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EMPIRICAL ANALYSIS OF INCOME INEQUALITY AND WELFARE IN THE FOREST AREA OF SOUTHWESTERN NIGERIA

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ABSTRACT

Inequality has been one of the biggest economic, social and political challenges of our time, as high level of income inequality produces unfavourable environment for economic growth and development. However, there is a dearth of information on the extent or degree which forest income contributes to income distribution and welfare of the rural households. Three states (Ogun, Osun and Ondo states) with highest concentration of forests in southwestern Nigeria were purposively selected, with a total of 430 households randomly selected. Descriptive statistics and Gini coefficient were used in the analyses. Majority of the household heads were male (92.1%), married (89.5%) with 2.4±5.0 years of education and 19.9±14.9 years of residency in the forest area. The primary occupations of the households were farming (65.3%), forest activities (17.9%) and others (16.7%), while 40.7%, 28.1% and 31.1% had forest activities, farming and others as their secondary occupations, respectively. Decomposition of income inequality with all income sources gave income share contribution of farm income (53%), forest income (29), trading (7%), artisanal (2%), transfer (1%) and wage/salary (8%) to total household income. This implied that farm and forest income contributed more to household welfare. The impact analysis of forest income on welfare shows that inequality was 0.52 with all income sources but increased when decomposed without forest income (0.56). This implied that farm and forest income source reduce income inequality in the study area thereby improve the household welfare.

Keywords: Income distribution, Forest income, Gini Coefficient, Household welfare, Inequality,

INTRODUCTION

Over the past few decades, environmental and developmental concerns have been converged, with increasing interest in both tropical forests as an important ecosystem, with regards to the welfare of people who live near them (Babulao, *et al.*, 2009). Forests are widely regarded as having an important role in sustainable development, according to Food and Agricultural Organisation (FAO, 2012). They contribute immensely to economic and social development through formal trade in timber, non-timber forest products (NTFPs) and environmental services, as well as through their serving as safety net and their aesthetic values (Dieng and Kojuwang, 2009). Forests have economic value in so far as they are limited, scarce and capable of improving human welfare (Daowei and Pearse, 2011). The forest has always been a major economic resource of great importance to the people around it and the nation in general (Oriola, 2009). For millennia before the industrial revolution, forests, woodlands and trees were the source of land for settlement and cultivation, products and materials for construction, woody biomass for fuel and energy, and indeed, directly for food and nutrition as well (Agrawal *et al.*, 2013). The contributions of forests to global biodiversity, to the fertility of agricultural lands and to the welfare of those who depend on them make forests of immense value for sustainability.

The FAO (2012) estimated that in 2008, industries utilizing forest resources contributed more than US$

450 billion to global GDP, contributing nearly 1% of the global GDP and provided formal employment to 0.4% of the global labour force. In Nigeria, forest contribution to Agriculture GDP between 2005 to 2014 had been average of 1.2% to 1.5% annually (Central Bank of Nigeria, CBN, 2015). Forests also provide other sources of income and subsistence benefits, generate informal work opportunity, and constitute reservoirs of economic values that help ameliorate shocks to household income– particularly in rural areas in poor countries (Kumari, 2012). Forests played a major role in influencing patterns of economic development, supporting livelihoods, helping in structuring economic change, and promoting sustainable growth. The importance of forest to mankind cannot be overemphasized. Agbogidi and Eshegbeyi (2008) noted that forests and forest products play vital roles in human life from the cradle to the grave. The cot in which the baby lies at birth, the buildings and furniture he uses, at the various levels of his education, his endeavors in industry and agriculture, the accommodation and furniture he acquires as a worker/ entrepreneur, his diet and health sustaining systems, the armchair in which he relaxes in his old age, and the coffin or casket in which he returns to mother earth are forest dependent (Agbogidi, 2011). Forests are critical for the well-being of people and the provision of a broad range of products, services and functions. They are among the most biologically-rich terrestrial ecosystems. The study identified various income sources in the study area, the contribution of various sources to household income and impact effect of forest income on income inequality and welfare

