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PROFITABILITY OF FUELWOOD IN GAMBARI FOREST RESERVE ENVIRONMENT IN OYO STATE NIGERIA

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ABSTRACT: Fuelwood is the most utilized non-timber forest product in Nigeria as it helps in sustenance and in meeting the energy need of people living in and around the forests. However, stopping the utilization of fuel wood as energy source will pose a major challenge to livelihood survival among the rural dwellers in Nigeria. This study assessed the profitability of fuelwood trade and contribution to the sustainable livelihood of the people living around the reserve. A purposive sampling procedure and simple random sampling were used for selection of 100 fuel wood sellers across the selected communities around Gambari forest reserve environment. A well-structured questionnaire was used as a test instrument for data collection. The data were analyzed with descriptive statistics (frequencies and percentages) and inferential statistics (Chi-square and logistic regression analysis α 0.05). Majority of the respondents (55%) were adults, about 51% of respondents were male; about 46% had no formal education. Major sources of fuel wood included both reserve and free areas while most of the respondents (87%) were of the opinion that fuel wood is readily available from time to time. The trade was economically viable as ₦24,050 was the average income being realized; meanwhile the minimum wage being paid by the government currently is ₦30,000. The study concluded that marketing of fuelwood in the study area was highly profitable despite challenges facing the trade. The study recommends that people around the reserve should be encouraged by the government to plant trees to replace the ones harvested to meet up the bulk of demand for domestic and industrial use.

Keywords: Economic Viability, Income, Fuelwood, Livelihood Sustenance

1. INTRODUCTION

Trade of non-timber forest products (NTFPs) such as Shea butter, chewing stick, gum Arabic to mention a few for income generation is not new. These products have been traded for centuries (Sunderland *et al.*, 2004). However, in recent decades these markets in many countries have expanded, due to entries of new products into the market and the growth in existing trade. This expansion reflects a growing recognition of the

contribution made by many NTFPs to rural economies, both in terms of supporting subsistence and as a means of generating income. Furthermore, the exploitation of NTFPs is widely believed to be relatively compatible with forest conservation as collecting NTFPs is generally considered to be less damaging to the forest resources than timber extraction (Arnold and Ruiz Perez, 1998; Belcher and Schreckenber, 2003). Consequently, trading NTFPs potentially offers a means of concurrently achieving both conservation and development goals

(Plotkin and Famolore, 1992). NTFPs are a very essential source of livelihood for large proportion of the poor living in or close to the forest in most tropical countries. For instance, fuel wood is a NTFP commonly used for domestic and industrial energy generation.

Wood harvesting is the third most important economic activity for the inhabitants of forest dependent area, after farming and animal husbandry (Food and Agriculture Organisation, 1990). Also, local processing of NTFPs increases off-farm rural employment. Campbell (1988) reports that 50% of income for 20% to 30% of the rural labour force of India is based on small scale forest enterprises, many of which are NTFPs based. In addition to subsistence and income generating potential, NTFPs also help provide food security to large low-income populations, their cattle and other domestic animals, particularly during drought and famines (FAO, 1996).

There are diverse technical, environmental, social, cultural and economic reasons for choosing fuelwood as a source of energy. For many users, the choice depends on the availability and affordability of other energy options (Horgan, 2000). For centuries fuel wood has remained an affordable and reliable source of domestic energy for the rural populations of the developing countries (FAO, 1990). For instance, rural population in oil rich developing countries will continue to depend on wood because bringing oil, gas and electricity within their reach would require very high capital expenditure on roads and on electric transmission lines. Awah (1995) pointed out that in the past, wood harvesting in developing countries was mainly for domestic consumption, and it was mostly women who gathered the dry branches and trunks of trees and shrubs for fuel wood.

