Forest extraction income participation and return analysis in south-western Nigeria

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Abstract

This study investigates the determinants of participation of poor rural households in forest resources extraction income and return to such enterprises in South-western Nigeria. A multi-stage random sampling approach was adopted in selecting the respondents' sample for the study. A total of four hundred and fifty households were interviewed with the aid of structured questionnaires. The data indicate that plank marketing, vegetables selling, furniture making, fuel wood, fruit and charcoal marketing were found to be prominent relative to total sampled population while bush meat selling, dried fish selling, broom selling, honey selling, wood craft trading, snail selling, medicinal plants selling, pole and leaves marketing in that order were moderately prominent. Also, gum, dye, fibre, insect and spices marketing were the least prominent. The study also suggests that five policy driven variables such as education, marital status, household size, forest access and forest management laws have a significant effect on the household participation in forest-related businesses. Gross Margin for the enterprises was 48.5 meaning that FREs has the potential of returning 48.5% profit of the total investment worth to the households on monthly basis. So, policy conception and application that will enhance the value chain for these businesses is expected to boost forest related enterprises returns in the study area.

Keywords: Forest income extraction; rural household; gross margin; logit model, South-western Nigeria

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1. Introduction

Majority of rural households in most parts of Sub-Sahara Africa considered forests as a key source of their livelihood whether as sources of food, medicine, shelter, building materials, fuels and cash income (Richardson et al*.,* 2011). It is estimated that more than 15 million people in Sub-Sahara Africa earn their income from forest-related businesses such as timber, fuel wood and charcoal sales, roof thatching materials, construction poles, honey, mushroom, resins, fish, insects, fruits and nuts, medicinal plants, small-scale saw-milling, commercial hunting, handicraft production, forest tree extracts such as bark, roots, tubers, leaves, flowers, seeds, from trees and other wild plants, and by hunting wild animals, for sale and consumption (Kaimowitz, 2003:46) as cited in Richardson et al. (2011:1). The author further maintained that the world food security goal relies on the integrity of forests mostly because of the dependence of the poor on forest resources.

Individuals living in the neighbouring forest communities explore the potentials of forest products to smooth income and consumption; they may act as a source of natural insurance or safety net, and may help the household to cope with challenges of poverty, insufficient or loss of agricultural yields, natural disasters, and other unfavourable circumstances associated with high-risk rural environments (Paumgarten, 2005).

In addition, forest and forest trees are sources of a variety of foods that complement agricultural produce (Inoni, 2009). Preponderance of rural and urban households in developing countries are dependent upon forest flora and fauna to meet part of their nutritional needs. Though, forest foods not often provide the bulk of staple items that people eat; but they add variety to diets, improve palatability and provide essential vitamins, minerals, proteins and calories. Similarly, during farming off season when there is occasion of low yields and stored food supplies have diminished and or at the inception of new crops harvest or during emergencies such as floods, famines and droughts, forest foods become major alternative or supplement at such periods (Inoni, 2009).

According to TEEB (2010), forest has both cash and non- cash benefits. Non-cash benefits comprise variety of aids derived from forest which cannot be quantified in terms of direct economic or monetary value. These include; environmental services – ecological services, biodiversity – protection of forest habitat, protection of hydrological services – for irrigation, forest-based tourism, carbon storage and sequestrations, forest multiplier effects etc. Forests thus produce both material and non-material benefits. The author reiterated that the material benefits of forests generally tend to be better recognized among governments and policymakers while the non-cash value of forests are often 'invisible' and not considered in decisions on natural resource use, including land use. For instance, government most often put value on agricultural produce to reflect the economic impact of agriculture in national GDP while failing to recognise the value of non-cash benefits of forests with respect to the land use where the agricultural practices are being undertaken. Hence, governments and others may choose to promote agriculture over forests without recognizing the full costs of these actions in terms of forest cover and environmental and other invaluable benefits provided by forests or to make other decisions that exacerbate resource degradation (TEEB 2010).

Another factor is that forests are under-valued because non-timber forest resources are usually gathered for subsistence livelihood or traded informally and do not register as market transactions that are valued,

with the exception of some commercially valuable products such as medicinal substances and mushrooms, among others. The aggregate value of Non Timber Forest Products (NTFPs) or Non Wood Forest Products (NWFPs) is often substantial but not collected or recorded by national governments; therefore, records on non-cash contributions of forests tends to be impromptu and case-study based, resulting in unreliable data at national and global scales (Barik and Mishra, 2008).

