



Research Paper

Determinant of households' dependence on Ikot Ondo Community Forest, Nigeria

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ABSTRACT

This study assessed the level of forest dependency and the socio-economic factors affecting it among rural households in Ikot Ondo, Akwa Ibom State, Nigeria. Data was obtained through a detailed structured household survey using 50 randomly sampled households. Descriptive statistics, Z-test and econometric models were employed to analyze the data collected. The findings showed that majority of the respondents were males (62%), aged 50 years and above (48%), had First School Leaving Certificates (40%), were traders (56%), had a household size of 6 to 10 (58%), resided in the study area between 20 to 29 years (30%) and a yearly income of <₦100,000.00. Firewood and bamboo stem were the dominant and significant products collected in the study area. Forest income contributed only 7.89% to the total income and was significantly different from non-forest income at $P < 0.05$. The result of regression analysis depicts that age ($p < 0.10$), distance to market ($p < 0.05$), farm income ($p < 0.01$) and non-farm incomes ($p < 0.01$) were the major determinants of forest dependence among rural households. It is therefore recommended that all tiers of government should intensify their efforts in providing more investment and development in the rural areas by improving, localizing and building on the existing livelihood strategies of the people as this further help in reducing dependence in the forest thereby conserving it for posterity.

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INTRODUCTION

It has long been appreciated, both internationally and within Nigeria, that forests offer numerous benefits to adjacent communities and society at large (NFAP, 1997; Agrawal et al., 2013; Arnold et al., 2011). Such benefits include consumptive resources, spiritual and aesthetic needs, employment and ecological services such as carbon sequestration and water provision (Jacob et al., 2013; Jacob and Ogo, 2011; Byron and Arnold, 1999).

However, in many situations, access to such benefits is neither uniform nor equitable both between and within communities (Charlie, 2004). The majority of forests, by their very nature, are located within rural and frequently remote areas (Charlie, 2004). Typically, this implies that

such areas are underdeveloped in terms of infrastructure, government services, markets and jobs. It is not surprising therefore, that communities living in and adjacent to forests are characterized by seemingly high levels of poverty and limited livelihood opportunities (Wunder, 2001). They depend on these resources as it is freely provided by the forest for their welfare.

In sub-Saharan Africa, about 15 million people derive their cash income from forest-related enterprises such as fuel wood and charcoal sales, small-scale saw-milling, commercial hunting and handicraft (Mwera, 2014). In addition, between 200,000 and 300,000 people are directly employed in the commercial timber industry (Jumbe et al.,

2005) and in some countries, the forestry sector is an important foreign exchange earner. However, studies have shown that most of the rural household budget surveys do not incorporate forest income in their assessments, as such their impact to household income, consumption and general welfare is always misunderstood. In Africa, there are few studies that directly assess the contribution of forest-earned income to the households that neighbor forests (Mwera, 2014). It can be assumed that the income from forest helps to supplement other sources of income during periods of hardship. It is well known that forest incomes are particularly important for the poor and deprivation of access to forest resources may have serious impact on rural household incomes both in terms of consumption and cash income generation. Therefore, there is need to derive the values that are generated from forest resource extraction.

In Nigeria, many rural households depend on forest extraction for daily sustenance yet, very little is known about its impact on the distribution of household total income, and on poverty in general (Fonta et al., 2010). The proportion of poor people depending on forest resources vary according to circumstances and evolvement of their livelihood patterns over time. The categories of forest dependence include: forest dwellers, including hunter-gatherers and subsistent cultivators; farmers living next to forest, who use forest as a complement to livelihood diversification (includes the landless); Commercial users, including small producers, traders and employees; Consumers of forest products among the urban poor (Byron and Arnold, 1999).

However, the current study uses a different approach and did not classify forest dependence into categories but focuses more on the differentiated products and services derived from the forest. The present study therefore examines the dependence and economic contribution made by Ikot Ondo community forest to rural households that surround it.

