



AgEcon SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

SEPTEMBER 23 - 26, 2019 // ABUJA, FEDERAL CAPITAL TERRITORY, NIGERIA

6th African Conference of Agricultural Economists

Rising to meet new challenges: Africa's agricultural development beyond 2020 Vision



***Invited paper presented at the 6th African
Conference of Agricultural Economists,
September 23-26, 2019, Abuja, Nigeria***

Copyright 2019 by [authors]. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

Non-timber forest products services and social protection: to what extent is environmental trade-off permissible in Afaka Forest Reserve, Kaduna State, Nigeria?

By

John E. Ochi¹ and E. Y. Zaman²

¹Department of Agricultural Economics & Extension, Abubakar Tafawa Balewa University, Bauchi

²Trial Afforestation Research Station Kaduna, Forest Research Institute of Nigeria

Abstract

The analysis of income inequality on non-timber forest products (NTFPs) is a paradigm shift from the focus on timber products to a more inclusive approach in relation to contemporary concerns about environmental and forest safety nets taking into cognizance the pivotal role of forests in carbon storage and sequestration, and provision of food and energy security, medicines, raw materials and platforms for protecting the cultural heritage amongst other benefits.

Key words: NTFPs, Income inequality, Gini index

Paper presented at African Association of Agricultural Economists, held at Sheraton Hotel & Towers, Abuja, Nigeria, 23-26 September, 2019

1.0 Introduction

There is a large stock of non-timber forest products (NTFPs) in Nigeria which is distributed in the various forest types across the country, namely; the lowland rainforest in the southern humid zone, the coastal mangrove and fresh water swamp forest, savanna woodlands in the drier middle belt and northern Sudan and guinea savannah vegetation zones, and the montane forests (in the south-eastern part and on the Jos Plateau), and the riparian forest found along the coastal south (USAID, 2008).

The Afaka Forest Reserve is located within the transition belt, between the far south and the savanna woodlands in northern Nigeria, where there is a large band of derived savanna, which has undergone large-scale anthropogenic modifications. Further north of Afaka Reserve, the

conditions get drier, with the woody vegetation getting sparser and the trees thornier, typified by mixed deciduous and semi-deciduous woodlands, with characteristic baobabs (*Adansonia digitata*) further north in the Sudan savanna.

The savanna habitats also support a good number of large mammals, such as various antelopes, elephants, pythons, and lions; bush meat from animals such as *Funisciurus sp* (tree squirrel), *Manis tricupsis* (pangolin), *Artherurus africana* (porcupines), *Dendohyrax dorsalis* (tree hyrax), *Thryonomys swinderianus* (grasscutter), *Cricelomys gambianus* (giant rat), *Varannus niloticus* (monitor lizard), *Tragelapus scriptus* (antelope), rabbit are also of great significance.

The savanna woodlands and montane forests are home to tree and shrub species such as *Vitellaria paradoxum* (shea butter), *Azadirachta indica* (neem), *Ceiba petandra* (silk cotton tree), *Acacia nilotica* (acacia), *Parkia biglobosa* (locust bean), *Phoenix reclinata* (date palm), *Tamarindus indica* (tamarind), *Vitex doniana*, and *Moringa oleifera* (moringa), and medicinal plants such as *Vernonia amygdalina* (bitter leaf), *Zingiber officinale* (ginger), *Tetrapleura tetraptera*, *Aframomum meleta*, *Xylopia aethiopica*, *Xanthoxylum xanthoxyles*, *Azelia bela*, *Kigelia Africana*, *Anninckia chloranta*, *Garcinia kola* (bitter kola).

There are several types of NTFPs of which about one hundred and fifty are of high economic value in international trade (Bolaji-Olutunji & Osadebe, 2010). An estimated 2 billion people, representing eighty percent of the developing world rely on NTFPs as their primary source of income, food, nutrition, and medicine. Whereas the uses of NTFPs may vary from place to place because of the heterogeneity of the community and different traditional practices by ethnic groups in the country, it is generally recognized that they play an important role for local communities in and around forests (Maske *et al.*, 2011). They are sources of food in the form of fruits, nuts, mushrooms, snails, honey, insects, bush meat, fodder, fibre, fertilizers, medicinal extracts, sources of raw materials for construction, cosmetic and cultural products, natural dyes, tannins, gums, resins, latex and other exudates, essential oils, spices, edible oils, decorative articles, horns, tusks, bones, pelts, plumes, hides and skins, non-wood ligno-cellulosic products, phyto-chemicals and aromatic chemicals. In addition, the expansion of NTFPs exploitation as against timber provides a veritable basis for sustaining biodiversity (Belcher *et al.*, 2003; Lindenmayer *et al.*, 2006), environmental protection/climate change mitigation and adaptation (Nadkarni & Kuel, 2013), conservation of culture & spiritual traditions (Rowland & Oyelana, 2014), and bio-energy/biofuel (Yahaya, 2015; Nadkarni & Kuehl, 2013).

The context of environmental-social protection derives from the important role forests play as safety nets for poor and vulnerable agricultural communities in times of economic or agricultural stress, when forest products like medicinal products, wild fruits, leafy vegetables, bush meat, fresh and dried nuts, wild honey, wild mushroom, etc provide food and nutrition substitutes. In other word, the various social services forests play, especially in emergency situations for food and nutrition confer on it a veritable instrument as pseudo-social protection.

The concept of social protection is concerned with protecting and helping those who are poor and vulnerable, such as children, women, older people, people living with disabilities, the displaced, the unemployed, and the sick. There are ongoing debates about which interventions constitute social protection, and which category they fit under, as social protection overlaps with a number of livelihoods, human capital and food security interventions (Harvey *et al.*, 2007).