In fact, while attempting to estimate forest contribution to human livelihood; it may be difficult to obtain correct data for policy and developmental plan unless holistic approach is employed to actually take into consideration the non-cash contributions of forests to inform governments and policymakers on the true value of forest resources. Part of such holistic approach includes cross-sectoral policies that encourage sustainable forest management and incorporate economic and livelihood objectives towards recognizing the non-material benefits of forests. For example, carbon storage and sequestration schemes seek to mitigate the contribution of tropical forests to global warming either by reducing forest degradation and deforestation or via reforestation or some combination of both such as REDD+ and others, represent policies that recognize the environmental protection functions of forests (Barik and Mishra, 2008).

According to Balmford et al. (2011), political attention has however begun to focus on the role of forests in climate change mitigation, but the awareness of the role of forests and their non-timber, non-wood values and their environmental service and recreation values are still very low and grossly under-valued. A good example is forest-based tourism such as Campfire Project in Zimbabwe; the Annapurna Conservation Area Project in Nepal; International Ecotourism Operations in Ecuador; and Nationally Dominated Tourism to Forest Areas in Brazil. This added substantial value to the livelihood of not only the local people where these natural tourisms are situated but also in terms of image boosting, multiplier effects to the nationalities of such places, while not minding the direct and indirect economic benefits to the places concerned.

So, valuation methodologies that reflect forest goods and services represent yet another avenue for recognizing the material and non-material benefits of forests (Balmford et al., 2011). Similarly, national accounting that incorporates data on forest products related to environmental and recreation services and fodder, food, fuel and medicinal values would facilitate better documentation of the full value of forests. Another option to enhance the non-cash benefits of forests is to ensure sustainable financing that promotes a broad view of sustainable forest management, including the cultural, environmental, provisioning and recreational benefits of forests. Some countries have adopted national forest programs on sustainable forest management or are in the process of developing or revising policies to reflect sustainable forest management goals include Brazil, Cameroon, Cyprus, Finland, Ghana, Jamaica, New Zealand and the Philippines United Nations Forum on Forest (UNFF, 2013).

According to UNFF (2013), although the mixture of cash and non cash benefits from both timber and non timber forest products constitutes the economy of the household, but there is a great deal of social variation in income opportunity – among rural households in terms of restriction of certain class of people to extract some forest products (e.g. timber). That is, there is a socio-economic discrimination on access to some forest resources by some rural households.

Besides, data on profitability index of forest related enterprises among rural households is also somewhat sketchy (Neumann and Hirsch, 2000). This has therefore created a major concern and it is against this backdrop, this study aims at investigating the determinants of participation of poor rural households in forest resources extraction income. That is, the issues surrounding the discrimination associated with the commercialization of forest products should be investigated so that there will be appropriate formulation of policies that will enhance the chances of the rural poor who formed the majority of Nigerian population on access to forest resources in order to reduce poverty in the land. Also, the study goes further to estimate the return (profit) to forest-related enterprises, within the context of the vulnerable group of rural households in South- western Nigeria.

Moreover, in line with the above stated objectives, the study provides empirical answers to the following questions such as: (i) what are the various forest related enterprises that rural households are engaging in the study area? (ii) what are the determinants of forest income participation in the study area? (iii) what are the economic contributions of FREs to the rural households' income in the study area?

2. Related literature

According to Kozak (2007) cited in UNFF (2013), the world of forestry is complex and multifaceted, comprising numerous business structures and spanning both the formal and informal sectors of the economy. Forest-based enterprises serve ever widening groups of customers and end-users with a vast array of forest-based products and services and are significant contributors to employment and economic well-being around the world. As such, they are seen to be important elements of strategies aimed at pro-poor economic growth in developing regions, especially in the tropics where extreme poverty conditions are widespread, high quality forest resources are abundant, and domestic markets are growing in importance. But like that for NTFPs, it is hard to gather precise records on small and medium forest enterprises (SMFEs). While it is difficult to quantify the economic contributions that SMFEs make, it is estimated that more than 20 million individuals are employed by such enterprises (Alao and Kuje, 2012:50). It is also known that these numbers are much higher – perhaps six or seven fold – when the ubiquitous informal sector that exists in developing economies is taken into account (Kozak, 2007:7). It is disturbing, the reason why the economic contributions that SMFEs provide have not yet been enumerated and why this sector is oftentimes overlooked in development strategies (Kozak, 2007). Although, Nketiah et al. (2011) asserts that SMFEs offer job opportunities to a large proportion of Ghana's population and serve as a main, additional or alternative income source for at least 3 million people in the country. Nketiah et al. (2011) as contained in UNFF (2013:63-64) estimates that tens or maybe hundreds of thousands of people are employed in the wood fuel production and trade industry. In the same vein, Osei-Tutu (2010) states that the timber and furniture industries employing 17,000 chainsaw milling crews, with an average of 6 people in each operation; 264,000 people involved in the chainsaw milled lumber-haulage sector; 21,000 people involved in chainsaw lumber, 1,300 chainsaw lumber brokers, each of which engage about 3 people; and 30,000 small scale carpentry firms employing about 200,000 people. Also, considering the efficacy of non-timber forest products as one of

