

# Sources and Impact of Income Inequalities among Rural Households: A Case Study of Forest Related Entrepreneurs in South-Western Nigeria

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**Abstract** The study assesses the sources and impact of income inequality among forest related entrepreneurs in the region. A multi-stage random sampling approach was adopted in selecting the respondents' sample while a total of 450 copies of structured questionnaire were administered. Linear regression model was used to determine factors that contribute to inequality while Gini-coefficient was used to determine the degree of income inequality among households. So, an increase in age, market access and labour cost would increase the predicted probability of the income inequality of the forest related entrepreneurs while an increase in forest management laws would decrease it. In terms of impact of forest income on rural households' inequality status, with the inclusion of forest income, there is a relative reduction of about 12.9%, 13.8% and 10.7% Gini coefficient among extremely poor (EP), moderately poor (MP) and non-poor (NP) household categories respectively. The study recommends that more incentives and encouragements should be given to rural forest entrepreneurs to foster improved commercialization and value chain of forest products in the region.

**Keywords** Forest income, Forest entrepreneur, Income inequality, Rural household, South-western Nigeria

## 1. Introduction

The increasing level of income inequality has been a concern to policy makers for a long time in Nigeria. For instance, income inequality has increased between 1980s and 1990s as shown by an increase in the Gini-coefficient from 38.1% in 1985 to 44.9% in 1992 [9, 6]. In 1997, the Gini index for Nigeria was 0.580 [45, 6] whereas the same figure was found by [35] using the 2004 National Living Standard Survey (NLSS) data was 0.580 where the income inequality was found to be higher in rural areas (Gini – 0.58) than in urban areas (Gini – 0.53).

Evidence from the National Bureau of Statistics (NBS) [27] also revealed that inequality in Nigeria increased between 2003 and 2009 both in rural and urban areas and this can be associated to the rising dimension of poverty. This increase was higher in inequality in rural areas (0.37 to 0.41) than in urban areas (0.38 to 0.41), a percentage change of 4% and 3% in rural and urban areas respectively since 2003-2009 [27].

Furthermore, NBS [27] disclosed in the Nigerian poverty

profile 2010 report that as national income inequality increased from 0.429 in 2004 to 0.447 in 2010, poverty incidences were 28.1, 46.3, 65.6, 58.3 and 69 percent in 1980, 1985, 1996, 2005 and 2010 respectively. This relationship is not surprise since income inequality is positively related to poverty, that is, as the inequality rises, poverty rate also increases [26]. As a result of the association between income inequality and poverty, reducing income inequality has therefore become a source of concern for policy analysts and developmental agencies in charge of addressing the twin challenges of income inequality and poverty [3].

Do forests have a role to play? Forests are now largely considered as "safety nets" because people benefit from available natural resources to meet emergency shortfalls and to keep them from being worse off in times of need [8]. The conventional safety net functions of forest holdings are however likely to give way as rural livelihood shifts to a cash-based economy hastened by the rising market systems.

Many people living in and around forest reserves harvest a range of products from forests for sale, trade, or barter, such as wood for timber, fuel wood, roof thatching materials, construction poles, honey, mushroom, caterpillars, and medicinal plants [38]. However, the most lucrative product, timber is predominantly in the hold of governments and the well-off while the least lucrative non-timber forest products (NTFPs) are generally devolved to communities and rural individuals [29]. This inequity in the distribution of

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forest products translates into disproportionate income distribution among forest users despite the multiplicity of benefits offered by forests [17]. This study investigated the sources and impact of income inequality among forest related entrepreneurs in South-western region in Nigeria. In this study, forest related entrepreneurs are rural households that engage in some forest based enterprises such as logging, fuel wood, charcoal, vegetables and fruits, honey, poles, bush meat, rattan, cocoon, gum, broom, locust bean, mushroom, spices, leaves, sticks, chewing stick, snails, cane, fibre, local wine, dye, paste and mortar, wood crafting, furniture making, basket weaving among others.

Specific objectives to achieve this goal include: (i) determining factors that influence income inequality among rural households and (ii) determining the impact of forest related activities to income inequality among rural households in the study area.

