ECONOMIC ANALYSIS OF FUEL WOOD CONSUMPTION IN GUMA LOCAL GOVERNMENT AREA OF BENUE STATE, NIGERIA

[1]Abah, D., [2]Umeonuora, T. G. and [1]Jimehena, T. S.
[1]Department of Agricultural Economics, Federal University of Agriculture, Makurdi, PMB 2373, Makurdi, Benue State, Nigeria.
[2]Department of Agricultural Economics, University of Nigeria Nsukka, Enugu State, Nigeria
Corresponding Authors' E-mail: dangod23@yahoo.com Tel.: 08038823544

ABSTRACT
The study empirically investigated the economics of fuel wood consumption in Guma Local Government Area of Benue State. Multi stage sampling technique was used to select respondents for the study. Data for the study were obtained from primary source using a well-structured questionnaire. Data collected were analyzed using descriptive statistics and regression analysis. The study found out that; there were more male (75.0%) fuel wood consumers than female (25%) fuel wood consumers in the study area, majority (33.3%) of consumers were aged between 21-40 years and majority (75.0) were married. Most (86.7) of the farmers had one form of formal education or the other; their occupation was farming (73.3%) with 25years of fuel wood consumption experience and most (89.2%) of the farmers had average income of less than ₦50,000 per month. The study also established that marital status (-6221.988) and income per month (66542.580) had significant effect on fuel wood consumption and demand in the study area. The result also showed that fuel wood products was important with high demanded for cooking, rice milling, roasting of meat, fish preservation bricks production and laundry/ironing in the study area. The study therefore, recommended that Government and non-government organizations should embark on public enlightenment campaigns to inform the citizen on the consequences of fuel wood consumption such as climate change, environmental pollution, and biodiversity loss.

Keywords: Fuel Wood, Consumption, Demand, Economic analysis, Energy.

INTRODUCTION

Fuel wood is a source of energy derived by burning wood materials like logs and twigs and is common among the rural dwellers. It is a traditional source of energy, which has remained the major source of fuel for over half of the world's population (FAO, 2001). Fuel wood comprises of wood and wood pulp material obtained from trunks, branches and other parts of trees and shrubs used as fuel for cooking, heating or generating energy through direct combustion. It was noted that among all tree products, fuel wood is the mostly utilized in Nigeria (Ebe, 2006). The rural population traditionally relies on the forest for various food products and fuel wood (NTFPs), both for own consumption and for sales to the urban sector. Chukwu (2001) observed that over 70% of the total population of Nigeria relies on fuelwood or charcoal as their major source of energy for cooking and heating purposes. International Food Policy Research Institute (IFPRI) publication (Onyekuru, 2008) indicated that about 50% of Nigeria's total energy consumed for agriculture and other domestic food processing activities came from fuel wood.

In Nigeria, fuel wood is largely obtained from the natural forest (communal forest, forest reserves or some private forests) free or at the payment of small fees to the landowners. The present situation is that wood extraction from the forest has led to a situation where forest

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increment obtained by natural regeneration is far less than the volume of wood extracted from the forests annually. With supplies diminishing and consumption growing, there is the likelihood of facing major challenges in terms of difficulty in obtaining firewood and the resultant consequences arising from forest depletion or massive tree felling without replenishment (Maurice *et al.,* 2015).

Fuel wood is consumed in diverse ways and at different levels and the life of the majority of rural dwellers depends either directly or indirectly on fuel wood. However, meeting rural household, wood fuel energy needs in the country has become a herculean task due to the enormous quantity of wood required. Daily consumption of firewood by the rural communities in Nigeria is estimated at 27.5 million kg/day (Ogunsawa and Ajala, 2002). This observation was buttressed by another recent data published by The Solar Cooking Archive (2011) which put the estimate of Nigeria's fuel wood consumption as percentage of energy at about 87%. Therefore, majority of the Nigerian rural people have been using and will continue to use the dried biomass fuels for energy for many years to come. Ebe (2006) in his study maintained that the increase in consumption of fuel wood in Nigeria could be attributed to the following two major factors: 1) rapid urbanization brought about by migrants from rural areas who carried along with their rural ways of life; 2) scarcity of conventional fuels such as kerosene, cooking gas and the subsequent increase in the prices of these fuels.