the large employers of labour in Ghana, about 600,000 women in shea butter collection and 300,000 local bush meat hunters are adequately engaged (Obeng et al., 2012; UNFF, 2013:63-64).

Fredericks et al. (2012) in the same manner estimated about 750 formal SMEs in Guyana's wood based sector, including forest extraction companies, sawmills, charcoal licensees, firewood producers, furniture manufacturers, timber and saw-pit dealers. About 90% of SMFEs are either individually or family owned most of which focus on the local market. SMFEs cover 31% of the productive forest area but employ 75% of employees in productive forest concessions which translate into 50% of government generated revenue.

Globally, according to Shackleton et al. (2011), forest enterprises offer an estimate of 45 million formal and informal employment, and approximately 0.5 to1 billions farmers who grow farm trees or manage "remnant" forests for subsistence and cash income are being engaged. While Macqueen (2008) corroborates these statistics, he states that SMFEs contribute more than 50% of forest-related jobs in many developing countries, and that more than 45 million people manage or work for forest enterprises worldwide (see Estruch et al., 2013:3).

Kozak (2007:10) declared that SMFEs is a key source of employment and revenue in developed and developing countries. Contrary to the declining trend in global employment rate in relation to wood processing industries, United State household wood furniture sub-sector and the Swedish sawmilling sub-sector remain stable and rising. He thus estimates that SMFEs employ more than 20 million persons worldwide and projected that the figure could be as high as 140 million if the informal sector is included. He estimates that SMFEs contributed over US $130 billion of gross value-added in the US and over 37.4% of total employment in the sawn wood products processing sector. He also noted that this statistics has the tendency to be increasing for firms with less than 100 employees and particularly those with less than 20 employees.

Furthermore, the European Union (EU) estimates that 90% of forestry industries employ fewer than 20 workers. EU thus based its estimate on the findings of Macqueen (2007) on the number of SMFE employees as a total of forestry employment was: 49.5-70% in Brazil, 50% in China, 75% in Guyana, 97.1% in India, 25% in South Africa, and 60% in Uganda. According to Kozak (2007); Alao and Kuje (2012:50), the growth of small SMFEs is outstripping medium SMFEs as they noted high growth in the value-added sector and low growth in the commodity sector due to competitiveness, economies of scale and high capital requirements.

Alao and Kuje (2012:53) posited that the viability of SMFEs such as furniture industries is very enduring. This has been succinctly shown by the outcome of their findings on economies of small-scale furniture production in some part of northern Nigeria. The study found that small-scale furniture production in the study area is profitable because of its high rate of return on investment (that is, RORI of 3.29%), thus for every one naira invested in furniture production in the study area N3.29 will be realized as profit which is an indication that the venture is viable.