Most of the wood harvested in the villages for household use are harvested by women and younger children and transported on head, animal, truck and bicycle. Today the situation has changed, as increased commercialization of the sector has led to the widespread harvest of both dead and live branches and trunks by men and women. The fuelwood sector now employs many men, women, and children in both rural and urban areas, offering both temporary and permanent employment opportunities. It is important economically because it offers an immediate source of income (Larinde and Kehinde, 2003). Fuelwood when harvested, is processed, marketed and consumed exclusively by forest dependent communities, moving from collectors through wholesalers and retailers to consumers. This is because fuel wood is a forest product with little sophistication in length of processing and marketing and the products reach the final consumers more or less directly.

A large number of rural households are becoming more involved in producing fuel wood for the market; hence it

is necessary to shift the focus of studies from subsistence to income generation. In Nigeria presently, it is important not only to consider what is currently produced and how it is marketed, but also to look critically at current and potential markets and to appraise whether a potential product is sustainably managed. For many fuelwood users in developing countries, energy options are limited.

In the commercial and industrial sector, a large number of prepared-food vendors such as restaurants, vendors of barbecue, bakeries, makers of agidi (maize steamed in leaves) and palm oil producers depend on wood fuel. Institutions such as hospitals, schools and prisons and industries such as blacksmiths are among the highest consumers of scrap wood, coconut wood and charcoal (Bista and Edward, 2006). Since stoppage of fuel wood as an energy source seems not possible in Nigeria or developing country at large, it is therefore necessary to look at its economic potentials so as to promote regeneration of various wood species that are very useful for this purpose instead of condemnation of its energy potential for more economic gain.

2. MATERIALS AND METHODS

2.1 Study Area

This study was conducted at Gambari Forest Reserve Environment located in Oluyole Local Government Area of Oyo State covering a land area of 17,984 hectares (Fig. 1). It is located on latitude 7°25'N and longitude 3°09'E within the semi-deciduous rain forest belt of Nigeria. The reserve has two sections; natural and plantation forest. The area has an undulating topography with attitude of between 90 and 140m above sea level. The annual rainfall ranges between 1200mm to 1300mm spreading from March to November. The dry season in the study area is severe with average annual temperature of about 26.4°C while the relative humidity is low; about 42.3% (Larinde and Olasupo, 2011).

2.2 Sampling Procedure and Data Analysis

A purposive sampling procedure was used to select five (5) adjoining communities around Shasha forest reserve environment. The selected communities were Olonde, Onigambari, Dalley, Onipe and Busogboro. Each of these selected communities consists of average 38 households respectively. Samples were drawn in proportion to population sizes with simple random sampling for selection of fuel wood sellers across the five selected communities namely; Olonde (16), Dalley (17), Busogboro (20), Onipe (24), and Onigambari (23). The respondents were fuel wood sellers and their population was identified through their association. Therefore, a total of 100 respondents were selected as sample size. A

well-structured questionnaire was used for data collection. The entire copies of 100 questionnaires administered for the study were retrieved. Data analysis was carried out with both descriptive and inferential

statistics. The descriptive statistics were frequencies and percentages while the inferential statistics were Chi-square and Logistic regression analysis.