METHODOLOGY

Study area

Ikot Ondo Community lies between latitudes 5000 N and longitudes 5015 N and longitude 7035 E and 7045 E in Essien Udim, Local government Area which has an area of about 50 km² (Ukpong et al., 2012). The community forest is a lowland rainforest located in Adiasim, Essien Udim Local Government area in Akwa Ibom State in South-South, Nigeria. The forest has a surface drainage with an average annual rainfall of 2000 to 3000 mm. Temperatures are uniformly high throughout the year with slight variation between 26 and 28°C, respectively. The topography is moderately plane with a little or no ridge or valley. It has a

tropical climate; it is significant most months of the year and the short dry season has little effect. However, most of the rural household depends on the forest for their subsistence agriculture, hunting and gathering of forest-based resource for their food and non-food needs which tend to degrade the ecosystem and threatened the existence of the forest (Ukpong et al., 2012).

Data collection

The study utilized both secondary and primary data. Secondary data collection sources included: official documents as well as, relevant literature and research reports specific to the area of study and phenomenon under investigation. Structured questionnaires were used in the gathering of the primary data using 50 randomly selected households out of the 273 household in the study area (that is, 18.32%) in order to ensure variation and representativeness (Udeagha, 2015; Heubach, 2012; Angelsen et al., 2011a, b; Rubin and Babbie, 2008; Babbie, 2005) and was also supplemented by other ethnographic and participatory methods of data collection such as: field observation, visual photography, transact walk, In-Depth Interviews (IDIs) and Focus Group Discussions (FGDs) with relevant community stakeholders who have ample knowledge of the subject matter. This was done with the assistance of community leaders and their council.

Data analysis

This study employed the use of both quantitative and qualitative data analysis techniques in the form of both probability and non-probability statistical analyses. These include the use of frequencies, measures of central tendency and dispersion, regression and z-Test.

Measurement of dependence of rural households of the community forest

To be able to measure the aforementioned variable, the mean scores of the responses from the respondents to the questions of the variable were used. The mean scores were derived from a five-point Likert scale question (Impact statement): “strongly agreed/Very favourable” = 5, “Agreed/ Favourable” = 4, “undecided/Varies” = 3, “disagreed/ Unfavourable” = 2; and “strongly disagreed/Very unfavourable” = 1. The mean values on the Likert- type scale were derived for the households’ dependence to determine their level. Based on the favorability scale of 1 to 5 (strongly disagree to strongly agree), the mean score coding was adopted as follows: 1.00 to 1.49 for “Strongly disagree”, 1.50 to 2.49 for “Disagree”,

2.50 to 3.49 for “Neutral”, 3.50 to 4.49 for “Agree”, and 4.50 to 5.00 for “Strongly agree”. The overall mean score for each variable was calculated by dividing the sum of mean score by the number of its impact statements. The equation is expressed as Equation 1:

$$\frac{\sum \bar{X}}{N} \quad (1)$$

Where:

$\sum \bar{X}$ = Summation of the mean score from each impact statement

N = Number of impact statement.

Decision rule: Any impact statement or variable whose mean score was ≥ 3.00 was regarded as significant, positive and ‘agreed’ decision that there is dependence of the rural household on the community forest, while mean score of < 3.00 was regarded as a non-significant, negative and disagreed decision, implying that there was no dependence of the rural households on the community forest in the study area.

Contribution of community forest to overall rural household income

The contribution of the community forest to rural household income was analyzed using descriptive statistics such as means, frequencies and percentages. It first required the computation of the forest income, which is the value of all the products collected from the forest and non-forest incomes. These values were obtained by multiplying the quantity of products obtained from the forest by their selling price (for products sold in the market) or reported market price (for products consumed by the household). Also, income from agriculture was measured using the reported price of agricultural products.

A pair-wise Z-test was employed to test for difference between the mean from forest income and the non-forest income sources per household. The Z-statistic is given as Equation 2:

$$Z_{cal} = \frac{\bar{x}_1 - \bar{x}_j}{\sqrt{\frac{s^2_{x_1}}{n_1} + \frac{s^2_{x_j}}{n_j}}} \quad (2)$$

Where:

$\bar{x}_1$ = The mean income of the household contributed by resources from the forest;

$\bar{x}_j$ = Mean income of the household from other sources not from the forest;

$S^2 \bar{x}_j$ = Square standard deviation for income of the household contributed by resources from the forest;

n_1 = Number of household with forest income source;

n_j = Number of household with non-forest income source.