3. Methodology

3.1. Study area

This study was carried out in Nigeria. It is situated in the West African region and lies between longitudes 3 degrees and 14 degrees and latitudes 4 degrees and 14 degrees. It has a land mass of 923,768 sq.km [Central Intelligency Agency (CIA), 2009a] cited in Agunwamba et al. (2009:7-8). Nigeria is bordered by Benin, Cameroon, Chad, Niger and 853km of coastline on the Gulf of Guinea, the Federal Republic of Nigeria covers 910,768 square kilometres of land in West Africa. Northern plains contrast with lowlands in the South-west, mountains in the South-east and central hills and plateaus (CIA, 2009). It is also Sub-Saharan Africa's most populous country and has a population of around 183,583,614 million people (7th most populous in the world) with almost 64 percent of the population living in the rural areas with farming as their primary occupation (NPC, 2015). The country is divided into two patterns of savannah to the north and forest to the south. According to the U.N. FAO (2010), 9.9% or about 9,041,000 ha of Nigeria land is forested. Nigeria had 382,000 ha of planted forest. Change in Forest Cover: Between 1990 and 2010, Nigeria lost an average of 409,650 ha or 2.38% per year. In total, between 1990 and 2010, Nigeria lost 47.5% of its forest cover or around 8,193,000 ha. Nigeria's forests contain 1,085 million metric tons of carbon in living forest biomass (U.N. FAO, 2010) cited in Agunwamba et al. (2009:7-8). Formally, Nigeria has six regional zones: North - east, North- west, North- central, South-east, South- west and South-south. Specifically, the study was carried out in South-western region of Nigeria. It is one of the six geo-political zones in the country (Agunwamba et al., 2009:8). The area lies between longitude 3^0 and 7^0E and latitude 4^0 and 9^0N and thus, west of the lower Niger and south of the Niger Trough. South-west region includes Osun, Oyo, Ogun, Lagos, Ondo and Ekiti states. The total land area is about 191,843 square kilometers (Agunwamba et al., 2009:8).
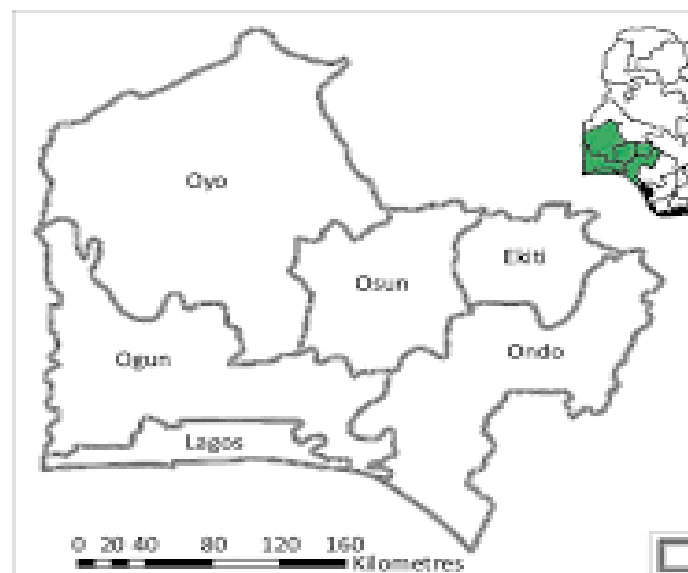
Figure1. Map of South-west Nigeria

3.2. Sampling frame and procedure

A multi-stage random sampling approach was adopted in selecting the respondents' sample (rural forest entrepreneurs) for the study. At first stage, three states were randomly selected from the five states that make up the South-west geo-political zone of the country excluding Lagos state due to its cosmopolitan and less forested nature. In the second stage, Local Government Areas (LGAs) were randomly selected based on proportionate to size sampling method. Therefore, five LGAs were randomly selected in Oyo states out thirty three LGAs while eight were randomly selected in Ogun state out of twenty one LGAs and five were randomly selected from thirty LGAs that make up of Osun state totaling eighteen LGAs. In the third stage, twenty-five households were randomly selected from each of the respective Local Government Areas previously selected. A total of four hundred and fifty households were interviewed for the study. Data were collected through the aid of structured questionnaires, which were administered to capture information on individual levels about the contributions of forest income with respect to their livelihood.

3.3. Methodological approaches

3.3.1. Sampling method

The required sample size was determined using proportionate to size sampling method by Anderson et al. (2007) as used by Kangogo (2013).

$$n = \frac{pqZ^2}{E^2}$$

Where n = sample size,

p = percentage of the population,

q= 1-p,

z= confidence Interval ($\alpha = 0.05$),

E = Marginal error. Meanwhile, the proportion of the population is unknown,

p=0.5, q = 1-0.5= 0.5, Z = 1.96 and E = ± 0.046.

$n = \frac{(0.5)(0.5)(1.96)^2}{(0.046)^2} = 450$

3.3.2. Data analysis and empirical models

SPSS computer program was used to profile various forest extraction income being engaged in by the rural households in the study site while STATA program was used to estimate Logit model to determine factors influencing households' participation in forest extraction income. Data for this study were collected from both primary and secondary sources. Primary data were collected using structured questionnaires. Journals, Conference Proceedings and internet were the sources of secondary data.

Descriptive analysis and two empirical models (Logit model and Budgetary analysis) were used to estimate the required variables. Descriptive analysis describes and profiles various forest extraction income

being engaged in by the rural households in the study site. Logit model was used to determine factors influencing the participation of rural households in forest – related enterprises while budgetary analysis was used to estimate profitability index of the enterprises.

