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Contributions of Non-Wood Forest Products to Household Livelihood and Poverty Reduction among Farmers in Enugu State, Nigeria

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Abstract

The study analysed the contributions of species of NWFPs to farm household's livelihood and poverty reduction. One hundred and twenty respondents were selected through multistage sampling procedure. Frequency, mean and likert scale and probit model were used for the analysis. The results indicated that the majority were male (63.33 %) and had mean age of 56 years. The most commonly collected plant species of NWFPs were bitter kola (Garcina kola), breadfruit (Treculia africana), bush mango (I.gabonenesis and wombulu), kola nut (Cola nitida), cashew nut (Anacardium occidentale), Icheku (Dalium guinese), African star apple (Chrysophylum albidium), Avocado pear (Persea americana), African bush mango (Dacryodes edulis) and Oil bean (Pentaclethra macrophylla) while the most commonly collected animal species of NWFPs were bee products (Apis mellifera linneaeus 1758), flying termites (Reticulitermes flavipes) and fish (Ictalurus punctatus). Wealth category and occupation positively and significantly increased the contributions of NWFPs to household food security. Educational level had negative and significant effect on the contributions of NWFPs to household food security. Household size and occupation positively and significantly increased the contributions of NWFPs to household income. Household size and occupation positively and significantly increased the contributions of NWFPs to household income. The result of the proportion of household income from NWFPs shows that 54.43% indicated that species of NWFPs constituted over 50% of their household income.

Key words – Non wood forest products, household income.

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Introduction

A forest, also referred to as a wood or the woods, is an area with a high density of trees. Forest is defined as land spanning more than 0.5 hectares with trees higher than 5 meters and a canopy cover of more than 10 percent, or trees able to reach these thresholds in situ. It does not include land that is predominantly under agricultural or urban land use (FAO, 2015). Forests can be classified in different ways and to different degrees of specificity. One such way is in terms of the "biome" in which they exist, combined with leaf longevity of the dominant species (whether they are evergreen or deciduous). Another distinction is whether the forests are composed predominantly of broadleaf trees, coniferous (needle-leaved) trees, or mixed.

Among the products obtained from forests are those classified as wood forest products and Non-Wood Forests Products (NWFPs). The United Kingdom's Forestry Commission defines non-wood forest product (NTFPs) as any biological resource found in woodlands except wood (timber and other forms of wood), United Kingdom Forest Research (UFR, 2013). Part of the reforesting Scotland project, defines them as materials supplied by woodlands - except the conventional harvest of wood, Scotland Forest Harvest (SFH, 2013). These definitions include wild and managed game, fish and insects, Center for International Forestry Research (CIFOR, 2013). When wood other than timber is included it is referred to as non- timber forests products (NTFPs).

Food security exists when all people, at all times, have physical, social and economic access to sufficient, safe and nutritious food which meets their dietary needs and food preferences for an active and healthy life. Household food security is the application of this concept to the family level, with individuals within households as the focus of concern (FAO, 2015). Conceptually, food security is broken down into four different components – availability, access, utilization and vulnerability – each capturing different, but overlapping dimension of the phenomenon (Migotto, Davis, Carletto, & Beegle, 2007). This study focused on flora (plant) and fauna(animal) species of non-wood forest products. Some of the plant species of NWFPs found in Nigeria, according to *Larinde, Oladele, & Nwakaego (2012*) include *Gnetum africanum* , *Gongronema latifolium*, *pterocarpus soyauxii*, *Ocimum gratisimum*, *Treculia Africana*, *Irvingia gabonensis*, *Dennettia tripetala, chrysophyllum albidium* (white straw apple) , *piper guineense*, *Afromomum spp* and *Garcinia kola*. Fauna species include snails, bee product (honey), grass cutter etc.

In Nigeria NWFPs is of utmost importance as 70% of Nigerians live below poverty line and the majority depend on forest resources especially NWFPs for their survival. Neglecting the resource may deepen poverty. Neglecting to adequately recognise non-wood values of forests often denies the socioeconomic benefits of forests to those who depend on them. Therefore, development of appropriate management and conservation of NWFP resource, either in natural forests or in plantations are of importance as part of

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strategies to meet the economic needs of people while maintaining biological diversity (Jimoh, Amusa, & Azeez 2013). Preliminary investigation showed that with few exceptions, the NWFPs have never been studied in depth, neither in aspect of quantities produced nor their socioeconomic importance to the people. There is considerable ignorance in many quarters concerning the optimal utilization of this resource base to uplift the rural poor, while at the same time protecting biodiversity and ensuring sustainability (Ogundele, Utin, Iwara, Njar, & Deekor 2012). This study evaluated the contributions of NWFPs to the livelihood and poverty reduction of the farm households in Enugu State. Specifically, the study: identified and characterized commonly used NWFPs and determined the contributions of NWFPs to farm household's food security.