Nigeria has already shown a tendency towards excessive total fuel wood consumption which, according to Sambo (2008), is due to population growth, low technical efficiency of the traditional cooking style and the lack of adoption of other sustainable cooking methodologies.

The ever-increasing population of Benue state inspires an increase in the demand for fuel wood and provides impetus for more people to engage in fuel wood business, with those involved therein seemingly making a living out of it. Meanwhile, woody vegetation is in abundance in the area and is being exploited for this business. There is the likelihood that sooner than later, supply sources would not cope with demand and the business would suffer.

One of the reasons that traditional energy source is the preferred domestic fuel is that it does not require a complex and expensive infrastructure to be produced and used as a fuel. Furthermore, so far it is the cheapest (usually free) available energy resource for the rural population and urban poor (Onyekuru, 2008). According to Yahaya (2002), there exists a direct relationship between human population and fuel wood demand, hence, the cutting down of wet wood can be said to be on the increase. The rate of consumption of fuel wood in Nigeria exceeds the rate of production. It is therefore right to say this renewable source of energy would sooner or later be scarce, should these form of exploitation continue.

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Various research works have been carried out on the aspects of fuel wood demand in Nigeria such as Onoja and Idoko (2008) and Zaku *et al.* (2013) who in their studies, respectively, focused on marketing of fuelwood and demand aspects of fuelwood in Kogi State and wood fuel consumption in Nigeria and the energy ladder in Kaduna state. There are however little or no known works on the determinants of fuel wood demand and consumption in Nigeria. This study therefore makes a bold attempt at resolving this research gap.

The broad objective of the study was to analyze the economics of fuel wood consumption in Guma Local Government Area of Benue state. The specific objectives include to: describe the socio-economic characteristics of fuel wood consumers; examine the importance of fuel wood demand in the study area; determine the factors influencing fuel demand in the study area; and describe the households' relative distribution of fuel wood products utilization in the study area.

MATERIALS AND METHODS
The Study Area
The study was carried out in Guma Local Government Area (LGA) of Benue State of Nigeria. Guma LGA derives its name from River Guma, the third largest river in the Local Government. Guma is located in the northern part of Benue State and lies between Longitudes 6035E and 80 10E of the Greenwich Meridian and Latitudes 60 30N and 80 10N of the equator and at an elevation of 97m above sea level in the Southern Guinea Savanna agro ecological zone. Guma LGA has a land area of 240,000 square kilometers with a population of 191,599 people (NPC, 2006). The LGA has a tropical climate with the rainy season starting from April to October while the dry season is from November to March. The annual average rainfall is 1250mm. During the rainy season, the daily mean temperature is 28^0C while in the hot season the average temperature is 35^0C (Ekpebu, 2001). Guma LGA shares boundaries with Nassarawa State in the north and west, Makurdi and Gwer LGAs in the south, Tarka and Logo LGAs in the east. The LGA is administratively divided into ten council wards: Abinsi, Kaambe, Mbabai, Mbadwem, Mbawa, Mbayel/Yandev, Nyiev, Nzorov, Saghev and Uvir. Gbajima, the headquarters of the LGA is the confluence town of Rivers Benue and Katsina-Ala, the two largest rivers in the State. The Tiv people who are predominantly farmers constitute more than 95% of the total population of the LGA.