Determinants of household dependence on community forest

The Ordinary Least Square (OLS), Double Log, Semi-Log and Exponential multiple regression tools were employed to identify the factors affecting respondents’ dependence on the community forest. They were also used to measure the amount of variability of the dependent variable that could be explained by the independent variables. The regression equations were estimated using Equations 3, 4 and 5. The explicit forms of the models are given as:

$$Y = a + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + \dots - B_{11}X_{11} + \mu \quad (3)$$

$$\text{Log}Y = a + B_1 \text{Log}X_1 + B_2 \text{Log}X_2 + \dots - B_{11} \text{Log}X_{11} + \mu \quad (4)$$

$$Y = a + B_1 \text{Log}X_1 + B_2 \text{Log}X_2 + \dots - B_{11} \text{Log}X_{11} + \mu \quad (5)$$

Where:

Y = total dependence on community forest a = constant, b_i , where $i = 1, 2, \dots, 9$ were the regression coefficients of X_i variable; X_1 = Total income in ₦ (\$); X_2 = Household size; X_3 = Gender (male = 1, female = 0); X_4 = Age of respondent in years; X_5 = Educational status (years in school); X_6 = Occupation (Artisan = 1, not artisan = 0), X_7 = Years of residence; X_8 = Distance to market (km); X_9 = Farm income in ₦ (\$); X_{10} = Non-farm income in ₦ (\$); X_{11} = Marital status (Married = 1, single = 0).

Table 1 shows the *a priori* expectation of the various variables used in the analysis.

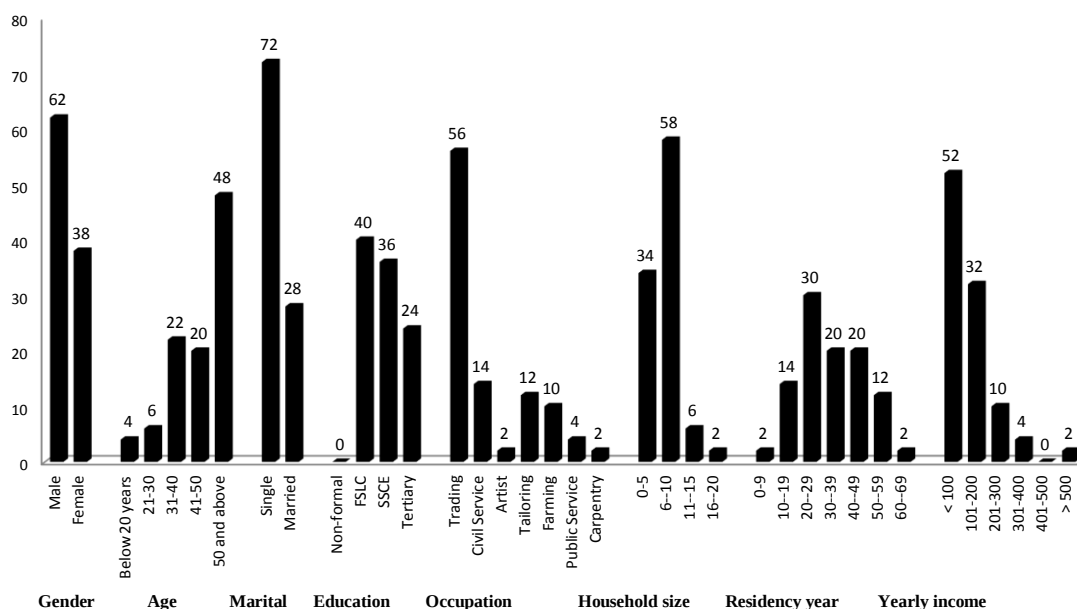
RESULTS AND DISCUSSION

Demographic characteristics of respondents

Figure 1 indicates that 62% of the respondents were males, while 38% were females. This indicates a more male headed household than the female headed households. This implies that almost all the households in the study area have an elderly man to dictate the affairs in each family. This is in agreement with Olorunsanya and Omotesho (2011) and Olawuyi and Adetunji (2013) and Jacob (2017) observation that majority of the rural households in Nigeria are male-headed. It however contrasts with Dreeze and

Table 1: Definition of dependent and independent variables included in the econometric model and expected signs (*a priori* Statement).

