

Fuel Wood Consumption in Selected Communities in Oshimili North Local Government Area, Delta State, Nigeria

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Author's contribution

Every step involved in the research was carried out by the sole author.

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ABSTRACT

For proper management of a forest, it is best to harmonise demand and availability of fuel wood. With this, the study estimate the wood consumed as fuel and the factors that influence wood consumed as fuel in selected communities. Four communities were purposively chosen based on fuel wood usage: *Ugbolu*, *Ngegu*, *Ani-Ngene* and *Aniwalo*. Ninety five questionnaires were randomly administered to harvesters of wood for fuel to obtain information on socio-economic characteristics, amount of fuel wood consumed and species of tree mostly harvested for fuel wood. The results showed that the respondents are mostly male (54.7%) and are within the age-bracket of 42-51 years, with household size of 6-10 persons. The average fuel wood consumed by each household is 0.016-0.081m³ weekly in dry season and 0.012-0.057m³ weekly in rainy season. The total amount of wood consumed as fuel is 13,433.7m³ annually. *Tectona grandis*, *Gmelina arborea* Roxb (Gmelina) and *Morinda lucida* Benth are the species of trees predominantly used for fuel wood. The multiple regression analysis shows that socio-economic characteristics have no influence on wood consumption as fuel.

Keywords: Forest, energy; fuel wood; consumption; tree species.

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1. INTRODUCTION

Fuel wood is frequently utilised in rural area as home energy in most developing countries [1]. It is about 14% of total energy used globally and the energy for three-quarters of population living in the world. Those who depend on fuel wood as primary energy is rising in Nigeria. The rising demand in fuel wood for different uses causes severe environmental problems in Nigeria [2]. The growth in usage could be ascribed to fast population growth and increase in natural gas and kerosene price. The rise in the use of fuel wood has caused acute deforestation, which is known to drive biodiversity loss [3]. It also reduce fertility of soil through nutrients loss, increased temperature, desertification, carbon dioxide increase; leading to change of climate.

It is important to estimate the fuel-wood collected and consumed; and to also know the exact plant communities that are available and their estimate in forests [2]. This will regulate firewood harvesting and thereby reduce the effects of wood harvesting for fuel in forests and forest reserves.

Wood demand for fuel and utilisation of trees is growing every day with no information on the exact species which are utilised and the ones that possess the burning ability of slow release of the energy content to enhance cooking and heating [4]. A good combustion ability of wood will reduce the wood used in heating and cooking.

When wood harvesting for fuel is unplanned and unsustainable it could strongly affect the structure and species composition of a forest [5]. Hence, this study determines the sum of wood used for fuel, assess the tree species mostly harvested for fuel wood and factors that influence consumption of wood as fuel which could help to achieve efficient use of fuel wood.

2. METHODOLOGY

2.1 Study Area

The selected communities are located in Oshimili North Local Government area of Delta State, Nigeria with coordinates between latitude 6°30'North and longitude 6°64'East. It is within the rain forest zone with a yearly rainfall of 1,500mm-1,847.3mm. The area experiences

double maxima of rainfall between June/July and September/October, a least and highest temperature of 26°C and 36°C and a mean temperature of 33°C. Sunshine is 8.1bars [6].

2.2 Data Collection and Analysis

Four communities were purposively chosen on usage of wood for fuel: *Ugbolu*, *Ngegu*, *Ani-Ngene* and *Aniwalo* (Fig. 1). Ninety five questionnaires were randomly administered to respondents to obtain information on socio-economic characteristics, amount of consumed fuel wood and species of trees mostly harvested for fuel.

Questionnaire and interview schedule were used to obtain data on the socio-economic characteristics of respondents, amount of wood harvested in rainy and dry season for fuel and species of trees harvested for fuel wood.

Fuel-wood consumed was measured in cubic metre (Lengthx widthx girth). The average amount of consumed fuel wood per person was estimated by dividing the wood consumed as fuel per household over the household size. The average amount of fuel wood consumed per person was multiplied by the projected population (165,848) of Oshimili North LGA.

Descriptive statistics was used to analyse the data; and multiple regression was applied to identify the socio-economic factors that influence consumption of wood as fuel.