3.3.3. Model specification

3.3.3.1. Gross margin

$$GM \% = TR\text{-}TC \div TR \times 100$$

Where GM= Gross Margin as a percentage

TR=Total Revenue

TC = Total Cost

3.3.3.2. Logit model

Logit analysis was employed to know the determinants of forest related enterprises participation in the study area. The model measures the parameters on the conditional probability of being a woodcraft entrepreneur, assuming a non-normal distribution of being such an entrepreneur. The implicit relationship between the binary status variable (W_i) and its determinants (Q_i) is specified as:

$W_i = B_i Q_i + v_i$

Where W_i = 1 for X_i d. Z, O otherwise; I = 1 -------- N

Q_i is a vector of explanatory variable and β is the vector of respective parameters. The logit procedure computes in maximum likelihood estimation of β given the non-linear probability distribution of the random error v.

The Logit model is estimated in the form:

$$L_i = L_\cup \left[\frac{P_i}{1 - P_i} \right] = \beta_i + \beta_2 X_i$$

Where L_i = log of odds ratio (logit)

P_i = Probability of participation

1 - P_i = Probability of not participation

B_i = Intercept

B_2 = Slope (co-efficient)

X_i is a vector of explanatory variables and is described as follows:

X_1 = Age of respondent (in years)

X_2 = Gender of respondent (Dummy, Male = 1, Female = 0)

X_3 = Marital Status (single/widow/separated = 0, married =1)

X_4 = Educational level (years of education)

X_5 = Household size (in numbers)

X_6 = Forest income per month (in naira)

X_7 = Labour cost (in naira)

X_8 = Forest access

X_9 = Forest management laws (Community = 1, Government = 0)

X_{10} = Forest enterprise (Formal = 1, Informal = 0)

X_{11} = Market access (Available = 1, Not available = 0)

4. Results and discussion

4.1. Sample households' profile of various forest related enterprises

Table 1 profiles most of the various forest-related enterprises that rural households are undertaking in the study area as captured by this study. Although field experience reveals that some of the forest-based entrepreneurs do combine several forest products for sales. For example, medicinal plants marketers offer a lot of Non Timber Forest Products (NTFPs) such as various plants roots, leaves, barks and seeds as traditional herbs and medicine; snails; insects and animals, honey among others.

Table 1. Profile of various forest related enterprises, sample households

Forest Related Enterprises (FREs)	Total	Poverty index					
		No. of (Extremely Poor)	% of (Extremely Poor)	No. of (Moderately Poor)	% of (Moderately Poor)	No. of (Non Poor)	% of (Non Poor)
Plank	76	4	5.3%	33	43.4%	39	51.3%
Mat making	15	6	40.0%	5	33.3%	4	26.7%
Furniture	49	11	22.4%	18	36.7%	20	40.8%
Wood craft	28	8	28.6%	8	28.6%	12	42.9%
Charcoal	41	16	39.0%	15	36.6%	10	24.4%
Fuel wood	47	17	36.2%	20	42.6%	10	21.3%
Paste & mortar	17	4	23.5%	5	29.4%	8	47.1%
Chew stick	18	8	44.4%	5	27.8%	5	27.8%
Bush meat	37	1	2.7%	21	56.8%	15	40.5%
Snail	26	4	15.4%	16	61.5%	6	23.1%
Fish	33	11	33.3%	11	33.3%	11	33.3%
Fruit	44	12	27.3%	16	36.4%	16	36.4%
Medicinal plants	25	7	25.0%	15	53.6%	6	21.4%
Gum	1	1	100.0%	0	0.0%	0	0.0%
Broom	32	6	18.8%	22	68.8%	4	12.5%
Poles	21	3	14.3%	9	42.9%	9	42.9%
Locust bean	10	4	40.0%	2	20.0%	10	40.0%

Insect	7	2	28.6%	4	57.1%	1	14.3%
Spices	10	2	20.0%	7	70.0%	1	10.0%
Leaves	20	6	30.0%	14	70.0%	0	0.0%
Mushroom	11	6	54.5%	4	36.4%	1	9.1%
Honey	29	6	20.7%	12	41.4%	11	37.9%
Cane	24	1	4.2%	17	70.8%	6	25.0%
Vegetables	63	15	23.8%	29	46.0%	19	30.2%
Fibre	5	0	0.0%	4	80.0%	1	20%
Local wine	18	5	27.8%	7	38.9%	6	33.3%
Dye	5	3	60.0%	2	40.0%	0	0.0%
TOTAL	**400**	**92**	**23%**	**171**	**42.75%**	**137**	**34.25%**

Source: Calculated by the authors from the field survey 2016

However, following the method of classification of poverty adopted by Sen (1981) as used by Aiyedogbon (2012) and Dubihlela (2014), households are classified into extremely poor, moderately poor and non poor based on their poverty index measures. There are two approaches (monetary and non-monetary indicators) through which this poverty categorization can be measured (Coudouel et al., 2002; Adekoya, 2014:329).