## 2. Empirical Framework of the Study

Quite very few studies have been conducted on the contributions of forest income in sub- Sahara Africa. Out of such few, the results seem to be inconclusive. For instance; in Zimbabwe, poverty and inequality measures were calculated with and without forest income and the results showed that when calculated without forest income, poverty and inequality can be increased by as much as 98% and 44% respectively, depending on the poverty line and measure used [10]. Also in Southern Malawi, [18] found that by excluding income from forestry when measuring inequality, income inequality in the region increases by as much as 12%.

In Malawi as well, [23] found out that forest income has contrasted welfare impacts across study villages and that forest dependence is poverty neutral. Likewise, [25] found quite a mixed results on the role of forest resources in income inequality in Cameroon. For instance, in terms of logging, overall contribution of forest income increases income inequalities by 3% while income from gathering and hunting activities on the contrary contributes to reducing inequalities. In Northern Ethiopia, [7] found that, including forest environmental incomes in household accounts showed that there was significant decrease in rural poverty and income inequality. This was corroborated by the study in the Democratic Republic of Congo by [28] who also found out that Gini coefficient rose significantly when forest income was excluded from inequality comparison. In Nigeria, [19] found out that when poverty and inequality were measured without forest, poverty and inequality can be overstated by as much as 6.8% and 20.3% respectively, depending on the poverty line and measure used.

Therefore, comparative empirical data on forest income inequality are very essential in order to target resources to specific groups of the population but micro level data are largely lacking. In this light, the study identifies various forest related enterprises and examines factors that influence income inequality among rural forest entrepreneurs. The study later on drew inferences on the contributions of forest income in reducing inequalities in the study site.