Variable	Type of variable	Expected sign
Total income	Continuous	Decrease
Household size	Continuous	Increase
Gender (Male)	Binary/dummy	Decrease
Age	Continuous	Decrease
Education	Continuous	Decrease
Occupation (Artisan)	Binary/dummy	Decrease
Years of residence	Continuous	Increase
Distance to market	Continuous	Decrease
Farm income	Continuous	Decrease
Non-farm income	Continuous	Decrease
Marital status (Married)	Binary/dummy	Increase

**Figure 1:** Demographic characteristics of respondents in the study area.

Srinivassan (1997) observation that female-headed households are more prominent in the rural areas. The dominance of male-headed in the rural areas in the country still subscribes to the patriarchal view that men provide for the family and have the power and authority to control the general affairs of the household unit, including decision-making concerning economic, social and political interactions, while women nurture it (Illo, 1989; Silver et al., 2015).

The age of the respondents was grouped into classes (Figure 2) and the result showed that those aged 50 years and above were the majority (48%) of the respondents, followed by 31 to 40, 41 to 50 years and 21 to 30 with 22, 20 and 6%, respectively while those aged below 20 years

had 4%. The mean age of the respondents was 48.8 ± 15.15 years with 48% of the respondents being young and still in their active working years. This agrees with the observation of Jacob et al., (2015) and (2013) that most of the support zone communities around the forest areas in Nigeria are young and actively engaged in forest livelihood activities.

Marital status of the respondents indicated that 72% of those surveyed were single (that is, not married, widowed or divorced), and 28% were married. The distribution showed that there were more single household heads than their married counterparts indicating a poor well-being of the rural household. According to studies such as White and Rogers (2000), unmarried or single parent households are more likely to live in poverty than their married

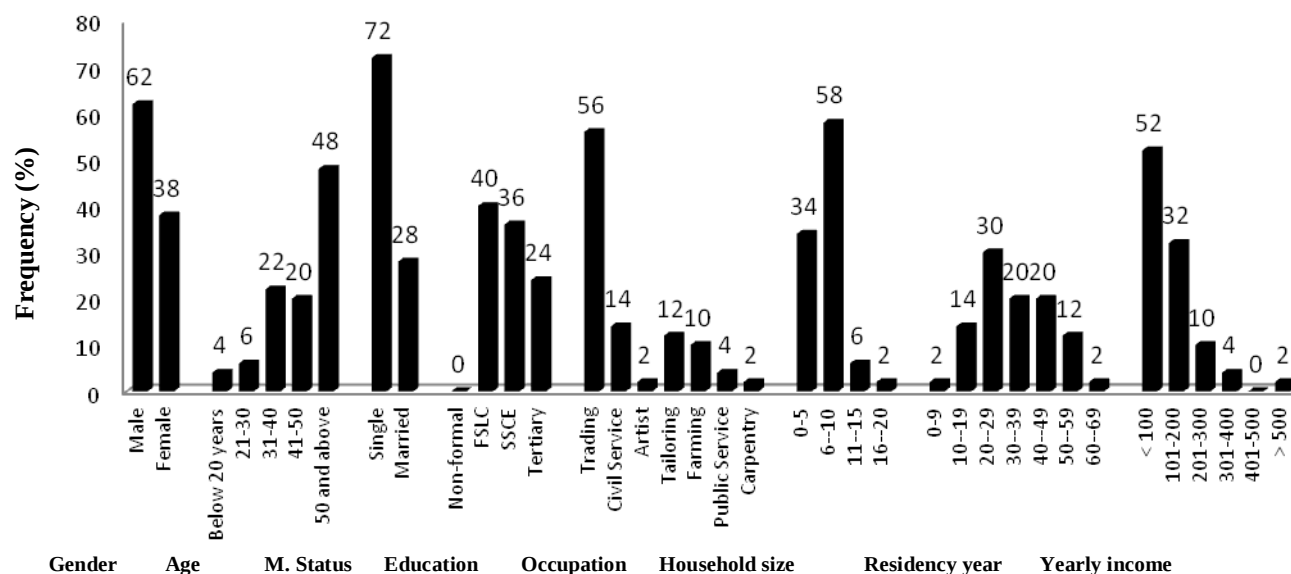


Figure 2: Demographic characteristics of respondents in the study area.

