.199574	0.609516	1.315079
period	0.9353904	0.0445614	-1.4	0.161	0.852005	1.026936	0.827371	1.057513
landho	0.6574736	0.20103	-1.37	0.17	0.361089	1.197134	0.299111	1.445186
distance	1.673517	0.4481099	1.92	0.054	0.990165	2.828475	0.839633	3.335575
_cons	106.073	124.0714	3.99	0	10.71452	1050.116	5.213415	2158.18

Wealth quintile: The higher the wealth quintile, the more likely the user depended on the forests taking all the other factors constant. A move from the lowest quintile to the second quintile increases the log likelihood by 1.05. In terms of odds ratio, the likelihood increases by 2.87. This relationship is significant with 95% confidence (P>|Z| =0.03 <<0.05, Z=2.14). A move from the lowest quintile to the third quintile increases the log likelihood by 1.13. In terms of odds ratio, the likelihood increases by 3.10 higher than the increase to the second quintile. This relationship is significant with 90% confidence (P>|Z| =0.10 <=0.10, Z=1.63). Finally, moving from the lowest quintile to the highest wealth quintile increases the log likelihood by 2.96. In terms of odds ratio, the likelihood increases by 19.34 higher than the increase to the second and third quintiles. This relationship is significant with 90% confidence (P>|Z| =0.07 <=0.10, Z=1.79).

Household head of resource user's household: This was negatively related to NTFP dependency. Households headed by children were more likely to depend on the forest than households headed by women. Children from these homes were orphaned as a result of HIV (AIDS) and relatives grabbed their assets. In such cases the children were left with no means of survival apart from depending of forest resources. Women headed households' have a reduced log likelihood of dependency on the forest by 0.74. In terms of odds ratio, the likelihood decreases by 0.48; however, this relationship is not significant (P>|Z| =0.31 <<0.05, Z=-1.03).

On the other hand male headed household are less likely to depend on the forest than female headed ones. A move from the households headed by children to those headed by men decreases the log likelihood by 1.79. In terms of odds ratio, the likelihood changes by 0.17 lower than the female headed households. This relationship is significant with 99% confidence ($P>|Z| = 0.00 <= 0.01$, $Z=-3.53$).

Distance of resource user's home from forest: Distance of resource user's home from forest and dependency on forests are positively related. The inter category relationships with dependency on forests are not significant ($P>|Z| = 0.99 >> 0.1$, $Z=0.01$).

Number of people in the household: Though the relationship between number of people in the household and dependency on forest products was not significant, the positive coefficient of the number of people in the household in the analysis means that households with bigger family size were earning more from NTFPs.

Gender of resource user: The relationship between the gender of the resource user and dependency on forest products was not significant, but in the current study females were less likely to depend on the forest than males. The study revealed that both women and men depended on the forest but there was variation in the products collected by each gender. Women were mostly involved in collection of wild foods, firewood and medicinal plants for home use thus contributing to their low value due to low volumes collected. On the other hand men were involved in more labour intensive activities involving commercial extraction of fire wood, construction materials and charcoal burning which offered high values and are produced deep in the forest.

Education level: The relationship between the education level of the resource user and dependency on forest cover was not significant. Respondents with primary and ordinary levels of education were less likely to depend on forest products than those without any formal education. On the other hand resource users that have attained Advanced level and tertiary levels of education were more likely to depend on the forest than those that had attained ordinary level of education. Thus education affects forest dependency either positively or negatively depending on the levels attained by users. Education creates opportunities for off farm employment, self-employment and facilitates search for better jobs to reduce on forest dependency on the forest. On one hand income obtained from other economic activities could be used by the educated to engage in commercial exploitation of forest products which require substantial capital thus justifying the positive relationship.

Ownership of land: Though the relationship between land ownership and dependence on the forest was not significant the negative coefficient suggests that the more land an individual owns the less the probability of depending on the forest. Respondents with more than three acres of land were less likely to depend on the forest than respondents that had less than three acres or no land at all. Land can be utilized for other production purposes like agriculture or sale or it could be rented which provides alternative sources of income for livelihood than NTFPs.

