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UTILIZATION OF FUELWOOD AS HOUSEHOLD ENERGY AMONG RESIDENTS OF BENIN METROPOLIS, EDO STATE, NIGERIA

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ABSTRACT

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The study evaluates the utilization of fuelwood as household energy among residents in Benin metropolis. Its utilization and availability as household energy source as well as reasons for its preference to other household energy sources was assessed. A random sampling technique was used to select 10 communities within the study area namely; Uselu, Siluko, Uwelu, Ogba area, Airport road, Ekehuan, Evbotubu, Aduwawa - Urora quarters, Upper sakponba The survey was carried out in these areas with the aid of a semi-structured questionnaire administered to respondents who utilize and sell fuelwood in these communities. A total of 200 copies of questionnaire were administered. The main variables measured were those of fuel wood consumption, availability and sources of fuelwood utilization. The results showed that the 50% of the respondents utilized fuelwood as their source of domestic house hold energy. 51% of the respondents sourced their fuelwood from fuelwood vendors while 25% source for fuelwood from their local farmland. 60% of the respondents in the study area spent an average of ₦200 daily on fuelwood while 52% of the respondents have a weekly expense of above ₦700 on fuel wood utilization. The average weekly consumption of fuelwood by 50% of the respondents was between 22 – 27 kg. Hevea braziliensis representing 33% of fuelwood species was the most abundant fuelwood consumed by residents in the study araea. The results from T-test and Pearson correlation showed that there was a significant difference in the amount of fuelwood consumed in the different communities within the study area. Therefore the quantity of fuelwood consumed is related to the number of persons per household.

INTRODUCTION

Fuelwood is a source of energy derived by burning wood materials like logs and twigs and is common among the rural dwellers. It is a traditional source of energy which has remained the major source of fuel to over half of the world's population (FAO, 2001). According to UNDP (2002), the share of various energy services in the total primary energy supply in Nigeria are made up of oil 10.4%, gas 6%, hydro 0.6% and commercial renewable energy 83%. The greater portion of commercial renewable energy is wood while agricultural wastes constitute the remaining smaller portion. The over-dependence on fuel wood or energy is chiefly because of its relatively low prices and easy accessibility (Adebayo, 2005). Domestic fuel wood consumption is the major component of energy economy in West Africa because other forms of energy are not readily available and affordable due to limited technological breakthrough which places fuel wood at the centre position. More than 80% of wood products consumed in developing countries are used in form of fuel wood and there are indications that fuel wood cannot be replaced with other sources of energy in the foreseeable future (Kaale, 1981). Enabor (1971), FAO (1983) reported that over 1.5 billion people the world over depend on fuel wood for cooking, maintenance of essential level of warmth and other domestic uses.

Energy from the forest has been a major source of energy available to man with more than 50% of the world's annual wood production being utilize as fuel with about 90% of this amount used as fuel in developing countries. It has also been observed that over 80% of the Nigeria population use fuelwood for the supply of energy, while 80% of wood extracted from the forest goes into fuelwood (Goodman, 1986). The use of wood for fuel in developing countries including Nigeria cannot be overemphasized. Accordingly, the UNDP figure in 1993 showed that Nigeria consumes 262,783 metric tonnes of fuelwood while South Africa consumes 7,120 metric tonnes and Thailand 35,313 metric tonnes. It has been stated that the poorer a country is, the greater its dependence on fuelwood. This is further buttressed by the United Nations Centre's for Human Settlements that despite the availability of modern energy sources to some city dwellers, the majority of immigrants cannot afford them. Wood therefore remains their major fuel source but instead of collecting them from dead trees, branches and twigs, they usually buy them from vendors. In the drive to satisfy fuelwood requirement, most land have been stripped bare of vegetation cover. This has resulted in soil exposure and erosion, and it has placed a heavy burden on the environment and on its resource base. The need for fuel wood has resulted in massive destruction of many wood resources leading to deforestation and increasingly desertification in parts of Nigeria and other parts of sub-Saharan African (Adebayo 2005). This study is therefore designed to assess the utilization of fuel wood as household energy among residents of Benin metropolis.