counterparts (because married people save much higher portions of their income and accumulate more assets). In addition, married household heads have significantly higher wealth than other types of household heads and is associated with a higher probability of attaining affluence over the course of life than the single household head (Hirsch et al., 2003). Married household heads pool their incomes and more frequently save for children's futures. They spend less time and less of the family's money outside their homes. According to Waite and Gallagher (2000), marriage generally add a potential earner to the household and increase the economic well-being of members of the family. Therefore, this result suggests the presence of a reduced well-being of households in the study area, as there are more single respondents than the married ones.

Educationally, majority (40%) of the respondents in the study area had attained primary education, followed by secondary and tertiary education with 36 and 24%, respectively. This implies that all the respondents in the study area are literate (Figure 2) with a mean number of years spent in school being 10.52 ± 3.89 years. This schooling years falls under post-primary level of education and is higher than 6.696 years recorded for most household in Nigeria National Parks support zone communities (Jacob, 2017), and 4.89 years reported for most of rural households in Uganda (Uganda Bureau of Statistics 2002; Balikoowa, 2008). The high literary rate in the study area agrees with the report of Olawuyi and Adetunji (2013), Jacob et al. (2013), Silver et al. (2015) and Oluwatusin and Sekumade (2016) that majority of the households in the rural areas in the country have had formal education.

Formal education according to Njoku (2000), Anyanwu (2013) and Jacob et al. (2013) has the potential for making

up of some of the deficiency in non-formal education and positively influence the adoption of innovation. It opens up better employment opportunities for people, thus, diverting them from agricultural and other subsistence activities (Hedges and Enters, 2000). The higher social status of the educated, government or private sector employees may also restrict their involvement in forest dependent activities since they can afford the modern type of lifestyle for example, using gas stoves or electricity for cooking (Lepetu et al., 2009). Also, with their level of education, the respondents possess the ability to participate effectively in resource management decisions of the community forest to ensure sustainable conservation of the forest resources while also meeting the needs of their households (Emelue et al., 2014).

Occupationally, majority (70%) of the respondents were traders, followed by civil servant (18%), while 12 and 10% were engaged in tailoring and farming as their main occupation. Only 2% of the respondents were engaged in carpentry works and arts jobs respectively. The result therefore reveals the relative importance of trading as the main occupation and the largest employer of labour in the study area. The high rate of trading in the study area disagrees with the report of Chianu et al. (2004), Tumusiime (2006), Manyong et al. (2006), Balikoowa (2008), Badmus et al. (2009) and Olayide et al. (2009) that agriculture is the dominant livelihood activities of rural communities in Nigeria.

The result in Figure 2 indicate that 58% of those sampled had a household size that comprised 6 to 10 members, followed by those with ≤ 5 members (34%), while those with 11 to 15 members and 16 to 20 members made up 6 and 2% respectively. From the result, it is evident that

Table 2: Z-Test for contribution of community forest to overall rural household income.

Income source	Total	%	Mean	Std. deviation	Std. error mean	t	df	Sig.
forest income (₦)	468000.00	7.89	9360.00	34509.058	4880.318	-2.112	49	**
Non-forest income (₦)	5462000.00	92.11	109240.00	75847.056	10726.394			
Total (₦)	5930000.00	100.00	118600.00					

** = $p < 0.05$, \$1 = ₦360.00.

household size in this study area is fairly large with an average of 10 members. This is expected to have a multiplier effect on the income status of the respondents. Household size in the study area is much higher than the national average of 3 and also higher than 5 persons for most rural areas in Nigeria. This agrees with the report of Olorunsanya and Omotesho (2011), Javed and Asif (2011) and Oluwatusin and Sekumade (2016) that rural areas are characterized by large family sizes with the family size ranging between 1 to 20 members per household. This could probably be as a result of the polygamous nature of most male-headed households in the study area (Olorunsanya and Omotesho, 2011).

