Journal of Forestry Research and Management. Vol. 17(2).148-158; 2020, ISSN 0189-8418

www.jfrm.org.ng

Fuelwood Consumption and Clean Cooking fuel Poverty in Kaduna State, Nigeria: Implication for Sustainable Forest Management.

*Balogun O. S, Usman M. B, Ayodele J. T, Aasa, O.S, and Anamayi, R.

Federal College of Forestry Mechanization, P.M.B 2273, Afaka, Kaduna state, Nigeria
Corresponding Author: baaseg2006@yahoo.com, 07066666016

ABSTRACT

The vast majority of poor people in developing countries continuous dependence on woodfuel have become inevitable as a result of energy crisis arising from fluctuations in the price of oil in the world markets. This study examined the factors affecting the consumption of fuel wood and clean cooking energy poverty in Kaduna State Nigeria. Primary and secondary data were used for the study. A multi-stage sampling technique was used to select two hundred and forty (240) urban households. Descriptive statistics, regression analysis and likert scale were used to achieve the stated objectives. The socioeconomic characteristics indicate that the respondents have a mean age of 29years with 58.75% aged between 20-30years.Sixty two percent(62%) of the respondents were males, 63.75% were married while about 48% attained tertiary education. An average household had about five persons in the study area. Four trees species are mostly preferred; they are *Isoberlinia doka*, *Khaya senegalensis.*, *Daniellia oliverii* and *Eucalyptus cammandulensis*. High fuel value, low smoke level, low moisture content, density and availability were responsible for their preference. The multiple linear regressions gives an adjusted R^2 value of about 77% implying that about 77% of the variation in fuelwood consumption in the study area was explained by the variables included in the model. All significant variables except age had an inverse relationship with the demand for fuel wood. The poverty incidence in the area was about 81.1% with a human development index of about 0.423.The major constraints to clean cooking energy consumption is poverty, over 95% of the population in area still rely on wood fuel.

Keywords: Fuel wood Consumption, Clean Cooking Fuel Poverty and Kaduna State

Introduction

The term 'Fuelwood' comprises firewood, charcoal, wood pulp material obtained from trunks, branches and other parts of trees and shrubs including wood-derived fuels that account for 70% of total energy use and 90% of household energy use in Africa(World Resources, 2001). In Nigeria the rural population and to some extent the peri-urban dwellers traditionally rely on the forest for various food products and fuelwood both for their own consumption and for sales to the urban sector.

United Nations Environment Programme (UNEP, 2019), noted that 3.04 billion people in the world- about nine times the population of the United States had no access to clean cooking fuel; of these, about 800 million people were from sub-Saharan Africa. Although Nigeria is a wealthy country in terms of human and natural resources, its social and economic development is quite slow. This fact can be illustrated by the country's high level of poverty, lack of basic social infrastructure.(Kar and Freitas, 2012). For example, about 65% of the country's approximately 160 million people are living below the poverty line (on less than US$1.25 a day) United Nations Development Programme (UNDP)(UNDP, 2010).

A household has the option of choosing among varying cooking energy sources depending on factors such as availability, accessibility, standard of living and income status. Available cooking energy sources includes clean energy sources, that is, energy derived from renewable, zero-emissions sources "renewables", as well as energy saved through energy efficiency "EE" measures. The most common renewable energy resources are biomass, geothermal, hydropower, solar, and wind. Also, an individual may result to traditional use of solid biomass such as wood and wood products; dependence on wood fuel may be primarily due to the lack of good and consistent access to modern energy sources, such as electricity, kerosene and liquefied petroleum gas (LPG).According to Energy Access Platform (EAP)Clean cooking fuels are ideal bridge fuels to non-intermittent, fully renewable energy options for household energy use. Otherwise called "BLEN fuels" (biogas, liquefied petroleum gas, electricity, and natural gas) are able to reduce household air pollution emissions to the level of WHO guidelines safe for health (EAP,2020).