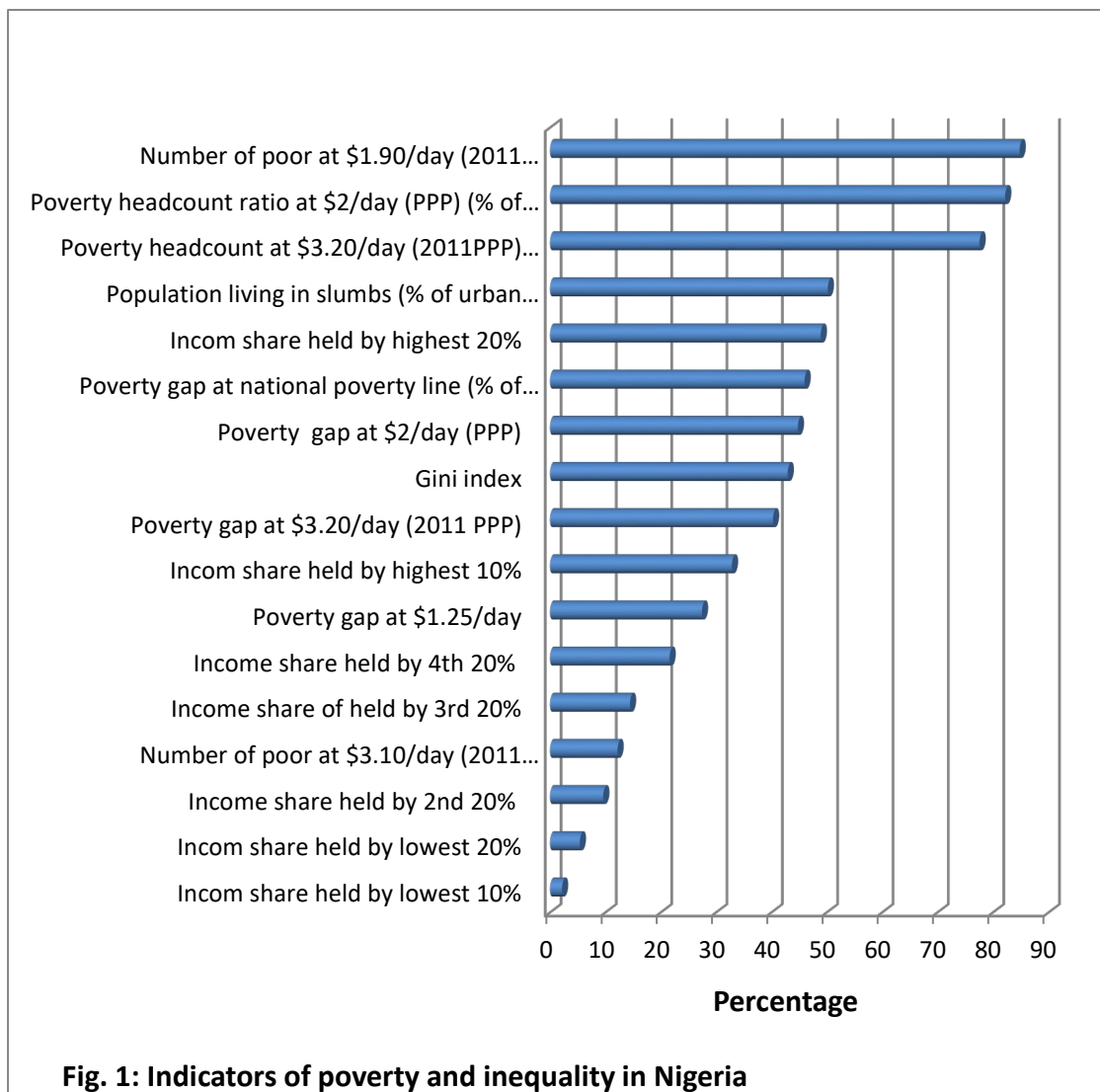
One of the manifestations for social protection is the presence of acute poverty and inequality among households. For instance, Nigeria was ranked by Oxfam Group as the country with the world highest inequality in 2017 for a second consecutive time, attributable to low social spending on health, education and social protection, the report however, also indicated that the country's 2018 rating would improve due to improved social spending in 2018 (Daily Trust Tues April 23, 2019).

Gini index (a measure of inequality) for Nigeria was reported to be 42.95 in 2010 (World Bank, 2010), which compared with 0.50, 0.53 for 2004 and 2010, respectively (Fagbemi *et al.*, 2015). Most developed European nations tend to have Gini coefficients between 0.24 and 0.36 while United States' Gini coefficient is above 0.4, indicating that United States have greater inequality (Wikipedia, 2019). Using the Gini can help quantify differences in welfare and compensation policies. Poverty and inequality levels in Nigeria may be summarized by the following indices (Fig. 1):

Brazil had one of the highest rates of inequality in the world, and poverty rates were high. Over 20% of the population (or 40 million people) lived under the national poverty line, and 7% were extremely poor. Within two decades, however, levels of inequality and poverty have been declining steadily. The Gini index has fallen significantly, by 5.2 points, from 59.4 to 54.2, and the percentage of households living below the poverty line halved between the early 1990s and 2008, falling from 36.0% to 17.2%. The success story of Brazil in the steady

declining poverty and inequality lies in its successful implementation of social protection instruments. “Brazil's social achievements in the first decade of the 21st century are remarkable and have captured the world's attention. Indeed, the country became and continues to be an important kind of laboratory for the experimentation of social policies and for testing them on a massive scale” (Barbosa, 2013).

Poverty of marginalized groups are often associated with rural and forest settlements or those people living in proximity to such locations. Consequently, people living in rural areas and around forests largely depend on natural resources found in such environment, such as collection of non-timber forest products (NTFPs) to serve as sources of income, food, nutrition, energy security, etc. However, while attempting to solve the problem of poverty by relying on NTFPs, the short-term poverty can be traded off for long run-run environmental problems such as biodiversity loss if NTFPs collection is not properly managed.



The purpose of the “protection” – whether of the natural environment or social welfare – is the enhancement of the capacity of forests to sustain their services to society. The objective of this study, therefore was the assessment of NTFPs income in relation to social and economic inequalities in Afaka Forest communities.

2.0 Conceptual Framework

2.1 Social Protection

There are different conceptual approaches to analysing social protection objectives and impacts. Each conceptualises potential impacts in different ways, namely; transformation; human capital; vulnerability; and human rights (Browne, 2015). Devereux and Sabates-Wheeler (2004) provide the most commonly used conceptual framework, which describes four social protection functions:

- **Protective:** providing relief from deprivation, e.g., income benefits, state pensions.
- **Preventative:** averting deprivation, e.g., savings clubs, social insurance.
- **Promotive:** enhancing incomes and capabilities, e.g., inputs, subsidy.
- **Transformative:** social equity and inclusion, empowerment and rights, e.g., labour laws.

The first three functions (the three Ps in the PPP+T framework) were originally conceptualised by the International Labour Organisation. The addition of the transformative element positions social protection not just to alleviate poverty but to transform lives, through pursuing policies that rebalance the unequal power relations which cause vulnerabilities.

