

## **Socio-Economic Factors Influencing the Use of Fuelwood in Urban Areas of Enugu State, Nigeria**

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**Abstract:** *This study was on use of fuel wood by households in urban areas of Enugu State, Nigeria. The study examined the level of use of fuel wood, effect of socio-economic factors on fuel wood demanded and the problems being experienced by those that use the fuelwood. A cluster random sampling techniques was employed to select the fuel wood users in three urban centers of the State. A total of 120 fuelwood consumers were selected and used for the study. Data were collected through primary sources. The data were analyzed by the use of descriptive and regression analyses. The result of the study revealed that majority of the fuelwood consumers had low level of education, low income and were married with large sizes of household. The findings also showed that socio-economic variables that significantly affected fuel wood demand were household size ( $t = 2.968$ ), income ( $t = 2.358$ ), prices of fuel wood ( $t=3.255$ ) and prices of fuel wood substitutes ( $t=5.668$ ). Fuel wood was mostly used for cooking, heating, preservation and ironing. The result further indicated that large sizes of household use large quantities of fuel wood and kerosene as substitutes. The constraints of fuelwood consumption were high prices of fuel wood, health problems, lack of storage space and attraction of harmful insects such as scorpion. The study therefore advocates that there is need for government to reduce the prices of alternatives energy sources such as kerosene and also carryout poverty reduction programmes in order to increase the income of the low income group that are always associated with the usage of fuelwood.*

**Keywords:** *Cooking, Heating, Preservation, Ironing, Socio-economic and fuel wood.*

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### **I. Introduction**

Fuel wood is wood burnt directly as fuel [1]. It is obtained from trunks, branches and other part of trees and shrubs [2]. It is found in the forest and savanna zones of Nigeria [3]. It is bulky and heavy materials of low unit value and low price compared to conventional fuels.

Fuel wood is socially and environmentally acceptable. It still remains a globally important source of energy to fossil fuel in their large scale use [4]. In terms of volume, fuel wood is the most important wood item consumed in Nigeria as well as in other West African countries. It accounts for about 95% of total wood consumed in Nigeria [5]. In Nigeria the role fuel wood energy source plays can only be replaced by expensive electric power, insecticides and food driers which most users of fuel wood cannot afford. In view of this, more than 70% of the total population relies on fuel wood as their major source of energy for cooking purposes [6 and 7]. Most of the dishes of the poor ones in Nigeria are subject to lengthy cooking probably because of the nature of the food itself, size of the household and also by the need to destroy germs and parasites [8]. It is the major source of energy in rural areas both for domestic uses, for use in small scale traditional industries and for commercial enterprises. In the urban areas, low income household use it as their main source of energy for cooking and heating. The middle income owners use it as substitutes or supplementary fuel for domestic cooking and heating [9].

In recent years, most countries face problem of energy crisis, a crisis arising from constant increase in the price of oil. But the vast majority of poor people in developing countries (Nigeria inclusive) particularly the poor ones face a different kind of energy crisis. This crisis is fuelwood shortages. This is because most of them have continued to depend on fuelwood. This situation has led to supply and demand gap and this gap has continued to widen. In Africa, the fuel wood consumption rose by 23.08% from 154 million to 190.2 million metric tonnes in 1975 [10 and 11]. 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. In the exploitation of the trees for fuelwood, tree covers are badly damaged and vast of it leads to deforestation. The effect of this is that vast areas of top soils are exposed to rains and wind with the result being erosion. The attendance consequence is low productivity [11]. The scarcity of fuelwood has even reflected in terms of increase in the prices of fuel wood. The shortages of the fuelwood has also been noticed in the prices of yam stakes and growing trades in the forest related items in South-East of Nigeria. Also in Nigeria the scarcity of conventional energy sources and the like in the prices of these fuels had also prompted the continued dependence on fuel wood by many households in relation to other commercial fuels even among urban households [11]. The high demand of wood product has also been adduced to the increases in the rate of poverty

in the country. Almost 70% or 89 million Nigerians live below poverty line and Enugu State has 60% of her population under this group [12, 13 and 14]. Also in 2005, it was pointed out that 87% or 93 million Nigerians still live below poverty line [15].

With the increases in prices of conventional fuels and effect of poverty, what are the levels of fuel wood used in households of the study area? How are the socio-economic variables responsible for the demand of fuel wood in the study area?

The study was then conducted to determine the level of fuel wood use and socio-economic factors that influence fuel wood demand in the study area. The study also identified the problems being experienced in fuel wood consumption.

## II. Methodology

Urban areas were used for the study because almost all the fuelwood users depend on market for their fuelwood consumption. As a result of this, they are frugal in the use of fuelwood.

Here cluster sampling techniques was employed to select the fuelwood user. In each of the three urban centers of the state namely Enugu, Nsukka and Oji-River, cluster of fuelwood users was compiled. From there, one cluster was chosen from each urban area. The clusters of fuelwood used for the study were Akakpa Nike Enugu, Odenigbo Nsukka and Ugwunzu in Oji-River. From the clusters, a list of households that use fuel wood was compiled to serve as sample frame. In the sample frame of each urban centre, 40 households were randomly selected. Therefore, the three zones gave a total of 120 households that were used for the study.

