



Analysis of Factors Influencing Fuelwood Consumption in Some Selected Local Government Areas of Taraba State, Nigeria

*Maurice, D. C., Umar, Y. and Zubairu, E.

Department of Agricultural Economics and Extension, Modibbo Adama University of Technology, Yola, Adamawa State, Nigeria

ABSTRACT

The study analyzed the factors influencing the consumption of fuelwood in selected Local Government Areas of Taraba State, Nigeria. Multi-stage random sampling technique was employed in selecting 150 respondents in three Local Government Areas of the State used for the study. Data collected were analyzed using percentages and multiple regression analyses. The results revealed that majority (71.33%) of the respondents were aged between 21-40 years with an average age of 34 years, an indication that they are in their most economically active age. Most of the respondents were married, educated and mostly males, and having an average household size of 7 persons. The results of the multiple regression analysis revealed that marital status and cost of alternative fuel (kerosene) positively influenced fuelwood consumption by households, while monthly income, labour and cost of fuelwood per kilogramme negatively influenced fuelwood consumption by households. The variables used in the model have explained 66% of the variation in fuelwood consumption in the area as indicated by the coefficient of determination. The study recommend further subsidy on kerosene by the government so as to make the product affordable; there should be a legislation that will ensure that the commodity is readily available to consumers and in the right quantity, among others.

Keywords: Fuelwood, Multiple regression, Consumption, Taraba State

INTRODUCTION

Forestry is a source of livelihood for many farmers and rural households in Nigeria. However, the utilization of fuelwood in Nigeria contributes greatly to desert encroachment, and consequently has implications with regards to climate change. The term ‘fuelwood’ comprises firewood, charcoal and other wood-derived fuels; and account for 70 percent of total energy use and 90 percent of household energy use in Africa, since they are the predominant fuel in urban as well as rural settings (World Resources, 2001).

In Nigeria, the population uses fuelwood either for cooking or heating purposes, and both household and non-household sectors in all the ecological zones of the country demand fuelwood. In the household sector, fuel wood is the domestic energy for cooking and to a lesser extent for space heating, especially during the cold season. The non- household sector consists of institutions (hospitals, prisons and schools), food industries (restaurants, bakeries) and craft industries (pottery, blacksmith, burnt bricks factories) and this sector consume a significant proportion of fuel wood (Adegbehin, 2001; Gundimela and Kohlin, 2003).

The rate at which trees are felled is by far more than the rate at which they are planted, and this is due largely to high demand for the commodity brought about by soaring prices of kerosene and gas used for

domestic energy. Many households remain subsistently dependent on fuelwood due to socio-economic (e.g. income and wealth), demographic (e.g. family size, household composition, lifestyle and culture) and location attributes (e.g. proximity to sources of modern and traditional fuels) in addition to fuelwood availability (Dovie *et al.*, 2004; Onoja, 2012).

In Nigeria, fuelwood 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 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.

The preference of fuelwood to other alternative energy sources is based on the concept of utility maximization. The household is expected to utilize fuelwood if the satisfaction it derives from utilizing the commodity rank highest among the available alternative energy sources. Although the use of fuelwood as domestic source of energy is regarded as an indication of poverty, fuelwood is still the most readily affordable source of domestic energy for the masses in the country and may remain so in the foreseeable future.

The demand for the use of fuelwood have been on the increase due to rural and urban poverty, low agricultural productivity, inequalities in land holding, rapid urbanization, sharp division in the socio-economic roles of men and women in some countries; rising costs of fossil fuel, kerosene, gas and electric cookers, coupled with low generation and high cost of electricity among others (Nash and Cecilia, 2006). Even though holistic understanding of the economic problems that perpetuate consumption of fuelwood is necessary in addressing efficient energy use and abatement of deforestation, this study will provide empirical findings of the drivers and dynamics of fuelwood consumption in the area. To this end, this study analyzed the factors influencing the consumption of fuelwood in selected Local Government Areas (LGAs) of Taraba State.

METHODOLOGY

Study area

Taraba State is located in the North-East geopolitical zone of Nigeria and is bounded in the west by Plateau and Benue States and in the east by the Republic of Cameroun. The State has an estimated land area of about 54,428 sq km, and lies between latitudes 6^o25¹ N and 9^o30¹ N and between longitudes 90^o30¹E and 11^o45¹E. With an estimated population of 2,294,800 (NPC, 2006), the State has sixteen LGAs, namely; Ardo-Kola, Donga, Gashaka, Gassol, Ibi, Jalingo, Karim-Lamido, Kurmi, Lau, Sardauna, Takum, Ussa, Wukari, Bali, Yorro and Zing.

The State lies largely within the savannah vegetation belt and has a vegetation of low forest in the southern part and grassland in the northern part. It also has undulating landscape dotted with a few mountainous features, such as the scenic and prominent Mambilla Plateau. The main source of fuel for cooking and heating purposes in both the rural and urban areas of the State is firewood and charcoal. Many people in the State derive their livelihood partly from fuel wood marketing.

