African Journal of Agricultural Research Vol. 7(39), pp. 5405-5411, 9 October, 2012
Available online at http://www.academicjournals.org/AJAR
DOI: 10.5897/AJAR12.731
ISSN 1991-637X ©2012 Academic Journals

Full Length Research Paper

Assessment of rural households 'cooking energy choice during kerosene subsidy in Nigeria: A case study of Oluyole Local Government Area of Oyo State

A. S. Oyekale[1]*, A. M. Dare[2] and O. O. Olugbire[2]

[1]Department of Agricultural Economics and Extension, North-West University Mafikeng Campus, Mmabatho, 2735 South Africa.
[2]Department of Agricultural Economics, University of Ibadan, Ibadan, Oyo State, Nigeria.

Accepted 26 September, 2012

The choice of domestic cooking energy in rural Nigeria is an issue for addressing deforestation and health hazards resulting from indoor air pollution. The study compared the demand for different cooking energy sources before and after implementation of kerosene subsidy and determined the correlates of choosing fuel wood/charcoal. The data were collected with structured questionnaires administered to 120 respondents that were selected randomly. Data were analyzed with descriptive statistics and Seemingly Unrelated Bivariate Probit (SUBP) regression. The results revealed that the proportion of households that depended on kerosene increased from 49.2% before the subsidy to 60.83% after the subsidy. Also 16.67 and 14.17% of the respondents collected firewood before and after the subsidy, respectively. Furthermore 6.67% of the respondents indicated that kerosene was scarce after the subsidy, as against 41.67% that indicated same before subsidy. The SUBP regression results revealed that using fuel wood/charcoal as cooking fuel before subsidy significantly reduced the probability of choosing fuel wood/charcoal after subsidy ($p<0.05$). As the price of kerosene increased, the probability of using fuel wood/charcoal significantly decreased ($p<0.01$). It was concluded that subsidy on kerosene portends a very high likelihood of leading to reduction in deforestation and indoor air pollution due to less usage of fuel wood/charcoal.

Key words: Fuel wood, charcoal, kerosene subsidy, seemingly unrelated bivariate probit (SUBP).

INTRODUCTION

It will be an understatement to assert that energy problem in Nigeria had over the past few decades grown from bad to worse. The crises, like cancerous cells had rapidly spread in magnitude of unimaginable dimension to all sectors of the economy. No doubt, an important premise for desiring regular supply of clean energy is its direct linkage with households' welfare. This had been widely brought to fore by multiple indicators of welfare, being synchronized into the framework for understanding the multidimensional nature of poverty. Moreover, desirability of clean energy is justified because it minimizes the release of air pollutants, which also constitute some externalities to households with adverse welfare consequences (Emmanuel and Samuel, 2012; Adenikinju, 2005).

Fuel wood and charcoal are among the solid agricultural products classified as biofuel. They are arguably part of the most important products from the local forests, especially for the majority of the rural poor in Nigeria. Similarly, forest resources are diverse and can be put to many uses. People have, therefore, depended on forests and trees for their economic livelihood and improvement in quality of life. Forests, as an economic resource provides food, fuel, fibre, timber and various non–wood products (World Bank, 1991; Sharma, 1992). No doubt, increasing prices of petroleum products impact some

*Corresponding author. E-mail: asoyekale@gmail.com.

pressure on the forest stock through deforestation. In some countries, particularly in Sub–Sahara Africa, fuel-wood and charcoal supply 70% or more of the national energy demand. Particularly in poorer developing countries, which are highly dependent on woodfuels, the unsustainable harvesting and use of wood can have negative environmental impacts (FAO, 2007). In Nigeria, it has been observed that costs of exploration, transportation and conversion of energy resources into various end uses have increased tremendously in recent times. This had led to significant increase in energy costs for various uses especially cooking by household. Therefore, it has now become imperative to carry out this study which is aimed at estimating the consumption pattern or level of rural households' use of biofuel under subsidized kerosene regime.

It should be noted that the main reason for energy demand in Nigeria is cooking. Moreover, government had attempted to staunch their legislative power to make kerosene easily accessible to the poor masses under the pretence of "supposed subsidies" on other petroleum products. Many rural and urban households therefore resort to using biofuel energy. The implication of this with regard to an increasing deforestation in Nigeria can be well conceptualized if one realizes that about two decades ago, 80.00% of the Nigerian population who were mostly rural dwellers depended solely on traditional fuel wood supplies for their domestic energy needs (Adegoke, 1993). The percentage of rural population that was using fuel wood and charcoal in 2008 was 90.00%, with national usage being 76.7% (Demographic and Health Survey, 2009).