METHODOLOGY

Study Area

The study was conducted in forest areas in rural southwestern Nigeria. Southwest Nigeria Fig. 1 represents a geographical area spreading between Latitude 2^0 to the North and latitude 6^0 to the south. It is marked by longitude 4^0 to the west and 6^0 to the east and has a land area of 114,271 km^2 representing 12% of the country's land mass and comprising of 6 states namely Oyo, Osun, Ondo, Ekiti, Ogun and Lagos States. It has the total population of 35.2million (CIA, 2012) and is predominantly agrarian; more than 96% of the population is Yoruba. The zone is characterised by a typically equatorial climate, with distinct dry and wet seasons. The main growing season lasts up to 9 months with two peaks in July and September. Rainfall ranges between 2600mm in the coastal areas of Lagos and Ogun states and nearly 1200mm in the northern areas of Ondo, Ekiti, Oyo and Osun states. The average zonal rainfall is 1480mm with a mean monthly temperature range of 18`24$^o$C during the rainy season and 30`35^{o}C during the dry season.

Sampling Procedure

A four - stage sampling procedure was used. The first stage was the purposive selection of Ogun, Osun and Ondo States with highest concentration density of forest in southwestern Nigeria. The second stage involved random selection of two forest reserves in each state. These are Omo and Olokemeji forest reserves in Ogun State; Akure (Aponmu) and Idanre forest reserves in Ondo State with Shasha and Ago-Owu forest reserves in Osun State. This was necessary to get a diversity of forest resources and forest activities. The third stage was the random sampling of villages in and around the reserves proportionate to size. Twelve (12) villages were randomly selected from Omo Forest Reserve; three (3) from Olokemeji Forest Reserve; three (3) from Akure Forest Reserve; two (2) from Idanre Forest Reserve; three (3) from Shasha and two (2) from in Ago-Owu Forest Reserves made up 25 villages altogether. The fourth stage was the random selection of household heads proportionate to size. The information on names and number of households were supplied by community leaders. Of the 450 household heads proposed for the study, 430 were valid and used for the analysis: 213 from Omo Forest Reserve, 59 from Olokemeji Forest Reserve, 37 from Shasha Forest Reserve, 32 from Ago-Owu forest reserve, 57 from Idanre Forest Reserve and 32 from Akure Forest Reserve. Descriptive statistics (percentage, frequency and mean) and Gini coefficient were used for the analysis.

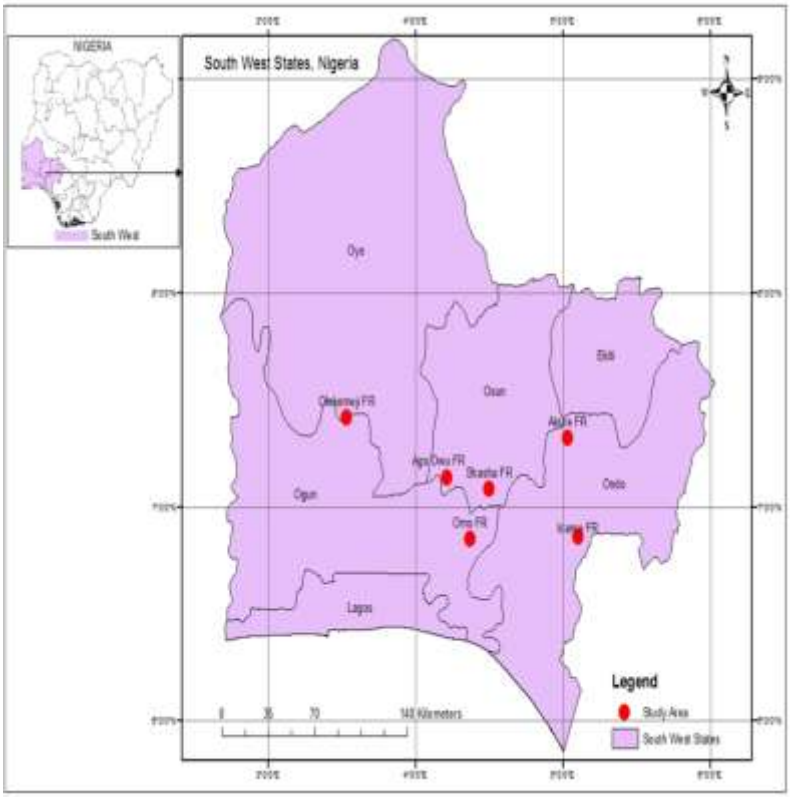

Figure 1: Showing the Selected Forest Reserves
Source: Author's Finding, 2017

Contribution of Forest Income to Total Income Inequality.

