



IMPLICATION OF ALTERNATIVE DOMESTIC ENERGY CONSUMPTION DURING KEROSENE SCARCITY IN CROSS RIVER STATE, NIGERIA

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ABSTRACT

The study examined the alternative utilization of domestic fuels in the face of kerosene scarcity. The objective is to identify the preferred domestic fuel and its effects. Survey method was adopted in the study. A sample size of 400 households was used for the study. The procedure adopted in selecting the 400 households was multi-stage random sampling. Data was collected through a structured questionnaire and analyzed using simple percentage and multiple regression analysis. Results showed fuel-wood as the popular domestic fuel during kerosene scarcity in rural and urban areas of Cross River State but popular utilization of fuel-wood has serious consequences in the environment such as deforestation, environmental degradation and health hazards. It is suggested that energy policy of Nigeria should be reviewed to pave way for environmentally friendly domestic fuel utilization.

Keywords: Domestic energy, fuel-wood, deforestation, health hazards

INTRODUCTION

Domestic energy is a vital component of everyday living. Domestic energy is derived from many sources such as: electricity, fossil fuel (gas, kerosene, coal etc), firewood and associated materials like kernel shells, saw dust and charcoal. Others are coal, candle, and cow dung FOA (1997b); Inyang (1987) and Dewers (1989). Domestic energy is utilized for cooking, heating, ironing, grinding, lightening, and operation of household appliances including electronic devices and machines. Although, Nigeria is blessed with abundant energy resources (tapped and untapped) the supply of domestic to meet the national demand has been grossly inadequate. Electricity supply has always been epileptic. The story is not different in the supply of petroleum products. The supply of petroleum products (kerosene, gas, petrol and diesel) is characterized by incessant scarcity making the products inaccessible to the low income earners.

Incessant power outages, scarcity of petroleum products and the declining popularity of coal have forced most rural and urban dwellers to resort to the utilization of fuel wood as either major or alternative

source of domestic fuel. The utilization of fuel-wood as domestic fuel among rural and urban dwellers has increased in recent times. Many urban dwellers use fuel-wood as alternative domestic for cooking during kerosene scarcity while the rural dwellers utilize it as a major source of fuel for cooking. The supply of firewood is currently being threatened by rapid urbanization, extensive agricultural projects and accelerated deforestation. This situation puts this type of domestic fuel in a precarious state. Grut (1972) had predicted a massive wood fuel gap or excess demand for fuel-wood emerging in the near future. The uncertainties in the supply of domestic fuels call for investigation into alternative domestic energy utilization.

Many scholars have conducted various studies in energy utilization. Some including Ojo (1980), Ibiang (2005), Igbozurike (1982), Thulin (1966) and Erabor (1976) focused on energy consumption in the rural areas of Western and East Central Nigeria. Inyang (1987), Edu (1983) and Offiong, Amuyou and Eno (2008) however conducted similar studies in South Eastern and North Central Nigeria. Their

investigations focused largely on fuel wood consumption in rural and urban centres respectively. Their studies did not examine energy consumption in a holistic perspective. The highlighted studies were conducted over a decade ago and therefore do not reflect the current realities of energy consumption in Nigeria, hence the need for this investigation.

Generally, the pattern and proportion of energy consumption differ spatially, culturally and in time Rahji (2005). The factors affecting energy utilization are identified as availability of the resource, available technology, efficiency of energy source, and available energy options Ibiang (2005) and Erabor (1976). Inyang (1989) also highlighted income, education and size of the households as other factors affecting energy consumption. These factors determine the energy options available in any given society.