Sampling Techniques
The population of the study comprised of all fuel wood consumers in Guma LGA of Benue State. A multi-stage random sampling technique was used to select a sample size of 120 respondents. In the first stage, Guma LGA was purposively selected based on the high rate of fuel wood consumption in the area. In the second stage, a random selection of three (3) council wards from the LGAs which comprised Gbajimba, Nyiev, and Uvir were selected based on the predominant fuel wood usage and production. Thirdly, five (4) villages were randomly selected from each council ward making a total of 12 villages. Finally, 20 fuel wood consumers were randomly selected from each village giving a sample size of 120 fuel wood consumers. Primary data were basically used in this study. The primary data were collected using a well-structured questionnaire.

Analytical Techniques
The model specifies that consumption of fuel wood (Y) is dependent on the socioeconomic characteristics of fuel wood consumers. Implicitly stated as:

$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, e)$ 　　　　　　…(1)

where;

Y = Consumption of fuel wood (Kg)

X_1 = Sex

X_2 = Age

X_4 = Marital status

X_5 = Education

X_6 = Monthly income

X_7 = Household size

X_8 = Experience in fuel wood usage

X_9 = Distance to obtain fuel wood

X_{10} = Cost of alternate fuel (kerosene or gas)

e = error term

RESULTS AND DISCUSSION

Socio-economic Characteristics of Fuel Wood Producers

The result of the socio-economic characteristics of fuel wood consumers is presented in Table 1. Findings on sex of the respondents revealed that majority (75.8%) were male while female constituted only (24.2%). This implies that men were predominant in fuel wood consumption because, they have legal right to land and most of them are bread winners of their families. This result agrees with the findings of Maurice *et al.* (2015) who revealed that males were engaged in fuel wood consumption than the females which is an indication of the predominance of male-headed households.

Analysis on age showed that (33.3%) of the respondents were found to fall within the age group of 21-30 years. On the average, the age of the respondents was found to be 36 year an indication that they were young and within the economically active age. The result agreed with the findings of Maurice *et al*. (2015) that the mean age of fuel wood consumers in Taraba state was between the age brackets of 21 – 40 years. The result is also in line with Isma'il *et al.* (2014) who found that majority of the fuel wood producers and consumers in Kaduna state fell within the age brackets of 20-29 years and 30-39 years.

The results on marital status showed that majority (75.0%) of the respondent were married connoting a higher level of social responsibility on them. The result of this study corroborated the work of Ebe (2014) in Enugu state that majority of fuel wood consumers were married. The result also agreed with the findings of Maurice *et al.* (2015) on the socio-economic analysis of fuel wood producers and consumers, that majority of the respondents were married.

Level of educational attainment of fuel wood consumers showed that, 86.7% of them had formal education at varying levels. The result implied that majority of fuel wood consumers in the study area are literate. The result agrees with Maurice *et al.* (2015) who observed that majority of fuel wood consumers had some form of formal education.

The result also showed that most fuel wood consumers (74.2%) had a household size of 6-15. The average household size was 8.57 persons, an indication of a relatively large household size. This result agrees with findings of Ebe (2014) who found out that most fuel wood consumers had house hold sizes ranging from 6-15. In addition, a study by Maurice *et al.* (2015) found a mean household size of 9 people in Taraba State, Nigeria.

Table 1: Socio-economic Characteristics of Fuel Wood Producers (n = 120)

Variable	Frequency	Percentage	Mean
Sex			26.29
Male	91	75.8	
Female	29	24.2	
Total	**120**	**100**	
Age (Years)			36.29
<20	12	10.0	
21-30	40	33.3	
31-40	36	30.0	
>41	32	26.7	
Total	**120**	**100**	
Marital status			
Married	90	75.0	
Single	23	19.2	
Separated	3	2.50	
Widow	4	3.3	
Total	**120**	**100**	
Years of Education Attainment			
No education	16	13.3	
Primary	32	26.7	
Secondary	56	46.7	
Tertiary	16	13.3	
Total	**120**	**100**	
Household size			8.57
<5	26	21.7	
6-10	71	59.2	
11-15	18	15.0	
>16	5	4.2	
Total	**120**	**100**	