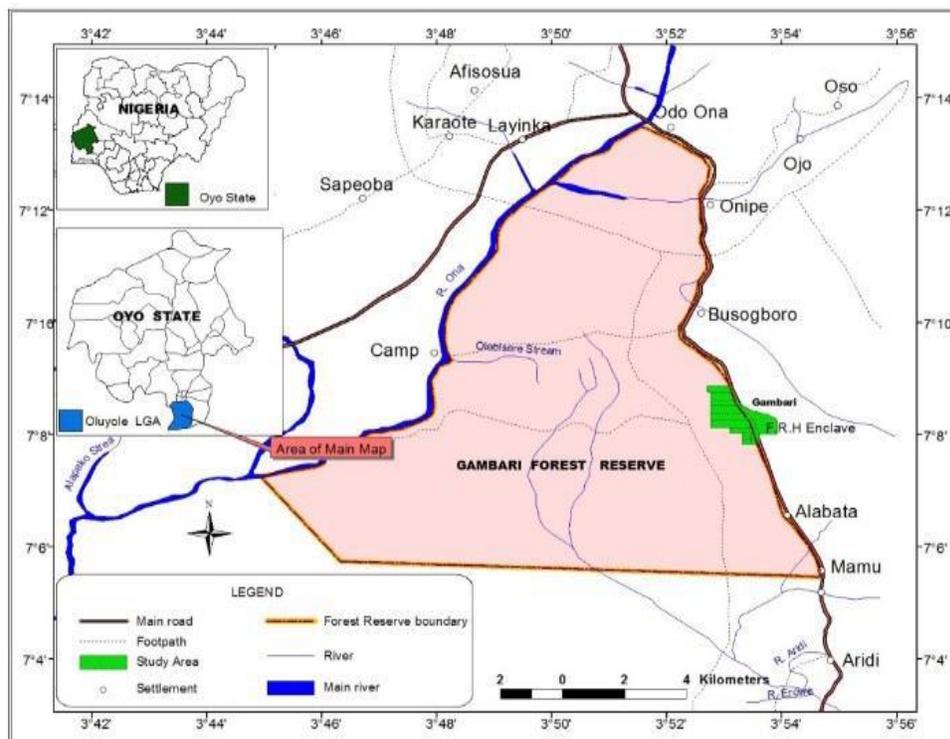


Figure 1: Map of Study Area Showing Gambari Forest Reserve Environment

2.3 Analytical Tools

2.3.1 Chi-square

$$\chi^2 = \sum \frac{(O-E)}{E} \dots\dots\dots (1)$$

Where:

χ^2 = Chi-Square

Σ = Summation

O = Observed values of frequencies of nominal variables like sex, religion, marital status; that is the socio-economic variables for the study.

E = Expected values are frequencies determined from response categories.

2.3.2 Logistic regression

The logit of a response p between 0 and 1 is given as:

$$\text{Logit}(p) = \log(p/1-p) = \log(p) - \log(1-p)$$

The simplest form of logit model is expressed as:

$$\text{Logit}(p_i) = a + b x_i \dots\dots\dots (2)$$

Where,

x_i = vector of predictor or independent variables

p_i = probability of adequacy of marketing fuelwood in Gambari forest reserve environment

a and b = regression parameters.

3. RESULTS AND DISCUSSION

The result in Table 1 reveals that 51% of the marketers in the study area were males while 49% were females. It could be inferred that more men are involved in this occupation. This could be attributed to the characterized laborious nature of fetching exercise viz a viz packing and loading. This corroborates with Birner and Allison (2006) who stated that male resilient nature to stress management make it possible for them to engage in more tedious work than their female counterpart. Age distribution reveals that most of the respondents were within the age bracket of 30-49 (55%). This result agrees with the findings of Larinde and Olasupo (2011) who reposed that majority of the people involved in fuel wood marketing in Gambari forest reserve were above 30 years

and below 60 years of age. Generally, performance of the trader seems to be age dependent. Thus, there is high likelihood of young traders performing better than the aged ones, due to agility require in marketing. Information on marital status of the respondents reveals that majority of the respondents (62%) were married. This is in line with Adedokun (2018) who reported that married people have more responsibilities (Provision of foods, education, health, well-being of their spouses and children) than singles. This may be the reason why the business is dominated by them.

Table 1: Demographic information of the respondents (n = 100)

Variable	Frequency	%
Gender		
Male	51	51.00
Female	49	49.00
Age		
<30	6	6.00
30-49	55	55.00
50-69	35	35.00
70 above	4	4.00
Education		
Tertiary	1	1.00
Secondary	15	15.00
Primary	35	35.00
No formal education	46	46.00
Others	3	3.00
Marital status		
Single	8	8.00
Married	62	62.00
Divorced	12	12.00
Widow/Widower	18	18.00

Source: Field survey, 2020

The study on primary occupation of the respondents indicated that 73% of them were farmers while the remaining fraction partakes in other economic activities such as fuelwood marketing, general trading, fishing and host of others (Figure 2). However, it was observed that the major secondary occupation of the respondents was fuelwood marketing (12%). Ekong (2003) had earlier reported that majority of rural dwellers; women inclusive engage themselves in farming as their primary occupation. Meanwhile, farming as the major economic activity in the rural area has been reported by several authors in the past (Wiggins and Proctor, 2001; Meijerink and Roza, 2007).