Energy options in Nigeria have been identified to include electricity, fossil fuel that is kerosene, petrol, diesel, aviation fuel and natural liquefied gas, coal, firewood, kernel-shell, saw-dust, and cow-dung. Earthscan (1986), and FOA (1976). Electricity as a source of energy in Nigeria is generated from hydro power and thermal stations. Thermal energy is derived from coal and gas power stations located in Afam, Oji River and Lagos. The power plants generate over 1050 mega-watts which is pooled to the national grid for distribution across the country NEPA (2001). However, out of the installed capacity of 25.5×10^9 kwh only 34.3% was generated in 1999. This is far below the amount of electricity demanded by electricity consumers, hence the inadequate electricity supply in Nigeria. Electricity is demanded and consumed by three main sectors, namely industrial, domestic and commercial/street lighting Inyang (1987). Among these sectors, domestic sector consumes 51.9% while others consume 48.1% Ojo (1986) and Morgan and Moss (1981). The domestic sector is the highest consumer of electricity.

The domestic sector utilizes electricity for lighting, ironing, heating,

cooling, and powering electronic devices. Inyang (1987) and Erabor (1976) identified lighting as the most popular use of electricity by households. Studies conducted by Igbozurike (1981) showed that only a very small proportion of Nigerians utilize electricity for cooking. The low utilization of electricity as cooking fuel is attributed to high tariffs and high cost of associated appliances like cookers. The limited use of electricity is also due to its inaccessibility to most people especially the rural dwellers Inyang (1987).

Cooking gas as domestic fuel is used in homes mainly for cooking. According to Grut (1972), Ojo (1980) and Inyang (1987) gas is mostly used for cooking during power cuts. However, Inyang (1987) and Offiong et al (2008) identified cooking gas as a popular energy option among urban dwellers. It is estimated that 3.6% urban households used cooking gas. The low utilization of liquidified gas is attributed to its high cost, high risk, high cost of associated appliances like gas cookers and irregular supply. Currently, the price of medium size (20kg) gas cylinder is not less than N4,000.

Kerosene is another domestic energy utilized primarily for cooking and lighting. Studies conducted by Ojo (1980), Erabor (1976), and Inyang (1987) in Western and South Eastern Nigeria respectively estimated that 63% of households in Nigeria utilize kerosene as the dominant fuel for cooking. The dominant use of kerosene by households is due to its high thermal efficiency FOA (1976). It is asserted that kerosene is nearly three times more efficient in burning than firewood. The popular use of kerosene as a cooking fuel is premised on its relatively low cost, affordability and cheap cooking appliances. However, the consumers sometime use other energy options in the face of scarcity of the product. The study area has been experiencing incessant shortages of kerosene over the years. During scarcity, kerosene is sold at very high price. Currently, a litre of kerosene is sold at about N150 in private petrol stations against the official pump price of N50.00. This situation

renders kerosene inaccessible to the poor constraining them to resort to other energy options which are cheap and readily available.

Firewood as energy option is mainly obtained from farms, secondary forests, fuel wood plantations, forest reserves, saw-mills, construction sites, and timber market. It is a principal energy source dominantly used in rural areas. FAO (1997) and Thulin, (1966) estimated that 60% of the rural dwellers and 30% of urban residents depend entirely on firewood for cooking. No wonder, Inyang (1987) concluded that fuel-wood is the dominant cooking fuel in South Eastern Nigeria. Fuel-wood is identified by Thulin (1966) as alternative cooking fuel to kerosene among urban dwellers.

Energy content of any source of domestic fuel determines its efficiency. FAO (1997b) and Thulin (1966) estimated the energy content of wood with 25-30% moisture content as 1kg of wood producing 3500k calories or 1 ton of wood producing 1420kwh. FAO (1997b), used this estimate to project firewood energy content per household per year as 83650k cal x 12. Inyang (1987) used these estimate to project and calculate the per capita fire wood consumption in Uyo as 8.2 tonnes per year per household or 0.99 tonnes per capita per year. Similarly, Adeyoja (1975) in surveying energy consumption in Western Nigeria estimated per capita energy consumption as 1.57 tons per year for a household size of 8 persons. Igbozurike (1981) and Dewers (2006) further estimated; per capita of 5.5 tonnes per year and 2.5 tonnes per year for household size of 7 and 5 persons respectively. Erabor (1976) used these estimate to project energy consumption of Oyo State as 110.5 million (m³) in 1995. These estimates are useful in projecting domestic fuel consumption as well as determining the adequacy of domestic fuel supply. FAO (1997b) projected wood energy consumption in Nigeria in 2010 to be 10.30 petajoules or 1,050 million cubic metres. To convert the energy content of fuel-wood to energy content of crude oil Morgan and Moss