Although the Nigerian government had for a long time insisted on deregulation of the "downstream sector of oil sector", labour and other civil protests have repeatedly resulted in reconsidering the issue. By July 2008, however, the government not only fixed the petroleum price at ₦65/L, but also promoted the availability of kerosene and reduced its official price to ₦50/L. This reduction lasted for one year and it represents about 50% of the average black market and retail price that the product was sold before. The government's position then was to subsidize the product for the people. However, subsidies on petroleum products are often pocketed by the marketers through illegal fuel exportation, fuel diversion and creation of artificial scarcity.

There is wide gap between access by urban and rural households to clean energy supplies. About 73% of Nigerian population lacks access to electricity although this may increase to about 90% for rural areas if properly disaggregated. Poor rural electricity supply attests to the window dressing nature of many rural electrification projects and lack of strong political will to offer permanent solution. It should be noted that energy needs for cooking represent the bulk of energy demand in Nigeria, although about 67% of the population uses dirty energy sources in form of fuel wood, charcoal, crop residues, animal dungs, plastics etc. This should raise a lot of environmental concerns because of its inefficiency and contributions to indoor air pollution. Similarly, households use kerosene for cooking although sometimes adulterated with petrol or diesel and this product is scarce and very expensive for poor households (Shaad and Wilson, 2009).

Some empirical studies on domestic energy demand had focused on sources of energy and factors responsible for choices made by the households. Some authors such as Onyekuru and Eboh (2011) and Shittu et al. (2004) have found positive relationship between income and improved energy demand in some studies on Nigeria. Shittu et al. (2004) also found household heads' age as an important factor that influenced demand for biomass fuel in Ogun state. Babanyara and Saleh (2010) found that for fuel wood, rural-urban migration, poverty and hikes in price of kerosene were critical factors influencing demand in urban Nigeria.

This study therefore intends to answer some pertinent questions. Does subsidy translate to kerosene availability? What is the pattern of domestic energy demand by rural households before and after kerosene subsidy? What factors explain the probability of rural households' preferences for fuel wood/charcoal before and after the subsidy? In the remaining parts of the paper, the materials and methods, results and discussions, and conclusion are presented in the stated order.

MATERIALS AND METHODS

The study was carried out in Oluyole Local Government Area of Oyo State. The population is predominantly rural. Data were collected by means of well-structured questionnaires supplemented with interview schedules. Multi-stage random sampling technique was used to select the respondents. The first stage was the random selection of three wards from a total of ten wards in the area. The second stage involved the selection of three villages from the selected wards. A total of 120 respondents were selected in proportion to the population of the villages based on preliminary results from 2006 Census.

Data were collected some months after the subsidy policy had been implemented and households had adjusted expenditure patterns. The data covered socio-economic characteristics, main source of energy for cooking, quantity of biofuel and kerosene consumed, costs of biofuel and kerosene and factors influencing the consumption of firewood, charcoal and kerosene.

Estimated model

The Seemingly Unrelated Bivariate Probit (SUBP) was used to determine the factors that influence the probability of rural households' usage of firewood/charcoal for cooking during and before the subsidy. It was noted that the choice of using fuel wood/charcoal after the subsidy can be influenced by its usage before the subsidy. Therefore, if this holds, our estimated parameters from Probit regression will not meet the conventional conditions for being Best Linear Unbiased Estimate (BLUE).

Therefore, estimation of the equations simultaneously is required as discussed by Maddala (1983). The structural form of the model can be stated as:

$$Q_{i1} = \alpha + \beta_i \sum_{i=1}^{n} X_i + v_i$$

$$Q_{i2} = \gamma + Q_{i1} + \delta_i \sum_{i=1}^{n} X_i + z_i$$

Q_{i1} and Q_{i2} are latent variables of using fuel wood/charcoal before and after subsidy respectively. These variables are dummy variables with values of 1 if using fuel wood/charcoal and 0 otherwise. Also, $\alpha, \beta, \gamma, \delta$ are the estimated parameters and X_i are the socio-economic variables of rural households. Included explanatory variables are log of age of respondents (in years), log of income of respondents (measured in naira), log of price of energy used (measured in naira), dummy estimated marital status (married =1, 0 otherwise), primary education (yes = 1, 0 otherwise), secondary education (yes = 1, 0 otherwise), tertiary education (yes = 1, 0 otherwise), number of dependants, studentship (yes = 1, 0 otherwise), civil service job (yes =1, 0 otherwise), trading (yes =1, 0 otherwise), source of wood (own farm = 1, 0 otherwise) and decision on choice of energy (spouse =1, 0 otherwise). The error terms of the model are dependent and distributed as a bivariate normal such that: $E(v_i) = E(z_i) = 0$, $var(v_i) = var(z_i) = 1$ and $\rho = cov(v_i, z_i)$. The Wald test, which is reflected by statistical significance of ρ was used to determine whether the models would be best estimated jointly in a recursive manner of not.