Among many reasons driving excessive dependence on fuelwood energy include population growth, rapid urbanization, lack of income growth and poverty. Poverty is a composite phenomenon; it is multidimensional and has been examined by many scholars and development associates in diverse ways. Though there have been various versions of definitions of the term poverty (World Bank, 1990; Lipton *et al*., 1995; Chamhuri *et al*., 2004; Abdul-Mamin and Shamshiry, 2014) over the decades, there is, however, no specific generally accepted definition of poverty due to its multifacetedness. Following the definition given by Abdul-Mamin and Shamshiry (2014), poverty is defined as a diversity of deprivations a person or household experiences simultaneously or separately that stifles the person's or households' abilities to function, live a life of purpose and fulfilment, In this context, the studies attempt to evaluate clean cooking energy poverty and its effect on fuelwood consumption.

Deprivations could be economic, social, political, cultural, physical or spiritual. From this definition and various perspectives, poverty is generally accepted as a phenomenon which goes beyond income and consumption standard but includes a state of wellbeing, which is economically, morally and socially unacceptable, caused by various dynamic interactions which make some better-off and others worse off.

In recent years, most countries came down with the problem of energy crisis that arose from constant fluctuation in the price of oil in the world markets with the vast majority of poor people in developing countries facing different kinds of energy crisis which prompted the continued dependence on fuel wood by many households in relation to other commercial fuels.In Africa, the fuel wood consumption rose by 23.08% from 154 million to 190.2 million metric tonnes(UNEP, 2019). The imbalance constitutes a great danger to the environment because the existing forest are diminishing and other fuel wood sources are being over exploited without due replacement. While renewable energy and other clean cooking energy is advancing rapidly, urgent action is required to address wood fuel use in the northern Nigeria. This is critical to meeting global energy goals by 2030, and ensuring the health of humans and forests in Nigeria. Also, analysing the demand for fuelwood and energy is important if these sources of energy are to be used efficiently and on a sustainable basis. It is in the light of these, the study attempted to provide answers to the following research questions; what are the

socio-economic characteristics of respondents? what are consumers' socio-economic determinants of fuel wood consumption?, what are the respondent's reasons for their preference for fuelwood and fuelwood species in the study area? Is there cooking energy poverty in the study area? What are the constraints to clean cooking energy consumption among households in the study area?

Materials and Methods

Study area. The study was carried out in Kaduna metropolis, a city in North Western Nigeria. Kaduna metropolis is made up of four district (4) Local Government Area namely; Chikun, Kaduna South, Kaduna north and Igabi. Kaduna is located between latitude 90^0N and 120^0N and longitude 60^0E and 90^0E of the prime meridian with land mass area of about 46,053km^2 it has a projected population of about8,252,366 National Bureau of Statistics, (NBS, 2017).Kaduna State is bordered by Katsina and Kano State to North; Bauchi to East; Plateau to South-East, Niger to the West and Abuja to the South, the mean annual rainfall decrease from south to north (1152mm-635mm). The rainy season usually commences in April in the Southern parts and June in the North. The natural vegetation includes; Sudan and Guinea Savannah Zones. Maize, Sorghum, groundnut, Cowpea, Millet and Soya beans are mostly grown in the state. However farming is becoming one of the major economic activities carried out by the people of the State.

Sampling Technique and Data Collection

Primary and secondary data were sourced to achieve the various objectives of the study. A multi-stage sampling technique was used to select two hundred and forty (240) respondents for the study. The first stage involves the random selection of two Local Government Areas namely, Igabi and Kaduna North LGA. This was followed by purposive selection of four districts from Kaduna North and three from Igabi Local Government Area notable for high concentration of fuelwood users as indicated by the volume of fuelwood marketed by marketers in those areas. The selected district under Igabi LGA includes Mando, Rigasa, Rigachikun, and Askolaye while Central market, U/dosa, Badarawa and Kawo were selected in Kaduna North."Table 1"

Table 1: Description of Sampled Respondents from the L.G.A districts

Kaduna North	No of Respondents	Igabi	No of Respondents
Central Market	32	Mando	35
UngwanDosa	30	Rigasa	38
Badarawa	36	Rigachikun	35
Kawo	34		
Total	132		108

Structured questionnaires were used to collect data on Socio-economic characteristics, quantity of fuel wood demanded and preference for fuel wood among the respondents. Furthermore, Secondary data on Socio-economic Characteristics of Nigeria Population, states in each Geo-political zones of the country,Human Poverty Indices, human development indices, and human poverty household with clean energy and percentage of households using wood as fuel source in the various zones of the country were sourced from, National Petroleum commission (NNPC), Renewable Energy Master Plan (REMP) and Ministry of Mines and Steal Development. National Bureau of Statistics (NBS, 2017) and Human Development Report (HDR, 2018) and

United Nation Environmental Programme (UNEP, 2019) Report.

