

Original Research Article

FUEL WOOD CONSUMPTION IN SELECTED COMMUNITIES IN OSHIMILI

NORTH LOCAL GOVERNMENT AREA, DELTA STATE, NIGERIA

Comment [WU1]: Fuel Wood Consumption In Selected Communities In Oshimili North Local Government Area, Delta State, Nigeria

ABSTRACT

For proper management of a forest, it is best to harmonised 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 *Aniwalu*. 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 per household is 0.016-0.081m³ weekly in dry season and 0.012-0.057m³ weekly in rainy season. The total amountof wood consumed as fuel is 13,433.7m³ annually. *Tectonagrandis*, *Gmelinaarborea*Roxb (Gmelina) and *Morindalucida*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. A large number of the peoplesurveyed still use fuel wood.

Comment [WU2]: harmonise

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

INTRODUCTION

Fuel wood is commonly used in rural area as domestic energy in most developing countries (Dhanai *et al.*, 2015). About 14% of total energy used globally is fuel wood and is the primary energy for three-quarters of the world's population living. Those who depend on fuel-wood as primary energy is rising in Nigeria (Specht, *et al.*, 2015).

The increase in fuel wood demand for different purposes is causing severe environmental problems in Nigeria (Orimoogunje and Asifat, 2015). The rise in usage could be attributed to fast population growth and increase in price of kerosene and natural gas. A lot of people cannot pay for fossil fuels and more crucially the unreliable nature of power supply in the country has increased fuel wood usage. The rise in usage has caused to unabated deforestation, which is known to be drivers of biodiversity loss and a threat to the existence of the global ecological problem (Ayodele *et al.*, 2000). Reduced soil fertility through loss of nutrients, drainage of moist forest soil, increased temperature, desertification, increased carbon dioxide; resulting to global warming and climate change are all ecological problems that arise from a raise in fuel wood usage.

Comment [WU3]: is the author trying to say "The rise in usage has caused an unabated level of deforestation".

It is important to know the amount and impact of fuel-wood collected and consumed; and to also know which specific plant communities are available and their estimate in forests (Orimoogunje and Asifat, 2015). This will regulate firewood harvesting and thereby reduce the effects of wood harvesting for fuel in forests and forest reserves.

Comment [WU4]: It is important to know the amount and impact of fuel-wood collected and consumed, and to also know which specific plant communities are available and their estimate in forests

Wood demand for fuel and exploitation of trees is growing every day with no knowledge of 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 (Wakiliet *et al.*, 2012). A good combustion ability of wood will reduce the amount of wood used in heating and cooking exercises.

When fuel wood harvesting is unplanned and unsustainable it could strongly affect the structure and species composition of natural forests (Pant, 2013). Hence, this study determine the amount of wood used for fuel, assess the tree species mostly harvested for fuel wood and factors that influence consumption of fuel wood which could help to achieve efficient use of wood for fuel.

Comment [WU5]: this study determines the amount of wood used for fuel, assess the tree species mostly harvested for fuel wood and factors that influence consumption of fuel wood which could help to achieve efficient use of wood for fuel.

METHODOLOGY

Study Area

The selected communities are located in Oshimili North Local Government area of Delta State, Nigeria with a 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 (Asaba meteorological station, 2017).

Comment [WU6]: Nigeria with coordinates between latitude 6°30'North and longitude 6°64'East.