RESULTS AND DISCUSSION

Socio-economic characteristics of respondents

Table 1 shows some socio-economic characteristics of the respondents. It shows that average age was 33.45 years with standard deviation of 13.34. The minimum age was 16 years, while the maximum was 80 years. The frequency distribution of the ages shows that 40.8% of the respondents were in the age range of 21 to 30 years. Also, 90.8% of the respondents were females, 78.3% were married, 16.7% were single and 5% were widows. The results further show that 83.4% had formal education, while 16.7% had informal education. Also, 8.3% of the respondents consumed the energy on their own, that is, without dependants, 87.2% had between 1 and 10 dependants and 5.0% had between 11 and 15 dependants. The mode of the number of dependant variable is 3 persons, while the mean is 3.97 persons. This implies that the highest proportion of the households had less than 10 dependants. The number of persons in the household is expected to influence the amount that would be spent on energy products and food. Therefore, if a household's need of energy is much, alternative sources that are cheaper might be sourced.

The table also shows the occupation of each of the respondents. The trading sector contributed the largest percentage of 46.7%. Others were artisans (28.3%), civil servants (5.6%), students (5%), farming sector (5%), Youth Corpers (2.5%), and those that had no jobs (5.8%). In the table, the average monthly income of the rural households was ₦18, 461.54, with standard deviation of ₦18, 146.93. The distribution also shows that only 47.5% of the respondents had a monthly income of up to ₦10, 000. This denotes a very low level of income and high inequality.

Sources of energy and demand before and after subsidies on kerosene

Table 2 shows the main sources of biofuel (firewood and charcoal) before and after subsidy. The number of respondents that used biofuel before subsidy was 50.83% whilst 39.17% used it after subsidy. This shows that the proportion of rural households using kerosene increased from 49.2% before the subsidy to 60.83% after the subsidy. Also, 16.67 and 14.17% of the respondents collected firewood from the farm before and after subsidy, respectively. At the same time, 8.33 and 7.50% purchased firewood before and after subsidy, respectively. These results show that a reduced price of kerosene results in more households stopped using biofuel as the main source of household fuel. This change in resource allocation is expected to have some positive implications for the conservation of forests and allows the alternative use of time that is required for gathering fuel wood for other economically productive activities. Similar results were obtained for charcoal where 22.50% respectively 15.00% purchased it before and after subsidy. This result also implies less dependence on the forest for domestic energy.

Table 3 shows the monthly average amount spent on energy products. The average amount of money spent on firewood decreased from ₦1425.29 before subsidy to ₦1337.85 after the subsidy. The average amount spent on charcoal significantly decreased ($p<0.05$) from ₦2092.43 before the subsidy to ₦1253.10 after the subsidy. The average quantities of kerosene that were consumed before and after subsidy were 3.53 and 3.79 L, respectively. These results have no of statistical significance ($p>0.10$). However, the average amounts being spent on kerosene significantly decreased ($p<0.05$) from ₦2607.51 before the subsidy to ₦1329.47 after the subsidy. Also, the total amount spent on all three categories of energy products significantly decreased ($p<0.01$) from ₦2173.33 before subsidy to ₦1317.92 after the subsidy.

Table 4 shows the major reasons for rural households' choice concerning cooking fuel. Before the subsidy, 18.33% indicated that kerosene was available, while this increased to 20.83% after subsidy. Concerning firewood 12.50% indicated the use of it before subsidy which was reduced to 9.17% after subsidy. The same proportion of the respondents (6.67%) indicated that firewood was cheaper before and after the subsidy. However, the proportion of rural households that indicated that kerosene was affordable increased from 1.67% before

Table 1. Some socio-economic characteristics of respondents.