Decomposition inequality by various income sources

Decomposition by the Gini inequality index called the Extended Gini Index was introduced by Yitzaki (1983). The index accommodates deferring aversion to inequality. The aggregate Gini coefficient, G_T, for total income inequality, where income is derived from k, different income sources, is given as

$$G_T = \sum S_k G_k R_k = \frac{2Cov[Y, F(y)]}{\mu} \quad \ldots\ldots \text{Equation 1}$$

where

S_k = the share of income source k in total income,

G_k = the disaggregated Gini coefficient for income source k

R_k = the Gini correlation between income source k and the cumulative distribution of total income

RESULTS

Socioeconomic Characteristics of Rural Household Heads

The socioeconomic characteristics of the respondents revealed that 92% of the household heads in the study area were male (Table 1). About 89.5% of the household heads were married, 5.6% were single, 3.5% were widowed and 1.4% was divorced. About 33.0% of the respondent was in age group between 46 and 55years of age and 22.8% were above 50 years old, only 3.0% were less than 25years. The mean of the household head age was 47.63 years ± 11.65. Average number of years in school of household head was 2.38 ± 5.016 years and the average years of settlement in the forest area was 19.89 ± 14.86. Farming was the major primary occupation of the household heads (65.30%). About 17.90% took extracting forest resources as their primary occupation, 5.6% were artisanal workers, 2.8% were only wage/salary and trading was just 8.4%.

Table 1: Demographic Characteristics of Respondents

Variable	Frequency	Percentage
Sex		
Male	396	92.10
Female	34	7.90
Total	430	100
Marital status		
Married	385	89.50
Singled	24	5.60
Windowed	15	3.50
Divorced	6	1.40
Total	430	100
Age		
Less 25	13	3.00
26-35	64	14.90
36-45	113	26.30
46-55	142	33.00
55-above	98	22.80
Total	430	100
Household size		
1-5	160	37.20
6-10	218	50.10
Above 11	52	12.70
Total	430	100
Education level		
No education	84	19.50
Pry education	150	34.90
Second education	152	35.30
Tertiary	44	10.20
Total	430	100
Years of residency		
1-10	141	32.80
11-20	137	31.90
Above 21	152	35.30
Total	430	100
Primary Occupation		
Farming	281	65.30
Forest activity	77	17.90
Artisanal activity	24	5.60
Wage/salary	12	2.80
Trading	22	5.11
Transfer	14	3.25
Total	430	100

Forest Uses and Dependence

Approximately 75% of the households interviewed were highly dependent on fuel wood both for source of energy and sale, 43% earned and consumed between ₦1,000 to ₦40,000 from fuel wood every year while 33% earned between ₦41,000 and above from it. Respondent engaged in charcoal enterprise earned between ₦1,000 and over a million naira per annum; ₦20,000 from honey production and 22% of households made ₦100 and over ₦21,000 from mushroom harvesting and about 49% earned between ₦100 and over ₦41,000 from snail harvesting for consumption and for sale while 27.2% earned between ₦11,000 and over ₦41,000

from bush meat annually. About 23% earned between ₦500 and over ₦31,000 from wrapping leaves sales like *Thaumatococcus danielli* and Teak leaves. Between ₦500 to over ₦31,000 was accrued to 28% of the respondents from the harvesting of fruit like *Garcinia cola* and walnuts. The study further revealed that there were about 5.3% involved in forest activities labour like loading, driving, tractor operation and machine operation. About 3.7% earned between ₦1000 and ₦100,000 from labour in a year, 0.7% earned between ₦100,001 and ₦200,000, and 0.9% got ₦200,001 and above from forest labour.