Social protection is commonly understood as “all public and private initiatives that provide income or consumption transfers to the poor, protect the vulnerable against livelihood risks and enhance the social status and rights of the marginalised; with the overall objective of reducing the economic and social vulnerability of poor, vulnerable and marginalised groups” (Devereux & Sabates-Wheeler, 2004).

There are different forms of social protection; ‘safety nets’ are a form of social protection which help people meet immediate basic needs in times of crisis. Typical short-term goals are to mitigate the immediate impact of shocks and to smooth consumption (Browne, 2015). Other

forms of social protection aim at longer-term development and enabling people to move permanently out of poverty (Babajanian *et al.*, 2014). Long-term goals include improving opportunities for inclusive growth, human capital development, equity and social stability. Some social protection programmes intend to be transformative, supporting equity, empowerment and human rights.

Most social protection frameworks also conceptualise social protection as an investment in human capital which increases capacities and the accumulation of productive assets (Barrientos, 2010), breaking the intergenerational transmission of poverty. Social protection contributes to human capital either directly, by providing food, skills and services; or indirectly, by providing cash and access, which enable households to invest in their own development.

A small number of countries (including India, South Africa and Uruguay) and organisations recognise social protection as a human right and an entitlement against low standards of living (Jones & Shahrokh, 2013). According to the usage in international development, social protection may be different from social policy definitions in high-income countries. Social protection is usually provided by the state; it is theoretically conceived as part of the ‘state-citizen’ contract, in which states and citizens have rights and responsibilities to each other (Harvey *et al.*, 2007).

2.2 Non Timber Forest Products

Non-timber forest products (NTFPs) may be defined as all biological materials, other than timber, which are extracted from forest for human use (NTFP-EP, 2019). FAO (2010) classified NTFPs broadly into plant and animal’s products/raw materials on the basis of sources and uses. The plant products/raw materials include food, fodder, raw material for medicine and aromatic products, raw material for colorants and dyes, raw material for utensils, handicrafts and construction, ornamental plants, exudates, and other plant products. The animal products/raw materials consist of living animals, hides, skins and trophies, wild honey and beeswax, wild (or bush) meat, raw materials for medicine, raw materials for colorants, other edible animal products, and other non-edible animal products. According to Mathur and Shiva (1996), “All products obtained from plants of forest origin and host plant species yielding products in association with insects and animals or their parts and items of mineral origin except timber, may be defined as ‘Minor Forest Products’ (MFP) or ‘Non-Wood Forest Products’ (NWFP) or Non-Timber Forest Products (NTFP)”. According to Beer and

McDermott (1989), NTFPs are derived from two main sources, namely; the natural forest, human influenced systems such as plantations and modified forests.

In many developing countries economic welfare has historically been influenced by natural resources such as forests (Fletcher *et al.*, 1991). On this basis, Kant and Nautiyal (1996) contended that the role of any natural resource in the economic welfare of rural economies should be evaluated in three dimensions: its economic contribution to the local economy; its implications for equal income distribution (or low levels of inequalities); and the seasonal spread of its contributions. Specifically, the returns from NTFPs in tropical forests for some local communities are of comparable magnitude to those from other sources of income such as agriculture. This is so because returns from NTFPs enhance the income of poor people proportionally more than that of others and thus reduce inequalities. Further, the availability of these returns throughout most of the year also provides security or safety nets to these vulnerable people by shielding them from the effects of the wide fluctuations in agricultural income.

2.3 Poverty and Inequality

Inequality is related to poverty. It is the relative distribution of resources or well-being within the economy which gives a picture of equity or otherwise. Inequality focuses on the distribution of attributes, such as income or consumption, across the whole population (the rich, well-off or non-poor and the poor). But poverty and inequality are not the same. The existence of poverty portrays inequality in the distribution of well-being or welfare. Inequality re-enforces poverty and either of these can change without affecting the other (Haughton & Khandker, 2009).

According to the UNRISD (2010), poverty and inequality must be considered as interconnected parts of the same problem given that high levels of inequality make it harder to reduce poverty even when economies are growing. Evidences from global economic outlook have revealed that inequality is generally more predominant in poor countries than in rich ones. Poverty is closely related to various dimensions of inequality, including income status, gender, ethnicity and location.

This explains why such countries have witnessed economic growth over the last decades without an accompanying improvement in the welfare of their people. For instance, it is

estimated that there are 1.2 billion extremely poor people and Sub-Saharan Africa has the top ten countries in the world with the unacceptably high poverty incidence (World Bank, 2016), and Nigeria ranks second to India among the top countries globally with the highest population of the poor (World Bank, 2016). Nigeria is ranked 152 on the Human Development Index (UNDP, 2015). This represents a paradox of development (attributable to income inequality) when viewed against the background of the economic growth witnessed for about a decade within the same period (UNDP 2015; NBS, 2012).

2.4. Measurement of inequality

One common way of measuring income inequality is to rank all households by income, from lowest to highest, and then to divide all households into five groups with equal numbers of people, known as quintiles. This calculation allows for measuring the distribution of income among the five groups compared to the total. The first quintile is the lowest fifth or 20%, the second quintile is the next lowest, and so on. Income inequality can be measured by comparing what share of the total income is earned by each quintile.

The other method and perhaps the most popular measurement tool for inequality is the Gini Index. In particular, the Gini coefficient technique presented by Lerman and Yitzhaki (1985) is often used. First, Gini results are easily interpreted with the aid of a Lorenz Curve. Second, the technique allows easy decomposition of inequality by income sources. Third, the technique lends itself to easy-to-interpret decompositions of income effects (Lopez-Feldman *et al.*, 2007). With the technique propounded by Lerman and Yitzhaki (1985), inequality can be decomposed into two parts: inequality between groups (horizontal inequality) and inequality within groups (vertical inequality). Among the range of groups one can examine, geography, education, and demography stand out as groups for which a large share of overall inequality is explained by the group to which one belongs (Beegle *et al.*, 2016).

3.0 Study Area

Afaka Forest Reserve was established as an experimental plantation with the primary aim to curtail the imminent loss of the semi-arid environment of the Northern Guinea Savannah of

Nigeria to desertification. The Reserve occupies an area of about 7,093.12 hectares of land and lies between latitudes $10^{\circ} 35' 10''$ N and $10^{\circ} 37' 48''$ N and Longitudes $7^{\circ} 18' 49''$ E and $7^{\circ} 21' 58''$ + E of the Greenwich meridian (Otiwa, 2015; Yahaya, 2015; JICA, 1991).