Age group (Years)	Number of respondents	Percentage
Up to 20	16	13.3
21-30	49	40.8
31-40	28	23.3
41-50	16	13.3
Above 50	11	9.2
Mean age = 33.45 and standard deviation = 13.34		
Sex		
Male	11	9.2
Female	109	90.8
Marital status		
Married	94	78.3
Single	20	16.7
Widow	6	5.0
Educational level		
Informal	20	16.7
Primary	39	32.5
Secondary	50	41.7
Tertiary	11	9.2
Number of dependants		
0	10	8.3
1-5	80	66.7
6-10	24	20.0
11-15	6	5.0
Total	120	100.0
Distribution of respondents by occupation		
Trading	56	46.7
Artisans	34	28.3
Civil servants	7	5.8
Students	6	5
Farming	6	5
Corper	3	2.5
None	7	5.8
Average income per month (N)		
Up to 10,000	50	47.5
10,001-20,000	30	25.0
20,001-30,000	13	10.8
30,001-40,000	3	2.5
40,001-50,000	11	9.2
Above 50,000	6	5.0

Source: Field survey (2009).

subsidy to 4.17% after subsidy. Furthermore, 17.50% noted that kerosene was time saving before subsidy and this increased to 20.83% after subsidy.

Table 5 reveals that only 6.67% of the respondents indicated that kerosene was scarce after the subsidy as against 41.67% before subsidy. This implies that

Table 2. Main source of biofuel before subsidy.

Categories	Before subsidy				After subsidy			
	Firewood		Charcoal		Firewood		Charcoal	
	Freq	%	Freq	%	Freq.	%	Freq	%
Farm	20	16.67	3	2.50	17	14.17	3	2.50
Purchase	10	8.33	27	22.50	9	7.50	18	15.00
Others (gift)	1	0.83	0	0.00	0	0.00	0	0.00
Total	31	25.83	30	25.00	26	21.67	21	17.5

Source: Field survey (2009).

Table 3. Quantities and amounts spent on main energy source before and after subsidy.

Energy groups	Qty before subsidy			Qty after subsidy			T-stat	Amount before subsidy		Amount after subsidy		T-stat
	Freq	Mean	Std.Dev.	Freq	Mean	Std.Dev.		Mean	Std. Dev.	Mean	Std.Dev.	
Firewood	31	14.14	14.03	26	13.24	14.58	0.235	1425.29	1398.49	1337.85	1453.17	0.230
Charcoal	30	4.37	3.31	21	5.36	3.99	-0.938	2092.43	1316.61	1253.10	635.15	3.024**
Kerosene	59	3.53	1.64	73	3.79	2.07	0.813	2607.51	1292.87	1329.47	853.30	6.530**
Total	120	6.48	8.62	120	6.12	8.03		2173.33	1403.94	1317.92	976.16	8.758***

** -Statistically significant at 5%; *** - statistically significant at 1%. Source: Field survey (2009).

Table 4. Major reasons for rural households' choice of the sources of cooking fuel.

Period	Energy groups	Availability	Cheapness	Interest	Time saving	Total
Before subsidy	Firewood	12.50	6.67	0.83	5.83	25.83
	Charcoal	7.50	3.33	5.83	8.33	25.00
	Kerosene	18.33	1.67	11.67	17.50	49.17
	Total	38.33	11.67	18.33	31.67	100.00
After subsidy	Firewood	9.17	6.67	0.83	5.00	21.67
	Charcoal	7.50	1.67	2.50	5.83	17.50
	Kerosene	20.83	4.17	15.00	20.83	60.83
	Total	37.50	12.50	18.33	31.67	100.00

Source: Field survey (2009).

Table 5. Rural households' experience of scarcity across different energy sources.

Period	Energy groups	Yes	No	Total
Before subsidy	Firewood	11.67	14.17	25.83
	Charcoal	19.17	5.83	25.00
	Kerosene	41.67	7.50	49.17
	Total	72.50	27.50	100.00
After subsidy	Firewood	9.17	12.50	21.67
	Charcoal	8.33	9.17	17.50
	Kerosene	6.67	54.17	60.83
	Total	24.17	75.83	100.00

Source: Field survey (2009).

Table 6. Determinants of fuel wood/charcoal utilization before and after the subsidy.