## 3. Methodology

### 3.1. Study Area

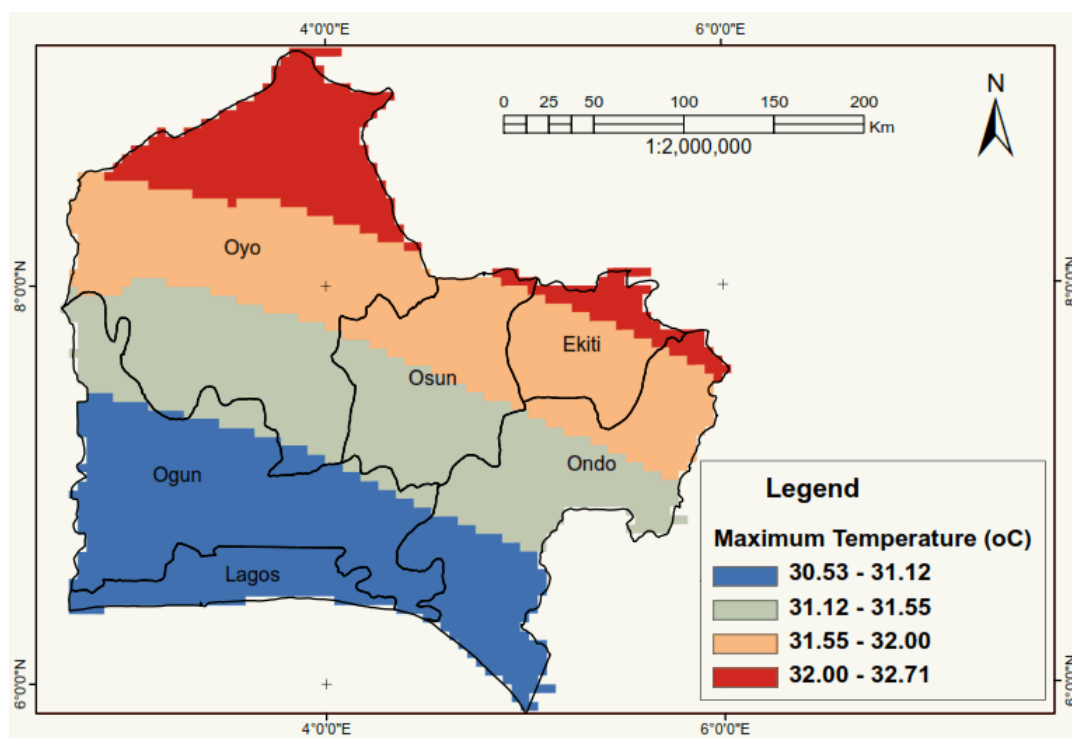


Figure 1. Map of South-west Nigeria

This research work was carried out in South-western region of Nigeria. It is one of the six geo-political zones in the country [36], spreading between 30° and 7°East, and 4° and 9°N. South-west region includes Osun, Oyo, Ogun, Lagos, Ondo and Ekiti states. The total land area is about 191,843 square kilometers [36]. Specifically, the study area where data were collected include: Ogun, Osun and Oyo States. Formally and informally, Nigeria has six regional zones: North - east, North- west, North- central, South-east, South- west and South-south (*see Figure 1*). These regional divisions reflect varying ecologies and climates, along with differing population characteristics. Nigeria has vegetation that supports various crops like cereals, tree crops, roots and tubers, vegetables among others. The country is divided into two patterns of savannah to the north and forest to the south. According to [44], 9.9% or about 9,041,000 ha of Nigeria is forested. Nigeria had 382,000 ha of planted forest. The report also stated that there were changes in forest cover between 1990 and 2010 as 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 [44]. In terms of biodiversity and Protected Areas, Nigeria has some 1417 known species of amphibians, birds, mammals and reptiles according to figures from the World Conservation Monitoring Centre. Of these, 1.2% are endemic, meaning that they exist in no other country, and 3.5% are threatened. Nigeria is well endowed with forest resources, accounting for about 2.5 percent of the Gross Domestic Products. These resources provide employment for over 2 million people through supply of fuel wood and poles and more than 80000 people working in the log processing industries, especially in the forest zones of the south [44].

### 3.2. Sampling Frame and Procedure

A multi-stage random sampling approach was adopted in selecting the respondents 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, eighteen Local Government Areas (LGAs) distributed among the three selected states were purposively selected based on their potentials in forestry and on their population size. At this stage, one forested village was randomly selected in each selected LGA, for a total of eighteen villages: seven in Oyo state, four in Ogun state and seven in Osun state. In the third stage, twenty-five households were randomly selected from each village. A total of four hundred and fifty households' heads were interviewed in the eighteen selected villages (271 males and 179 females). Each respondent was interviewed separately and each interview lasted for about 1 hour. The exercise was carried out between December 2015 and April 2016. The questionnaire was structured to elicit information on individual basis about the sources of income and the contributions of forest income with respect to their

livelihoods.

### 3.3. Analytical Technique

The analytical techniques used include: linear regression model and Gini coefficient. The linear regression model was used to determine the different factors that contribute to inequality in income distribution and to show the effect of this income inequality on welfare of the rural households who engage in forest related businesses [5] while Gini-coefficient was used for the estimation and comparison of the impact of forest income inequality among rural households.

### 3.4. Model Specification

The regression model is specified as:  $Y(g) = f(X_i, \mu)$ ,

where:  $Y(g)$  is the household income inequality which is dependent on the explanatory variables  $X_1, X_2, X_3, X_4, \dots, X_n$ , i.e. how much income inequality is accounted for by each of the explanatory variables and how much is unexplained as measured by the error term  $\mu$ .

The explanatory variables include; age of household head, sex, educational level, household size, type of forest enterprise, forest distance, transportation, forest management related laws (with respect to their mode of enforcement in the different locations), market access, forest product availability, labour cost the error term ( $\mu$ ). The study considers a fairly wide range of possible determinants of income distribution, being guided by previous empirical studies (see [33, 21, 19, 16]).

The Gini-coefficient is computed as follows:

$$I_{gini}(Y) = \frac{2}{n^2} \mu \sum_{i=1}^n \left( i - \frac{n+2}{2} \right) Y_i$$

Where:  $n$  is number of observations,  $\mu$  is mean of the distribution,  $Y_i$  is income of the  $i$ th household, and  $i$  is the corresponding rank of income. The Gini-coefficient is a measure of statistical dispersion most prominently used as a measure to show the degree of income distribution or inequality of wealth distribution between different households in a population. Gini-coefficient ratio ranges between zero and one (0-1). A low Gini-coefficient indicates more equal income or wealth distribution, while a high Gini-coefficient indicates more unequal distribution. Zero (0) corresponds to perfect equality while one (1) corresponds to perfect inequality. Gini coefficient is based on the Lorenz curve, a cumulative frequency curve that compares the distribution of a specific variable (for instance, income) with the uniform distribution that represents equality. The Lorenz curve constructs the Gini coefficient such that the *cumulative* percentage of rural households (from poor to rich) will be on the horizontal axis while the *cumulative* percentage of expenditure (or income) will be on the vertical axis as shown in the figure 2. The cumulative is up to 100%, meaning that both axes are equally long. At every point on the diagram, the percentage of expenditure or income is exactly equal to the percentage of the population. For instance; while the

point halfway along the diagonal line represents 50% of the expenditure or income to exactly 50% of the population; its three quarter represents 75% of the population. In essence, the diagonal line is a representative of perfect equality in size distribution of income.