3.1 Sampling Procedure

The study was conducted to assess the livelihood systems, poverty and income equality among households living around the Reserve. The data were collected between December, 2016 and March, 2017. Data for this study were collected from Udawa, Buruku and Kuriga communities in Chikun LGA and Rigasa, Mando (Sabon-Afaka), Likora, Gwazaye, and Hayin Dan-mani communities in Igabi LGA. The eight communities were purposively selected based on their proximity to the Reserve. A total of 204 households were systematically and proportionately selected for the study, viz; Rigasa (60), Mando (50), Gwazaye (25), Likora (10) and Hayin Dan-mani (10) all in Igabi Local government Area. While the samples from Chikun Local government Area were Buruku (25), Udawa (25) and Kuriga (10). The major economic activities of the communities include farming, livestock rearing, hunting, wild fruits collection, weaving, trading, amongst others.

3.3 Data Analysis

The data were analyzed for Gini coefficients to estimate the effects of NTFPs incomes on income inequality as an index of forest safety net, and Foster-Greer-Thorbeck (FGT) was used to measure the effect of NTFPs income on poverty profile. The Gini coefficient is a common measure of income inequality across individuals or households (Fisher, 2004; FAO, 2006; Lambert, 1993).

The Gini coefficient also referred to as Gini Index (by expressing the coefficient as a percentage) is associated with the Lorenz Curve such that it measures the ratio of the area between the Lorenz Curve and the equidistribution line (also known as the concentration line) to the area of maximum concentration. It is therefore defined as a ratio with values between 0 and 1, such that, 0 corresponds to perfect income equality (meaning everyone has the same income) while 1 corresponds to perfect income inequality (meaning one person has all the income, while everyone else has zero income).

The Gini coefficient was used to measure the impact of NTFP income on inequality in the study area. Therefore to estimate the effect of forest income on inequality, the Gini coefficient model proposed by Lerman and Titzhaki (1985) and adopted by Fonta and Ayuk (2013) was adopted.

Assuming k is any income source [and in this study incomes from: NTFPs(x_1), agriculture(x_2), artisanal activities(x_3), trading(x_4), paid employment(x_5), and gifts(x_6)], the Gini Coefficient for any particular income source k is computed as:

$$G_k = 2 \frac{COV[Y_k, F(Y_k)]}{\mu_k} \quad G_k = 2 \frac{COV[Y_k, F(Y_k)]}{\mu_k} \quad \dots (1)$$

Where,

Y_k = the income of the household (i.e., NTFPs and other income sources); $F(Y_k)$ = the cumulative distribution of income source k ; μ_k = mean household income; and G_k = the Gini coefficient of each income source k .

Similarly, assuming G_T as the Gini coefficient of total income, then the Gini coefficient (G_T) of total household income is given by:

$$G_T = 2 \sum_{k=1}^k COV[Y_k, F(Y_k)] / \mu_T \quad G_T = 2 \sum_{k=1}^k COV[Y_k, F(Y_k)] / \mu_T \quad \dots (2)$$

This also equates:

$$G_T = \sum_{k=1}^k S_k G_k R_k \quad G_T = \sum_{k=1}^k S_k G_k R_k \quad \dots (3)$$

Where S_k represents the share of household income k on total income, G_k measures the Gini coefficient of each income source k , while R_k measures the Gini correlation between income source k and the distribution of total income.

Hence equation (1) enables the decomposition of the influence of any income component such as NTFPs income on total income inequality to be determined and answers three questions:

- i. What is the contribution of the income source (e.g., NTFPs) to total income (S_k)?
- ii. How equally (or unequally) distributed is the income source (G_k), and
- iii. What is the correlation between the income source and the distribution of total income (R_k)?

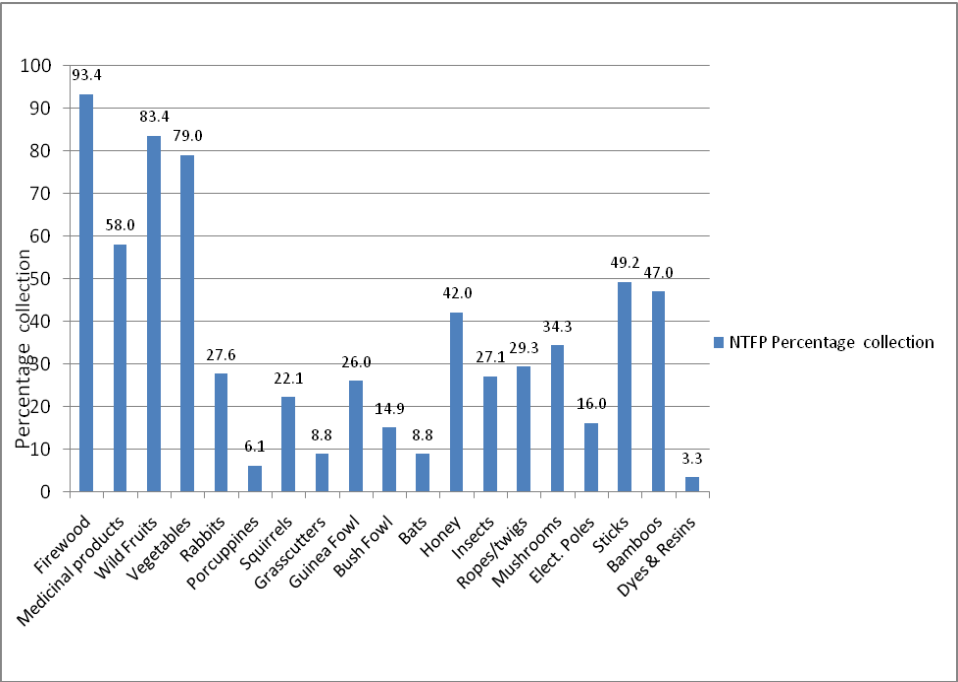
The effect of a small change from any income source k , (holding others constant) is therefore given by:

$$\frac{\delta G_T}{\delta k} / G_T = (S_k G_k R_k) / G_T - S_k \quad \dots (4)$$

4.0 Results and Discussion

The Non-timber forest products being extracted from Afaka Forest can be categorized into six major groups, namely; food, medicine, fuel, construction, animal feed stuffs and other raw materials. Figure 1 provides the example of these NTFPs extraction from Afaka Forest and the percentage utilization of each product for household food. There was a relatively high dependence on NTFPs for food, especially meat supply. The over 80% of the households depending on NTFP meat supply was an indication of extreme poverty. One of the characteristics of extremely poor households is the tendency to be frugal in spending in order to stretch the household budget. Very often, poor households spend less on proteins because of the constrained food budget since proteins are relatively expensive. Forest is home to very poor community because of the proximity to sources of food and nutrition in form of fruits, nuts, mushrooms, snails, wild honey, bushmeat, fodder, etc.