Resident time: The relationship between resident time and dependency on forest cover was not significant. Respondents who had stayed in the forest adjacent village for 1 to 5 years were less likely to depend on forest than those who had stayed less than one year and those who stayed for more than 10 years.

4. Discussion:

The current study shows that people in rural communities adjacent to Mabira CFR depend on the forest for extraction of NTFPs used for both subsistence consumption and generation of income. The NTFPs extracted from Mabira CFR included firewood, charcoal, construction materials, wild foods, medicinal plants and raw materials for manufacture of secondary products like mingling sticks, tool handles, racks, baskets and mats among others. The study with regard to forest use and dependence shows a similar pattern to findings from other studies that highlight how rural households within the forest vicinity depend on forest resources for their livelihoods (Carpentier, Vosti, & Witcover, 2000; Godoy & Bawa, 1993; Ticktin, 2005). Both men and women depended on the forest but there was a clear distinction of the NTFPs collected by each gender and the purpose for which the products were collected. Women mainly collected firewood and medicinal plants for home use while men were more engaged in extraction of charcoal, firewood and construction materials for income generation.

This distinction represents the specific gender roles that are rooted in the conditions of production and reinforced by cultural and ideological systems prevailing in society. For instance it may be considered a man's role to collect raw materials from the forest and a woman's role to process those raw materials into marketable products. In the current study women were more involved in weaving mats and baskets.

On the other hand men were involved in processing of products that were strenuous like wood carving, rattan furniture production and bark cloth manufacture. Harvesting of Rattan was also an activity for men and required travelling for long distances deep into the forest. Similar differences in NTFP use have been shown in other forest communities (Neuman & Hirsch, 2000; Oliveira & Anderson, 1999). Commercial extraction of firewood and charcoal burning is an illegal activity in the forest thus the users carry out the activities deep in the forest which poses a risk from attack by wild animals hence favouring men for the activity more than women. Men by their nature are risk averse and can manoeuver their way out if caught by forest guards. Women are not likely to engage in illegal harvesting and this explains their heavy involvement in collection of firewood and medicinal plants for home use whose collection are not prohibited by NFA. Local collection and sale of firewood and charcoal by men is detrimental to the forest resource since it involves significant felling of individual trees.

The high value of charcoal was attributed to the fact that most users were involved in charcoal production for commercial purposes which was in high volumes.This is not surprising given that charcoal and fuel are the main sources of cooking energy in Uganda for the urban and rural areas respectively(Shepherd et al., 2012). This is attributed to absence of cheaper alternative sources of energy. The use of charcoal and firewood increases the significance of forests as a source of energy for communities around forests. A similar pattern was reported in Zambia (Mulenga et al., 2011). Lack of affordable alternative sources of energy rises the demand for both charcoal and firewood in the country. One of the damages of increased firewood harvesting and felling trees for charcoal production is their impact on the structure of the forest that results in decline in large and old trees resulting into their complete disappearance. Once these trees are lost the size of the gaps created increases (Ruger, Gutierrez, Kissling, Armesto, & Huth, 2007) resulting into forest fragmentation and susceptibility to invasion by ephemerals which inhibit regeneration of seedlings of other trees. In the current study *Broussonetia papyrifera* was very abundant in forest patches that were created as a result of tree felling for charcoal production and firewood collection. Uncontrolled harvesting of trees for charcoal and firewood may in the long run have a negative effect on the climate of the region.