(1981) stated that 860 million cubic metres or 8.430 petajoul energy content of fuel wood is equivalent to energy content of 1 barrel or 42 gallons of crude oil. This implies that kerosene scarcity would force more people to switch to fuel wood with attendant effect of more pressure on the forest. Such pressure would lead to the disappearance of many tree species. The aim of this study was to examine the domestic energy consumption alternatives during kerosene scarcity in Cross River State. In order to determine the most preferred domestic fuel in the study area, identify the factors affecting the utilization of domestic energy alternatives, and highlight the impact of the popular domestic fuel option in the study area. Highlighting the current domestic energy consumption pattern in Cross River State would provide a basis for reassessing domestic fuel consumption and supply policy in Nigeria as well as bring to focus the implications of utilizing the alternative domestic fuel to man and environment. The findings of will also help in seeking for ways of addressing the emerging climate change and the associated problems.

MATERIALS and METHODS

Survey method was adopted for the study. Data was collected with the aid of a designed questionnaire, containing items on type of fuel used by households, preferred fuel, alternative fuel, reasons for utilizing alternative fuel, estimated quantity of fuel use by the households in a week, prices of fuel used by households, personal characteristics of the respondents including income and educational level. Multi-stage sampling technique was used in determining households used in study. First a stratified random sampling was used in selecting 8 rural areas and 4 urban centres in the study area. In the second stage, 50 households were selected from each rural area using simple random sampling procedure. To select the households used for the study every 10th house was selected from a determined starting point in the selected rural and urban areas. The sample size for the study was 400 households.

Data Analysis involved multiple regression model which was constructed to express household consumption of domestic fuel as:

$$Q = f(x_1, x_2, x_3, x_4, \dots, e)$$

Where

Q = Average monthly quantity consumed by the household (kg),

x_1 = Average price of fuel wood (x_1)

x_2 = Average price of kerosene (x_3)

x_3 = Average price of cooking gas (x_4)

x_4 = Household monthly income (x_5)

x_5 = Educational level of Head of Household (x_6)

x_6 = Perceived cost of alternative fuel (x_7)

x_7 = Cost of associated appliances (x_8)

x_8 = Is the dummy variable representing the effect of scarcity of kerosene on the demand for fuel-wood with scarcity period = 1, Otherwise = 0; e is the error term.

The specific form of the model is

$$Q = Ax_1^{b1}, X_2^{b2}, X_3^{b3}, X_4^{b4}, X_5^{b5}, X_6^{b6}, X_7^{b7}, X_8^{b8}.e$$

The b_1 s are the parameters to be estimated.

RESULTS AND DISCUSSION

The study revealed that 87.7% of the sample population used other fuels as alternative fuel during kerosene scarcity. A break down of the domestic fuels used by households shows that 60.5% use fuel-wood while 22.6% and 3.00% use cooking gas and electricity respectively (Table 1). This result shows fuel-wood as the popular alternative domestic fuel during kerosene scarcity. This implies that the demand for fuel-wood increases as kerosene becomes scarce. The implication of this finding is that more pressure would be put on the forest in order to extract fire-wood. This would result to deforestation in the study area.