Table 2. Distribution of Non-timber Forest Product Income among the household heads in the Forest Areas Southwestern Nigeria

Products income (₦)	**Frequency**	**Percentage**
Fuelwood (₦)		
1000-20000	132	31.2
21000-40000	155	36.0
41000-Above	141	32.8
Total	430	100.0
Charcoal(₦)		
None	416	45.6
1000-10000	4	0.9
11000-20000	2	0.5
21000-30000	3	0.7
31000-40000	1	0.2
41000-above	5	1.2
Total	430	100
Honey (₦)		
None	300	92.6
Less-20000	17	4.0
21000-40000	4	0.8
41000 and above	11	2.6
Total	430	100.0
Bushmeat(₦)		
1000-10000	313	72.8
11000-20000	39	9.0
21000-30000	34	7.9
31000-40000	15	3.5
41000 and above	29	6.7
Total	430	100.0
Fruits (₦)		
500-10000	375	93.1
11000-20000	19	4.5
21000-30000	5	1.2
3100ans above	3	1.2
Total	430	100.0
Herbs/Medicinal Plants		
100-10000	395	93.1
11000-20000	19	4.3
21000-30000	5	1.2
31000 and Above	5	1.2
Total	430	100.0

Table 3: Contribution of Timber Income to household income in the Forest Areas Southwestern Nigeria

Variable	Frequency	Percentage
Timber Activities (₦)		
None	357	83.0
10000-100000	35	8.1
100001-1,000,000	26	8.1
1,000,001 & Above	12	2.8
Total	**430**	**100.0**

As shown in Table 4, farm income had the highest income percentage (53.11%) followed by forest income (29.37%). The contributions of other income sources: wages/salary (8.51%), transfer (1.39%), trading (7.26%) and artisanal income (0.03%) were very small. The second column of Table 4 designated as G_k shows the Gini coefficient for each income source, called concentration index. It captures how equally or unequally the source income was distributed. Forest income had a Gini of 0.54, the concentration index for farming (0.81), trading (0.89), transfer (0.96), artisanal (0.97) and wage income (0.93) were higher. R_k, (third column) presents the Gini correlation of income from source k with the distribution of total income, that is, the ratio of individual inequality to total inequality. The source Gini for farm income was 0.81, the Gini correlation between forest income and total income distribution, R_k, was 0.78 and positive.

S_G, is the percentage contributions of each of the income source of total inequality. Farm income accounted for 56% of the total inequality, forest income accounted for 30% of the total inequality The other sources of income wage (6%), transfer (1%) and trading (6%) had low contributions to total inequality. The results in the fifth column gives the marginal effect of Gini on total income, the marginal impact of the change in inequality following a small proportional change in one income source. It indicates that 10% increase in income share from farm, forest, and transfer, increase income inequality in the area. The last column shows the total Gini coefficient of 0.56 when forest income was removed from the analysis compared to when forest income was included (0.52).

Table 4. Income Decomposition by Factor Components

Income Source	Share in Total Income, (S_k)	Income Source Gini (G_k)	Gini Correlation with total income, (R_K)	% share in Gini of total income, (S_G)	Marginal effect on Gini of total income	Income Source Gini,(Gk)without forest income
Forest income	0.2937	0.5428	0.7828	0.3035	0.0098	
Wage income	0.0851	0.9331	0.4067	0.0615	-0.02368	0.9331
Artisanal income	0.0237	0.9785	-0.2797	-0.0019	-0.0056	0.9785
Farm income	0.5311	0.8112	0.8369	0.5552	0.0242	0.6555
Transfer income	0.0139	0.9672	0.6434	0.0164	0.0026	0.9672
Trading income	0.0726	0.8902	0.5295	0.0653	-0.0074	0.8902
Total income	1.000	0.5247				0.5622