Descriptive statistics (such asmean, frequency distribution, and percentage), multiple linear regression model and Linkert scale were employed to achieve the objectives of the study.

Specification of multiple linear regression model.

$$.Y = b_0 + b_1X_1 + b_2X_3 + b_3X_4 + b_5X_6 + b_7X_7 + b_8X_8 + \varepsilon_0$$

where;

Y = Quantity of Fuelwood demanded/consumer/month(kg), X_1= Age (years), X_2= Household size(Number of people in a household), X_3= Marital Status (Married =1,Single=2, widow=3, divorced=4),X_4= Income(₦), X_5= Price of fuelwood/kg, X_6= Price ofcharcoal/Kg),X_7= Level of education (years of Schooling), X_8= Distance of energy source from respondents (Km),ε_0= Stochastic term.

The Likert Scale

The constraint to the use of clean cooking energy was measured by a given set of perception questions to respondents. Their responses were recorded using the five (5) Point Likert Scale of strongly agree (SA), agree (A), undecided (U), disagree (D) strongly disagree (SD). These were scored 5, 4, 3, 2, 1 respectively.

Perception Measurement

SA - Strongly agree (5 points), A -Agree (4 points), U-Undecided (3 points),

D - Disagree (2 points), SD-Strongly disagree (1 point),In order to rate the perception of respondent's constraints the total raw score of the respondents using the five-point Likert scale is represented as:The mean was calculated for each of the constraint =

$$\frac{5(N)+4(N)+3(N)+2(N)+1(N)}{S}$$

Where;
N = Number of respondents in respect to their identified level of constraints
S = total sample size of sampled households.

Decision Rule

The mean score of respondents below 2.44 (0-2.43) was considered as negative (i.e not a constraint) while the mean score variable of the respondents within the range of (2.44-3.44) was considered as uncertain and the mean score of respondents above 3.44 (3.45 – 5.0) was consideredas positive (i.e. a constraint) for the study.

Results and Discussion

Socio-economic Characteristics of Respondent in the Study

Results from the socio-economic characteristics considered in this study were presented in Table 2. The study revealed that the sampled household had a mean age of 29 years. Most of the respondents were aged between 21-30 years. This age group makes up about 58% of the total sampled respondents, although the mean age of the respondents was 29 years, 22.5 % of them were aged between 31-40 years old these attributes shows that the sampled respondent are youths, Furthermore, most of the respondents 62.5%were female while 37.5% were male. These shows that more women utilse fuelwood in the study area. This finding is at variance with that of Maurice, Umar and Zubairu (2015) who in a similar study observed that more male than female utilise fuelwood in Taraba State. The findings in this study suggest that although, males were the traditional household head and responsible for household upkeep in the study area, the responsibility of cooking and fuelwood related issues were undertaken by women. Also, it was observed that most of

the men involved in wood fuel use were those in the business of preparing roasted meat(locally referred to as Suya), fish, tea and bread baking. Furthermore, most of the sampled households were educated with 48% having attained tertiary education. On marital status, the distribution shows that 63.75%of the respondents were responsibly married adults, 27.5 % are single, 2.50%widow and 6.25% divorced. About 45% of the sampled households were traders23.75% farmers while 11.25 % are civil servants. The mean household size for the area was 5, majority (60 %) of the respondents have household size of about 1-5 persons per familyhowever32.50 % had between 6-10 household members.

Table2: Socio-economic Characteristics of Respondents

Variables	Frequency	Percentage
AGE		
10-20	21	8.75
21-30	141	58.75
31-40	54	22.5
41-50	18	7.5
51-60	6	2.5
Mean Age 29 years		
Gender		
Female	150	62.5
Male	90	37.5
Level of Education		
Primary education	53	22
Secondary education	72	30
Tertiary education	115	48
Marital Status		
Married	153	63.75
Single	66	27.5
Widow	6	2.5
Divorced	15	6.25
Occupation Distribution		
Trader	108	45
Farmer	57	23.75
Civil Servants	27	11.25
Others	48	20
Household size		
1-5	144	60
6-10	78	32.5
11-15	12	5
15 and above	6	2.5
Mean 4.9		
Total	**240**	**100**

Determinants of fuel wood consumption.

