



ANALYSES OF SOCIO-ECONOMIC FACTORS INFLUENCING THE CONSUMPTION OF FUELWOOD IN SOUTHERN KADUNA, NIGERIA.

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Abstract

This study was carried out to examine the socio-economic factors influencing the consumption of fuelwood in Southern Kaduna, Nigeria. Multi-stage random sampling technique was employed in selecting 150 respondents in three Local Government Areas of the Southern part of Kaduna State, Nigeria. The data collected were analyzed using descriptive statistics and multiple regression analyses. The results revealed that the majority (71.33%) of the respondents were aged between 21-40 years with an average age of 32 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 seven 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 bundle negatively influenced fuelwood consumption by households in the study area. 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 recommends 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, Southern Kaduna, Nigeria*

Introduction

Non-Timber Forest Products (NTFPs) are source of livelihood for many rural households in Nigeria. Fuelwood, which is one of the NTFPs, comprises of firewood, charcoal and other wood-derived fuels; and account for 75 % of total energy use and 87 % of household energy use in Africa, since they are the predominant fuel in urban as well as rural settings (Gupaet *et al.*, 2019).

In Nigeria, majority of the population are using fuelwood for either 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, fuelwood is the domestic energy for cooking and to a lesser extent for space heating, especially during the harmattan season. The non-household sector consists of institutions and food industries and this sector consumes a significant proportion of fuelwood (Zira, 2019; Adam, 2011; Godwin and Kola, 2003). The rate at which trees are felled is more than the rate at which they are planted today. This is due largely to the high demand for the commodity as a result of the soaring prices of kerosene and gas used for domestic energy. Many households also 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, 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 near future. The demand for the use of fuelwood have been on the increase due to rural and urban poverty 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 Southern Kaduna, Nigeria.

Methodology

Study Area

This study was carried out in the southern part of Kaduna State. It covers a land area of about 37,872km² which lies between latitude 9°N and 10°15'N of the equator and between longitude 7°00' and 9°00'E of the Greenwich meridian. The study area shares boundaries with Nasarawa State, Niger State, Plateau State and Abuja (Kaduna State Statistics Book, 1996). The climate is characteristic of Southern Guinea savannah. It has two seasons; rain and dry seasons. The rain season is between May to October and dry season is between November to April. The mean annual rainfall ranges from 1300 mm to 1700 mm. The annual mean temperature is 25°C and humidity 63%. (Kaduna Development plan, 2008) The population of the Southern part of Kaduna State according to the 2006 population census stand as 2,587,900, using 3.18% growth rate as allowed by the National Population commission, the projected population of Southern Kaduna stand at 3,163,967 (2013 projection), therefore by the year 2018 the Southern Kaduna population would stand at 3,575,443. Farming is the main economic activity in the study area. Over 70 % of the active populations are farmers. The increased demand for land has led to shortening of fallow periods and consequently severe degradation of the farm (Kaduna Development plan 2008).

Sampling Technique and Sample Size

The data for this study was collected with the use of well-structured questionnaire. A Multi-Stage Sampling Technique was employed in the selection of respondents for the study. First stage sampling involved the purposive election of three LGAs in Southern part of Kaduna based on convenience. These LGAs are Jema'a, Kaura and Zangon Kataf. 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 for questionnaire administration.

Method of Data Analysis

The data were analyzed with descriptive statistics (means, tables, frequencies and percentages) and Multiple Linear Regression Model.

The multiple regression model was used in determining the factors influencing fuelwood consumption in the study area.

The explicit form of the model is presented as:

$$Y = \alpha_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \beta_9 X_9 + e_i$$

Where; Y_i = Expenditure on fuelwood (N/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 (N)

X_7 = Labour on fuelwood collection (mandays)

X_8 = Cost of fuelwood per Kg (N)

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

$\beta_1 - \beta_8$ 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 were 32 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 7, an indication of a relatively large household size. On their educational level, the majority (84%) had some form of formal education, with 48% that 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	Mean = 32.12 year
51-60	15	10.00	
>60	09	06.00	
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	
11-15	22	14.67	
16 and above	30	2.00	Mean = 7.04
Educational Level			
No formal education	24	16.00	
Primary school	17	11.33	
Secondary school	37	24.67	
Tertiarylevel	72	48.00	

Multiple Regression Analysis

The result of the Multiple Regression Analysis is presented in Table 2. The results show that five of the nine explanatory variables used in the model significantly affected the consumption of fuelwood by the households. Marital status (X_2) and cost of alternative fuel (X_9) positively influenced the consumption of fuelwood by the households in the study area. 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 rate of fuelwood and vice versa. The number of people in households tends to be higher among the married than the unmarried, hence the 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 (cost of kerosene per litre) is positive and statistically significant at 5% level. This implies that as the cost per litre of kerosene increases, the consumption of fuelwood will also increase. 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 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 fuel wood Consumption in Southern Kaduna, Nigeria

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 (X_7)	β_7	-0.1568	-1.9822*
Cost of per Kg (X_8)	β_8	-0.1226	-3.1147***
Cost of alternative fuel (X_9)	β_9	0.0804	2.3604**
R^2		0.6623	
Adjusted R^2		0.6410	
F-statistics			18.6536***

* 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 Southern Kaduna, 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 government to make the product affordable should further subsidize the cost of kerosene. In addition, 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 cushion the effect of inflation, which may be running in the economy.

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