The high income attributed to construction materials is due to the fact that many people in the study area use forest products for construction of houses. In Uganda 97% of houses are directly constructed from forest products and of these 40% have thatched roofs (UBOS, 2009). The contribution of NTFPs income to total household income in this study was 40%. Previous studies on the contribution of NTFP income to households came up with different percentages of dependence. Kamanga et al. (2009) obtained 15% in Malawi, Babulo et al. (2009) obtained 27% in northern Ethiopia, Faye, Webwr, Mounkoro, and Dakouo (2010) obtained 40% in Mali while Cavendish (2000) got 35% in Zimbabwe. The 40% dependence level in the current study is within the range of studies conducted in different countries which had a range of 15-40% dependence with a mean of 30%. The rate is also one of the highest signifying the importance forests to surrounding communities. The variation in these figures could be attributed to different data sets and socio economic contexts in which the studies were carried out.

Results further showed that the maximum average contribution of NTFP incomes of the poorest households was high at 53% which is line with findings from several other studies (Cavendish, 2000; Neuman & Hirsch, 2000; Scherl et al., 2004; USAID, 2006). Gauli and Hauser (2011) obtained a lower NTFP contribution of 15% and 21% in the Mahaderthan and Suspa respectively. The high contribution of relative NTFP income (53%) for poor households could be attributed to several factors like lack of enough land to engage in agriculture and other economic activities, low levels of education and lack of investment capital among others. The education levels of most household members were low often up to primary level that left household members with no option for any other gainful employment, thus heavy dependence on NTFP income. Hedge and Enters (2000) discovered that educated people have greater off-farm employment opportunities than less educated people. In general, education is expected to open up diverse employment opportunities. Similar studies from tropical regions (De Beer & McDermott, 1989; Shiva & Verma, 2002; Sunderlin et al., 2005; P. Vedeld et al., 2007) indicated that it was often the poorest households in rural communities that depended of NTFPs.

Households that had lower annual income from other forest based activities, and whose members had low education levels were more interested in forest use than households that were well off in terms of these indicators.

Wunder (2001) found that households with lower annual income, social status and education were more interested in forest use due to poor livelihood options. Education creates opportunities for off farm employment, self-employment and even facilitates search for better jobs that reduce dependence on forest resources.

Results of the current study show the often reported pattern (Kamanga et al., 2009; Vedeld et al., 2007) that relative income from forest products tend to be higher for the poorest (table 6) but absolute income from forest products was higher for better off households (Table 6).The average share of NTFP income to total household income was highest for households in the lowest wealth quintile. This means that the poor households are more dependent on NTFPs than the wealthier households. Neuman and Hirsch (2000) noted that in developing countries the poorest of the poor depend on NTFP for food, medicine, shelter, cash income and other uses. This is in line with results from this study. This reinforces previous assertions of the association between NTFPs and poverty (Angelsen & Wunder, 2003; Sunderlin, Angelsen, & Wunder, 2003). On the contrary Escobal and Aldana (2003) found that demand for forest resources increased with income levels. They noted that this was because the more income an individual has the better placed they are to exploit the forest resource. This explains the high levels of absolute income obtained by households in the highest wealth quintile. Households in the lower wealth quintile tend to have disproportionately less income from trade and employment categories thus increasing their proportion of forest income by default. Several reasons can be advanced to support this observation. Low or no capital is needed for extraction of NTFP implying that the poor who do not have access to capital can easily collect NTFPs without much strain apart from their labour input. During the study most resource users mentioned use of less sophisticated tools like pangas and knives in NTFP extraction apart from the rich that used chain saws for felling trees. These tools are available for use for other activities and are owned by each household on top of being less expensive.

Wealthier households obtained more income in absolute terms from the forest and disproportionately higher incomes from some forest product types compared to poor households. In the current study wealthier households engaged more in commercial extraction of firewood and charcoal. The rich have the means to extract larger quantities of NTFPs from the forest because they are able to use advanced harvesting techniques and at the same time are capable of employing more labour in the extraction process. The rich also have the capacity market more forest products.Thus these high volumes translate into high absolute values.