In economic theory, a number of factors influence the consumption of commodities. In this study, the result of a multiple linear regression for the specified consumption function in the study area was presented in Table 3. The result shows a regression with expected apriory signs of regressors and an adjusted R^2 value of about 77%. The

adjusted R-squared value shows that about 77% of the total variations in consumption of fuelwood by the respondents were explained by the variables included in the model. Six regressors age (ß = -0.2196, p< 0.05), household size (ß =0.1425,p<0.05), income (ß =-0.2326, p<0.01), price (ß =-0.4824,p<0.01) per kilogramme of fuelwood, the prices of close substitutes and distance (P<0.05) of charcoal were significant and negatively related with consumption of fuelwood except household size.

The implication of this is that as the variable increases the households' consumption of fuelwood decreases. For example as a sampled respondents income increases by 10%the consumption of fuelwood decreases by about 2.3% in other words respondents may shift to a cleaner cooking energy alternative as disposable income increases. This finding agrees with those of Onoja (2012) who found an inverse relationship between the price of fuelwood and the quantity demanded as prices of close substitute increases. This according to him was because less fuel wood is consumed as respondents can afford cleaner cooking energy alternatives. However, the influence of age of respondents with wood consumption may be indeterminate as households increase in size as the family age. This also could mean that the higher the age of respondents the more the responsibilities in terms of competing demands on the disposable income hence the higher the fuel wood consumed by the respondents. Also, this may mean that as people mature in age in urban areas, their income per capita increases (this may apply especially to the educated class) a household with relatively high income will likely go for clean cooking energy sources due to higher purchasing power. Jonathan and Victor (2013)noted that there is greater flexibility of shift to cleaner cooking household fuel as the income of household head increases.

Also, the positive sign of household size indicates that as the household increases in size, more fuelwood is consumed because income per capita may not have a proportionate increase with house hold growth.

Table 3: The Multiple Regression Result of the Factors Affecting Consumption of Fuelwood in Kaduna Metropolis**.**

Variables	**Coefficient**	**Standard error**	**t-values**
Constant	2.860	0.4520	6.3330
Age	-0.2196**	0.1016	-2.6107
Household size	0.1425**	0.0665	2.0451
Marital Status	3.0421	2.1416	1.4204
Income	-0.2326***	0.0723	-3.2146
Price of fuelwood/kg	-0.4824***	0.1132	-4.2630
Price of close substitute	-2.3450**	0.7966	-2.9436
Level of Education	2.2632	1.8792	1.2043
Distance (km)	0.5604***	0.2014	2.7823
R^2	0.7960		
Adjusted $\mathbf{R^2}$	0.7717		

. *** Significant at1% level, ** significant at 5%

Respondent's Preference for Common Fuel Wood based Traits and Characteristics.

The respondents in the study area exhibits preference for some of fuel wood available in the study area. To this effect respondents

were asked to respond to structured questions on their reasons for their choice of use for certain species of woods over the others. *Isoberlinia doka* the most preferred by the respondents as attested by 114 (60%). It is said to produce high fire rating capacity with low smoke and low moisture retention during the raining season as well as produce good charcoal capable of retaining fire for a long time. Furthermore, some respondents 18.75% often go for *Khaya senegalensis* noting that it has high fire retention, low smoke, low moisture. About 12.5% and 8.75 % prefer *Daniellia oliverii* and *Eucalyptus cammandulensis* for reasons such as availability and affordability in terms of price(Table 4).

Table 4.Reasons for Respondent's Preference for Common Fuel Wood

Species Used	Frequency	Percentage (%)	Traits/Reasons for Choice
IsoberliniadokaCraid&Stapf.	144	60	High quality fire, retaining capacity, low smoke, low moisture holding capacity and readily available
KhayasenegalensisDers.	45	18.75	High fire retaining capacity, low smoke low moisture and readily available
Danielliaoliverii Rolfe.	30	12.5	Low smoke, Readily available
Eucalyptus cammandulensis L.	21	8.75	Low moisture holding capacity, Cheap and Moderately available.

Clean Cooking Energy Poverty in Kaduna State.