The general specification of the analysis is as follows:

$$FWC (Y) = \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + e \dots\dots\dots \text{Equation (1)}$$

Where

- FWC = fuel wood consumption
- X₁=gender
- X₂= age
- X₃= marital status
- X₄ = educational status
- X₅ = origin
- X₆ = years of residence
- X₇= household size
- e = error term.

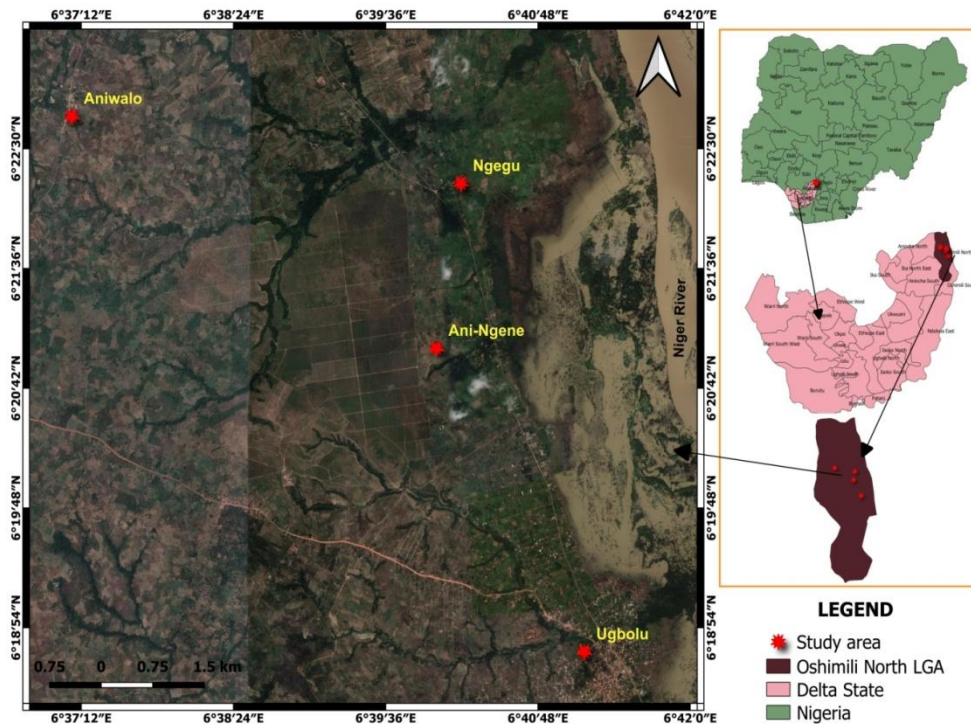


Fig. 1. Map of Oshimili North and the selected communities

3. RESULTS

3.1 Socio-Economic Characteristics

The respondents were mostly male (Table 1); with age range between 42-51 years; and are married (55.8%). The highest educational status is primary education. They are mostly migrants and have resided in the location for 11-20 years; with household size of six to ten persons.

3.2 Wood Consumed as Fuel

Average consumption of fuel wood per household ranges from 0.016-0.081m³ weekly in dry season and 0.012-0.057m³ weekly in rainy season. And an aggregate of 13,433.688m³ calculated as the annual quantity consumed (Table 2).

3.3 Species of Trees Used for Fuel wood

The common tree species harvested for fuel wood are *Tectona grandis* L.F (Teak), *Gmelina arborea* Roxb (Gmelina) and *Morinda lucida* Benth.

3.4 Socio-Economic Factors that Influence Wood Consumed as Fuel

The result in Table 3 indicates the variables that influence wood consumed as fuel. There was no

significant difference in wood consumed and the socio-economic factors of respondents.

4. DISCUSSION

4.1 Socio-Economic Characteristics

A large proportion of the people surveyed are in their energetic age (42-51 years) and this support Pashupati et al. [7], which observed that many heads of households are between forty to fifty years and are in energetic age and could survive the stress involved in harvesting fuel wood. Majority of them are married (55.8%); having primary education as their highest school qualification and are migrants from mostly Eastern area and other parts of Nigeria. The households comprise of six to ten persons and this concur with the work of Egwuonwu and Nweke [8], that also observed the size of household of those who consumed wood as fuel in Orlu to be six people.