The years of residency of the sampled respondents in the study area shows that 30% of the respondents have lived in the area between 20 to 29 years, followed by those who lived between 30 to 39 and 40 to 49 years who made up 20% of the respondents respectively, 14% lived between 10 to 19 years, while 12% had resided in the study area for 50 to 59 years. The respondents with the least years of residency were those who lived less than 9 years and 60 to 69 years with 2% respectively. According to Shackleton and Shackleton (2004), years of residency of a household in a study area has a significant effect on the income of households because the more their number of years in the area, the more their chances of getting involved in the collection of forest products and the more their diversification of income sources.

Income level of the respondents indicates that more than half (52%) of the total respondents earn a yearly income of less than ₦50,000.00, 32% earned between ₦51,000.00 and ₦100,000.00, 10% earned between ₦101,000.00 to ₦150,000.00 and 4% earned between ₦151,000.00 to ₦200,000.00 while no household had an income class of ₦201,000.00 to ₦250,000.00, only 2% earned an income that is greater than ₦250,000.00. The mean annual income of the sampled respondents was ₦118,600.00±99364.72. This result implies that the income level of respondents is low considering the average household size of 6.78 ± 3.18 in the study area. Members of the sampled households survived on less than \$1 (approximately ₦360.00) per day indicating there is poverty incidence in the study area. According to Oluwatayo (2009), income per capita of a household is low if the household is surviving on less than \$1 (₦360) per head daily for households in developing countries (as Nigeria).

Contribution of community forest to overall rural household livelihood

Table 2 shows the contribution of Ikot Ondo community forest to the total income of household in the study area. A total of ₦5,930,000.00 was earned as an annual income of respondents in the study area with a mean annual income of ₦118,600.00 per respondent. Analysis of forest contribution to the total income of the respondents indicate that forest income contributed to only 7.89% (₦9,360.00/respondent) of the total income while non-forest income amounted to 92.11% (₦109,240.00/respondent) of their total income. Further analysis was carried out using Z – test to determine if there is significant difference between the incomes earned from the forest and non-forest incomes. The result of the analysis (Table 1) indicates that the Z-test was significant at 5% ($P < 0.05$). This implies that there is significant difference between the income earned from the community forest and those earned from non-forest income in the study area. The aforementioned result is in line with the observations of Jacob et al. (2016, 2015), Daniel et al. (2016), Udeagha et al. (2013) and Fonta et al. (2010) that rural communities in Nigeria also derive their household income from resources exploited in the forest. However, the contribution of the community forest to the total income of the households in the study area is lower than the 18.6% reported for rural household's dependent on Ngong Forest in Kenya (Mwera, 2014). It also did not agree with earlier studies such as Vedeld et al. (2004), Fisher (2004), Cavendish (2003) and Angelsen and Wunder (2003) who reported that forest dependence and environmental income is relatively more important for the poor. The results of the study indicate that the households in the study area are poor, living below the bench mark per capita income of \$1 (₦360.00) per day and yet their dependence and income from the forest is very meagre. This therefore leaves much to be explained by the scenario. It is either the bench mark of qualifying a household to be poor which does not necessarily apply to the study area or the community forest degraded and as such cannot provide the needed resources to the people; there is regulated use of the forest or the households are rich and therefore do not necessarily depend on the forest for their survival. According to Vedeld et al. (2004) observation, only poor households rely more on the forests for their survival as opposed to the rich households who

Table 3: Dependence of rural households on the community forest.