Kaduna State is located in North–Western Geo-Political zone of the country, Results from Table 5 shows that only about 48.75% of the household in the zone has access to electricity while the price of alternative clean cooking energy fluctuates between ₦55-120 naira per litter. This means that a good number of the population in the study area may be deprived of clean cooking energy most of the time. According to HDR, (2019) report, in Nigeria, 51.4% of the population are multidimensional poor while an additional 16.8% are classified as vulnerable to multidimensional poverty. The deprivation intensity in Nigeria, which is the average deprivation score experienced by people in multidimensional poverty, is 56.6 %. The Multidimensional poverty Index (MPI), which is the share of the population that is multidimensional poor, adjusted by the intensity of the deprivations, is 0.291. Fig 1 shows the percentage of the total population having access to clean cooking energy (electricity) in the various geo-political Zones in Nigeria.

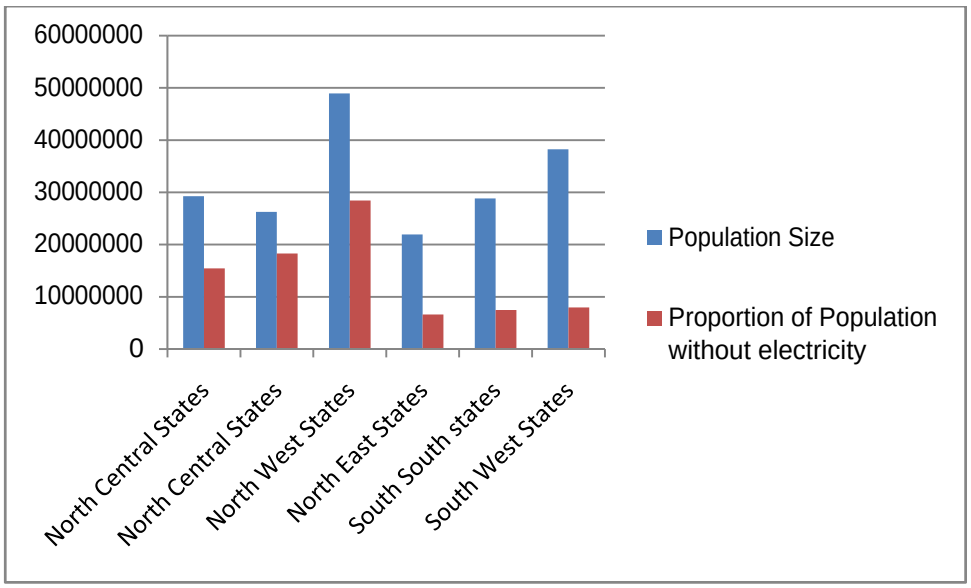

Fig I. Access to Clean Energy in the Geo-political zones of the Country

Furthermore, the data presented in Table 5 shows that, the human poverty index (HPI) 81.1% in the region is the highest in the country. Also, the percentage of people relying on fuelwood 96.3% in the zone is extremely high and only second to the North-Eastern States 97.2%(Figure 2). Chukwu (2001) observed that over 70%t of the total population of Nigeria relies on fuelwood or charcoal as their major source of energy for cooking and heating purposes. According to International Food Policy Research Institute (IFPRI) publication Onyema, (2010), about 50 percent of Nigeria's total energy consumed for agriculture and other domestic food processing activities came from fuel wood. This is because the predominant fuel in rural as well as most peri-urban settings is wood fuel making it one of the most useful forest resources consumed by man among all tree products (Ezema, 2000; Ebe, 2006).