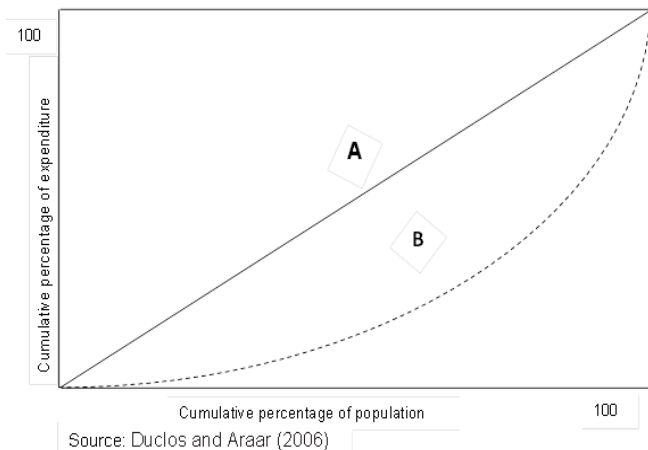


Figure 2. Lorenz curve

## 4. Results

### 4.1. Forest- related Enterprises (FREs)

This study recognizes the neutral role of religion beliefs in venturing into forest related businesses (Table 1) giving credence to the two most commonly practised religions in the study area, (Islam and Christianity) which abhors the traditional use of forest products through trade-medicine or alternative medicine most especially when the usage has some fetish beliefs attached to it.

Table 1. Households' statistics

Item	Frequency	Percentage
Household's Head Age		
≤ 20	3	0.7
21 - 40	168	37.4
41 - 60	212	47.2
61 - 80	66	14.7
Household's Head Sex		
Male	271	60.4
Female	178	39.6
Household's Head Year of Education		
No Formal Education	60	13.4
Primary	107	23.8
Secondary	184	41.0
Tertiary	98	21.8
Marital Status		
Single	54	12.0
Married	325	72.4
Divorced	18	4.0
Separated	52	11.6

Household size		
<2	313	69.7
3 - 4	16	3.60
5 - 6	109	24.3
7 - 8	11	2.40
Religion		
Islam	213	47.4
Christianity	223	49.7
Traditional	13	2.90
Total	449	100

Source: Calculated from field survey, 2016

### 4.2. Profile of Various Forest Related Enterprises (FREs)

Table 2 profiles most of the various forest- related enterprises that rural households employ in the study area as captured by this study. Following the method of classification of poverty adopted by [40] as used by [4] and [14], 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 [12, 2].

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 [30, 31, 34, 2] in most poverty studies in Nigeria. Example here is *setting the two-thirds of the mean per capita households' expenditure* (see [39]). 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 [40], [4] and [14])<sup>1</sup>.

Based on the table 2 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 (NP). Likewise, bush meat selling, dried fish selling, broom, honey, wood

<sup>1</sup> 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. 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).

craft, snail, medicinal plants, pole and leaves marketing in that order were moderately prominent and the households who participate in the 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.

#### 4.3. Determinants of Income Inequality among Forest Users

This section analyzes the determinants of household income inequality. This analysis can help to further understand the causes of income disparity among households in terms of potentials and constraints in forest related enterprises. Table 3 shows an  $R^2$  of 0.96 signifying that the weighted combination of predictor variables was jointly significant in explaining the dependent variable. The study also revealed that labour cost, market access, forest management laws and the age of the household head have significant effect on the income inequality of the forest entrepreneurs in South-western Nigeria.