MATERIALS AND METHODS

The study was carried out in Benin Metropolis, Edo State, Nigeria. Edo State has a land area of 19035 km^2 with a population figure of 3,218,332 (NPC, 2006). The state is located in the South-South Geo-political zone of Nigeria. Edo State is dominated by the moist tropical forest with lowland rainforest representing 76.5% of the total land area (FORMECU, 1999).Geographically, the state is bounded by latitude 5° 45' and 7° 8' and longitude 5°4' and 6° 52' east. The climate of the state is tropical and is characterized by humid conditions in the south and sub-humid conditions in the north with distinct wet and dry season (Beaks and Geomatics, 1999). The rainfall pattern in the state is bimodal and varies from 200mm a year in the humid southern part to about 1150mm a year in the sub-humid northern parts. The mean monthly temperature of the state is about 27 °C with a range of 22-35 °C while the relative humidity range from 79 to 90% (Beaks and Geomatics, 1999) .The state is made up of 18 local government areas. There are three main forest types in Edo State namely: the low land rain forest, fresh water swamp, and the mangrove forest.

A random sampling techniques (based on zone) was used to select ten communities in the study area namely Uselu, Siluko, Uwelu quarters, Ogba area, Airport Road, Ekenwah, Evbotubu, Aduwawa-Urora quarters, Upper mission road and Upper Sakponba. The survey was carried out in these communities with the aid of structured questionnaire to respondents who utilize and sell fuel wood in these communities. A total of 200 copies questionnaires were administered. The main variable measured were the level of fuel wood consumption, availability and sources of fuel wood. In addition, fuel wood marketers were requested to give a check list of woody species readily available in their locality, and those of woody species readily available in their locality and those commonly harvested for fuel wood purposes. Identification of plants was done by comparing specimens of taxa identified by the respondents with those that were collected from the field using the Nigerian tree (Keay, 1989).

The data collected was collated and analyzed using descriptive statistics. The students T–test was employed to compare the differences in the amount of fuel wood utilized by the selected communities. Also Pearson's product moment correlation co-efficient (r) was used to examine the relationship between house hold size and the level of fuel wood consumption in the study area.

RESULTS AND DISCUSSION

The results of the demographic data of respondents in the study area are presented in Table 1. The results showed that 33% of the respondents were from Egor Local Government Area, 35% were from Oredo Local Government area while 32% were from Ikpoba-okha Local Government Area. The results also showed that 26.5% of the respondents were male while 73.5% were female thus indicating that fuelwood utilization were mainly dominated by women compared to the percentage of men utilizing fuelwood as source of household energy. This findings agrees with previous report by the author on the utilization potential of sawmill wood wastes and charcoal utilization as domestic energy source among household in Benin City (Izekor and Osayimwen, 2010; Izekor and Modugu, 2011). 53.5% of the respondents has household family size of between 1-3 persons, 25% of respondents had family size in the range of 4-6 persons while 14.5% of the respondents had family size of about 7-9 persons. However, respondents whose family sizes were more than 9 persons represented 5% of the sampled population.

The result further showed that majority of the respondents were above 40 years in age, representing 30% of the population while those that belong to the age bracket of 31-40 years represented 26% of the respondents and those that belong to the age bracket of 21-30 years were 20% with the least age bracket being 15-20 years representing 19% of the respondents. In addition, the result further revealed that most of the respondents were married representing 51% while the single, divorced and widowed represented 26%, 8% and 15% of the respondents respectively. Furthermore, most of the respondents in the study area were business men and women representing 52.5% while 30% of the respondents were farmers, others were artisans (4.5%), students (3%), civil servants (2.5%) and unemployed (7.5%) respectively.

Respondents source of domestic energy and utilization

The results from the various forms of energy utilized within the study area revealed that majority of respondents indicating 50% of the population depends on fuelwood as source of domestic energy. This is in accordance with FAO (1985), which observed that 200 million people in the world especially the rural people and urban poor depend on fuel wood for their main source of energy supply. The study further revealed that 19% of the respondents use kerosene, 15.5% of the respondents use gas while 5% of the respondents use electricity and 10.5% of the respondents utilize charcoal to support fuel wood in meeting their household energy needs.