However, the most common indicators used in practice are based on household consumption expenditure and household income. The study adopts the standard practise of using per capita consumption expenditure as a measure of living standard as used by many authors such as Okunmadewa et al. (2005); Olaniyan and Bankole (2005); Oni and Yusuf (2006) and Addae-Korankye (2014) in most poverty studies in Nigeria. Example here is *setting the two-thirds of the mean per capita households' expenditure* (see Rogers 2015). Having set this, any household whose per capital consumption expenditure is below this poverty line is regarded as poor while those above it are considered non-poor. Further, households whose per capita expenditures are less than one-thirds of the total households' per capita expenditure are regarded as extremely poor while those households with average monthly expenditures greater than one-third of total households' expenditure but less than two-thirds of the total households' expenditure are considered moderately poor (see Sen, 1981; Aiyedogbon, 2012; and Dubihlela, 2014).

Based on the above explanation, households' poverty classification was based on their per capita consumption expenditure and the prominence rate (in terms of income generation and size of the business) of various FREs they engage in. Therefore, Table 2 reported that plank marketing, vegetables selling, furniture making, fuel wood selling, fruit and charcoal marketing were the most prominent FREs relative to total sampled population while such households in this category are considered to be non-poor[1] (NP). Likewise, bush meat selling, dried fish selling, broom, honey, wood craft, snail, medicinal plants, pole and leaves marketing in that order were moderately prominent and the households who participate in the

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[1] *Households are considered non poor since their per capital monthly expenditure is equal to or greater than the pre- determined poverty line of N 18,331*

₦18331 *set as poverty line for the study area (South-western Nigeria) was calculated by dividing total households' monthly per capita expenditure by total households' size. Then, the two third of the answer was calculated. It coincidentally matched the present Nigerian workers' minimum wage (2016). Survey data are almost always related to households, so to measure poverty at the individual level, we must make a critical assumption that all members of a given household enjoy the same level of well-being.*

moderately prominent FREs are ranked moderately poor (MP) households. On the other hand, gum, dye, fibre, insect and spices businesses were the least prominent whose marketers belong to extremely poor households (EP). Further, Table 2 thus revealed that 137 FREs households (34.25%) of the total sampled households were non poor, 171 FREs households (42.75%) were moderately poor and 92 FREs households (23%) were extremely poor in the study site.

4.2. Determinants of participation in forest extraction income

Table 2 presents the estimated parameters and the statistically significant variables explaining the participation rate of rural household in forest extraction income. The diagnostic test as shown in Table 2 records a log likelihood of about 59.34 reporting the log likelihood of coefficients estimates assuming that they are normally distributed. Chi-squared test was significant at 1% suggesting that the model had a goodness of fit to the observed variables and there is a high degree of association between the dependent and independent variables. Also, the test reports R^2 of about 0.261 suggesting that the explanatory variables were about 26% relevant in explaining the participation decision in forest-related enterprises. Furthermore, five key policy driven variables were statistically significant at 1% and 5% levels of significance. These include: education, marital status, household size, forest access and forest management laws. This therefore suggests that education, marital status, household, forest access and forest management laws have a significant effect on the choice of participation of the household in forest-related business.

Table 2. Determinant of rural households' participation in forest extraction

Variable	Coefficient	Standard Error	Z	P-value
Constant	-0.8906	1.6653	-0.53	0.593
Age	0.3719	0.3896	0.95	0.34
Sex	-1.0155	0.6034	-1.68	0.092
Marital status	0.8400**	0.3791	2.22	0.027
Education	0.6799**	0.2972	2.29	0.022
Household size	0.1802**	0.0717	2.51	0.012
Forest income	3.72E-06	3.47E-06-	1.07	0.283
Labour cost	-0.2307	0.1867	-1.24	0.216
Forest access	1.5008***	0.5407	-2.78	0.006
Forest Mgt. laws	-1.2775**	0.5329	-2.4	0.017
Forest enterprises	-0.3522	0.6618	-0.53	0.595
Market access	0.4231	0.67881	0.62	0.533
Log likelihood =	-59.340			
χ^2	41.91			
Probability of χ^2	0.0007***			
Pseudo R^2	0.261			
N	223			