**Table 2.** Profile of various forest related enterprises

Forest Related Enterprises (FREs)	Total	Poverty index					
		Extremely Poor		Moderately Poor		Non- Poor	
		No. of (EP)	% of (EP)	No. of (MP)	% of (MP)	No. of NP)	% of (NP)
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

Note: EP means extremely poor, MP means moderately poor and NP means non-poor

**Table 3.** Factors that influence income inequality among forest entrepreneurs

Variable	Coefficient	Standard Error	Z	P-value
Constant	-1095	8537	-12.83	0.000
Age	2316**	8733	2.65	0.012
Sex	6298	1193	0.53	0.601
Education	6358	6144	1.03	0.308
Household	-234.3	2132	-0.11	0.913
NFRE	246.0	326.9	0.75	0.456
Forest distance	-6600	5289	-1.25	0.220
Transportation	-7193	1518	-0.47	0.639
Forest mgt. laws	-4046***	1333	-3.03	0.004
Market access	1149***	4470	25.72	0.000
Forest availability	-1382	1204	-1.15	0.258
Labour cost	2726***	5691	4.79	0.000
Probability of F	0.0000*			
R <sup>2</sup>	0.9665			
Adj R <sup>2</sup>	0.9557			
N	400			

\*\*\*, \*\*, \*: Significant at 1%, 5% and 10% respectively

Source: Calculated from field survey, 2016

#### 4.4. Impact of Forest Income in Reducing Inequalities

This section introduces the impact of forest income on reducing inequality in South-western Nigeria. The study analyses the income inequality level of the rural households with and without forest income (Table 4) as it correspondingly reveals the impact of forest income on inequality.

**Table 4.** Impact of forest income on reducing inequalities

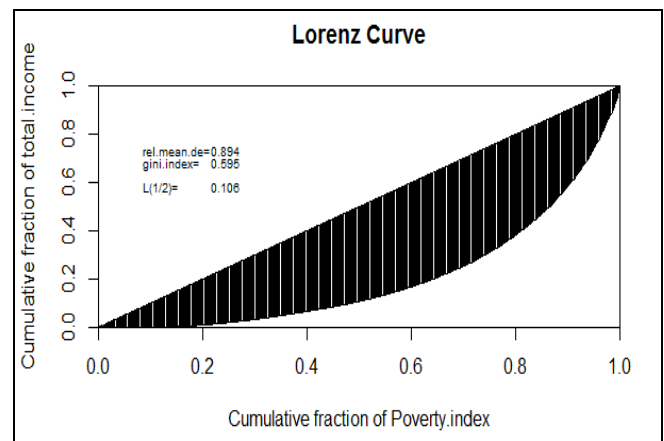
Poverty index	Gini with forest income	Gini without forest income	Percentage Relative change
Extremely poor	0.571	0.700	12.9%
Moderately poor	0.545	0.683	13.8%
Non poor	0.615	0.722	10.7%
Total	0.606	0.711	10.5%

Source: Calculated from field survey, 2016

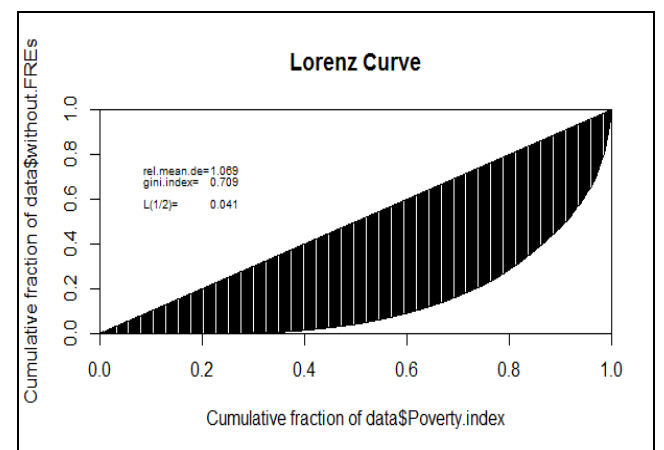
Results from the study (Table 4) revealed that if forest income is included, the proportion of extremely poor household with unequal income reduced to 57.12%, about 13% relative change. In the same vein, using the same phenomenon in the moderately poor category, the differential percentage was 13.8% while that of non poor was 10.7% (that is, a drop of 12.9%, 13.8% and 10.7% respectively).

#### 4.5. Variability in Inequalities Using Lorenz Curves

The study analyses variability in inequalities using Lorenz curves as detailed in Figure 3a and 3b. The Lorenz curve (Figure 3a.) below suggests that 59.5% of the forest income households have unequal income while 40.5% of the households have equal income. Likewise, Figure 3b. also suggests that 70.9% of the non forest households are income disproportionate but 29.1% have equal income.