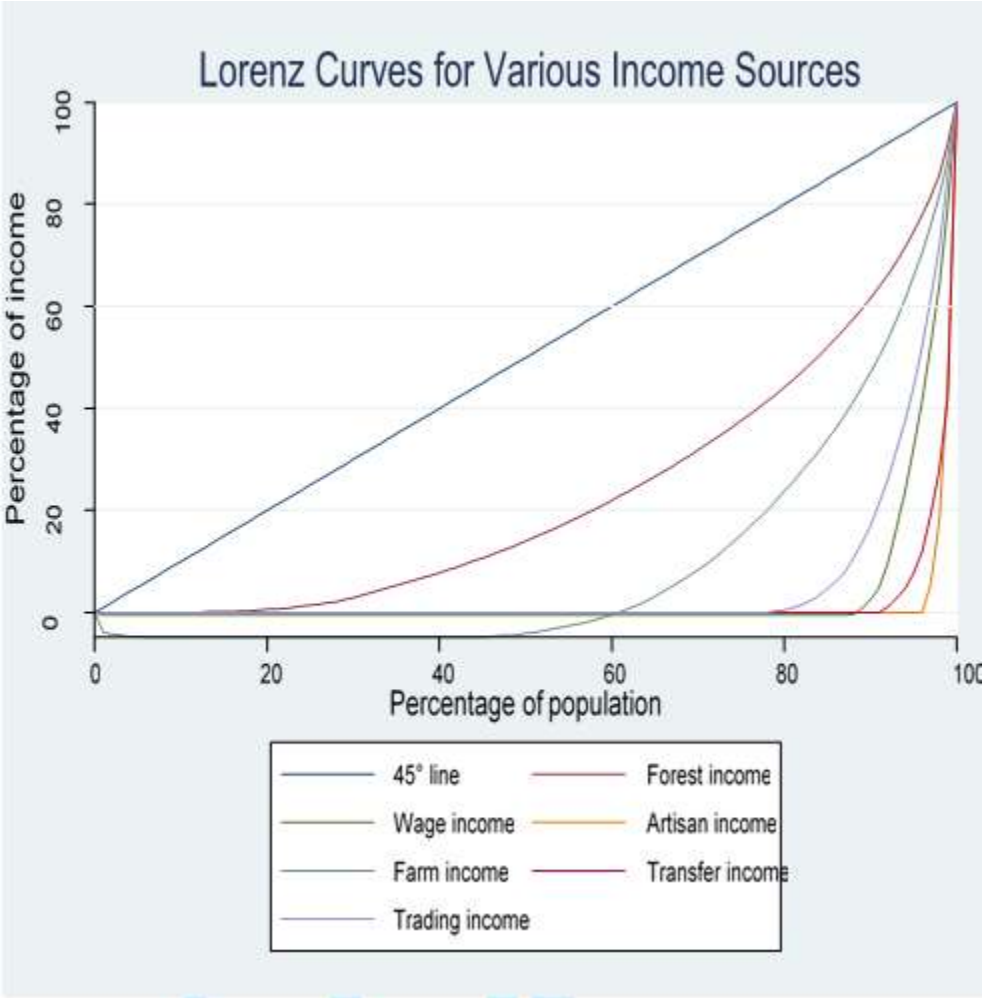

Figure 2: Income Distribution

DISCUSSION

The socioeconomic characteristics of rural household heads in southwestern, Nigeria showed that more males were involved in extraction from the forest, such as snail harvesting and hunting which are done majorly at night. Also there were more married household heads in the forest areas than other marital status. The mean of the age groups indicated that household heads were in the economically active age, implying that .they can perform forest activities quite easily. This is substantiated by Yemiru *et al.* (2010) findings that the average household head was 46.6 years old in Bale forest area in Ethiopia. The average household size of respondents in the study area was of 6.92. This implies that household members were used as labour because hired labours were scarce. The average number of years in the school indicated that that majority of the household heads had primary education level, and this low level of education made them to depend on the forest. This is similar to the findings of Yemiru *et al.* (2010) where they recorded an average education years of 1.31 in. Ethiopia. However this is contrary to finding of Fonta *et al*. (2010) in South Eastern Nigeria and Nwera (2014) in Ngong forest findings where the number of years in school were higher 5.23 and 5.1 respectively, though all are still within primary education. . This signifies that low educational level persisted in the rural areas and expected best are not made out of forest resources. Furthermore, the average year of settlement in the area, which is line with Bwalya, (2013) study in Zambia. Kartoolinejad *et al,*. (2007) found that long-term resident of forest were more knowledgeable about the ecological structure, composition and seasonal patterns of the forests and hence collect more forest products while studying ecological parameter of some trees. It is therefore expected that length of residency is directly related to forest dependency.