The major occupation of the people of the State is Agriculture, and cash crops grown include coffee, tea, groundnut, cotton and cassava. Food crops grown include maize, rice, sorghum, millet and yam. In addition, cattle, sheep and goat are reared in large numbers, especially on Mambilla Plateau and along the Benue and Taraba valleys.

Sampling Technique and Sample Size

A multi-stage sampling technique was employed in the selection of respondents for the study. First stage sampling involved the purposive selection of one LGA in each of the three senatorial zones of the State based on convenience. These LGAs include; Wukari (southern senatorial zone), Jalingo (central senatorial zone) and Karim Lamido (northern senatorial zone). From each of the selected LGA, five villages were randomly selected giving a total of fifteen sampled villages. Finally, ten (10) household heads in each of the fifteen (15) selected villages were randomly selected, giving a total of one hundred and fifty (150) respondents. Data were collected in 2012.

Model Specification

The multiple regression analysis was used in determining the factors influencing fuelwood consumption in the study area. The explicit form of the model is presented as: $Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_9 X_9 + e_i$

Where;

Y_i = Expenditure on fuelwood (₦/month)

X_1 = Age (years)

X_2 = Marital status (Dummy, where 1=married and 0 = otherwise)

X_3 = Sex (male =1 and female = 2)

X_4 = Family size (measured by number of people in a household)

X_5 = Education level (measured by years of formal schooling)

X_6 = Monthly income (₦)

X_7 = Labour on fuelwood collection (mandays)

X_8 = Cost of fuelwood per Kg (₦)

X_9 = Cost of alternative fuel (kerosene) (₦/litre)

$\alpha_0, \beta_1 - \beta_8$ were parameters estimated

e_i = Error term

RESULTS AND DISCUSSION

Socio-economic characteristics

Socio-economic characteristics is an economic and sociological combination of total measure of a person's economic and social position relative to others, based on experience, sex, age, marital status, household size, education, among others. These characteristics as they relate to the respondents are presented in Table 1. The age distribution of the household heads shows that respondents within the age bracket of 21-40 years constituted majority (71.33%), while those above 50 years constituted only 16%. The mean ages of respondents was 34 years, an indication that they were young and within the economically active age. On their marital status, majority (65.33%) were married connoting a higher level of social responsibility on them. On their gender, majority (62.67%) were male while female constituted only 37.33%, an indication of the predominance of male-headed households. The distribution of their family size revealed that 37.33% had family size of 1-5 persons, 46% had family size of 6-10 persons, while 16.67% had family size of more than 10 persons. The average household size was estimated at 9, an indication of a relatively large household size. On their educational level, majority (84%) had some form of formal education, with 48% attained tertiary education. Only 16% of the respondents had no formal education.

Table 1: Socio-economic characteristics of the respondents (n = 150)

Variables	Frequency	Percentage (%)
Age (years)		
21-30	39	26.00
31-40	68	45.33
41-50	19	12.67
51-60	15	10.00
> 60	09	06.00
Mean	34.17 years	
Marital status		
Single	32	21.33
Married	98	65.33
Widow	20	13.33
Sex		
Male	94	62.67
Female	56	37.33
Family size		
1-5	56	37.33
6-10	69	46.00
11-15	22	14.67
16 and above	3	02.00
Mean	9.02	
Education level		
No formal education	24	16.00
Primary school	17	11.33
Secondary school	37	24.67
Tertiary level	72	48.00

Source: Field survey, 2012

Multiple regression analysis

The result of the multiple regression analysis is presented in Table 2. The double-logarithm gave the best fit and hence, was selected as the lead equation based on the number of significant variables, plausible magnitude of the regression coefficients, magnitude of the coefficient of determination (r^2) and correctness of signs of the coefficients. Other functional forms tried were the linear, exponential and semi-logarithm functions.

The result shows that five of the nine explanatory variables used in the model significantly affected the consumption of fuelwood by households. These variables are; marital status (X_2) and cost of alternative fuel (X_8), these variables positively influence the consumption of fuelwood by households. On the other hand, monthly income (X_6), labour on fuelwood collection (X_7) and cost of fuelwood per Kg (X_8) had negative influence on fuelwood consumption.

The positive coefficient of marital status and its statistical significance at 10% implies that the more the number of married people in a population the higher the consumption of fuelwood and vice versa. Number of people in households tends to be higher among the married than the unmarried, hence increase cost of living. The implication is that the use of fuelwood is a cost-saving mechanism to cope with prevailing economic realities so that the limited funds can be used to meet other basic family needs.

The coefficient of cost of alternative fuel (i.e cost of kerosene per litre) is positive and statistically significant at 5% level implying that as the cost per litre of kerosene increases the consumption of fuelwood

increases. For every 1% increase in cost of alternative fuel, fuelwood consumption increases by 0.08%. This is expected because households tend to consume more of fuelwood than kerosene because it is relatively cheaper and also readily accessible especially for people in rural areas.