Figure 2 shows the concentration of households on individual NTFP in terms of collection from Afaka Forest. Firewood, wild fruits and vegetables collection exceeded 70% mark. Firewood collection has been identified as one of the environmental concerns of many poor countries, especially south of the Sahara where Nigeria has the largest population. However, under a well controlled NTFPs collection firewood collection without felling of trees can act as a modifier of forests by selective felling and topping of trees.



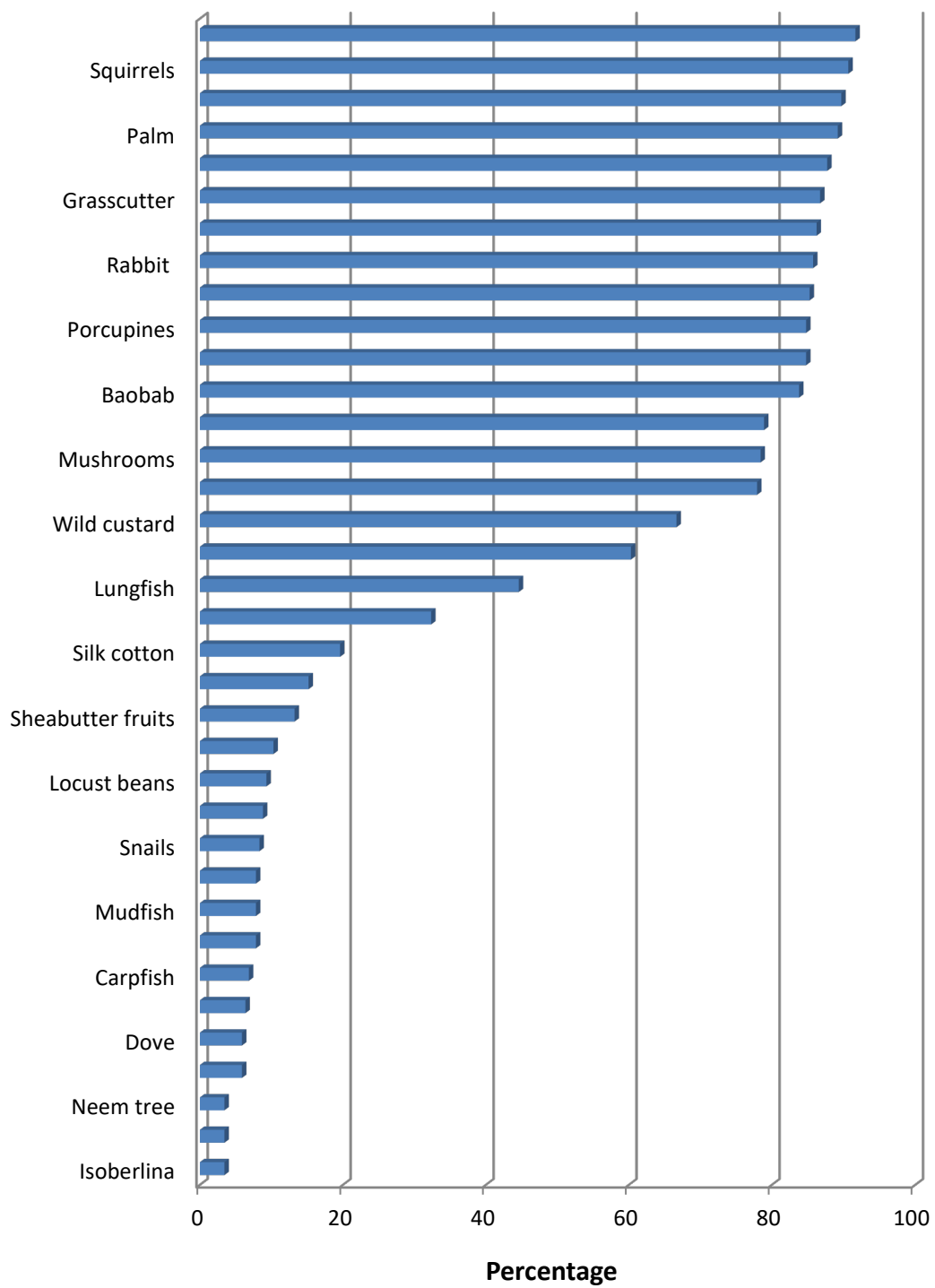


Fig. 2: Percentage utilization of NTFPs as household food

Figure 3 shows the distribution of households engaged in NTFPs collection. Firewood was collected by nearly all the households in the communities, accounting for 93% (Fig. 1). Some of the NTFPs' collection was engaged by relatively few households, e.g. porcupine, but its utilization was by majority of households in the communities, which accounted for 84.8% (Fig. 2).