The households were majorly farmers and specialised in planting cocoa, kolanut, yam, cassava, palm trees, bitter Kola, plantain and bananas. It could be seen that few people took into artisanal, wage and trading as primary occupation in the rural areas. More people took forest activities as their secondary occupation (40.70%). This confirms the fact that forest resources serve as economic safety nets during periods of economic hardship, drought, seasonal food shortfalls, off farming season (Kabubo-Maiaran and Gachoki, 2008) and a source of regular subsistence (Nwera, 2014).

Dependence on forests income, wild food, fuel wood and construction poles were quite visible in all the communities of the study. It could be discovered from the results (Table 2 and 3). that a lot of economic activities are going on in the forest communities, that were not captured even in the Nigeria GDP, At the national level, the value of forest resources to household economy is often merged with agricultural income such that the real contribution of forest resources to Nigeria economy is not portrayed (FAO, 2010). Even at that, it has been discovered that only wood products are accounted for, non-timber forest products have been largely ignored. Most of the forest products are traded in non-organised parts of the economy (Mulenga *et al,* 2012).

Table 4 presents the relative contributions of different income sources to the total household incomes. The first column labeled S_k (Table 4) shows the share or percentage of each income source i.e farm income, forest income, wage income, transfer income, artisanal income and trading income in the total household income. As indicated in the result, the principal source of household total income was farm income and forest income. This showed that these two sources contributed more to rural household welfare. The contribution of forest income to household income is fairly comparable to the result by Bwalya (2013) in Zambia in which forest income contributed 30% of the total household income. Likewise, in Chi-radzulu District, Malawi, forest income constituted around 15% of the total income (Katanga *et al*., 2009) and 17% in a rural forest community in Ethiopia (Teshome *et al.*, 2015). In a community forest area in Cross River State southern Nigeria, forest income contributed close to 25% of the total household income (Fonta *et al*., 2010). The concentration index in the second column implying that that forest income improve on household welfare having the inequality index was the lowest and more equally distributed. The inequality index for farming, trading, transfer, artisanal and wage income were very high indicating high income variation in income distribution in the study area. This implied that they cause reduction in household standard of living, that is, reduce household welfare. R_k, which presents the Gini correlation of income from source k with the distribution of total income, that is, the ratio of individual inequality to total inequality. It was to capture whether or not the income source is correlated with total income.. This implies that inequality increased with farm income because it was the major source of income in the study area. There was negative correlation with artisanal income, implying that artisanal income reduced inequality. This could be that because there were very few artisans in the study area and contributed minimally to household income and welfare

The figures in the fourth column presents, S_G, the percentage contributions of each of the income source of total inequality. Farm income accounted for had the highest contribution to total income (53%), followed by forest income. It could be derived from research study that forest income had impact on the rural economy of the selected forest areas. The other sources of income had low contributions to total inequality because they had low contribution to total household income and welfare. The marginal effect of Gini on total income indicated that 10% increase in farm income, forest income or transfers income, other things being equal, are associated with increase in the Gini coefficients of total income inequality by 0.30%, 0.97%, and 0.32% respectively. Likewise, 10% increases in trading, artisanal or wage incomes, other things being equal, are associated with reduction in the Gini coefficient of total income inequality by 0.17% and 1.42% respectively. Wage and artisanal income had negative values, thereby reducing their effect on total income in the study area. The share of the source in total income matters because, all other things being equal, a 10% change in income from a large source is bound to

have a larger impact on inequality than a 10 % change from a smaller source (Wodon and Yitzaki, 2008). The impact factors confirmed the fact that forest income had an eqaulising effect on income inequality among rural communities in the forest areas. It bridges the gap between the forest income classes of high, medium and low dependent classes.

CONCLUSION

The study found that forest income is an important source of income in the rural areas even though not the main source of income for majority of the household heads. It contributed about one-quarter (25%) of the total household income and therefore improve on the household welfare. It reduces income inequality therefore improve on the rural welfare.

RECOMMENDATIONS

It is recommended that government should embark on programs and make policies that will sustainably conserve the forest and prevent indiscriminate exploitation of forest resources. Also a high degree of forest dependence may actually lead to overexploitation. This call for careful targeting, and a mix of forest –welfare approach should be encouraged. This may include forest development initiatives that harmonize both economic and forest resources.

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