Table 1: Alternative domestic fuel usage during kerosene scarcity

S/n	Type of fuel	Alternative energy	%
1	Fuel-wood	242	60.5
2	Kerosene	55	13.8
3	Cooking Gas	91	22.7
4	Electricity	12	3.0
Total		400	100

Table 2, reveals the factors responsible for the use of fuel-wood as alternative domestic fuel. The table highlight that 48.5% of the population use fuel-wood because of its affordability. The availability of fuel-wood has attracted 28.3% of the sample population.

Table 2: Factors affecting fuel wood consumption

S/N	Factors	Households	
		No.	%
1	Availability	113	28.3
2	Cost	138	34.5
3	Combustibility	40	10.0
4	Palatability of meals	34	8.5
5	Safety	29	7.2
6	Low cost	36	9.0
7	Traditional	10	2.5
TOTAL		400	100

Other reasons for the popular use of fuel-wood are safety of use i.e low risk factor (7.2%). Burns faster i.e. (high Carotie content) (10.0%), cooks better meals (8.5%) and low cost of its appliances (9%). The implication of this finding is that for other domestic fuels to attract high patronage, they have to be readily available, affordable and safe.

Table 3 highlights the result of the estimated model. The R^2 value of 0.831 indicates that about 83% of the variation in the consumption of domestic fuel is accounted for by the explanatory variables. This shows that the variables used for the study are properly selected.

The individual variables show that the average price of kerosene (x_1) is positively related to the demand for fuel-wood. The implication is that an increase in the price of kerosene would result to increase consumption of fuel-wood in the study area. The coefficient of the price of kerosene (x_2) although negative is significant at 1% level. This indicates that as the price of kerosene increases during scarcity, the quantity consumed by households is reduced. In other words, households are likely to substitute other types of domestic fuel for kerosene as kerosene becomes unaffordable.

Table 3: Results of the estimated domestic fuel consumption function

Variables	Parameter	t-values	Sig.F
Average price of fuel wood (x_1)	-0.350	3.514	0.001
Average price of fuel kerosene Per litres (x_2)	-0.465	3.350	0.000
Price of electricity (x_3)	-0.004	-0.035	0.972
Price of cooking gas per kg (x_4)	0.220	3.255	0.004
Average household monthly income (x_5)	0.215	3.276	0.003
Household size (x_6)	0.035	-0.026	0.354
Household head education (x_7)	0.615	2.615	0.002
Perceived cost of other fuels (x_8)	0.138	3.610	0.001
Scarcity of kerosene (x_9)		-1.218	-.313
K = 2.2145; R ² = 0.831; F = 301.077; N = 400			

The household income (x_5) has a positive relationship at 1% level of significance. This implies that household consumption of kerosene falls with decreasing income during kerosene scarcity and increases with increase in income. This is because high income households would find it more convenient to use kerosene than fuel-wood that is considered as inferior domestic fuel. Equally, educational level of household-head (x_7) has a negative insignificant effect on fuel-wood consumption. The implication of this finding is that as the level of education increases, the consumption of fuel-wood decreases. The perceived cost of other forms of fuel (x_8) relative to kerosene is positive and significant at 5% level. The coefficient of the cost variable is 0.138. This implies that the consumption of other forms of domestic fuel increase as the cost of kerosene increases.

CONCLUSION

Kerosene has been identified as the preferred domestic fuel in the study area. However, incessant kerosene scarcity with its accompanying high price leads to low demand for kerosene and high demand for fuel-wood as domestic fuel in the study area. The policy implication of this finding is that availability and affordability of kerosene may serve as incentive for poor households to use kerosene as a preferred domestic fuel. The high income use kerosene as preferred domestic fuel because they can afford it. However, the poor use fuel-wood as

alternative domestic fuel because of its availability and affordability. The study established that the incessant scarcity of kerosene and its associated high cost have caused most households to switch to fuel-wood as alternative domestic fuel. This implied that a more environmental friendly domestic energy option which is cheap and accessible would be preferred by domestic energy consumers if made available. The increase in demand for fuel-wood has serious repercussions on the environment.