Methodology

The study area was Enugu State, Nigeria with latitudes 5^0 56^1 N and 7^0 05^1 N of equator and longitudes 6^0 53^1 E and 7^0 55^1 E of Greenwich meridian (Enugu State Agricultural Development Project (ENADEP, 2009). The state is an interesting area for this study because of its location and considerable socioeconomic heterogeneity. Multi-stage sampling procedure was used to select the respondents from a list of 246,542 registered farming households in Enugu State (GESS, 2013). One hundred and twenty (120) farm households were selected for the study.

Data for the study were collected by using a set of structured, pre-tested and validated questionnaire. Frequency, mean and likert scale and Probit model were used in analysing the data.

In measuring the contribution of species of NWFPs to household food security, a modified food intake indicator was adopted. The modified food intake indicator did not exactly measure the actual quantity consumed by households. However, the measurement was carried out as follows: first, as part of the questionnaire, households were made to indicate the NWFPs that they often use in their meals, part used, form used and method of acquisition. The likelihood that some proportion of household foods contains NWFPs was then estimated using a Probit model. The Probit model is generally given as

$$Pr (Y= 1/x) = \Phi (X' \beta)$$

Where Pr denotes probability, Φ is the cumulative distribution function (CDF) of the standard normal distribution and β is a vector of parameter estimates. The probit here is estimated in form of a latent variable model:

$$Y^* = X'\beta + \varepsilon; \text{ where } \varepsilon \sim N(0;1)$$

Y^* is the critical threshold level which if exceeded will indicate that the respondent consumes NWFPs, in this case 50%. Thus, consumption of plant species of NWFPs $Y=1$ if the critical threshold is greater than or equal to 50%, zero otherwise. Thus:

$$Y = 1 (y^* \geq 50\%) = \{1 \text{ if } Y^* \geq 50\%\}$$
$$0 \text{ otherwise}$$

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The explicit form of the model is;

$Pr(Y=1/x)= B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + e.$

Where;

Y= Consumption of species of NWFPs
B_0 = intercept

B_1- B_8 = coefficient of independent variables.

e = stochastic error term.

The hypothesized factors influencing the consumption of species of NWFPs include;

X_1 = Gender (1 for male, otherwise 0), X_2 = Age (in years), X_3 = No of years in school, X_4 = Household size (number of people living with the farmer whose responsibility he bears), X_5 = Occupation-Civil servant, X_6 = Occupation-Business, X_7 = High wealth, X_8 = Medium wealth.

In measuring the contribution of species of NWFPs to farm household income
$Y^* = X'\beta + \varepsilon$; where $\varepsilon \sim N(0;1)$
Y* is the critical threshold level which if exceeded will indicate that the respondent obtain income from NWFPs, in this case 50%. Thus, Income from species of NWFPs Y=1 if the critical threshold is greater than or equal to 50%, zero otherwise. Thus:
$Y = 1\ (y^* \geq 50\%) = \{1 \text{ if } Y^* \geq 50\%\}$
0 otherwise
The explicit form of the model is;

$Pr(Y=1/x)= B_0 + B_1 X_1 + B_2 X_2 + B_3 X_3 + B_4 X_4 + B_5 X_5 + B_6 X_6 + B_7 X_7 + B_8 X_8 + e.$

Where;

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Results and Discussion

Commonly Collected Non-Wood Forest Products

Plant species

The frequency distribution of plant species of NWFPs often used, part used, form of use and method of acquisition is presented in Table 2 below. The result shows that the respondents collect fifteen plant species of NWFPs from their forests and markets. Bitter kola, Breadfruit, Bush mango, Kolanut, Cashew, African blackberry(*Dalium guinese*), *Udara(*African star apple), Pear, Ube (African bush pear), and Oil bean recorded the highest frequency (120) indicating that they were the most commonly collected species. They were followed by *Achi* {(*Brachystegia eurycoma*) (102)}, *Akpalata*{ *Afzelia africana* (101)},and the least being Aligator pepper { *Afromomium meleguata* (80)}, and *Mmimi*{*Dennetia tripetala*(80)}.