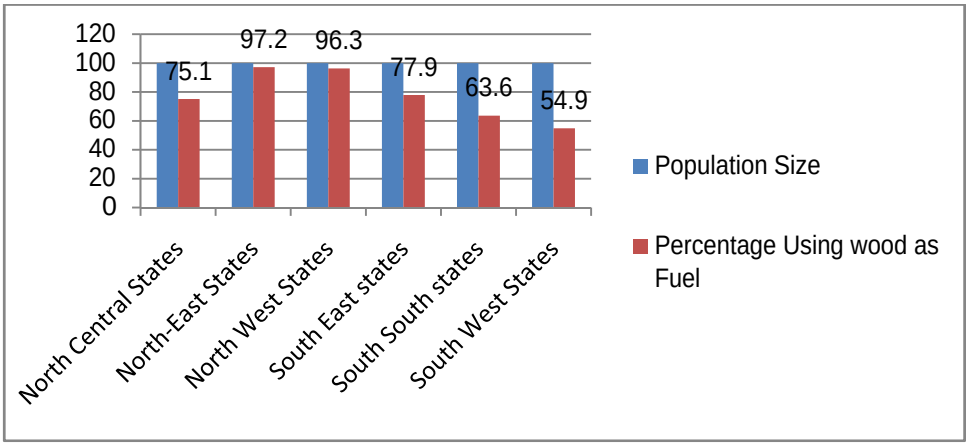

Fig 2 Proportion of the population using wood fuel in the various Geopolitical zones.

Journal of Forestry Research and Management. Vol. 17(2).148-158; 2020, ISSN 0189-8418
www.jfrm.org.ng

Table 5. Socio-economic Characteristics of Nigeria Showing the Population, Poverty Indices and Human development indices in the various Geo-political Zones

Nigerian Geopolitical zones	North Central states	North-East States	North- West States	South East states	South-South States	South-West States
States in each Zones	FCT Abuja, Benue, Kogi, Kwara Nasarawa, Niger and Plateau	Adamawa, Bauchi, Borno, Gombe, Traba and Yobe	**Kaduna**. Jigawa,. Kano, Katsina, Kebbi, Sokoto and Zamfara.	Abia, Anambra, Ebonyi, Enugu and Imo	Akwa Ibom, Bayelsa, Cross River, Delta. Edo and Rivers.	Ekiti, Lagos, Ogun, Ondo Osun and Oyo.
Population Size	29,252,408	26,263,866	48,942,307	21,955,414	28,829,288	38,257,260
Household with Electricity	5,292,830	3,743,438	6,920,492	4,359,335	5,807,106	6,040,316
Percentage (%) of Household with electricity	79.71	54.5	48.57	84.75	86.5	98.33
Proportion of population deprived of electricity	0.528	0.696	0.581	0.302	0.259	0.208
Price Range of Kerosine	105-115	60-120	55-120	100-125	60-125	70-120
Percentage using wood as Fuel Source	75.1	97.2	96.3	77.9	63.6	39.6
Human Development summery statistics. Human Development Index(HDI).	0.569	0.449	0.423	0.628	0.629	0.631
Human Poverty Index (HPI) % of total Population.	42.6	76.8	81.1	27.4	25.2	19.3

Source: Figures from National Population Commission (NBS) (2017). Figures from NHI was calculated from Wikipedia lists of Nigerian States by Human Development Index (HDI) 2018. No of Household as of 1997 was extrapolated based on 1991 Census. % of Household with electricity as of 1997 was quoted from general household survey

Constraints to Clean Cooking Energy Consumption Among Respondents in the Study Area.

Table6.below presents the perception of the respondents on their preference for fuelwood at the expense of cleaner cooking energy sources such as Kerosene, Electricity and Gas. The perceived constraints were evaluated for difficulty in getting clean energy, incessant shortages of clean energy, cost of procuring clean energy, distance of source of alternative clean energy, acceptability by neighbours and ready availability. The results shows that out of the six perceived constraints evaluated only cost of procuring alternative clean energy was rated as major. The mean score for availability was inconclusive while the other four items were not really policy factors. This finding corroborates the poor poverty index exhibited in the geopolitical zone.

Table 6: Constraints to Clean Energy Consumption in the Study Area.

Items	SA	AG	UD	DA	SD	Total Score	Mean Score MS	Remark
Its difficult to get clean cooking energy	5	25	23	90	95	380	1.583	Not a Constraint
There is always shortage of clean cooking energy	14	27	24	109	65	563	2.346	Not a Constraint
clean cooking energy is too expensive	90	79	30	22	19	965	4.021	Constraint
Where I procure my clean cooking energy is far from my home.	22	46	35	82	55	582	2.425	Not a constraint
My neighbours complain whenever I use fuel wood	22	16	34	76	92	483	2.013	Not a constrain
Clean cooking energy is not always available.	50	91	10	19	**70**	774	3.225	Uncertain

Conclusion

The study revealed that a major constraint to clean cooking energy use in Kaduna state is poverty. The study area has the highest population size in the country with a low Human Development Index of 0.423 and Human Poverty Index of about 81.1. Currently, over 50 percent of her population cannot access clean cooking energy. By implication, the clean cooking energy poverty and deprivation level in the area is high hence the preference of the people for fuelwood. This scenario continues to impact negatively on activities that encourage deforestation and its debilitating effect on the environment. Therefore, this study recommends a holistic approach to the energy poverty in the area by formulating policies targeted at improving the income of the populace, human development oriented programmes, development of poverty reduction programmes such as entrepreneurship and improved clean cooking energy pricing policies that creates better access to these facilities.