The impact indicators are widespread deforestation, soil erosion, land degradation and destruction of wildlife. Rapid fuel-wood extraction has led to accelerated deforestation. Deforestation is identified as one of the factors of climate change. The latter is a global concern. Other consequences of fuel wood consumption are the production of soot/black carbon that blacken walls and deface buildings. Smoke from fuel-wood could pose some health hazards to the users. It could expose people to cough, heart diseases and eye problems.

This paper recommends that a substantial decrease in price of kerosene and its steady supply as a policy option may serve as an incentive for poor households to switch over to the use of kerosene and reduce pressure on the forest; a policy that encourages local production of other energy accessories at affordable prices would promote the utilization of other domestic options; a forest policy that restricts the production/supply of fuel wood would make

many households to switch to other energy options; and efforts should be directed towards harnessing, generating and distribution of solar energy in Nigeria.

REFERENCES

- Dewers, P. A. (1989). The Wood Fuel Arises Reconsidered: Observations on the Dynamics of Abundance and Scarcity. *World Development*, 17(8):1159-1172.
- Dewers, P. A. (2006) Wood Energy Consumption Patterns <http://www.fao.org/docsp/w7744e/w7744.htm> 05/09/2006 p1-9.
- Earthscan (1986) Wood Fuel and Rural Household Earthscan Information Technical Report No.5 International Institute of Environmental Development p86.
- Edu, N. E. (1983) Rural Energy Resources and Utilization. Paper presented at the 26th Annual Conference of Nigerian Geographical Association, Ilorin.
- Erabor, E. E. (1976) Wood Consumption Requirements in Nigeria a Reassessment *Nigerian Journal of Economics and Social Studies*, 18: 121-141.
- Food and Agricultural Organisation (1997b). United Nations Yearbook of Forestry Products. 1964-75, Rome, FAO.
- Grut, M. (1972) The Market for Firewood, Poles, and Sawwood in the Major Towns and Cities of the Savanna Region. F.OA: SF/NIR 16, Technical Report 6, FAO, Rome p52.
- Ibiang, E. I. (2005). Fuelwood Extraction and Consumption in Cross River State Central. Unpublished Mini Research Project submitted to the Department of Geography, University of Uyo.
- Igbozurike, U. M. (1981). Rural Fuel Wood Utilization in parts of Eastern Nigerian. Paper presented at the 24th Annual Conference of the Nigeria Geographical Association, Kano, 6-10 April 1981.
- Inyang, I. (1987) A Comparative Analysis of Urban and Rural Domestic Fuel Consumption in the Cross River State of Nigeria. *African Environmental Studies and Regional Planning Bulletin*, 4(5): 1-12.
- Inyang, I. (1989). Household Energy Options in Urban Nigeria. *Third World Planning Review*, 2(4): 429-444.
- Morgan, W. B. and Moss, R. P. (1981) Fuelwood and Rural Energy Production and supply in the Humid Tropics. Tycrooly International Publishing Ltd. Dublin p224.
- Offiong, R. A., Amuyou, U. A. & Eno, S. G. (2008) Consequences of Indiscriminate Fuel-Wood Extraction in Ekorì, Central Cross River State, Nigeria. The International Researcher. *A Multi-Disciplinary Journal of the Graduate School, University of Calabar*. 2(1): 1740-179.
- Ojo. G. I. A. (1980) Fuel Consumption Patterns in Rural Community of South Western Nigeria in Morgan, W. B. (eds). *Rural Energy Systems in the Humid Tropics*. Workshop Proceeding, Tokyo U. N. University.
- Rahji, M. A. Y. (2005) Household Demand for Charcoal and Fuel Substitution Possibilities in Some Areas of Ibadan, Nigeria. *Journal of Forestry Research and Management*, 9: 23-33.
- Thulin, S. (1966) Report on Wood Requirements in Relation to Plantation Establishments in Savanna Region of Nigeria. FAO, Rome. p48.



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