Variables	Before subsidy			After subsidy		
	Parameter	Std error	t -value	Parameter	Std error	t -value
Before subsidy				-0.57**	0.26	-2.15
Log of age	0.02	1.56	0.01	-1.45	1.26	-1.15
Log of income	1.16***	0.44	2.60	1.06***	0.43	2.43
Log price after subsidy	-3.50***	1.26	-2.77	-3.12***	0.96	-3.23
Married	1.34**	0.64	2.08	-0.33	0.47	-0.69
Pry school	-1.20*	0.64	-1.87	-0.50	0.60	-0.83
Sec school	-1.01	0.71	-1.42	-0.93	0.62	-1.49
Tertiary school	-1.64**	0.69	-2.37	-1.46**	0.72	-2.01
Log dependants	-0.36	0.56	-0.64	0.51	0.51	1.00
Students	2.55***	0.87	2.93	-0.18	0.74	-0.25
Civil service	0.62	0.57	1.07	0.59	0.64	0.93
Trading	-0.34	0.44	-0.78	0.13	0.37	0.36
Decision about fuel	0.62	0.39	1.59	0.34	0.32	1.06
Constant	3.17	4.24	0.75	5.67*	3.22	1.76
				13.49	770.77	

Likelihood-ratio test of rho=0: chi2 (1) = 5.8495 Prob > chi2 = 0.0156; *Significant at 10%, ** significant at 5%, *** significant at 1% Source: Field survey (2009).

kerosene was sufficiently available to the rural households during the subsidy. Furthermore, 11.67 and 9.17% of the respondents experienced scarcity of fire-wood and charcoal, respectively before subsidy. These percentages declined to 9.17 and 8.33% for firewood and charcoal, respectively after the subsidy. This shows that with kerosene subsidy and its availability the demand for firewood and charcoal must have declined, making them to be readily available.

Factors explaining households' choice of fuel wood/charcoal before and after subsidy

Table 6 shows the results of the SUBP regression. The model was estimated jointly due to the understanding that choice of fuel wood/charcoal before subsidy might influence the choice of it after subsidy. It was econometrically correct to do so because the likelihood ratio test statistics of rho was statistically significant ($p<0.05$). This implies that if estimated independently and nor-recursively, the parameters will not be efficient. The joint structural equation for choice of fuel wood/charcoal before and after the subsidy have the log likelihood chi square values of -79.651, which gives a Wald Chi square statistics (53.24) that is statistically significant ($p<0.01$). This implies that the models produced a good fit of the data.

The results further show that the endogenous variable that was introduced into the after subsidy model was statistically significant ($p<0.05$) and with negative sign. This implies that those rural households that were using fuel wood/charcoal for cooking before subsidy on kerosene was introduced had significantly lower probability of using fuel wood/charcoal to cook during the subsidy. This finding is contrary to what Pitt (1983) concluded about the demand for firewood with respect to the price of kerosene in Java, Indonesia. It implies that if kerosene is available at cheaper price, some rural households that were using fuel wood and charcoal as cooking fuel would divert to this more efficient and cleaner energy source.

The income parameters for the before subsidy and after subsidy analyses are statistically significant ($p<0.05$). This implies that if the log of income increases, the probability of using fuel wood/charcoal will significantly increase. United Nations Development Programme/World Bank (Undated) noted that income rise alone would not lead to reduction in using fuel wood/charcoal as cooking fuel. The implication is that given the nature and volume of food that is cooked by rural households, even if income increases, it fuel wood/charcoal would still be demanded. For instance, a household that comprises of many people and for which large volume of food would have to be cooked at once may not be able to cope with kerosene even if the price is reduced and it is readily available.

The parameter of log of price kerosene after subsidy is statistically significant ($p<0.01$) and with negative sign in the models for before and after subsidy. This implies that if the price of kerosene after subsidy increases, the probability of using fuel wood/charcoal will also decline. This is as a result of drastic reduction of 100% that was effected on kerosene. It implies that households' surpluses were so high and they would still use less of fuel wood/charcoal if price of kerosene increases. United

Nations Development Programme/World Bank (Undated) concluded that price reduction for kerosene may not in all cases be pro-poor. However, it was found that with reduction in product price, poor households were able to switch from using fuel wood/charcoal to using kerosene and gas, which are quite cleaner and more efficient.

The variable "married" is significant in the model estimated for before kerosene subsidy ($p<0.05$) and it is with positive sign. However, the model we estimated for after kerosene subsidy has the marital status parameter not being statistically significant ($p>0.10$) and with negative signed. This implies that those who were married have significantly higher probability of using fuel wood/charcoal before the subsidy. The main issue to be raised in respect of associations between being married and choice of fuel wood/charcoal is related to household size. A single household will need less cooking energy that can be easily supplied by kerosene stove. However, if the household head is married, tendencies are that the household size will be large thereby requiring the use of fuel wood/charcoal.