Source: Field Survey Data, 2018

Findings on fuel wood consumption experience showed that majority of the respondents (73.3%) had experience of above 16 years. On the average, fuel wood consumers in the study area had a consumption experience of 25.14 years. This implied that, the respondents were experienced in fuel wood consumption; hence, they had over the years acquired enough experience needed to perceive and manage the risks accustomed with fuel wood consumption. Result on access to credit show that majority of the respondents (76.7%) had access to credit. This implied that, the respondents had access to credit to enable them acquire fuel wood for consumption. The result further revealed that majority of the respondents (73.3%) engage in farming as their major occupation. This is in line with the work of Isma'il *et al.* (2014) who found that majority of fuel wood consumers are farmers.

The result also showed that (89.2%) of the respondents had income per month of less than ₦50,000. The average farm income was in the study area was ₦30,604.04. This showed that fuel wood income is an important source of income for the respondent's household income.

Table 1: Socio-economic Characteristics of Fuel Wood Producers **Cont'd.**

Variable	Frequency	Percentage	Mean
Years of Experience			25.14
<5	5	4.2	
6-10	9	7.5	
11-15	18	15.0	
>16	88	73.3	
Total	**120**	**100**	
Access to Credit			
No	28	23.3	
Yes	92	76.7	
Total	**120**	**100**	
Major Occupation			
Farming	88	73.3	
Civil Servant	10	8.3	
Trader	22	18.3	
Total	**120**	**100**	
Income			
<50000	107	89.2	
50001-100000	6	5.0	
100001-150000	4	3.3	
>150001	3	2.5	
Total	**120**	**100**	

Source: Field Survey Data, 2018

Importance of Fuel wood Demand

The result on the importance of fuel wood demand is presented in Table 2. The result showed that the demand for fuel wood products used for cooking (92.5%) is high which fuel wood is predominantly used for cooking in the study area therefore, it is important to consumers. This work agrees with Ogwuche and Asobo (2013) who observed that most consumers use fuel wood (charcoal and firewood) for cooking in Makurdi. This is also in line with Madukwe (2014) who pointed out that majority of rural households in Enugu use firewood for cooking.

The further revealed that 12.5% of the respondents demand fuel wood products for roasting yams/maize/plantain/groundnut. This work agrees with Ogwuche and Asobo (2013) who observed that rural households also use fuel wood (charcoal and firewood) for roasting of yams/maize/plantain/groundnut indicating the importance of fuel wood consumers especially in rural areas.

Analysis on the demand and importance of fuel wood used for roasting of meat and making *suya* showed that 20% of respondents in the study area strongly agreed to the fact that fuel wood are used for roasting of meat and making suya because of its relative abundance and low cost. This work is in line with Tee *et al.* (2009) who reported the usage of fuel wood for roasting of meat and making of suya in Makurdi.

The result on the importance and demand of fuel wood for rice milling revealed that 56.7% of the respondents strongly agreed to the use of fuel wood for rice milling. This may be attributed to lack of modern rice milling machines that uses modern forms of energy such as

electricity in the study area. This is in line with Tee *et al.* (2009) who found that rural households in Makurdi demand high quantity of fuel wood for rice milling.

The result further revealed that only 15.8% of the respondents strongly agreed to the demand for fuel wood products for metal works in the study area. This implies that with modern technology like the use of welding machine, the use and demand for fuel wood for metal works is on the decline. This works agree with the findings Ogwuche and Asobo (2013) that show very low usage of fuel wood for metal work in Makurdi.

The result also showed that 30.8% of the respondents strongly agreed to the demand and importance of fuel wood used in palm oil production. This implies that rural people demand for fuel wood used for palm oil production is high in the study area. Results obtained from the respondents on fuel wood used for brewing of liquor showed that 21.7% of the respondents strongly agreed to the demand and importance of fuel wood used for brewing of liquor. This implies that rural people demand for fuel wood used for brewing of liquor is low in the study area. This is in accordance with Tee *et al.* (2009) who reported low demand of fuel wood for brewing of liquor in Makurdi.