***, ** Significant at 1% and 5% respectively / Source: Calculated from field survey, 2016

The statistical coefficient of marital status shows a positive and significant relationship with participation rate by a very large magnitude of 84%. In particular, being positively signed, it indicates that married households are more likely to participate in forest extraction about 84 times more than non married households. For the former class, most of the respondents in the region who engage in one FRE or the other confirmed that they inherited the business from their parents as a family job. So, majority of them have been engaging in the businesses even before they got married. Similarly, the positive relationship between marital status and participation in FREs may not be out of place since marital status has a strong connection with raising of children which could later become a source of family labour that will support forest products extraction activities to boost the family income. Besides, wives in most rural households do normally assist their spouses in both economic and domestic activities which would enhance their choice of participation than single households. Faleyimu and Agbeja (2004) recorded similar submission where about 96.88% of the respondents participating in wood carving were married while 3.12% were single.

Similarly, the coefficient of educational level of household head is positive and significantly associated with the probability of participation in FREs by magnitude of 68%. This implies that households' head years of education has the likelihood of influencing the choice of participating in forest extraction to a large extent. It is plausible because educated households' heads may apply some entrepreneurial skills and marketing strategies to their advantages across the entire value chain of the business. This is quite in agreement with the findings of Jumbe and Angelsen (2007) in Malawi who recorded that more educated households have higher share of forest income and participate in forest businesses by a magnitude of 90% than uneducated households. Although, it runs contrary to the outcome of the findings of Fonta and Ayuk (2013) which stated that the lower the educational level of the household head, the higher the likelihood of participating in forest extraction income in South-eastern Nigeria..

Furthermore, household size is also positive and significant at 5% suggesting that the larger the family size is, the higher the likelihood of rural household participating in forest extraction income activities. This is not surprising, perhaps because forest gathering activities are labour intensive. A larger household would therefore employ the services of its family members in the gathering and marketing activities and such households may derive more resources from using the forest. This is in line with the findings of Jumbe and Angelsen (2007) in Malawi which stated that the larger the household size, the higher the participation rate of the household in forest related income.

In the same vein, the estimated coefficient for forest products access is positive and statistically significant implying that forest products access encourages rural household to participate more since they are likely to access their products without hitch. This is reasonable, and conform with the common notion that an increase in forest products access would improve the participation rate since there would be high potential for increased turnover and would subsequently bring high income to the household. Besides, such households would have greater accessibility to the forest products and less time and less resources would be spent on collecting forest products. This supports the findings of Fonta and Ayuk (2013) which indicated similar submission.

Lastly, forest management laws is negatively associated with forest extraction activities in the study area. This suggests that an increase in one component of forest management laws may likely decrease the participation rate of rural household in forest extraction activities by magnitude of 1.2775. In particular, being negatively signed, it implies that the more stringent those forest management laws are, the lower the tendency to extract forest resources most especially, from the forest reserves. Similar observation was noted by Kaimowitz (2003) who argued that greater enforcement of forest management laws have the potential to negatively affect rural income because such legislation often prohibits forestry activities participation such as small-scale timber production, fuel wood collection, and hunting that millions of poor rural households depend on.

In essence, these findings thus suggest that if households' head education, number of married households, households size and forest access increase while the forest management laws become less stringent, more rural households would be willing to participate in forest extraction activities as all these factors trigger the choices and the rate of participation in FREs in the study area. However, this study did not reveal the significance relationship in other variables such as age, forest income, labour cost, market access and forest enterprise. That is not to say that they are not equally important but as far as the results of this study are concerned, they are less significant even though some of their signs follow *a priori* expectation.
The logistic regression estimate is represented thus:

Log (p/1-p) = - 0.8907 + 0.3719 age - 1.0155 sex + 0.8400 marital status + 0.0799 education + 0.1802 household size - 3.72E-06 forest income - 0.2307 labour cost + 1.5008 forest access - 1.2775 forest management laws - 0.3522 forest enterprise + 0.4231 market access

Where p is the likelihood of the household participating in forest extraction income, the estimate suggest that keeping all other predictors constant a unit increase in marital status, education, household size and forest access, we expect an increase in the log-odds of the level of participation of the household in forest extraction income with coefficients 0.8400, 0.0799, 0.1802 and 1.5008 respectively while a unit increase in forest management laws would decrease the likelihood of household participating in forest extraction income with coefficient of 1.2775 in the study site.