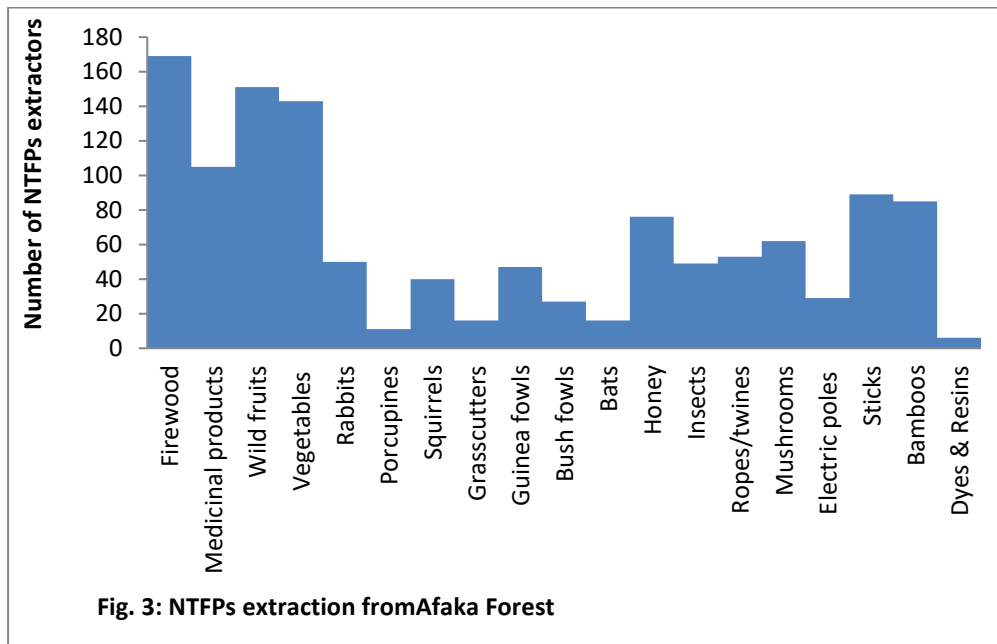


Figure 4 shows the ten topmost NTFPs on the basis of estimated gross income realized 2015. Firewood accounted for the highest gross income of ₦4, 661,400, followed by electric poles ₦2, 698, 800. The high estimated incomes from these two NTFPs, especially have implication for high rate of extraction, which may predispose the forest tree species to extinction and carbon sequestration, which would result in trade-off of public good for private short term satisfaction. Forests act as good sink surface for carbon dioxide and other dangerous green house gases from exposing the atmosphere to direct effects of anthropogenic activities, thereby bringing ozone layer – which acts as an effective screen from dangerous green house gases – to direct impact, resulting in the high heat wave across Nigeria, for instance. The negative external effects of private production and consumption decisions is the bane of the poor governance in Nigeria, where majority of the population are left to scavenge for short-run survival, irrespective of the long-run negative impact. It is the responsibility of the state to bridge poverty gaps (money poverty, food poverty, material poverty, etc) through social protection instruments such as cash transfers (conditional and unconditional), subsidies, and food voucher. Social protection is theoretically conceived as part of the ‘state-citizen’ contract, in which states and citizens have

rights and responsibilities to each other (Harvey *et al.*, 2007). Trade-off or social externality is a common phenomenon in Nigeria, where there is high level abuse of public goods such as forests. There is much reliance of the poor on forests for food, medicaments, fuel, construction, raw materials, etc, rather than allowing forests to serve as safety nets or wealth of society. Social pension serves as a key instrument of social protection in some countries, such as Brazil, where 26% reduction in extreme poverty was attributed to pension (Homes, *et al.*, 2011), the use of pension, which affect majority of employees, is not well developed in Nigeria.

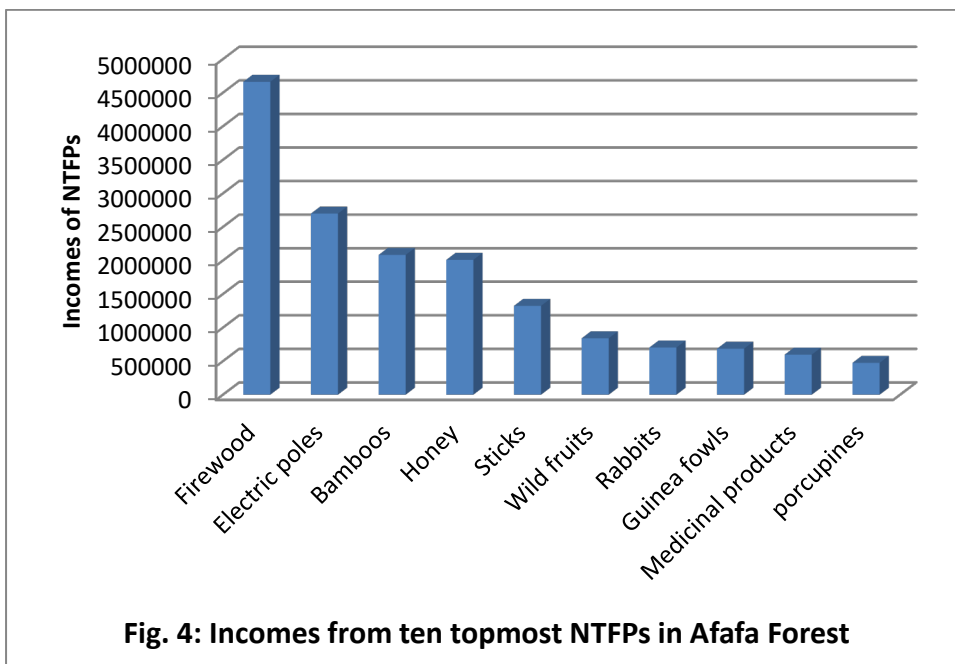


Figure 5 shows the per capita income among Afaka communities, which have been categorized into two, namely; per capita income of households living only on NTFPs (PMIHH1) and per capita income of households with NTFPs income as a supplement (PMIHH2). The PMIHH2 was much higher than PMIHH1. The difference was highly significant ($P < 0.001$). This finding brings to the fore the importance of forests as safety nets, however, it also stresses the role forest can play as pseudo-social protection instrument by augmenting the income of households, as conventional social assistance would, thereby stretching the household budget. Several studies identify social transfers as having played a key role in increasing per capita income of households (see Hailu, 2009).

While classic economic theory has suggested that inequality is a natural by-product of rapid growth, recent research has shown that high levels of inequality and poverty can undermine

economic growth through several channels, including weak social cohesion, fiscal instability, biased social spending, elite domination, insecurity, etc. (Birdsall,2007; Santos, 2010, van der Hoeven, 2008).