Table 2: Importance of Fuel Wood Demand in the Study Area

Importance of fuel wood demand	*Frequency	Percentage
Cooking food	111	92.5
Roasting Yams/maize/plantain/groundnut	15	12.5
Roasting meat/making *suya*	24	20.0
Rice milling	68	56.7
Metal work	19	15.8
Fish smoking/frying of bean cakes and baking of bread	14	11.7
Palm oil production	37	30.8
Brewing of liquor (*burukutu,* etc.)	26	21.7
Brick production	48	40.0
Laundry/ironing	20.0	16.7

*Multiple responses
Source: Field Survey Data, 2018

The result also showed that 40.0% the respondents strongly agreed to demand and importance of fuel wood used for bricks production in the study area. The result agrees with Tee *et al.* (2009) who observed that in Makurdi, the demand for fuel wood is high as it is used mostly for bricks production. Results obtained from the respondents on fuel wood used for laundry/ironing showed that 16.7% of the respondents strongly agreed to the demand and importance of fuel wood used for laundry/ironing. This is evident in the work of Ogwuche and Asobo (2013) who reported usage of fuel wood (charcoal) for laundry/ironing activities in Makurdi. In addition, Madukwe (2014) reported that in the rural areas of the Enugu state, charcoal is the most used fuel wood products for ironing.

Household Relative Distribution of Fuel wood Products
The result of household relative distribution of fuel wood products is presented in Table 3. The result showed that majority (87.5%) of the respondents strongly agreed that they use firewood for cooking in the study area. This is in line with Chukwu (2001) who indicated that over 70 percent of the total population of Nigeria relies on firewood or charcoal as their major

source of energy for cooking and heating purposes. In addition, Onoja and Emodi (2012) indicated that fuel wood is mainly used for cooking in Kogi State.

The result also revealed that 31.7% of the respondents strongly agreed that they use charcoal for cooking in the study area while 23.3% of the respondents strongly agreed that they use firewood for cooking in the study area. This implies that fuel wood (firewood or charcoal) is mostly utilized in households for heating purposes in the study area. The result further showed that 37.5% of the respondents strongly agreed that they use charcoal for preservation while 16.7% of the respondents strongly agreed that they use firewood for preservation in the study area. This implies that fuel wood (firewood or charcoal) is mostly utilized in households for food preservation. Madukwe (2014) asserted that in the rural areas of the Enugu State, firewood is the most used fuel wood product for food preservation Onoja and Emodi (2012) also observed households' relative distribution and usage of fuel wood products (firewood and charcoal) for preservation in Kogi State.

The result also showed that 29.2% of the respondents strongly agreed that they use charcoal for metal works while 11.7% of the respondents strongly agreed that they use firewood for metal works in the study area. This implies that fuel wood (firewood or charcoal) is rarely utilized for metal works in rural households. This is attributed to the fact that blacksmith business is on a decline therefore; rural people do not distribute fuel wood products to metal works. This is in line with Ogwuche and Asobo (2013) who reported the reduction in blacksmith business thereby a decline in the distribution of fuel wood products for metal work in Makurdi.

Table 3: Household Relative Distribution of Fuel wood Products

Products	*Frequency	Percentage
Firewood for cooking	105	87.5
Charcoal for cooking	54	45.0
Firewood for heating	28	23.3
Charcoal for heating	38	31.7
Firewood for preservation	20	16.7
Charcoal for preservation	45	37.5
Firewood for metal work	11.7	11.7
Charcoal for metal work	35	29.2