Education level of resource users negatively affected income from NTFPs and related activities. This is because households whose members are more educated are less likely to participate in NTFP collection. This means that higher education levels are associated with low dependence on forest products for rural livelihoods. Education expands the opportunities for employment in other sectors and hence minimizing dependence of the educated on NTFP extraction. The poor in the studied communities were less educated making them less skilled for alternative employment opportunities and hence more vulnerable to NTFP collection. Such a category of people will resort to NTFP collection where education is not a big requirement. Previous studies have shown education to reduce forest dependency (Godoy & Contreras, 2001; Gunatilake, 1998; Mamo et al., 2007).

In addition to the above most poor households lacked enough land on which to carry out extensive agriculture and in most cases cultivated crops for home consumption only. This left them with limited options for other sources of income for sustenance leaving them with an option of NTFP collection to fill the gaps. Households that have other sources of income would rely less on the forest for their livelihoods. Godoy, Brokao, and Wilkie (1995) found that as income rises the importance of NTFPs in a household shrinks. This is because the economic importance of other income sources would rise relative to income from environmental resources. As the value of labour rises with increase in wealth, the cost of continuing to spend time gathering NTFPS rather than purchasing them becomes increasingly unattractive. As such the rich who have several sources of income would prefer to buy whichever NTFP they want instead of collecting it from the forest. This is also attributed to the fact that most forest based activities generate low returns that can easily be ignored as other alternative income sources become available. In addition as wealth levels increase, the marginal propensity to consume NTFPs declines in favour of other products. Wealthier households for instance are capable of using other construction materials like bricks and iron sheets instead of depending on the forest for poles and thatch grass and this was evident in the villages under study.

Lack of employment income in some villages could be attributed to the low educational levels observed in the study area. In addition lack of business income in some villages could be attributed to the wealth status of users in the affected villages who were poor and thus lack enough capital for engaging in other business ventures. This suggests that participation in other business activities increases with increase in household income.

It also suggests that wealthier households have more educated members who are able to exploit alternative employment opportunities. The wealthier households are often endowed with enough capital to venture into other income generating activities instead of engaging in NTFP harvesting

Agriculture income was dominant in all villages and this poses a threat to the forest resource because as the population increases the size of land available for agriculture remains static and dwindles and may in the long run drive residents into encroaching on the forest reserve for agriculture. Though the poor may not have enough land to carry out extensive agricultural production, they still depend on agricultural income by working as labourers on the farms of the rich. This partly explains why agricultural income contributed highly to households in the second wealth group. It is however the highest contributor for households in highest wealth quintile. In general agriculture is still the main activity in rural areas.

This study showed that households that had more members had a high probability of depending on the forest compared to those that had few members. Larger households collect more NTFPs from the forest because they have more labour to allocate to the activity in order to obtain larger quantities of all NTFPs to use. Larger households require, for instance, more fuel wood for cooking and more of any other resource compared to households with fewer members. The large number of household members drives them into forest use as their land endowment gets limited. Similar findings have been reported in earlier studies (Dove, 1995; Godoy et al., 1997).These findings are consistent with a study in Ethiopia where dependency of the forest was found to be positively related with household size (Mamo et al., 2007).

Ownership of land reduced the likelihood of dependence on the forest. Individuals with more land are able to put it to other economic activities like agriculture that generates alternative income instead of NTFP income thus reducing dependence on the forest. Agriculture contributed the highest (62%) relative income to households in the highest wealth quintile and this resulted into decreased relative income of the same households from the forest.

Gender is an important factor in utilisation of forest products. Both men and women depended on Mabira CFR for collection of NTFPs but the products collected varied between the two gender groups. The variation can be seen at two different levels between female and male resource users and within a household between male headed and female headed household. Men collected products that required travelling deep into the forest, required extra effort in processing and mainly for commercial purposes. Men were mainly engaged in harvesting firewood and construction materials and charcoal burning for commercial purposes an activity prohibited in the forest reserve by NFA. These are risky ventures since commercial extraction is prohibited by NFA and women who are fearful are less likely to be involved in such activities. Women mainly collected products for subsistence use which were permitted by NFA. Some studies have reported similar differentiation in products extracted by men and women from the forest (Agarwal, 1997; Goebel, 1997). The current study however showed that women headed households was more likely to depend on the forest than male headed households. This is attributed to the fact that women are less likely to own land than men and its men who usually control the use of land and incomes therefrom. In the study area women who headed households were widowed further aggravating the loss of power over land. These scenarios aggravate the dependence on the forest by women since it's a common resource. Despite lack of tenure and control, women's work and incomes can have a substantial contribution to household welfare.