The data for the study were collected from primary sources by using questionnaires and oral interviews.

The data included socio-economic characteristics of the heads of households, access to alternative sources of energy, price of fuelwood and fuelwood substitutes, quantity of fuelwood used weekly and monthly and problems of fuelwood consumption.

Descriptive statistical method of percentage was used to determine the level of fuelwood used, problems of fuelwood consumption and partly the socio-economic characteristics of the fuelwood users. To determine the socio-economic variables that affect fuel wood demand in the study area, regression analysis was used to realize it.

The result of the demand analysis was based on the standard statistical and econometric criteria such as the values of coefficient of determination ( $R^2$ ), F-test, t-values and magnitude of the regression coefficients. Only the double-log model out of the three functional specifications of the regression model was chosen as the lead equation for the demand analysis. The reason for the choice was that it gave the highest values of  $R^2$ , number of significant variables and consistency of signs of coefficient with a prior expectation.

The implicit function used for the determination of quantity of fuelwood demanded is:

$$Y_d = f(H_s, I_n, P_w, P_s, E_d, U)$$

Where;

$Y_d$  = Quantity of fuelwood demanded (kg)

$H_s$  = Household size (number)

$I_n$  = Income (₦)

$P_w$  = Price of fuel wood (₦)

$P_s$  = Prices of fuel wood substitutes (₦)

$E_d$  = Education level of the household head (Yrs)

$U$  = Stochastic or error term.

## III. Results and Discussion

**Table 1: Percentage distribution according to socio-economic characteristics of fuelwood users**

Variables	Categories	Percentage
<b>MARITAL STATUS</b>		
Single		2
Married		72
Widowed		24
Divorced		3
<b>LEVEL OF EDUCATION</b>		
1-6 years		17
7-13 years		53
14-18 years		15
Above 18 years		13
<b>HOUSEHOLD SIZE</b>		
1-5		33
6-10		43
11-15		23
16 and above		1
<b>PRIMARY OCCUPATION</b>		

Farming		7
Civil service		22
Trading		28
Artisan		26
Teaching		17
<b>MONTHLY INCOME</b>		
Less than ₦10,000		48
₦10,000 – ₦20,000		39
₦20,000 – ₦30,000		9
₦30,000 – ₦40,000		3
₦40,000 and above		1

The results from the above table showed that majority of the respondents were married. The implication of this is that married couples often have high child and relation dependence ratio which implies high consumption. The table 1 also showed that 17% had no formal education. Majority (53%) of the respondents attained maximum of six years in formal education while 30% spent from seven years and above. This result shows that with more number of years spent in education, the less the number of fuelwood users. The result indicated that household size ranging from 6-15 constituted the largest proportion (66%) of the respondents surveyed. The implication of the large household size is that the family might spend more on conventional energy sources and this would make them go for fuel wood, the one that is considered cheaper. As it affects the occupation, the least (7%) of the respondents were farmers. This could be that farmers who use fuelwood in the urban area is small whereas most of them live in rural areas. Also majority (87%) of the fuel wood users fell within income level, of ₦20, 000.00 and less monthly. This shows that the higher the level of income, the less the number of the respondents that use fuelwood.

### Uses of Fuelwood in Households

**Table II: Distribution of household according to uses of fuelwood**

Uses	Percentage
Cooking	92
Heating	27
Drying/preservation	17
Ironing	4

Multiple responses recorded

**Table III: Distribution according to fuel wood consumption by households**

Size of household	Monthly Consumption (kg)	Yearly Consumption (kg)
1-5	180	2160
6-10	220	2640
11-15	250	3000
16 and above	270	3240

**Table IV: Distribution of household according to sources of alternative energy**

Sources of Alternative Energy	Percentage
Kerosene	97
Electricity	–
Cooking gas	2
Coal	3

Multiple responses recorded

Table II above showed that fuelwood is used mainly for cooking, heating, drying/preservation and ironing. Out of this, large proportions (92%) of the respondents use fuelwood for cooking. This was followed by heating (27%), drying/preservation (17%) and ironing (4%) respectively.

From table III, it is observed that a household whose size was between 1-5 persons consumed 180kg of fuelwood monthly, amounting to 2160kg of fuelwood annually. Also a household of 6-10 persons utilize an average quantity of 220kg monthly and 2640kg annually, while a household ranging from 11-15 persons used 250kg monthly and 3000kg annually and that of 16 persons and above consumed about 270kg and above monthly. This result clearly shows that as the size of household increases, the quantity of fuelwood being consumed also increases but not in the same proportion.

Table IV depicted that among the respondents, 97% used kerosene in cooking. The kerosene served as substitutes to fuelwood for preparation of food. On the average a household whose size was 1-6 persons used 6-10 litres of kerosene monthly, while families of 6-10 persons, 11-15 persons utilized, 12-16 litres and 20-22 litres of kerosene sourced alternative energy from cooking gas while only 3% used coal for cooking and heating.