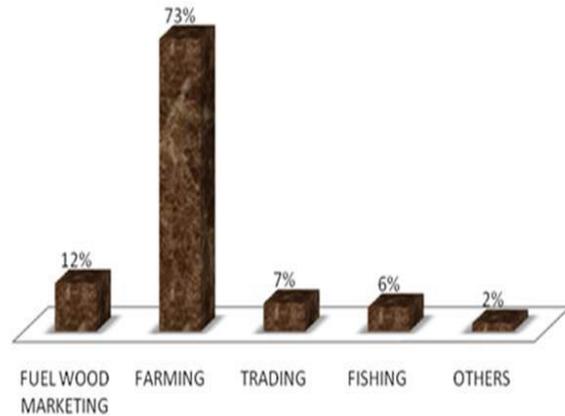


Figure 2: Primary occupation of respondents

Figure 3 reveals that most of the respondents had long years of experience in the trade. About 10% of respondents had 1-5 years' business experience. This indicates that many respondents despite their involvement in other means of livelihood have been engaged in fuelwood trade for many years. This finding agrees with Adeoye *et al.* (2011), who stated that the higher the number of years a marketer engages in a particular business, the better he/she becomes in the business. It could be inferred that the trade is an ancient one in the study area.

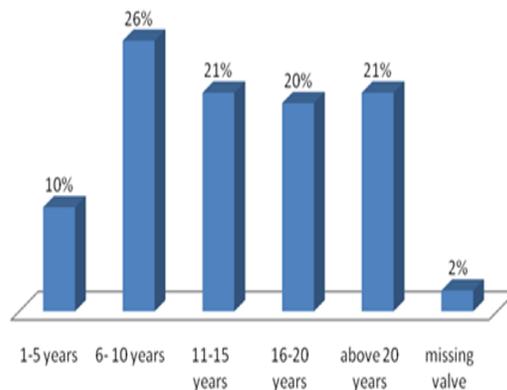


Figure 3: Business/ trade experience

The result in Table 2 reveals information on sources of fuel wood in the study area. Most of the respondents (47%) indicated that they source their fuel wood from both the reserve and free area while a close fraction of them (42%) submitted that they depend solely on the reserved forest for their fuel wood collection. This finding agrees with Jonah *et al.* (2013) who observed that majority of those involved in NTFPs activities (65.7%) gathered their products from the forest area. Therefore, forest reserves are very significant to the livelihood of the rural and urban dwellers. Hence, this result implies that there is a lot of pressure on Gambari forest reserve as most of the respondents relies on it for sustainability of their trade.

Table 2: Sources of wood fuel in the study area (n = 100)

Variable	Frequency	%
Reserve	42	42.00
Free area	3	3.00
Reserve and free area	47	47.00
Around home	5	5.00
Neighboring town	2	2.00
Outside Oyo state	1	1.00

Source: Field survey, 2020

The result in Table 3 shows the method that most of the respondents (84%) engaged in sourcing their fuel wood from the reserve without tampering with standing trees. The result indicates that about 10% of fuelwood collectors contribute to deforestation problem in the reserve. To enable the collectors to gather dried /dead woods, permits must be issued to them by the State Department of Forestry under maximum supervision of the forest guards.

Table 3: Method of sourcing for fuel wood (n = 100)

Variable	Frequency	%
Cutting of standing trees	10	10.0
Collecting dried/dead woods	84	84.0
No response	6	6.0

Source: Field survey, 2020

The result in Table 4 provides information on the availability of fuel woods in the study area. Most of the respondents (87%) are of the opinion that fuel woods are readily available for collection in the reserve. Non-readily availability of this product indicated by this fraction of respondents may be the reason while some have to cut down standing trees so as to ensure accomplishment of their immediate economic gain. This concurs with Adejumo *et al.* (2014) who reposed that local residents in Ondo state are fond of deforestation in order to enjoy bountiful harvest of fuel wood.