4.2 Wood Consumed as Fuel

A rise in wood consumed as fuel could result to excessive exploitation of trees; and could result to reduction in carbon storage and sequestration [1]. An average of 91.9 tons of fuel wood is harvested from Afaka forest reserve and

transported into Kaduna [9]. Production and availability of wood used as fuel in forests differs greatly with the accessibility of wood off-cuts and alternative fuels, cooking behaviours and heating requirements in Nigeria [3]. It is stated that since harvesting of trees and collection of wood for fuel requires small or no money, it could be the major fuel source for rural and semi urban communities in the future [10].

4.3 Species of Trees Used for Fuel Wood

Tectona grandis L.F (Teak), *Gmelina arborea* Roxb (Gmelina) and *Morinda lucida* Benth usage for fuel wood could be as a result of their abundance in the location. Shaheen et al. [11], observed that *Pinus wallichiana*, *Abies pindrow* and *Quercus dilatata* are the most harvested tree species used for fuel wood in local forests in Kashmir Himalayas. Petro et al. [12], noted *Acacia xanthophloea*, *Eucalyptus maidenii*, *Cordia africana*, *Casuarina equisetifolia*, *Terminalia superba*, *Senna siamea*, *Bauhinia petersiana*, *Azadirachta indica*, *Albizia versicolor*

and *Ficus benjamina* as species of trees suitable for fuel in Kilimanjaro. Ten tree species utilised as fuel in Bauchi State were listed [4]. They include; *Pterocarpus erinaceus*, *Prosopis africana*, *Terminalia glaucescens*, *Anogeisus leiocarpus*, *Balanites egyptiaca*, *Vitellaria paradoxum*, *Combretum hypopillinum*, *Combretum glutinosum*, *Combretum molle*, *Acacia hebecladoeids*.

4.4 Socio-Economic Factors that Influence Wood Consumed as Fuel

From the study the socio-economic factors of respondents do not have influence on wood consumed as fuel. Other factors like high cost of other energy sources, easy access to wood collection as fuel and reduced time spent in cooking due to high combustion of fuel wood might be accountable for the utilization of fuel wood. Egwuonwu and Nweke [8] also determine the factors that influence consumption of fuel wood and the result revealed an association between heads of household and amount of wood consumed weekly as fuel.

Table 1. Socio-economic characteristics of fuel wood harvesters

Socio-economic characteristics	Frequency/Mode	Percentage (%)
Gender (male)	52	54.7
Age (42-51)	16	16.8
Marital status (married)	53	55.8
Educational status (primary school)	49	51.6
Origin (non-indigene)	53	55.8
Years of residence (11-20 years)	15	15.8
Household size (6-10 persons)	40	42.1

Table 2. Quantity of wood consumed as fuel

	Fuel wood consumed (weekly)
Dry season	0.016-0.081m ³
Rainy season	0.012-0.057m ³

Table 3. Socio-economic factors that influence wood consumed as fuel

Socio-economic variables	Standard error	Beta	T-ratio	Significance
Constant	0.023		-0.154	0.879
Gender	0.015	-0.021	-0.084	0.933
Age	0.002	0.041	0.230	0.819
Marital status	0.018	-0.013	-0.052	0.959
Educational status	0.004	0.034	-0.215	0.831
Origin	0.012	0.067	0.402	0.690
Years of residence	0.002	0.076	0.380	0.706
Household size	0.004	0.51	0.330	0.743

* Significant at P= 0.05

5. CONCLUSION

This study revealed that the quantity of fuel wood consumed in dry season exceeds the quantity consumed in rainy season; the three species of tree mostly harvested for fuel wood and the parts harvested. Gender, age, marital status, educational status, origin, years of residence and size of household of respondents' have no influence on fuel wood utilised.

6. RECOMMENDATION

Establishment of community fuel woodlot is necessary to have sustainable fuel wood. Modern energy or clean cooking fuels like biogas, natural gas, biomass and clean cooking stove should be accessible to the selected communities in line with the sustainable development goal 7 which advocate access to inexpensive, dependable, sustainable and modern energy for all.

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COMPETING INTERESTS

The author asserts no competing interests.

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