People residing far away from the forest may extract more valuable quantities of NTFPs in order to justify the amount of time spent on the activity. They are also more likely to engage in illegal harvesting than residents close to the forest since they may not be easily recognized by the local residents.

Residence time of resource users negatively affected dependence on the forest. The more time an individual resides in an area, the more alternative economic activities he gets than relying on the forest. Other studies have found a different effect where long term residents were more knowledgeable about the ecological structure, composition and seasonal patterns of the forest and thus able to collect more products (Kartoolinejad, Hosseini, Mirnia, Akbarinia, & Shayanmehr, 2007; Pattanayak, Sills, Mehta, & Kramer, 2003).People that have stayed in an area for a long time understand all the strategies employed by the forest patrols deployed by NFA to control illegal harvesting of products from the forest.

They are therefore more likely to counteract such controls in order to obtain a lot of NTFPs from the forest. On the other hand, residents that have just occupied an area have not well established themselves economically and end up resorting to the forest for livelihood sustenance.

5. Conclusions

The study shows that NTFPs contributed 40% to total household income of users on average. The study further showed that wealth quintile, total non-forest income, household head, distance from the forest and age of the user were significant at 99% level in determining dependence on forest for extraction of NTFPs. Other socioeconomic factors were not significant in the model and included number of people in a household, education level of the user, gender of the user, occupation of the user, residence time and land ownership. The signs of coefficients of explanatory variables that were not significant however showed how a change in these variables is likely to change the probability of being forest dependent.

Understanding the dependency on Mabira CFR is critical in the development of management strategies that will enhance its conservation. Reducing human pressure on the forest is a fundamental policy concern for Uganda given the decline in Uganda's forest cover. In the face of rapid population growth in Uganda and the fact that the land available for use remains static, sustainable harvesting of forest products, both timber and non-timber forests products is not easy. This research revealed that forest resources are an important component of the livelihoods of forest adjacent communities in provision of products for both subsistence consumption and sale. Therefore strategies that will promote sustainable utilisation of the forest resource need to be devised.

Poor households heavily utilize NTFPs compared to wealthy households for both subsistence consumption and generation of cash income. The income generated from the sale of NTFPs is important in covering expenses for other household needs. This implies that depriving poor households from extraction of such resources can impact negatively on their wellbeing. In such instances households within the vicinity of forests should be allowed access to the resource however environmental education is still necessary to ensure sustainable utilisation of the resource. Forest dependence can be detrimental especially where destructive extractive techniques like those involved in charcoal burning and firewood extraction are used. The local people should be advised on harvesting techniques that do not harm the forest resource. This will go along in way in ensuring sustainable utilization of the forest in perpetuity.

Charcoal and firewood were found to be the most common source of energy used. Collection of these resources is detrimental to the environment since in most cases involve clear felling of trees leading to creation of forest patches. It has been reported that the high dependence of Ugandans on biomass puts a lot of pressure on the country's natural vegetation and this has triggered massive deforestation. This trend in energy consumption is likely to continue to escalate in the face of increasing electricity tariffs. The discovery of oil and gas in the Albertine graben however, is likely to release pressure exerted on Uganda's forest resource for production of energy but this calls for caution to put in place measures that do not negatively impact on the environment.