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Table 1: Plant species of NWFPs often used, part used, form of use and method of acquisition

Common name	Botanical name	Part used	Used fresh (%)	Cooked (%)	Collected from forest (%)	Purchased (%)
Achi	*Brachystega Eurycoma*	Seed		100	100	100
Alligator pepper	*Afromomim meleguata*	Seed	100		100	37.5
Bitter kola	*Garcina kola*	Seed	100		100	60
Breadfruit	*Treculia africana*	Seed		100	100	33.3
Bush mango	*Irvingia gabonensis and wombulu*	Seed		100	100	41.7
Kolanut	*Cola nitida*	Seed	100		78.33	46.7
Mushroom	Agaricus bisporus	Whole plant		100	68.75	100
Cashew	*Anacardim occidentale*	Fruit/seed	100	100	100	62.5
Icheku	*Dalium guinese*	Fruit	100		91.67	48.3
African star apple(udara)	*Chrysophylum Albidium*	Fruit	100		27.5	72.5
Avocado pear	*Persea Americana*	Fruit	100			
African bush pear	*Dacryodes edulis*	Fruit	36.67	100	75	37.5
Oilbean	*Pentacletha macrophyla*	Seed		100	100	100
Akpalata	*Afzelia Africana*	Seed		100	100	100
Mmimmi	Dennetia Tripetala	Whole plant	100		100	100

Source: Field data 2017

Animal species of NWFPs

The frequency distribution of animal species of NWFPs often used, part used, form of use and method of acquisition is presented in Table 3 below. The result of respondent's opinion on the animal species of NWFPs collected from forests and bought from markets is shown in Table 3. The result shows that the respondents collect eight animal species of NWFPs from the forests and markets. Fish and Bee products recorded the highest frequency (120) indicating that they were the most commonly collected species. They were followed by Bush rat (97), Snail (70), Grasscutter (47), Vegetable caterpillars (40) and the least being Palm weevil larva (20).

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Table 3: Animal species of NWFPs often used and method of acquisition

Common name	Binomial name	Collected from the forest (%)	Purchased (%)
Snail	*Achatina achatina*	100	100
Bee products	*Apis mellifera Linnaeus 1758*	25	75
Grasscutter	*Thronomys Swinderianus*	89.36	93.61
Flying termites/ Swarmer /Alate(Aku)	*Reticulitermes flavipes*	100	41.67
Vegetable caterpillars(Wiwi)		100	25
Fish	*Ictalurus punctatus*	25	100
Palm weevil larva	*Rhynchophorus species*	100	50
Bush rat	*Ratus fuscipes*	100	100

Source: Field survey data, 2017

Contributions of NWFPs to household food security

The result of the contributions of NWFPs to household food security is shown in Table 4. The model as indicated by the prob > chi^2= 0.0000 was highly significant at 1% level of probability suggesting that the model is of best fit. The pseudo R^2 of 0.8667 shows that about 87% of the contributions of NWFPs to household food security was explained by the explanatory variable. The result shows that wealth category and occupation had positive and significant ($p<0.01$) influence on the proportion of NWFPs consumed by the respondents. The coefficient of medium wealth category and primary occupation (civil servants) were positively significant to the proportion of household food from NWFPs. It could be that the medium wealth most likely included NWFPs in their food basket. The implication of the result on primary occupation as civil servants is that the more stable and secured the household income, more likely they will include NWFPs in their food basket. This is because a stable and secured source of income encourages high consumption of NWFPs. The high consumption may act as cushion effect during hunger periods among households.

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Educational level had negative and significant ($p<0.05$) effect on the contributions of NWFPs to household food security. The fact that the number of years in school had negative and significant effect on the contributions of NWFPs to household food security suggests that consumption of NWFPs may decrease with education because education offer individual opportunities to be more employable thereby making more income. This may also be attributed to availability and lack of information on the NWFPs; thus, highly educated people are less likely to consume NWFPs. Also, age had negative but not significant relationship with the proportion of household food from species of NWFPs. This could mean that the older the household head the less likely that they will include NWFPs in their food basket. This means that older household head may not be energetic enough to walk far distance to forest to pick the NWFPs.

Table 4: Contribution of NWFPs to household food security.