REFERENCES

Abdul-Mamin, A. andShamshiry, E. (2014).Linking Sustainable Livelihood to Natural Resources and Governance, the scale of Poverty in the Muslim World, Springer.

Chamhuri, N.H., Karim, H.A. and Hamdam, H.(2004).ASIA Pacific International Conference on Environment-Behaviour

StudiesMercure Le Sphinx Cairo Hotel, Giza, Egypt, 31 October 2 November 2012. Procedia Social and Behavioural Sciences 68 (2012) 804 – 814.

Chukwu, I. E. W. (2000).Agricultural sustainability and farmers' decisions at farm level. In Sagary N (ed). Proceeding of the 6th scientific workshop of Sub-Saharan African Network (SUSAN) held at the International Institute of Tropical Agriculture (IITA), Ibadan, Nigeria, August 23-27.

Energy Access Platform (2020).The Need for Clean Cooking SolutionsOil& Gas Industry Energy Access Platform (EAP).**https://www.google.com/search?client=firefox-b-d&q=what+is+clean+cooking+fuel.** Retrieved 29/06/2020.

Ebe, F. E. (2006). Economic study of Fuelwood marketing and consumption in Enugu State, Nigeria.APh.D Research findings presented to the Department of Agricultural Economics, University of Nigeria, Nsukka. August.

Ezema, F.I. (2001). Conventional Sources of energy". In: Ezekwesili, N.O., P.O. UbaChukwu and C.R. Nwagbo (eds), Introduction to Natural Sciences. Onitsha: Newcrest Publishers.

Human Development Report (2019). Inequalities in Human Development in the 21st Century UNDP *Briefing note for countries on the 2019 Human Development Report* Nigeria

Jonathan, O. A. and Victor, A. (2013).Assessment of Socio-economic Factors affecting Household Charcoal use in Makurdi Urban Area of Benue State, Nigeria. *Journal of Environmental Research and Management*, 3(7):180-188

Kar,D. andFreitas,S. (2012). Illicit financial flows from Developing Countries: 2001-2010. Global Financial Integrity Report, Washington.

Maurice, D. C., Umar, Y. and Zubairu, E (2015).Analysis of Factors Influencing Fuelwood Consumption in Some Selected Local Government Areas of Taraba State, Nigeria. *Journal of Agricultural Economics, Environment and Social Sciences* 1(1):163–168

Naibbi, A. I. and Richard, G. H. (2013).Northern Nigeria's Dependence on Fuelwood: Insights from Nationwide CookingFuel Distribution Data. *International Journal of Humanities and Social Science*,3 (17): 160-170

National Bureau of Statistics (NBS).(2017). *Issues*.www.nigerianstart.gov.ng. National Bureau of Statistics Press, Nigeria.

Onoja, A. O. (2012). Econometric Analysis of Factors Influencing Fuelwood Demand in Rural and Peri-Urban Farm Households in Kogi State, Nigeria.*The Journal of Sustainable Development*, 8(1):115 – 127.

Onyema, M.A. (2010).Alternative energy sources for agricultural production and processing in Nigeria. FPRI Report (2010)

UNEP (2019). "Review of Woodfuel Biomass Production and Utilization in Africa: A Desk Study" United Nations Environment Programme Nairobi Kenya

United Nation Development Programme (UNDP) (2010). Human Development Report Nigeria, 2008-2009.Achieving Growth withEquity. United Nations Development Programme P 52.

World Bank (2005).Economic Evaluation of Sectoral Emission Reduction Objectives for Climate Change.

World Resources (2001). People and Ecosystem: The Fraying Web of Life. WRI. Washington, D. C. Science Magazine, 292 (5519): 1071-1072.

World Bank. (1990). *World development report: Poverty*. Oxford University Press.