The forest patches created as a result of tree felling for charcoal and firewood creates suitable conditions for growth and proliferation of light demanding species like the *Broussonetia papyrifera* that prevents establishment of other tree species. The current study revealed decline in the availability of tree species used for firewood and charcoal production as a result of deforestation, yet measures to conserve the species in question were very minimal. This means that if the current deforestation rates are not checked the forest resource is threatened and will continue to diminish. The rates will also impact negatively on the environment by reducing the environmental values offered by forests such as carbon sequestration, soil erosion control, water stabilization among others. To minimize the heavy dependence of households on the forest for fuel energy, energy conservation measures should be instituted by relevant authorities. Such measures may include use of energy saving mechanisms like use of energy saving stoves, subsidizing the installation and purchase of renewable energy equipment's.

NTFPs provide an opportunity to earn income and improve the livelihoods of the communities around Mabira CFR. The 40% income share from NTFPs and related activities is an indicator that households will continue to rely on these products for the foreseeable future. There is thus a need to create awareness among these communities on the continued availability of NTFPs which greatly depends on maintaining the integrity of Mabira CFR. In this way NTFPs can act as an incentive for sustainable utilization of the forest.

Age, gender of household head and educational level of resource users are important determinants for dependence on the forest for NTFP extraction. Increase in these variables is associated with decrease in NTFP extraction. Since the poor and women were found to be heavily dependent of NTFP extraction, poverty alleviation policies should be applied to forest dwellers with priority to poor and women heading households in order to divert their heavy reliance of forest. This will reduce their dependence on NTFPs leading to forest conservation. Poverty can be mitigated through raising educational levels and creating labour intensive local industries that will increase off farm employment opportunities. Improving legislation on land ownership to give more power to women in decision making regarding matters of land is also instrumental in poverty reduction. The government of Uganda is to some extent trying to combat the low education levels in the country through provision of Universal Primary Education (UPE) and Universal Secondary Education (USE) but efficient implementation is still required in order to realise positive efforts.

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Appendix 1

Logistic model of dependency on forests controlling for categories (reporting coefficients and odds ratio)

dependency on the forest	does not depend depend	Coef.	Odds Ratio	z	P>|z|
Age		-0.01	0.99	-0.53	0.59
nopeople		0.01	1.01	0.11	0.92
totalother		0.00	1.00	-6.72	0.00
Wealth quintile	Lowest (Reference)				
	second	1.05	2.87	2.14	0.03
	third	1.13	3.10	1.63	0.10
	highest	2.96	19.34	1.79	0.07
Household head	_Ihhead_1(child)(Reference)				
	_Ihhead_2 (woman)	-0.74	0.48	-1.03	0.31
	_Ihhead_3 (Man)	-1.79	0.17	-3.53	0.00
Level of education	non formal (Reference)				
	student	-0.55	0.58	-0.91	0.37
	O level	-0.51	0.60	-0.69	0.49
	A level	2.52	12.49	1.19	0.23
	Tertiary level	0.01	1.01	0.00	1.00
Gender of the user	Male (Reference)				
	female	-0.72	0.49	-1.36	0.17
Occupation of the resource user	no work (Reference)				
	student	1.19	3.30	1.06	0.29
	farming	-0.96	0.38	-1.02	0.31
	wage labour	-2.44	0.09	-1.82	0.07
	salaried employee	-1.27	0.28	-0.64	0.52
	own business	-0.35	0.70	-0.33	0.74
period of stay in the area	0 (Reference)				
	less than 1 year	0.00	1.00		
	1-5 years	17.31	33000000	0.01	1.00
	5-10 years	19.70	358000000	0.01	0.99
	more than 10 years	18.03	67300000	0.01	0.99
land holding	no land (Reference)				
	1-3 acres	0.87	2.38	1.26	0.21
	more than 3 acres of land	0.03	1.03	0.04	0.97
Distance from the forest	_Idistance_0(<500m (Reference)				
	_Idistance_1 (500m)	15.18	3910789	0.01	0.99
	_Idistance_2 (1 Km)	14.88	2898265	0.01	0.99
	_Idistance_3 (>1km)	16.68	17500000	0.01	0.99
_constant term		29.67	0.00	-0.01	0.99