Impact question	Total	Mean	Significance
Fuel wood	168	3.36	**
Fodder	107	2.14	ns
Timber	147	2.94	ns
Bamboo stem	151	3.02	**
Rope stems	83	1.66	ns
Vegetables	105	2.1	ns
Medicinal plants	130	2.6	ns
Clay	72	1.44	ns
Thatching grass	80	1.6	ns
Wild meat	132	2.64	ns
Building poles	130	2.6	ns
Rattan	78	1.56	ns
Stones / Minerals	69	1.38	ns
Fruits	116	2.32	ns
Mushroom	122	2.44	ns
Palm Wine	86	1.72	ns
Total	1776	35.52	
Mean	111	2.22	ns

= Significance, ns = Not significance.

are at the end of the value chain and benefit from the finished forest products and have other sources of income to rely on. Therefore, forest degradation and overuse hurt the poor more than the non-poor.

Dependence of rural households on the community forest resources

The result of the analysis of the level of dependence of the rural household on the community forest resources (Table 3) indicates that there was some level of dependence of the households on the forest for some items/resources and the mean score for each resource used ranged between 1.38 for Rattan and 3.36 for fuel wood. However, only the mean score for fuel wood (3.36) and Bamboo stem (3.02) uses were significant, while the other resources uses were not significant. In general, the total mean scores (2.22) for resource utilization in the community indicated that there is no significant dependence of the sample respondent on the community forest. Individual assessment of the resource utilization or dependence of the respondent indicates that fuel wood and bamboo stem were the most exploited resources in the forest. A further probe indicates that fuel wood was mostly utilized as an energy source in the community for domestic and industrial uses. This agrees with the observations of Chukwu (2001), Ezema (2001), Hafeez (2000) and Ayotebi (2000) that rural areas in Nigeria traditionally relies on fuel woods for both home and industrial uses and for sales to the urban areas.

Madubansi (2003) further documented an 11% increase between 1992 and 2002 in the proportion of households having to purchase fuel wood to meet their needs in the rural villages while bamboo is exploited for roofing and furniture making. The use of fuel wood in the study area could be attributed to its availability and affordability than other sources particularly kerosene which is usually expensive and scares (Nelson et al., 2017; Paul, 2008; Horgan, 2001).

Regression analysis and predictors of ornamental nursery output

As shown in Table 4, the Ordinary Least Square (OLS) model was selected as the model of best fit (the lead model) on the basis of its possession of the highest number of significant variables with appropriate theoretically expected signs and a high value of the coefficient of multiple determination (R^2). The coefficient of multiple determination (R^2) value was 0.8067. This indicates that all the regressors included in the model explained about 80.67% of the variations in forest dependence among the households in the studied area. The F-statistic of 14.42 was highly significant at ($p < 0.01$) and indicated that the regressors included in the model had a positive impact on the forest dependence among the households in the studied area. Farm dependence and non-farm dependence of household incomes were significant at $p < 0.01$, while age of household head and distance of the community forest from

Table 4: Regression analysis and predictors of Ikot Ondo community forest dependence.

Variable	Double-log	Semi-log	OLS++
Intercept	0.4013 (0.1184)***	2.1748 (0.3634)***	0.8441 (0.1302)***
Total income	-0.0094(0.0178)	-0.0181(0.0546)	-1.04E-07(2.37E-07)
Household size	0.0183(0.0360)	0.0709(0.1103)	0.0010(0.0053)
Gender	-0.0634(0.0393)	-0.1601 (0.1205)	0.0340(0.0325)
Age	-0.0623(0.0499)	-0.2456(0.1533)	-0.0030(0.0015)*
Education	0.0198 (0.0452)	0.0798(0.1385)	0.0001(0.0056)
Occupation	-0.0957(0.0616)	-0.3055(0.1980)	0.0597(0.05620)
Years of residence	0.0032(0.0374)	0.03470(0.1146)	0.0013(0.0017)
Distance to market	0.0520(0.0422)	0.1871(0.1296)	0.03954(0.0185)**
Farm income	-0.7021(0.1284)***	-2.1805(0.3938)***	-0.7968(0.1147)***
Non-farm income	-0.9654(0.1298)***	-2.9530 (0.3983)***	-0.9806 (0.1092)***
Marital status	-0.0095(0.0528)	-0.0290(0.1620)	*0.0134(0.0508)
R-square	0.7769	0.7767	0.8067
Adj. R-square	0.7123	0.7120	0.7509
F-statistics	12.026***	12.0128***	14.4253***

***, ** and * represent 1, 5 and 10% significance levels, respectively. Figures in parenthesis are t-ratios. ++ = lead model.

the household compound were significant at $p < 0.10$ and $p < 0.05$ respectively (Table 4).