3a. Lorenz curve with forest income



3b. Lorenz curve without forest income

Note: Lorenz curve shows the degree and extent of inequality in a certain society or region. The diagonal line denotes perfect equality and deviations from the line (the curves) measure the extent of inequality. The further away the curve is, the greater the inequality

**Figure 3.** Lorenz curves with and without forest income for the region



Comparing the two figures, if forest income are excluded from the inequality analysis, the estimated Gini coefficient increases from 0.60 to 0.71 which shows that addition of forest income reduces measured income inequality of 11%, all else equal.

## 5. Discussion

### 5.1. Forest-related Enterprises (FREs)

The study identifies various forest related enterprises, examines factors that influence income inequality and determines the impact of forest related activities to income inequality among rural households in the study area. Results from the current study recognize the impartial role of religion beliefs in venturing into forest related businesses (Table 1) giving credence to the two most commonly practised religions in the study area, (Islam and Christianity) which abhors the traditional use of forest products through trado-medicine or alternative medicine most especially when the usage has some fetish belief being attached to it. Traditionally, through provision of medicinal products, forests commonly serve as frontline interventions for household health care for the majority of people [11].

The variety of cultural values and symbolic functions ascribed to the forests are as numerous and diverse as the communities and cultures of the region. Likewise, forests are viewed in both positive and negative lights as sources of evil as well as power and munificence, as providers for, and hindrances to development. The mystical qualities of specific forest resources often play a crucial role in traditional healing practices. Forests provide the venue for religious, social, cultural events and healing ceremonies<sup>2</sup>.

Furthermore, forest-related enterprises improve the socio-economic wellbeing of rural populace. Though a larger proportion of forest income goes to support the household through direct consumption rather than through cash sales. Thus, the main role of forest to rural households is to provide energy security, shelter and furniture, food and nutritional, health among other basic necessities of life. All of these aspects of forest income reduce the susceptibility of the household to the unexpected circumstances [43].

Table 2 profiles most of the various forest-related enterprises that rural households employ 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 variety of NTFPs such as various plants roots, leaves, barks and seeds as traditional herbs and medicine; snails; insects and animals, honey among others.

Following the FREs profile as reported in Table 2, plank marketing, vegetables marketing and farming, furniture making, fuel wood, fruit and charcoal marketing were found

to be prominent in the total sampled population while bush meat selling, dried fish selling, broom selling, honey selling, wood craft selling, snail selling, medicinal plants selling, pole and leaves marketing in that order were moderately prominent. On the other hand, gum selling, dye selling, fibre selling, insect and spices marketing were the least prominent FREs in the study site. Likewise, in terms of the households' poverty status classification (Table 2), 137 FREs households (34.25%) of the total sampled households were non poor, 171 (42.75%) were moderately poor and 92 (23%) were extremely poor. This statistics therefore shows that the poor households (moderately and extremely poor) outnumbered the non poor households in the study area. This development actually calls for serious attention like this current study looking forward to suggesting appropriate policy recommendations and proffering necessary solutions to the menace in the study site.

### 5.2. Determinants of Income Inequality among Forest Users

In this section, the study analyzes the determinants of households income inequality. This can help to further understand the causes of income disparity among households in terms of potentials and constraints in forest related enterprises. Therefore, household income inequality was regressed on a set of explanatory variables (Table 3). The study uses the same household and contextual characteristics, as they are likely to be those factors influencing income inequality among rural forest related entrepreneurs. The study uses linear regression model similar to the approach used by [16].

Therefore, the reports of the outcomes of most of these possible determinants are as follows:

Table 3 shows an  $R^2$  of 0.96, suggesting that the weighted combination of predictor variables was jointly significant in explaining the dependent variable. The parameter estimates such as labour cost, market access, forest management laws and the age of the household head have significant effect on the income inequality of the forest entrepreneurs in South-western Nigeria (Table 3). This significant effect suggests that an increase in age, market access and labour cost would increase the probability of the income inequality of the forest related entrepreneurs while an increase in forest management laws would decrease the probability of the income inequality.

The study reveals positive and significant relationship between age and income inequality indicating that population aging would increase the income inequality. This association is in total conformity with the findings of [24] who argued that the accelerating trend of population aging is one of the most important determinants in deepening income inequality in Korea because there was an accelerated rise of aging population (thus a population dominated by aged people) between 1980 and 2012 in Korea who perhaps could not afford to engage in some strenuous works due to their less physical strength compared to younger populations (thus

<sup>2</sup> FAO Corporate Document Repository, produced by Forestry Department.  
Title: The Major Significance of 'Minor' Forest Products: The Local Use and Value of Forests. <http://www.fao.org>.

a population dominated by young people) who are very strong and energetic leading to low income inequality.