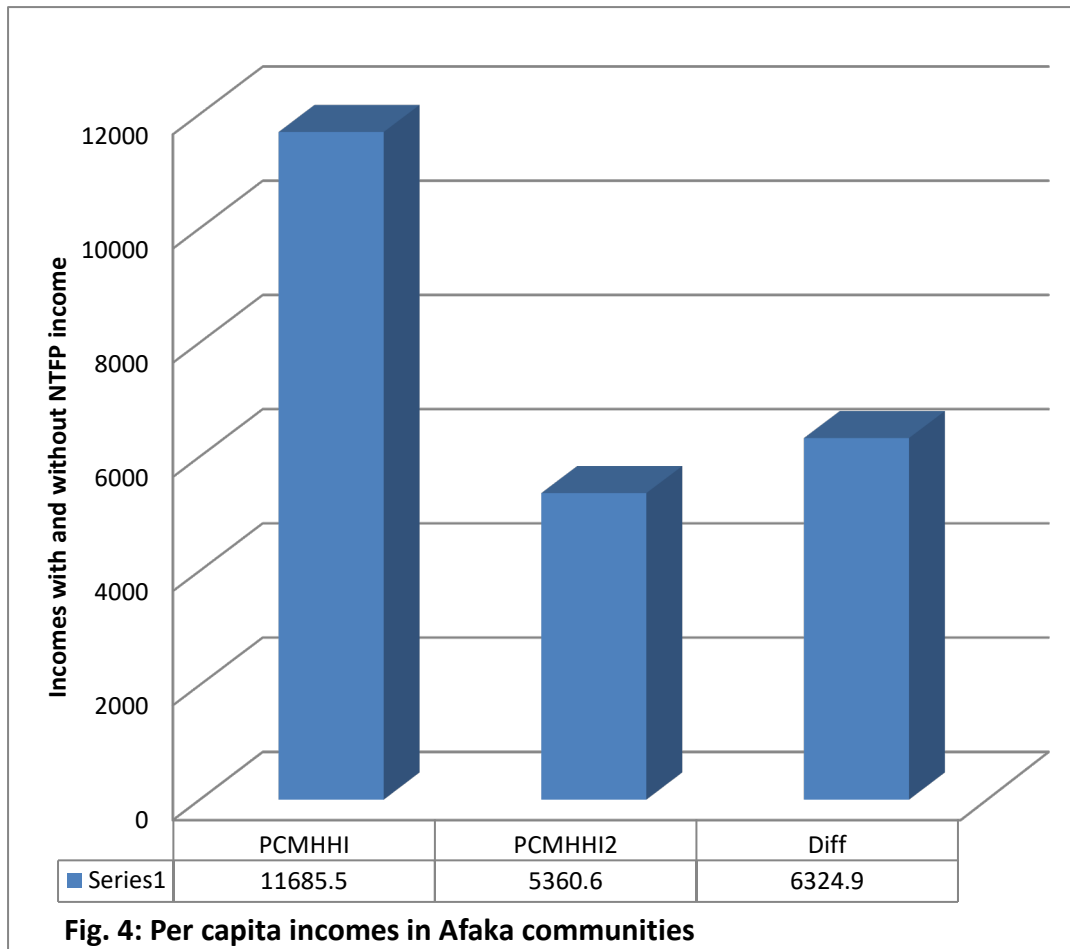


Fig. 4: Per capita incomes in Afaka communities

Decomposition of Gini index by income sources.

Decomposition of income inequality provides some idea on the concentration of total inequality. In other word, the decomposition shows how each component of total incomes stands in terms of contribution to the total inequality (Araar, 2006; Lorenzo & Liberati, 2006). There were six major sources of income this study investigated in terms of share of total income and contribution to income inequality, namely; NTFPs, farming, crafts, trading, paid employment and pension (Table 1). The study found Gini coefficient of 0.3427 for the total income inequality. The decomposition of the Gini coefficient shows that the average monthly farming income ($AMFAR_{INC}$) accounted for the highest share (0.5975 or 59%) but had a Gini coefficient of 0.4028 while the least share of income (0.0073) came from trading

(AMTRAD_{INC}). Income from NTFPs (AMNFP_{INC}) accounted for 8 percent share of total income sources with a Gini coefficient of 0.4426 and a relative contribution to income inequality was 0.0178, implying that NTFP incomes have a reducing power on inequality, suggesting that a 10 percent rise in NTFPs' income would result in 0.178 percent increase in total income inequality (or relative poverty index), which compares with the 59 percent coming from farming income. Fisher (2004) obtained a similar result, who reported that forest income reduced income inequality by 12 percent. The graphical decomposition of the Gini analysis is represented by the Lorenzo curves on figure 4.

Table 1. Decomposition of inequality by sources of income among the households

Sources	Income share(S_K)	Gini Correlation (R_K)	Gini Index (G_k)	Absolute Contribution (S k*R k*G k)	Relative Contribution (S k*R k*G k/G)
1.AMNTFPinc	0.0842	0.1635	0.4426	0.0061	0.0178
2.AMFARINC	0.5975	0.7229	0.4028	0.1740	0.5078
3.AMCRAFINC	0.0450	0.2577	0.8808	0.0102	0.0298
4.AMTRADINC	0.0073	-0.3844	0.8281	-0.0023	-0.0068
5.AMPDINC	0.2390	0.7753	0.8062	0.1494	0.4360
6.APENINC	0.0270	0.2051	0.9541	0.0053	0.0154
Total	1.0000	---	---	0.3427	1.0000

Note: AMNTFPinc – Average monthly Non-Timber Forest income; AVMFARINC - Average monthly farm income; AMCRAFINC - Average monthly crafts income; AMTRADINC - Average monthly trade income; AMPEINC - Average monthly paid employment income; AMPENINC - Average monthly pension income

Decomposition of NTFP income Gini index by groups.

Further analysis showed the distribution of NTFP incomes among different categories of the population. Hence, the distribution of these incomes examined the context of sex (or gender), education and primary occupation of the household.

Table 2 shows that female headed households had a relatively higher Gini coefficient of 0.4711 than their male counterparts, although their income share in the population was 6 percent. On whole, the relative contribution to inequality accounted for within and between sexes was 81 and 14 percent, respectively. Gender is a key dimension in income inequality, and women tend to be disadvantaged relative to men in most spheres of lives (UNRISD, 2010).

Table 2. Decomposition of NTFP income by gender of household head

Group	Gini Index	Population Share	Income share	Absolute contribution	Relative contribution
Male-headed HH	0.4017	0.8847	0.9425	0.3350	0.7978
Female-headed HH	0.4711	0.1153	0.0575	0.0031	0.0074
Within	---	---	---	0.3381	0.8052
Between	---	---	---	0.0578	0.1376
Overlap	---	---	---	0.0240	0.0572
Population (Total)	0.4199	1.0000	1.0000	0.4199	1.0000

HH = Household head

The decomposition of income inequality by educational status of the household head showed that although those with tertiary education had the lowest Gini coefficient of 0.37 their share in NTFP incomes was 9 percent (Table 3). The highest income share came from non-formal education (37 percent), also with the second highest Gini coefficient (0.47), which may be attributed to relatively fewer number people involved, but generated high income from the types of NTFPs such as electric poles.