*Multiple responses
Source: Field Survey Data, 2018

Factors Influencing Fuel Wood Demand

The result of the regression analysis showing the factors influencing fuel wood demand in the study area is presented in Table 4. The coefficient of determination (R^2) shows that 85.9% of the variations in the consumption of fuel wood in the study area are explained by the socio-economic characteristics of the respondents which show a very good fit. The result further showed that marital status (-6221.988) was negative and significant at 5%. This implies that, a unit increase in marital status will decrease the demand and consumption of fuel wood by 6221.988. The result also revealed that income per month (66542.580) was positive and significant at 1%. This implies that, a unit increase in income of the respondents will lead to 66542.580 increases in the demand and consumption of fuel wood in the study area. This is because if the respondents have more money they will be able to purchase more fuel wood for

their domestic uses especially those in rural areas where access to electricity and gas is relatively difficult and this study agrees with the finding of Onoja and Emodi (2012).

Table 4: Factors Influencing Fuel wood Demand in the Study Area

Variables	Coefficients	Std. Error	t value	Sig.
Constant	-72284.879	15562.289	-4.645	0.00
Sex	6244.575	4100.635	1.523	0.131
Age	-65.652	259.386	-253	0.801
Marital Status	-6221.988	2584.700	-2.407	0.018
Access Credit	6444.069	4223.555	1.526**	0.130
Education	766.293	2181.267	0.351	0.726
Income per month	66542.580	2887.190	23.128***	0.00
Household size	639.555	2382.527	0.268	0.789
Experience	694.761	2343.352	0.296	0.767
Distance	17.512	11.786	1.486	0.140
Alternative wood cost	5950.745	3818.773	1.558	0.122
R^2	0.859			
Adjusted R^2	0.844			

, * represents significance at 5% and 1%, respectively
Source: Field Survey Data, 2018

Test for Hypothesis

The result of the test of hypothesis is presented in Table 5. The result shows that F (59.614) is significant at 1% which explains the overall significance of the model. Therefore, the null hypothesis which stipulated that the socio-economic characteristics of fuel wood consumers do not have any significant effect on the demands of fuel wood consumption in Guma Local Government is rejected because social economic characteristics of the respondents greatly influence the consumption of firewood and therefore increase the demand for it. The more money the consumer have the more fuel wood they purchase for their domestic uses.

Table 5: Test for Hypothesis

			ANOVA		
Model	Sum of squares	Df	Mean Square	F	Sig.
Regression	2.108	11	1.917	59.614	.000
Residual	3.472	108	3.215		
Total	2.455	119			

Source: Field Survey Data, 2018

CONCLUSION AND RECOMMENDATIONS

The study concluded that marital status of the respondents had a negative effect on the demand and consumption of fuel wood while monthly income of the respondents had positive effect on the demand and consumption of fuel wood in the study area. The study also revealed that consumers demand for fuel wood products for different purposes such as cooking, preservation, palm oil production etc. Conversely, a good number of respondents do not demand for fuel wood used for metal works, this is due to the fact that blacksmithing business

is declining and being replaced with modern technologies. The study therefore, recommended that:

1. Government and non-government organizations should embark on public enlightenment campaigns to inform the citizen on the consequences of fuel wood consumption such as climate change, environmental pollution, and biodiversity loss.
2. More so, efforts should be doubled by the Nigerian government to make available, alternative source of cooking and heating energy like LPG, kerosene and electricity to households which will reduce dependence on fuel wood products by households.

REFERENCES

Abah, D and Ochonu, J.O (2018). Effect of Forest Resources on Rural Household Income In Ado Local Government Area of Benue State, Nigeria. *Dynamics of Natural Resources and Environmental Management in Nigeria, theory, Practice, Bureaucracy, advocacy.* pp 193-203.

Chukwu, I. E. W. (2001). "*Agricultural Sustainability and farmers: Decision at Farmer level.* In: Sagary, N. (ed), Proceeding of the Sixth Scientific Workshop of Sub-Saharan African Network (SUSAN) held at the International Institute of Tropical Agriculture (IITA), Ibadan, August, 23 – 27.

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

Ebe, F. E. (2014). Socio-Economic Factors Influencing the Use of Fuelwood in Urban Areas of Enugu State, Nigeria. *Journal of Business and Management,* **1**(11):147-15.