In buttressing this argument, [22] posited that population ageing has contributed to higher inequality in market income in Japan because, the elderly have less income than the working-age population. Some of the reasons include the increase in the share of elderly from 10% of the Japanese population in the mid-1980s to 17% in 2000 which has raised the level of inequality because of larger between-group income differences. Also, the level of inequality of market income among those over age 65 is higher than for the 18 to 65 age group, due to the fact that a smaller portion of the over 65 age group is in the labour force.

However, the findings of [33] argued rather contrarily. The decomposition analysis of their study indicates that age is not an important determinant factor in explaining inequality among rural households in Nigeria because most of the inequality can be traced to within group component (more than 99 percent of total inequality). This result shows that the disparity between the age - group is not significant in overall inequality since the bulk of the inequality still exists between households headed by individuals of the same age group.

Equally, the parameter estimate for the forest management laws is negative and statistically significant. That is, increase in forest management laws is negatively associated with income inequality meaning that increase in forest management laws reduces income distributional gap among households. This is specious because, increased forest management laws debar equal access to harvestable forest products by users. This increase creates unequal income sources among users hence increase their income inequality. Increasing forest management laws will put the downtrodden into more distress in accessing forest products because only the well-off would benefit more given that some products of logging, which has dominated forest commercial activities are predominantly in the hold of governments in the region while NTFPs usually face resource control related problems. Thus, the gap-filling role of forests among the poor gets soar leading to increase in their income inequality.

This relationship contrasts with the opinion of [41] who posited that increased forest management laws may reduce poverty and income inequality if good forest management practices (such as forest regeneration, selective exploration afforestation, tungya system practice etc.) are adopted.

Furthermore, the parameter estimate for market access for forest products is positive and statistically significant, implying that increase in market access increases the income inequality in South-western Nigeria. Market access for open access forest products with limited management laws (which was the case from the study area) promote lucrative markets for the first few claimers (households) for harvesting is based on first come first serve. This therefore creates high income inequality among users. This positive association may be explained by the declaration of [20] who declared that market access may partly account for increasing geographic income inequality in China because policies to improve

access to domestic markets among different income groups differ such that the lowest income group benefits the least, and the benefit of better access is increasing with income from the lowest to the middle income group and jumps to the highest income group. These policies therefore tend to widen the income inequality between the poorer segment (low to middle income groups) and the richer segment (higher middle to highest income groups).

In addition, labour cost also has a positive and significant effect on household income inequality. Increase in hired (skilled) labour cost associated with harvesting forest products excludes many poor households from participating. If harvestable forest products require services of hired labour (skilled) force at a cost, this therefore promotes unequal access capable of triggering income inequality as revealed by the model results. For example, some forest products (e.g. products of logging, furniture making etc.) require certain machineries and technical know-how to be accomplished which are harder to replace by manual task. If the demand shifts are not offset by equal shifts in the composition of labour supply (e.g. by having enough capital to acquire the machines or the needed skilled workers within the households), such deficiency may affect labour cost inequality as they can benefit higher-skilled worker households more than others.

### 5.3. Impact of Forest Income in Reducing Inequalities

This section introduces the impact of forest income on reducing inequality in South-western Nigeria. The study analyses the income inequality level of the rural households with and without forest income (Table 4). The study revealed that forest income is inequality- decreasing and that income inequality is not only peculiar to the forest based poor households alone but rather, it also affects other categories of households that are considered either moderately poor or non poor in terms of their poverty status classification.

The impact of forest income on inequality among forest entrepreneurs was determined by their Gini coefficient differentials. Table 4 suggests that if forest income is included, the proportion of extremely poor household with unequal income reduced to 57.12%, about 13% relative change. In the same vein, using the same phenomenon in the moderately poor household category, the differential percentage was 13.8% while that of non poor was 10.7% as observed in Table 5 (that is, a drop of 12.9%, 13.8% and 10.7% respectively).