Monthly income was found to inversely affect the consumption of fuelwood in the area at a probability level of 0.05. This implies that as the monthly income of household heads increases fuelwood consumption decreases. For every 1% increase in income of household heads, fuelwood consumption decreases by 0.13%. Increase in income increases the purchasing power of people; hence, households may increase the consumption of other alternative sources of domestic fuel such as kerosene and gas, thereby reducing the consumption of fuelwood. This agrees with the study by Jonathan and Victor (2013) who reported that the higher the income of the head of household, the greater the flexibility of shift to the desired household fuel.

The coefficient of man-days of labour used in fuelwood collection is negative and statistically significant at 10%. This implies that the higher the man-days of labour used in fuelwood collection the less the consumption of fuelwood. For every 1% increase in man-days of labour used in fuelwood collection, fuelwood consumption decreases by 0.16%. This situation is true especially when the fuelwood is not readily and easily accessible. This however, depends on the disposable income of households.

Cost of fuelwood was found to inversely affect its consumption at a probability level of 0.05. This implies that the higher the cost of fuelwood the less its consumption. For every 1% increase in cost of fuelwood per kilogram, its consumption decreases by 0.12%. This is in line with economic theory where price is inversely related to quantity demanded of a commodity. Samuelson and Nordhaus (2005) stated that costs of commodities are primarily determined by the prices of inputs such as time, labour, capital and technological advances. This corroborates the findings of Onoja (2012) who found an inverse relationship between the price of fuelwood and the quantity demanded.

Table 2: Multiple regression estimates of socio-economic factors influencing fuelwood Consumption in Taraba State.

Variables	Parameter	Coefficients	t- ratio
Constant	α_0	-0.4052	-0.7825
Age (X_1)	β_1	-0.0198	-1.5107
Marital status (X_2)	β_2	0.1215	1.9652*
Sex (X_3)	β_3	-0.0345	-0.1697
Family size (X_4)	β_4	0.1092	1.7620
Education level (X_5)	β_5	0.0262	1.4303
Monthly income (X_6)	β_6	-0.1327	-2.1475**
Labour on fuelwood collection (X_7)	β_7	-0.1568	-1.9822*
Cost of fuelwood per Kg(X_8)	β_8	-0.1226	-3.1147***
Cost of alternative fuel (kerosene) (X_9)	β_9	0.0804	2.3604**
R^2		0.6623	
Adjusted R^2		0.6410	
F- statistics		18.6536***	

Source: Field survey, 2012. * Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level

CONCLUSION AND RECOMMENDATIONS

This study has identified the main socio-economic factors affecting fuelwood consumption in selected LGAs of Taraba State, Nigeria. It revealed that marital status and cost of alternative fuel positively influenced the consumption of fuelwood by households; while monthly income, labour on fuelwood collection and cost of fuelwood negatively affected the consumption of fuelwood. These factors accounted a higher variation in fuelwood consumption in the area.

The cost of kerosene should be further subsidized by the government to make the product affordable. Also, there should be legislation to ensure that the commodity is readily available to consumers. Government and non-governmental organizations should periodically review the wages paid to workers with a view to raising their purchasing power and to also cushion the effect of inflation which may be running in the economy.

REFERENCES

- Adegbihin, J.O. (2001). Bridging the gap between fuel wood using fast-growing. *NAQAS Newsletter*, 1(4):8-12.
- Dovie, D. B. K; Witkowski, E. T. F. and Shackleton, C. M. (2004). The fuelwood crisis in Southern Africa: relating fuelwood use to livelihoods in a rural village, *Geo- Journal*. 60: 123-139.
- Gundimela, H and Kohlin, G. (2003). Fuel Demand Elasticities for Energy and Development Studies: Indian sample survey evidence. Environmental Economic Unit, Goteborg University, Sweden. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=553761
- Jonathan, O. A. and Victor, A. (2013). Assessment of Socio-economic Factors affecting Household Charcoal use in Makurdi Urban Area of Benue State, Nigeria. *Journal of Environmental Research and Management*, 3(7):180-188
- Nash, R. and Cecilia, L. (2006). *Forest Policy and Environment Programme: The Firewood Debate*. Mainasara Publishers, Maiduguri, Nigeria. www.odipeg.org.uk/publications/grey_literature. Pp1-5.
- NPC (2006). National Population Census, Federal Republic of Nigeria Official Gazette, Vol.94, Lagos. 244pp.
- Onoja, A. O. (2012). Econometric Analysis of Factors Influencing Fuelwood Demand in Rural and Peri-Urban Farm Households in Kogi State, Nigeria. *The Journal of Sustainable Development*, 8(1):115 – 127.
- Samuelson, P. A. and Nordhaus, W. A. (2005). *Economics*. Tata-McGraw-Hill: New Delhi. 17th Edition. Pp52-57
- World Resources (2001). *People and Ecosystem: The Fraying Web of Life*. WRI. Washington, D. C. Science Magazine, 292 (5519): 1071-1072.