4.3. Gross margin analysis

This section presents Gross margin analysis estimating the profitability index of the forest-related enterprises as shown in Table 3. Gross margin is the difference between revenue and cost of goods sold, or (COGS), divided by revenue, expressed as a percentage. Generally, it is calculated as the selling price of an item, less the cost of goods sold (production or acquisition costs, essentially).That is, Gross margin was calculated by subtracting the costs of goods sold from the total revenue. As in Table 3 for example, if the FREs has ₦710351 in revenue and ₦365744 in costs of goods sold, we would subtract ₦365744 from ₦710351to get ₦344607. Divide the result by the revenue to calculate the Gross margin. Then, express the result as a percentage by multiplying the answer with 100.

As shown above, the budgetary analysis indicates that every forest related entrepreneur on the average, would realize a total revenue of ₦710351 per month. The total variable cost and the total fixed cost were ₦274244 and ₦91500 respectively. The Gross margin was 48.5 as observed in Table 3 which means that FREs has the potential of returning 48.5% profit of the total investment worth to the households on monthly basis. Then, the profitability index of 0.485 implies that for every ₦1 spent by the forest related entrepreneurs in the study area on their respective businesses, 48.5 kobo was realized as profit on the aggregate. This findings gave a strong support for the earlier works by Azeez et al. (2011; 2015) where similar approach was used and 10% and 75% of the total investment worth were realized respectively as profits for any ₦1 spent on the investments. Moreover, the study also conform with the findings of Awe et al. (2012) on Irvingia kernels marketing in Akure, Ondo State which stated that, for every one naira spent by the sellers, there was a return of 65kobo. Similarly, the study equally compares favourably with a study by Okunmadewa et al. (2000) on sun-dried meat trading which had marketing efficiency of 1.14. Another related finding is Alao and Kuje (2012) on economies of small-scale furniture production in some part of northern Nigeria. The study found that small-scale furniture production in the study area is profitable because of its high rate of return on investment (that is, RORI of 3.29%). Thus, for every one naira invested in furniture production in the study area ₦3.29 will be realized as profit which is an indication that the venture is viable. In summary, forest related businesses are profitable ventures with higher market efficiency in South-western region Nigeria.

Table 3. Gross margin analysis

Total Revenue (Total sales and other variations)	TR	₦710351
Total Variable Cost	TVC	₦274244
Total Fixed Cost	TFC	₦91500
Total Cost (Cost of revenue and other variations)	TC = TVC + TFC	₦365744
Gross Income (GI) or profit	GI or π = TR - TC	₦344607
Gross Margin GM %	GI ÷ TR × 100	344607 ÷ 710351×100 = **48.5**
Profitability Index		**0.485**

Source: Computed by the authors, 2016

5. Conclusion

This study analysed forest extraction income participation and returns in South-western region Nigeria. The data indicates that plank, vegetables, furniture making, fuel wood, fruit and charcoal businesses were found to be prominent relative to total sample population while bush meat, dried fish, broom, honey, wood craft, snail, medicinal plants, pole and leaves businesses in that order were moderately prominent. On the other hand, gum, dye, fibre, insect and spices businesses were the least prominent. The study also suggests that five policy driven variables such as education, marital status, household, forest access and forest management

law have a significant effect on the choice of participation of the household in the forest related business. Furthermore, the Gross margin for the enterprises was 48.5 meaning that FREs has the potential of returning 48.5% profit of the total investment worth to the households on monthly basis. Then, the profitability index of 0.485 implies that for every ₦1 spent by the forest related entrepreneurs in the study area on their respective businesses, 48.5 kobo was realized as profit on the aggregate.

6. Policy implications

Arising from the above, policy measure such as micro lending programs, creation and crafting of a veritable market for the products and other incentives to assist the poor forest based entrepreneurs should be given a needful attention and priority.

Likewise, education of the grass root people should be enhanced to facilitate the process of engagement of the rural people in forest extraction business. Furthermore, forest access and forest management laws are two important but conflicting factors determining the choice of household participation because of over dependency on forest resources. However, Government should ensure the creation of robust economic strategies to diversify the means of livelihood in form of alternative income sources for the teeming rural populace. This will ensure some level of equilibrium between poverty mitigation and sustainable forest management.

Finally, forest extraction income was found to be profitable and has higher market efficiency in the region. So, developmental policy conception and application that will enhance the value chain for these businesses is expected to boost the forest related enterprises returns. For example, the Federal Government of Nigeria should launch a proposal such as: "Nigeria Incentive-Based Risk Sharing System For Forestry Lending (NIRSFOL)" through the Central Bank of Nigeria (CBN) with the aim of achieving the linking of forestry value chains and the financial value chain. This is expected to boost the forestry activities through lending from the commercial banks and to also facilitate the processing of such forest products to attract more income to the forest based entrepreneurs.

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