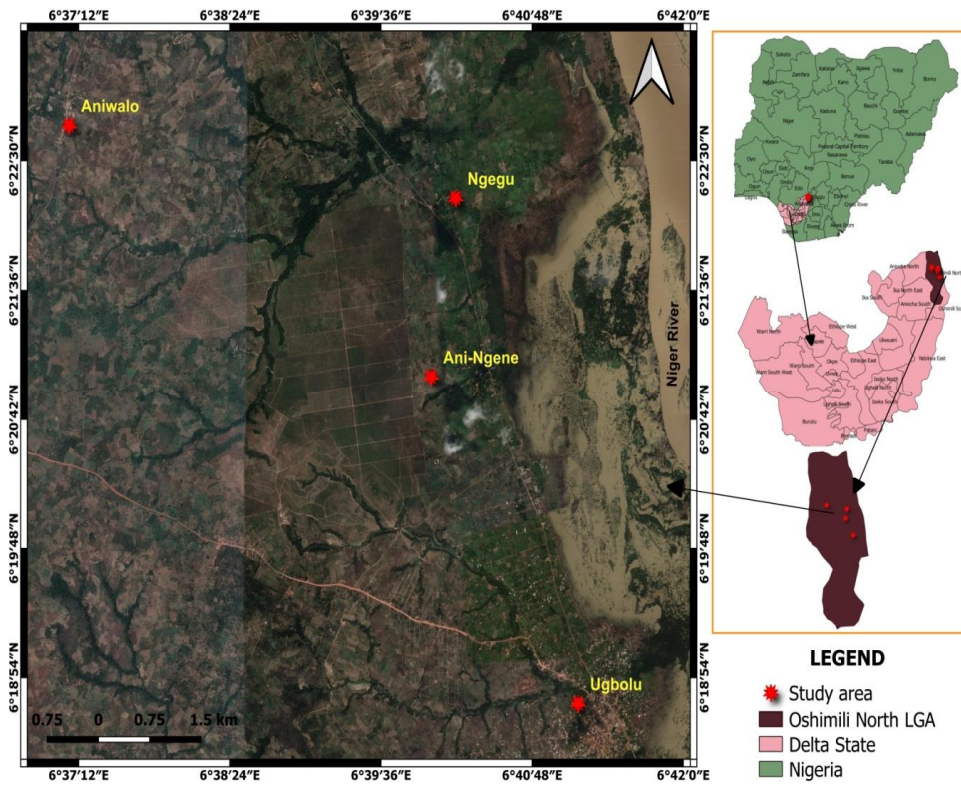


Figure 1 Map of Oshimili North and the Selected Communities.

Comment [WU7]: Figure 1:Map of Oshimili North and the Selected Communities.

Data Collection and Analysis

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

Questionnaire and interview schedule 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 meter (Length× width× girth). The average amount of wood consumed as fuel per person was estimated by dividing the fuel wood consumed 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.

Multiple regression analysis was applied to identify the socio-economic factors that influence consumption wood as fuel.

The general specification of the analysis is as follows:

$$FWC(Y) = \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + e \dots \dots \dots \text{Equation (1)}$$

Where, FWC = fuel wood consumption

X_1 = gender

X_2 = age

X_3 = marital status

X_4 = educational status

X_5 = origin

X_6 = years of residence

X_7 = household size

e = error term.

Comment [WU8]: Where, FWC = Fuel Wood Consumption

RESULTS

Socio-Economic Characteristics

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

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

Comment [WU9]: What formula was used to obtain the percentage (%) value of the frequency/mode.

Wood Consumed as Fuel

Average fuel wood consumed 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).

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

Species of Trees Used for Fuel wood

The common tree species harvested for fuel wood are *Tectonagrandis* L.F(Teak), *Gmelinaarborea*Roxb (Gmelina) and *Morindalucida*Benth.

Socio-Economic Factors that Influence Wood Consumed as Fuel

The result in Table 3 indicates the variables that influence wood consumed as fuel in the communities selected. There was no significant different in wood consumed as and the factors. It means all the socio-economic factors do not affect the wood consumed as fuel.

Comment [WU10]: The sentence is incomplete "There was no significant different in wood consumed as and the factors."

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

DISCUSSION

Socio-Economic Characteristics

A large proportion of the people surveyed are in their active age (42-51 years) and this supports Pashupati *et al.* (2017), which revealed that most heads of households are within the age range of 40 to 50 years and are still in their active age and could survive the stress involved in fuel wood harvesting. 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 concurs with the work of Egwuonwu and Nweke (2019), that also observed the household size of those who consumed wood as fuel in Orlu to be six people.

Wood Consumed as Fuel

A rise in wood consumed as fuel could lead to excessive exploitation of trees; and could result to fuel wood unavailability (Dhanai *et al.*, 2015). An average of 91.9 tons of fuel wood is harvested from Afaka forest reserve and transported into Kaduna (Adewuyi and Olofin, 2014). The reliance on wood for fuel by the forest dwellers reduces carbon storage and sequestration, leading to a rise in environmental degradation and deforestation rate. 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 (Ayodele *et al.*, 2000). It is stated that since harvesting of trees and collection of wood for fuel requires small or no money, it could be the main source of fuel for rural and semi urban communities in the future (Wakili and Abdullahi, 2010).

Species of Trees Used for Fuel wood

The use of *Tectona grandis* L.F (Teak), *Gmelina arborea* Roxb (Gmelina) and *Morinda lucida* Benth for fuel wood could be because of its abundance in the selected communities. Shaheen *et al.* (2016), observed that *Pinus wallichiana*, *Abies pindrow* and

Comment [WU11]: could be because of its abundance in the selected communities.

Quercus dilatata as the most harvested tree species used for fuel wood in local forests in Kashmir Himalayas. Petro *et al.* (2015), noted *Acacia xanthophloea*, *Eucalyptus maidenii*, *Cordia africana*, *Casuarina equisetifolia*, *Terminalia superba*, *Sennasiamea*, *Bauhinia petersiana*, *Azadirachta indica*, *Albizia versicolor* and *Ficus benjamina* as species of trees suitable for fuel in Kilimanjaro. Ten tree species used as fuel wood in Bauchi State were listed (Wakiliet *al.*, 2012). They include; *Pterocarpus erinaceus*, *Prosopis africana*, *Terminalia glaucescens*, *Anogeisus leiocarpus*, *Balanites egyptiaca*, *Vitellaria paradoxum*, *Combretum hypopilinum*, *Combretum glutinosum*, *Combretum molle*, *Acacia hebecladoeids*.