This decrease in inequality is in conformity with the finding of [19] with a difference of 16.4% when the like of this study was carried out in the South-east region in Nigeria. Their findings therefore argued that forest income is more pro-poor and has higher income equalizing effect than any other income source in South-eastern Nigeria. Similarly, [42] also argued that small and medium scale forest enterprises have the potential to diversify rural livelihoods and improve their standard of living because they require only small initial investment to set up which can make them accessible and attractive to the poor and in turn diversify their economic



opportunities and improve their livelihood security (see [43]. It is thus plausible because most rural households found trust in forest income than in non-forest related enterprises since forests perform "safety nets" function among rural households. Rural people usually draw on available natural resources to meet emergency shortfalls and to keep them from being worse off in times of need [8].

#### 5.4. Variability in Inequalities Using Lorenz Curves

This section analyses variability in inequalities using Lorenz curves (Figure 3a and 3b). This variability however corroborates the impact of forest income on income inequalities of the rural households in the South-west Nigeria. The Lorenz curves show that the addition of forest income to total income reduces the departure of the curve from the line of equal distribution when Figure 3a and 3b. are compared. The Lorenz curve (Figure 3a.) further suggests that 59.5% of the forest income households have unequal income while 40.5% of the households have equal income. Likewise, Figure 3b. suggests that 70.9% of the non forest households are income disproportionate but 29.1% have equal income.

Comparing the two figures, if forest income are excluded from the inequality analysis, the estimated Gini coefficient increases from 0.60 to 0.71 which shows that addition of forest income reduces measured income inequality of 11%, all else equal. This result is in conformity with a number of studies ([10, 18, 19]). For instance; in Zimbabwe, poverty and inequality measures were calculated with and without forest income and the results showed that when calculated without forest income, poverty and inequality can be increased by as much as 98% and 44% respectively, depending on the poverty line and measure used [10]. Also in Southern Malawi, [18] found that by excluding income from forestry when measuring inequality, income inequality in the region increases by as much as 12%. Likewise in Nigeria, [19] found out that when poverty and inequality were measured without forest, poverty and inequality can be overstated by as much as 6.8% and 20.3% respectively, depending on the poverty line and measure used.

## 6. Conclusions and Policy Implications

This study assesses the causes and impact of income inequality on socio economic characteristics of forest related entrepreneurs in South- western Nigeria. In line with previous works in other countries, the study uses households characteristics as factors influencing income inequality among rural households engaging in forest related businesses using linear regression model. The study suggests that an increase in age, market access and labour cost would increase the probability of the income inequality of the forest related entrepreneurs while increase in forest management laws would decrease it. In light of the above findings, five important policy implications can be drawn. Firstly, the

study revealed that age is a critical factor that is capable of increasing the income inequality due to the fact that most rural households who engaged in forest related businesses in the study area are dominated by aged people (50 years and above) who could not afford to engage in some strenuous forest activities due to their less physical strength compared to younger populations who are very strong and energetic. Therefore, older people should be supported with needed machineries and facilities to ease the task of forest income generating activities while younger population should also be encouraged to venture into forest based enterprises through both formal and informal enlightenment programmes in order to close the gap of income inequality.

Secondly, the results further indicated positive effects of market access for forest harvestable products on income inequality under limited forest management laws where resources are managed under open access. Market unions should take responsibility for improving on market flooding and price related upheavals to control unnecessary competition and unwholesome rivalry among forest related entrepreneurs.

Thirdly, increased (skilled) labour cost related to forest activities positively influence income inequality by excluding the majority of the rural poor who fail to pay for the skilled labour necessary to promote harvesting of forest produce. Targeted training programmes that empower rural poor households with necessary forest harvesting skills may enhance equal participation (harvesting) that may reduce income inequality.

Fourthly, study results revealed the positive effect of forest management laws on reducing income inequality (negative association – increase in forest management laws reduces income inequality). Thus far, equal accessibility to forests engendered by forest management laws and supportive markets for harvestable forest products should be enhanced to reduce income inequality. That is, crafting and implementation of sustainable forest management laws supported by government platforms to enhance equal access of forest harvestable products by rural households capable of triggering an income equalizing effect should be adopted.

In terms of impact of forest income on rural households' inequality status, with the inclusion of forest income, there is a relative reduction of about 12.9%, 13.8% and 10.7% Gini coefficient among EP, MP and NP household categories respectively. Towards this end, more incentives and encouragements should be given to rural forest entrepreneurship to foster improved commercialization and value chain of forest products in order to reduce the perennial scourge of income inequality among rural households.

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