Table 4: Availability of wood fuel for marketing (n = 100)

Variable	Frequency	%
Readily available	87	87.0
Not readily available	11	11.0
No response	2	2.0

Source: Field survey, 2020

The result in Table 5 reveals that the major patronizers of the fuel wood marketers comes from Bakery (42%) as a lot of local bakeries from the nearby towns rely on fuelwood to power their local industries. The importance of fuelwood for some daily economic activities as source of energy cannot be ruled out.

Table 5: Patronizers of wood fuel in the study area (n = 100)

Variable	Frequency	%
Bakery	42	42.0
Cafeteria	11	11.0
Other factories	16	16.0
Domestic users	19	19.0
Roaster meat sellers	6	6.0
No response	6	6.0

Source: Field survey, 2020

The result in Tables 6 reveals that majority of the respondents were wholesalers (68%) while few of them were retailers (27%). The activities of middle men cannot be ruled out in any products' marketing in recent time. This finding corroborates with Afolabi (2009) who reposed that dominance of wholesalers in any trade generally may be due to the fact that they have better opportunities to make better returns from their sales.

Table 6: Identified marketing channels (n = 100)

Variable	Frequency	%
Wholesalers	68	68.0
Retailers	27	27.0
Merchants (Middle men)	2	2.0
Agent(Middle men)	1	1.0
Commissioned agent	1	1.0
No response	1	1.0

Source: Field survey, 2020

The chi-square analysis in Table 7 reveals that respondents' engagement in other occupation such as farming, general trading and fishing were significantly ($p < 0.05$) dependent on the socio-economic variables of the respondents. It is important to note that the major primary occupation of the respondents in the area had been earlier identified in this study as farming. The relevance of these socio-economic factors in influencing profitability of fuel

wood had been established by Ebe (2006) and the supply theory in Samuelson and Norhaus (2009) who reported that socio-economic variable such as community, age, gender, education, marital status and primary occupation, government policy and experience could influence the supply level of fuel wood positively.

Table 7: Chi-square analysis of effect of engagement in other occupation on socio-economic characteristics

Variable	Chi-square	df	p-value	Decision
Community	10.529	8	0.230	ns
Gender	3.021	2	0.220	ns
Age	9.867	6	0.130	ns
Education	6.780	8	0.561	ns
Marital status	3.694	6	0.718	ns
Primary occupation	19.069	8	0.014	*

ns: Not significant; * Significant

Source: Data Analysis, 2020

The result in Table 8 shows the monthly income realizes on fuelwood trading in the study area. Most of the respondents submitted that they make up to between ₦11, 000- N20, 000 (32%) and between ₦21, 000- N30, 000 (32%) monthly, depending on the sales. Those who indicated that they make more than ₦30, 000 monthly are few (23%). The average monthly income from fuel wood trade in the study area is therefore ₦24, 050 while the minimum wage of Oyo state government is ₦30, 000. Hence it could be inferred from this study that the trade is a viable one since the average monthly income from the trade is greater than the minimum wage being paid to government workers in the State. This agrees with the study of Azeez *et al.* (2014), which reported that an average net income of N540, 800 per annum was being realized from fuelwood sales in source areas in Ibadan metropolis. In other words, average monthly income of N45, 000 was being realized which is greater than that of this study. More importantly, this study established the economic viability of fuelwood trade.