The variable "primary education" has a negative sign and statistically significant ($p<0.10$) in the model estimated for before kerosene subsidy. This implies that those household heads with primary education had lower probability of using fuel wood/charcoal. The parameters of "secondary education" variable have negative sign in the models estimated for before and after kerosene subsidy but statistically insignificant ($p>0.10$). They indicate that those with secondary education (have lower probability of) using fuel wood/charcoal. The parameters of tertiary education are also with negative sign and are statistically significant ($p<0.05$) in the two models. These results generally show that compared to those with no education, household heads with formal education has lower probability of using fuel wood/charcoal.

The parameter of "student" has a positive sign and it is statistically significant ($p<0.01$) in the model estimated for before subsidy. This implies that students have higher probability of using fuel wood/charcoal for cooking before the subsidy. This result can be explained from the fact that kerosene was not readily availability and costly before the subsidy.

Conclusion

The demand pattern for energy products in some rural households has been analyzed. The findings show that kerosene was not only available when subsidized, its price also dropped drastically. This resolved the doubt of diversion and black market hoarding which used to be the practices. Due to this, many rural households switched from using fuel wood/charcoal as major cooking fuel to kerosene. Therefore, Nigerian policy makers can utilize pro-poor spending to prevent excessive deforestation due to increasing pressure on fuel wood gathering for domestic and other uses. This is important because poverty is a major driver of environmental degradation. The Nigerian case as presented in this study reveals that when appropriately targeted at the primary beneficiaries, the government is able to use product subsidies to realize some environmental conservation objective, especially if there is a kind of substitution among those products. Ensuring reduction in the use of fuel wood/charcoal so as to reduce the rate of deforestation in the rural areas requires appropriate education targeted in particular at the women who have the primary responsibility of household keeping. Demand for kerosene in the rural areas will also increase if the subsidy is sustained and efforts are being made to prevent unintended beneficiaries from illegal fuel diversion and hoarding.

REFERENCES

Adegoke OS (1991). The Conventional Energy Resources of Nigeria. In: Adegbulugbe AO, Seriki OA (eds). World Energy Council Conference Proceedings, Culpar Limited, Lagos pp.29-35.

Adenikinju A (2005). Analysis of the Cost of Infrastructure Failures in A Developing Economy: The Case of the Electricity Sector in Nigeria. AERC Research Paper 148, African Economic Research Consortium, Nairobi.

Babanyara YY, Saleh UF (2010). Urbanisation and the Choice of Fuel Wood as a Source of Energy in Nigeria, J. Hum. Ecol. 31(1):19-26.

Demographic and Health Survey (DHS) (2009). Nigeria Report of Demographic and health Survey. National Bureau of Statisttics, Abuja, Nigeria.

Emmanuel SO, Samuel O (2012). Cost Analysis for Alternate Energy Source. Indian J. Sci. Technol. 5(1):1946-1952.

Maddala G (1983). Limited Dependent and Qualitative variables in Econometrics, Econometrics Society Monograph, No 3, Cambridge University Press, New York.

Onyekuru NA, Eboh EC (2011). Determinants of Cooking Energy Demand in the Rural Households of Enugu State, Nigeria: An Application of the Bivariate Probit Model. Asian J. Exp. Biol. Sci. 2(2):332-335.

Pitt MM (1983). Equity, Externalities and Energy subsidles: Tile case of kerosene in Indonesia. Discussion Paper No. 181, August, 1983. Internet file retrieved from http://www.econ.umn.edu/library/mnpapers/1983-181.pdf.

Shaad B, Wilson E (2009). Access to Sustainable Energy: What Role for International Oil and Gas Companies? Focus on Nigeria', IIED, London.

Shittu AM, Idowu AO, Otunaiya AO, Ismail AK (2004). Demand for Energy Among Households in Ijebu Division, Ogun State, Nigeria Agrekon 43(1):38-51.

United Nations Development Programme (UNDP)/World Bank (Undated). Access of the Poor to Clean Household Fuels in India. Joint United Nations Development Programme (UNDP)/ World Bank Energy Sector Management Assistance Programme (ESMAP) http://www.cleancookstoves.org/resources_files/access-of-the-poor-to-clean.pdf.

World Bank (1991). The forestry Sector: A World Bank policy paper, The World Bank, Washington D.C.

Sharma PN (1992). Managing the World's Forests: Looking for Balance Between Conservation and Development" Kendall/Hunt Publishing Company Iowa p.605.