FAO (2001). "*The Role of Woodfuel in Africa by D. Gustafon.* In: N Wamukonye (Ed) Proceeding of a High Level Regional meeting on Energy and Sustainable Development." 10-13 January 2001. Nairobi, Kenya. Food and Agriculture Organization of the United Nations, Rome. pp. 99-101.

Isma'il, M., Maiwada, A., Bashir, A., Musa, I. J., Gaddafi, A. and Babajo, H. (2014). Comparative Analysis of Fuelwood Utilization In-and-Aroud Ikara Local Government Area of Kaduna State, Nigeria. *Global Journal of Research and Review*, **1**(3): 125-135.

Madukwe, C. E. (2014). *Domestic Energy Usage Pattern of Households in Selected Urban and Rural Communities of Enugu State.* A M.Sc. Dissertation, Department of Agricultural Economics, University of Nigeria Nsukka.

Maurice, D. C., Umar, Y. and Zubairu, E. (2014). Analysis of Factors Influencing Fuel wood Consumption in Some Selected Local Government Areas of Taraba State, Nigeria. *Journal of Agricultural Economics, Environment and Social Sciences,* **1**(1): 163–168.

Nigerian National Petroleum Corporation [NNPC] (2012). *Annual statistical bulletin.* Corporate Planning and Strategy Division (CP&S). NNPC ASB 2012 – 1st Edition.

Ogunsawa, O. Y. and Ajala, O. O. (2002). *Firewood crises in Lagos- implication on the suburban and rural ecosysyem management.* In: J. E. Abu, P. O. Oni, L. Popoola (eds). Proceeding of the 28th annual conference of Forestry Association of Nigeria at Akure, Ondo State. Nov. 4th – 8th. Pp257- 264.

Ogwuche, J. A. and Asobo, V. (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.

Onoja, A. O. and Emodi, A. I. (2012). Economic Analysis of Fuelwood Production and Consumption: Evidence from a Nigerian State. *British Journal of Management & Economics,* **2**(1): 13-23.

Onoja, A. O. and Idoko, C. (2009). *Econometric modeling of fuelwood demand function in kogi state, Nigeria: a two-stage least squares approach.* A paper presented at the 1st International Conference of International Institute of Tropical Agriculture (IITA) & International Association of Research Scholars and Fellows (IARSAF) on Global Agriculture and Environmental Sustainability. The challenges and solutions held at international institute of tropical agriculture, Ibadan, Nigeria, 17th – 20th March.

Onyekuru, N. A. (2008), "*Effects of Cooking Energy Price Changes on their Substitution and Resource Allocation: A Comparative Analysis of Rural andUrban households in Enugu State, Nigeria*". A M.Sc. Dissertation, Department of Agricultural Economics, University of Nigeria Nsukka.

Sambo, A. S. (2008). *Renewable Energy Options for the Environment and Sustainable Development in Nigeria.* Paper Presented At The National Workshop On Energy Investment And Private Sector And Participation At The Petroleum Training Institute, Warri.

Tee, N. T., Ancha, P. U. and Asue, J. (2009). Evaluation of fuelwood consumption and implications on the environment: case study of Makurdi area in Benue state, Nigeria. *Journal of Applied Biosciences*, **19**: 1041 – 1048.

Yahaya, S. B. (2002). *The Development and Adoption of Local Alternative Sources of Energy against fuelwood.* A paper presented at a two-day training workshop on Agroforestry management, for sustainable agricultural production. Manpower Development Centre: Office of the Head of Service, Kano State, Nigeria.

Zaku, S. G., Kabir, A., Tukur, A. A. and Jimento I. G. (2013). Wood fuel consumption in Nigeria and the energy ladder: A review of fuel wood use in Kaduna State. *Journal of Petroleum Technology and Alternative Fuels,* **4**(5): 85-89.