Age of household head with a negative coefficient (-0.0030) and significance at $p < 0.10$ conformed to the *a priori* expectation. The negative sign implies that an increase in age of respondent would lead to a decrease in forest dependence. This observation agreed with the finding of Lepetu et al. (2009) that young people are more dependent of the forest for its resources than elderly people. This can be attributed to young people having multiple uses of the forests and forest products collection being labor intensive. Also, the elderly people do not necessarily take the risk of going into the forest to undertake forest activities particularly those that are strenuous and time staking to carry out (Kohlin and Parks, 2001) and because the age of the household head is related to the household's experience in managing common resources as well as, accumulation of social capital (Mwera, 2014).

The variable farm income conformed to the *a priori* expectation as it showed a negative (-0.7968, $p < 0.01$) relationship with forest dependency. This implies that households with high agricultural income are less dependent on the community forest. This is in line with the study of Adam and El Tayeb (2014) and Gunatilake (1998) observations who reported agricultural income to have a negative impact on forest dependency in Sarf-Saaid reserve in Kenya and Sinharaja community forest in Sri Lanka, respectively. Agriculture constitutes the main source of income for rural households in Nigeria as majority of the rural dwellers are farmers (Badmus et al., 2009; Falusi and Adeleye, 2000). Hence, households who are poor with little

agricultural income are prone to more dependence on the forest.

Non-farm income also showed a negative (-0.9806, $p < 0.01$) relationship with forest dependency and agreed to *a priori* expectation. This is in line with earlier studies conducted by Babatunde and Quim (2010) and Ogbanje et al. (2015) who reported that off-farm income is becoming an important component of livelihood strategies among rural households in most developing countries as a result of less dependency on the forest, the declining farm income and the desire to insure against agricultural production and market risk. The share of off-farm income in total household income is also expected to increase substantially in the coming years, especially in sub-Saharan Africa where increasing population growth, forest destruction and limited agricultural resources are threatening the growth of the agricultural sector and forest dependence (Hagblade et al., 2007; Babatunde, 2015).

The coefficient for distance to market place was positive (0.03954, $p < 0.05$) and did not conform to the *a priori* expectation. This implies that an increase in distance to the market place to sell or buy a product will also increase dependency on the community forest. Inability to access the market to sell due to long distance reduces household income. This agrees with Babatunde (2008) observation that households in rural areas of Kwara State, Nigeria who were located 1 km away from market centers had their income reduced by ₦1,800.00. Adam and El Tayeb (2014) also reported a negative relationship between market access and forest dependence. Local communities tend to depend less on forest resources when they are integrated with the outside market but people living in communities

which are isolated and have limited access to external markets and infrastructures are prone to poverty and will continue to depend on the surrounding forests for their livelihoods. The communities which have access to markets have a wide range of opportunities such as employment and trading to increase their income. This also supports the argument of Cavendish (2000) and Angelsen and Kaimowitz (1999) that households with higher income are less dependent on the forest.

The other variables such as total income, household size, gender of household head, education, occupation, years of residence and marital status of household heads which were insignificant do not imply they contribute to household dependence on the forest but their contribution is only marginal. The positive coefficient of gender implies that male gender are more dependent on forest resources (Adam and El Tayeb, 2014), while the negative coefficient of total income suggest that households which have higher income are less dependent on forest resources.

Conclusion and recommendations

Forest dependence in the study area is very low except for firewood and bamboo which were collected for subsistence use. The result of the multiple regression analysis showed that age of household head, distance to market, income from the farm and off-farm significantly influenced household dependence on the community forest. The study recommends strengthening agroforestry systems in the study area together with woodlots establishments to help in minimizing the pressure of extracting firewood and bamboo from the community forests. It also stresses the need for all tiers of government to intensify their efforts in providing more investment and development in the rural areas by improving, localizing and building on the existing livelihood strategies of the people as this further help in reducing poverty and forest dependence.

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