Variable	Coefficients	Marginal effects	Z
Gender	0.22	0.66	0.33
Age	-0.004	0.04	-0.10
Number of years in school	-0.37	0.16	-2.27**
Household size	0.02	0.22	0.08
Wealth category	2.01	0.71	2.82***
Occupation	2.38	0.72	3.33***

Source: Field survey data 2017. ***, ** = significant at 1%, 5% level of probability. Number of Observations = 120. LR Chi^2 (6) = 85.23, Prob > chi^2 = 0.0000, Pseudo R^2 = 0.8667, a = 1 if Gender is male; 0 otherwise (female), b = 1 if major occupation is farming; 0 otherwise, c = 1 if high and medium wealth; 0 otherwise

Table 5: Proportion of income from NWFPs.

Item	Category	Percentage (%)	Mean
Proportion of income from NWFPs	Less than 50%	45.57	
	50% and above	54.43	50

Source: Field survey data, 2017

Contributions of NWFPs to Farm household income

Table 6 shows that some variables significantly influenced household income from NWFPs. Thus the hypothesis that none of the independent variables significantly

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influenced household food security from NWFPs was rejected. The model as indicated by the prob > chi^2= 0.0000 was highly significant at 1% level of probability suggesting that the model is of best fit. The pseudo R^2 of 0.5448 shows that about 55% of the contributions of NWFPs to household income was explained by the explanatory variable. The result shows that household size and occupation positively and significantly ($p < 0.01$) increase the likelihood of having a proportion of household income from species of NWFPs being greater than or equal to 50%. Gender, educational level and wealth category has a positive relationship but not significant effect on the proportion of household income from species of NWFPs.

The result of the influence of household size is expected, as large households would require more income to maintain, thus the higher collection of NWFPs and sales. On occupation, farmers and NWFPs gatherers are more likely to have a higher proportion of their income from NWFPs. The result on gender shows that the male respondents are more likely to be involved in NWFPs collection for the market. The implication of the result on educational level and wealth category is that the more educated respondents and those in high wealth category are more likely to have larger scale of operation; thus higher income from NWFPs.

Table 6: Contributions of NWFPs to farm household income

Variable	Coefficients	Standard error	Z-statistics
Gender[a]	0.36	0.34	1.04
Age	-0.03	0.02	-1.34
Number of years in school	0.04	0.06	0.78
Household size	1.60	0.60	2.67***
Wealth category[c]	0.03	0.14	0.19
Occupation[b]	1.30	0.29	4.47***
Constant	-1.15	1.19	-0.97

Source: Field survey data 2017. *****, **** = significant at 1%, 5% level of probability. Number of Observations = 120. LR Chi^2 (6) = 90.34, Prob > chi^2 = 0.0000, Pseudo R^2 = 0.5448, a = 1 if Gender is male; 0 otherwise (female), b = 1 if major occupation is farming; 0 otherwise, c = 1 if high and medium wealth; 0 otherwise

Conclusion and Recommendations

The most commonly collected plant species of NWFPs were Bitter kola(*Garcina kola*), Breadfruit (*Treculia africana*), Bush mango(*I.gabonenesis and wombulu*), Kola nut(*Cola nitida*), Cashew (*Anacardium occidentale*), *Icheku* (*Dalium guinese*), African star apple(*Chrysophylum albidium*), Avocado pear(*Persea americana*), African bush mango (*Dacryodes edulis*) and Oil bean(*Pentaclethra macrophylla*) while the most commonly

collected animal species of NWFPs were Bee products(*Apis mellifera linneaeus 1758*), Flying termites(*Reticulitermes flavipes*) and Fish(*Ictalurus punctatus*).

Socioeconomic attributes that had influence on contributions of NWFPs to household food security were household size, wealth category, occupation (civil servant), occupation (business), number of years in school, and age. While household size, wealth category, occupation (civil servant) and occupation (business) positively and significantly increased the contributions of NWFPs to household food security, number of years in school, and age had negative and significant effect on the contributions of NWFPs to household food security.
Also some socioeconomic characteristics had influence on contributions of NWFPs to household income such as household size and occupation. Household size and occupation positively and significantly increased the likelihood of having a proportion of household income from species of NWFPs.
Remedial measures such as the incorporation of NWFPs in national accounting systems by the government in order to attract the deserved attention from policy makers.

Public enlightenment campaign on the economic and health benefits of NWFPs by the national orientation agencies and the provision of infrastructural amenities by the government and humanitarian organizations.

These species should be included by the government in the National Forestry Draft Act as among the key species to be conserved and the logging of tree species among them should be legislated against.
In promoting the utilization of NWFPs, especially as safety nets during hunger periods, emphasis by governments and NGOs should be placed on encouraging households to plant and rear major consumed species in home gardens where they can be easily accessible.

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