Table 8: Monthly income of fuelwood trade (n = 100)

Income	Frequency	%
₦ < 10,000	3	3.00
₦ 11,000 - ₦20,000	32	32.00
₦ 21,000 - ₦30,000	32	32.00
₦ 31,000 - ₦40,000	5	5.00
₦ 41,000 - ₦50,000	3	3.00
₦ > 50,000	15	15.00
No response	10	10.00

Source: Field survey, 2020

The chi-square analysis in Table 9 reveals that monthly income from fuelwood is not significantly ($p < 0.05$) dependent on gender, education, and primary occupation of the respondents. But, monthly income from fuel wood was significantly ($p < 0.05$) dependent on the Community, Age and Marital status of the respondents. It could be inferred that closeness of the Community to the forest coupled with the availability of fuel wood in that locality might be responsible for quantity available for sale. Also, since the forest estate is very large, availability of fuel wood for sale may vary from one community to another. Furthermore, collectors in their active age also have tendency to gather large quantity of fuel wood for sale which would certainly boost their income. Also, married respondents with grown up children are likely to enjoy assistance in collection of fuelwood for sale. The larger the quantity gather for sale, the better the income realized from sales. This agrees with Chamberlain *et al.* (1998) who reported that people have benefited from NTFPs for many generations and that in some cases; NTFPs contribute significantly to family income, local and regional economics.

Table 9: Chi-square analysis on effect of monthly income from wood fuel trading on socio-economic characteristics

Variable	Chi-square	df	p-value	Decision
Community	64.153	20	0.000	*
Gender	5.742	5	0.332	ns
Age	34.396	15	0.130	*
Education	19.957	20	0.461	ns
Marital status	26.986	15	0.718	*
Primary occupation	16.220	20	0.703	ns

ns: Not significant; * Significant

Source: Data Analysis, 2020

The logistic regression in Table 10 shows the challenges against adequate marketing of fuelwood in Gambari and its environs such as product availability to meet up with the demand and frequent logging ban by government. There was sufficient evidence that the estimated coefficients for the factors were greater than 1. This implies that the regression parameters in the model were statistically significant. Thus, the higher the value of odd-ratios, the more likelihood these challenges affect marketing of fuel wood in Gambari and its environs. Hence, it clearly indicates the variable(s) i.e., factors (challenges) that mostly influence marketing of fuelwood in Gambari and its environs. Therefore, the existence of these factors poses serious challenges to marketing of fuelwood in the study area.

Table 10: Logistic regression for adequacy of marketing fuelwood in Gambari forest reserve

Independent variables	Coefficient	Odd-ratio	Decision
If adequate transport facilities will affect adequate MFW	5.52	3.99x10 ⁻³	ns
If regular patronage will affect adequate MFW	6.8	910.37	*
If product availability will affect adequate MFW	2.9	419.1	*
If access restriction by government will affect adequate MFW	37.8	10.00	ns
If frequent logging ban by government will affect adequate MFW	2.09	1.15x10 ⁹	*
If government policy on deforestation will affect adequate MFW	8.07	3.13x10 ⁻⁴	ns
If product evacuation will affect adequate MFW	50.61	1.04x10 ⁻²²	ns
If estimation of fuelwood value estimation problem will affect adequate MFW	5.17	5.66x10 ⁻³	ns

Dependent variable = Marketing of fuelwood adequacy; MFW (Yes = 1, No = 0)

df,8 = 11.011; Final loss = 0.00; p<0.05; * = Significant, ns = Not significant

4. CONCLUSION AND RECOMMENDATION

1. The study established that majority of respondents who engaged in fuelwood marketing over the years were also involved farming and other means of livelihood.
2. Most of the respondents sourced for fuelwood from forest reserve and areas around the forest environment without tampering without devastating/felling the forest trees.
3. The fuelwood trade was lucrative as a result of high patronage from industry-based users and middlemen from nearby towns and cities which showed a proof of economic viability from high income accruals.
4. However, since the trade holds a great potential for income generation, community people should be encouraged by the government to establish plantations for this purpose to fill the bulk of the demand for domestic and industrial use. In other words, unemployed youths can be encouraged to establish fuel wood plantations, sensitize and train dwellers on the rudiments of sustainable harvesting and marketing of fuel wood product as a way of alleviating poverty in study area.

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