Table 3. Decomposition of NTFP income by educational status of household head

Group	Gini Index	Population Share	Income share	Absolute contribution	Relative contribution
Non-formal edu	0.4741	0.3334	0.36673	0.0386	0.0919
Primary edu	0.4245	0.2038	0.2339	0.0202	0.0482
Secondary edu	0.4826	0.3104	0.3083	0.0462	0.1100
Tertiary edu	0.3747	0.1525	0.0905	0.0052	0.0123
Within	---	---	---	0.1102	0.2624
Between	---	---	---	0.0891	0.2122
Overlap	---	---	---	0.2206	0.5254
Population (Total)	0.4199	1.0000	1.0000	0.4199	1.0000

The analysis of income inequality by occupation depicted paid employment as having the highest Gini coefficient (0.49) with 17 percent income share (Table 4). So the most important category is farming, not just because their income share was 64 percent but also due to having accounted the largest share of the population (57%). An improvement in the income and its distribution amongst farmers who also collected NTFPs would improve the welfare of the communities around the Reserve.

Table 4. Decomposition of NTFP Gini index by occupation of household head

Group	Gini Index	Population Share	Income share	Absolute contribution	Relative contribution
Farming	0.3966	0.5699	0.6428	0.1453	0.3460
Hunting	0.1969	0.0224	0.0308	0.0001	0.0003
Trading	0.4882	0.0934	0.0782	0.0036	0.0085
Paid Employment	0.4889	0.2120	0.1713	0.0178	0.0423
Others	0.3712	0.1022	0.0769	0.0016	0.0039
Within	---	---	---	0.1684	0.4010
Between	---	---	---	0.0872	0.2076
Overlap	---	---	---	0.1643	0.3913
Population (Total)	0.4199	1.0000	1.0000	0.4199	1.0000

Conclusion

Non-timber forest products are important sources of food, medicine, energy, raw materials, incomes, cultural conservation, and ecosystem services which affect the livelihoods of the Afaka forest communities. NTFPs are collected by households to supplement earnings from primary occupations and are also safety nets. The contribution of NTFP incomes in reducing income inequalities in the communities around the Afaka Forest Reserve underscores the positive welfare impact of NTFPs in these communities.

References

Beegle, K., Christiaensen, L., Dabalen, L and Gaddis, I.(2016). *Poverty in a Rising Africa*. Washington, DC: World Bank.

Belcher, B., Ruiz-Perez, M and Achdiawan, R. (2003). Non-timber forest products (NTFPs), small-scale logging and rural livelihoods. Paper presented at the *International Conference on Rural Livelihoods, Forests and Biodiversity* 19-23 May 2003, Bonn, Germany, 27pp.

Daily Trust, Tuesday April 23, 2019

FAO (2006). Inequality Analysis: The Gini Index. *EASYPol, On-line Resource materials for Policy Making, Module 040*, Food and Agriculture Organization of the United Nations, FAO, 30pp.

FAO (2010). Global Forestry Resources Assessment, 2010. Food and Agricultural Organization. (FAO). *Forestry paper 163*, Rome, Italy, pp. 340.

Fletcher, S., White, W., Phillips, W. and Constantino, L (1991). *An Economic Analysis of Canadian Prairie Provinces' Forest Dependent Communities*, Department of Rural Economy, University of Alberta, Edmonton, p. 62.

Fisher, M. (2004), 'Household welfare and forest dependence in Southern Malawi.' *Environment and Development Economics* 9(2):135-154.

Fonta, W.M & Ayuk, T.E. (2013). Measuring the role of forest income in mitigating poverty and inequality: evidence from south-eastern Nigeria, *Forests, Trees and Livelihoods* 22(2): 86-105

Haughton, R and Khandker, S. R. (2009). Handbook on Poverty and Inequality. Published by The World Bank, 1818 H Street NW, Washington, DC 20433, USA.

Kant, S and Nautiyal, J.C. (1996). Forests and economic welfare, *Journal of Economic Studies*, 2 (23): 31-43, MCB University Press

Kopnina, H. (2014). Contesting 'environment' through the lens of sustainability: Examining implications for environmental education and education for sustainable development. *Culture Unbound*, Volume 6: 931-967, <http://www.cultureunbound.ep.liu.se>, Accessed March 28, 2019

- Lambert, P. J. (1993). *The Distribution and Redistribution of Income* (2nd ed.), Manchester University Press, Manchester, 307pp.
- Lerman, R., & Yitzhaki, S. (1986). Income inequality effects by income sources: a new approach and application to the US. *Review of Economics and Statistics*. 67(1): 151-156.
- Lindenmayer, D.B., Franklin, J.F and Fischer, J.(2006).General management principles and a checklist of strategies to guide forest biodiversity conservation. In: *Biological Conservation*. Elsevier131(2006):433-445. www.elsevier.com/locate/biocon. Also available at: www.sciencedirect.com.
- Mathur R.B. and Shiva M.P (1996). Standard NTFP classification and documentation manual. *Dehra Dun: Khanna Bandhu*, pp. 1-40.
- Maske, M., Mungole, A., Kamble, R., Chaturvedi, A. and Chaturvedi, A. 2011. Impact of non-timber forest produces (NTFPs) on rural tribes' economy in Gondia district of Maharashtra, India. *Achieves of Applied Science Research* 3(30): 109-114.
- Nadkarni, M & Kuel, Y (2013). Forests beyond trees: NTFPs as tools for climate change mitigation and adaptation, *INBAR Working Paper No. 74*, International Network for Bamboo and Rattan (INBAR), Beijing, China. pp 26.
- Otiwa, G. (2015). Geographical assessment of Non Timber Forest Products (NTFPs) in Afaka Forest Reserve, Unpublished M.Sc Thesis, Geography Department, Nigerian Defence Academy (NDA), Kaduna
- Pătruți, A. (2015). The ethics of environmental **protection**. Bucharest Academy of Economic Studies
- Roland, R. O and Oyelana, A. A (2014). Contribution of non timber forest products to rural household income in Eastern Cape Province, South Africa, *Mediterranean Journal of Social Sciences*. 5(23): 749- 757.
- Yahaya, U. (2015). *Bio-ethanol Production from Eucalyptus Wastes*. Lambert Academic publishing, 102pp.

UN (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*. Resolution (A/RES/70/1) adopted by the General Assembly on 25 September 2015, during the Seventieth session.

UNRISD (2010). *Combating Poverty and Inequality*. United Nations Research Institute for Social Development (UNRISD), Geneva, Switzerland, 360pp.

USAID (2008). *Nigeria Biodiversity and Tropical Forestry Assessment: Maximizing Agricultural Revenue in Key Enterprises for Targeted Sites (Markets)*. United States Agency for International Development (USAID), Nigeria, 90pp.

World Bank (2016_a). “Who are the poor in the developing world?” Policy Research Working Paper 7844, *Background Paper. Poverty and Shared Prosperity Report 2016: Taking on Inequality*.