Those who used coal were from Enugu urban and this was attributed to availability of the product. None was recorded in the use of electricity for cooking and heating. The reason adduced was irregularity and its cost.

**IV. Socio-economic Factors that Influence Fuelwood Demand**

**Table V: Regression analysis on the socio-economic factors that affect the quantity of fuelwood demanded**

Independent variables	Coefficient	t – Values	R <sup>2</sup> (adj)	F – Ratio
Constant	3.760	4.62	0.68	49
Household size	0.286	2.97*		
Income	-0.151	-2.36*		
Prices of fuel wood Substitutes	0.522	5.67*		
Prices of fuel wood	-0.193	-3.26*		
Education	-0.037	-0.07		

The table V above showed the result of regression analysis on the socio-economic factors (household size, income, prices of fuel wood substitutes, prices of fuel wood and education) that influence the quantity of fuelwood demanded. This shows that the following variables; household size (t = 2.97), income (t= -2.36), prices of fuel wood substitutes (t = 5.67) and prices of fuel wood (t = - 3.26) were statistically significant at 5% level of probability.

The estimated regression coefficients that carry positive signs implied that they have direct positive relationship with the dependent variable.

The size of household was statistically significant with positive relationship. This is consistent with a prior expectation. This implies that as the number of person increases in the household, the more mouth that would be fed thereby leading to utilization of more fuelwood.

Income variable had a negative relationship with quantity of fuelwood demanded and was statistically significant. This shows that income elasticity was negative indicating that fuelwood is not a luxury item but inferior good to the consumers. The implication of this is that as the income of household increases, there is the tendency that one would go for alternative energy sources such as kerosene, cooking gas etc.

The price of fuelwood demanded showed negative (-0.193) showing that the demand function satisfied a prior expectation. The variable was also significant. However, the estimated price elasticity in absolute value was less than unity, implying that demand for fuel wood was inelastic.

The price of fuelwood substitutes was significant with positive relationship. This implies that an increase in the price of alternative energy sources will make the respondents demand more of fuel wood.

Level of education was not significant and had negative relationship with quantity of fuelwood demanded. The negative relationship is consistent with a prior expectation which implies that an attainment of higher level of education might make an individual consume less of fuelwood as a result of accepting alternatives energy sources such as kerosene and cooking gas etc.

The overall result of double-log showed that coefficient of multiple determination was high (0.68). The higher R<sup>2</sup> is an evidence of good fit of the model on the data obtained. The equation then explains that 68% of the observed variables have influence on the quantity of fuelwood demanded with an F-ratio (49) being significant.

**V. Major Problems of Fuelwood Consumption**

**Table 6: Problems being experienced in the usage of fuelwood**

Problems	Percentage
Higher price of fuelwood	91
Health problems	94
Lack of space for storage	63
Attack of harmful insects (scorpions)	31

Multiple responses recorded

Majority of the consumers gave positive responses to health problems. These health problems were associated with respiratory cases, effect of smoke on eyes, pollution of the environment. This result is in consonance with the findings of Irene and Joan (1997) and Smith *et al*, (1993). High prices of fuelwood in urban areas were reported by Foster (1986) as one of the major problems affecting fuelwood users. This problem was also viewed to be in conformity with the above report as 91% of respondents gave similar response. Sixty three percent responded to lack of space. This was attributed to the fact that most of the fuelwood users in urban centers are low income earners and they usually live in crowded houses.

Thirty percent of the respondents claimed that fuelwood attracts harmful insects such as scorpion. These insects hide at the back of the wood and at times sting the users.

## **VI. Summary and Conclusion**

The study determined the level of use of fuelwood and the socio-economic factors that affect the fuel wood demanded. It also identified the problems being experienced in fuelwood consumption. The level of use of fuelwood, part of socio-economic factors and problems of fuelwood consumption were analyzed with percentage while the determination of the socio-economic factors that affect fuel wood demanded was analyzed by employing regression analysis.

Results showed that majority (70%) of the fuelwood consumers had low level of education while 87% of them fell under low come group. Most of the respondents were married with large sizes of household. The findings also showed that fuel wood was used mostly for cooking, heating, preservation and ironing. The result further indicated that large sizes of households use large quantities of fuelwood and kerosene.

The findings also depict that socio-economic variables that significantly influence dependent variable included household size, income, prices of fuelwood and alternative energy sources. The overall regression equation was statistically significant at 5% level of probability as 68% of the variation was explained by the socio-economic characteristics of the fuelwood consumers and F-ratio was 49.

The constraints of fuel wood consumption were high prices of fuelwood, health problems, and lack of space for storage and attraction of harmful insects.

The overall result has shown that fuelwood usage was highly affected by poverty related variables such as big size of household, low income and low level of education in the study area.

The study concludes that there is need for government to reduce the prices of alternative energy sources such as kerosene and also carry out poverty reduction programmes in order to increase the income of the low income group that are linked with this aspect of energy source so that they can afford alternative source of energy. This will equally reduce the effect of fuelwood consumption on the environment.

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