Comment [WU12]: are the most harvested tree species used for fuel wood in local forests in Kashmir Himalayas.

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 responsible for the utilization of fuel wood. Egwuonwu and Nweke (2019) also use multiple regression analysis to determine the factors that influence fuel wood consumption in Orlu Agricultural Zone of Imo State and the result revealed that there was significant relationship between household heads socio-economic characteristic and amount of fuel wood consumed weekly. The main factors that influence fuel wood collection and consumption in the area were age, sex, farm size, marital status, occupation and education of household heads.

CONCLUSION

This study established that the amount of fuel wood consumption in dry season exceeds the quantity consumed in rainy season; the three species of trees mostly harvested for fuel wood and the parts harvested. Gender, age, marital status, educational status and the other three socio-economic factors of respondents have no influence on fuel wood consumption.

Comment [WU13]: Be specific just like you started (comprehensive) i.e Gender, age, marital status, educational status, ..., ..., and ...

RECOMMENDATION

Establishment of community fuel woodlot is necessary to meet the demand for 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.

REFERENCES

Adeyuyi, T.O. and Olofin, E.A. Sustainability of Fuel Wood Harvesting from Afaka Forest Reserve, Kaduna State, Nigeria. *Journal of Agricultural Science*; 7.(1): 129-137, 2015.

Comment [WU14]: APA reference style is Okay.

Asaba Meteorological Station. Monthly record of meteorological observations 2017.

Ayodele, A.S, Falokun, L.N and Fasehun, F.E. Population, Environment and Sustainable Development in Nigeria, The Fuel Wood Phenomenon: A Case Study of Ikire; in Philips A.O and Ajakaye (eds.) population-Environment Interaction in Nigeria. *Nigerian Institutes of Social and Economic Research*, Ibadan, pp 95 – 106, 2000.

Dhanai, R., Negi, R.S., Singh, S., and Parmar, M.K. Fuelwood Consumption by Villagers in Different Altitudinal Gradient: A Case of Takoligad Watershed of Garhwal Himalaya, India. *International Journal of Current Engineering and Technology*. 5.(1): 72-80, 2015.

Egwuonwu, H. A. and Nweke, A. P. Influence of Socio-economic Factors of Rural Households on Fuel wood Consumption in Orlu Agricultural Zone of Imo State, Nigeria. *Journal of Energy Research and Reviews*. 2(1): 1-6, 2019

- Orimoogunje, O.O.I. and Asifat, J. Fuel Wood Consumption and Species Degradation in South-Western Nigeria: The Ecological Relevance. *Journal of Landscape Ecology*. 8.(1). 14pp, 2015.
- Pant S. Response of *Pinus wallichiana* to Climate Change, a Study from MANASLU Conservation Area, Western Nepal. Master's Thesis in Environmental Science. Kathmandu, Nepal. Central Department of Environmental Science, Tribhuvan University. 61 pp, 2013.
- Pashupati C, Seidler R, and Bawa K. Patterns and determinants of domestic energy use in Kanchenjunga Himalaya. *International Journal of Energy and Environmental Science*. (1):1-11, 2017.
- Petro, R., Laswai, F., Mijai, G.M., Balama, N.C. A Review on Tree Species Suitability for Wood Fuel in Kilimanjaro Region. *Journal of Environment and Earth Science*. 5.(7): 23-28, 2015.
- Shaheen, H., Azad, B., Mushtaq, A., Raja Waqar Ahmad Khan, R.W.A. Fuelwood Consumption Pattern and its Impact on Forest Structure in Kashmir Himalayas. *BOSQUE*. 37.(2): 419-424, 2016.
- Specht, M.J., Pinto, S.R.R., Albuquerque, U.P., Tabarelli, M., Melo, F.P.L. Burning biodiversity: Fuel Wood Harvesting Causes Forest Degradation in Human-Dominated tropical landscapes. *Global Ecology and Conservation*. 3: 200–209, 2015.
- Wakili, A., Abdullahi. M. B., Gani, A. M., and Bello, A. A. Combustion Rate of Ten Wood Fuel Tree Species in Bauchi State. *International Journal of Applied Biological Research*. Vol. 4(1&2): 171 – 177, 2012.
- Wakili, A. and Abdullahi M. B. Identification of Fuel wood Tree Species in Bauchi State. *Journal of League of Researchers*. 8.(2): 51-58, 2010.