Daily expenditure on fuelwood utilization by household

The daily expenditure on fuelwood utilization per household of respondents in the study area showed that 10% of the respondents spends between₦50.00 - ₦100.00, 30% of the respondents spends between ₦100.00 - ₦200.00 while majority of the respondents representing 60% of the sampled population spends above ₦200.00 daily on fuel wood.

Table 1: Demographic data of respondents in the study area

Variables	Frequency	Percentage
Study areas		
Egor	66	33
Oredo	70	35
Ikpoba-Okha	64	32
Age distribution		
15-20	38	19
21-30	50	25
31-40	52	26
>40	60	30
Gender		
Male	53	26.5
Female	147	73.5
Marital status		
Single	52	26
Married	102	51
Divorced	16	8.0
Widowed	30	15
Educational qualifications		
Non formal education	34	17
Primary	100	50
Secondary	43	21.5
Tertiary	23	11.5
Household family sizes		
1-3	107	53.5
4-6	50	25
7-9	29	14.5
>10	14	7.0
Occupation		
Unemployed	15	7.5
Student	06	3.0
Business	105	52.5
Farmer	60	30
Artisan	09	4.5
Civil servant	05	2.5

Table 2: Source of domestic energy utilization

Sources	Frequency	Percentage
Fuel wood	100	50
Kerosene	38	19
Gas	31	15.5
Electricity	10	5
Charcoal	21	10.5
Total	200	100

Table 3: Household daily fuelwood utilization

Amount (₦)	Frequency	Percentage (%)
50-100	20	10
101-200	60	30
>200	120	60
Total	200	100

Table 4: Factors influencing fuelwood consumption as domestic energy source

Factors	Frequency	Percentage
Relative cheapness	60	30
Cooks faster	99	49.5
Readily available	24	12
High prices of other forms of fuel	17	8.5
Total	200	100

Table 5: Sources of fuel wood utilized by household

Sources	Frequency	Percentage
Fuel wood sellers	102	51
Surrounding bushes	30	15
Farmland	50	25
Free area	18	9
Total	200	100

Factors influencing fuelwood consumption as domestic energy source
The result presented in the Table below shows that 30% of respondents that utilize fuelwood preferred fuelwood due to its relative cheapness, 49.5% of the respondents prefers fuel wood to other energy sources due to its ability to cook faster while 12% of the respondents prefer fuel wood because of its ready availability. However, 8.5% of the respondents that utilize fuelwood preferred it due to high prices of alternative energy sources such as kerosene, gas, electricity etc.

Sources of fuelwood utilized by households
Majority of the respondents representing 51% of the population in the study area get their supply of fuelwood from fuel wood sellers, 15% collect their fuelwood from surrounding bushes while 25% of the respondents source their fuel wood from farmlands and 9% get their fuel wood from free areas (i.e. areas not under any restrictions from exploiting fuelwood).

Weekly expenditure on fuelwood utilization by households
The respondents' weekly expenses on fuelwood utilization per household in the study area showed that 8% of the population spent between ₦100.00 - ₦250.00 on fuelwood per week, while 7.5% of the respondents spend between ₦250.00 - ₦400.00 weekly. Also 14.5% of the respondents spent between ₦400.00 - ₦550.00. However, 18% of the respondents spend between ₦550.00 - ₦700.00 with majority of the respondent representing 52% of the population in the study area spending above ₦700.00 on fuelwood consumption weekly in meeting their household energy needs. The variations on the weekly household fuel wood consumption could be attributed to the number of persons per household, income level, nature of job or business, type of food consumed and purpose of utilization (Eldirdiri and Adams, 2010).

Weekly quantity of fuelwood utilized per household
The result of the weekly quantity of fuel wood utilization per household is presented in Table 6. The result showed that 5% of respondents that utilized fuelwood consumed an average of 10 -15 kg of fuelwood per week while 15% of the respondents utilize 16 - 21kg. However, 50% of the respondents utilized 22-27kg of fuelwood

per week. The variation in percentages of fuelwood consumption in the study area could be attributed to family size, average monthly income, and availability of fuelwood.

Table 6: Weekly expense on fuelwood utilization per household

Table 7: Weekly quantity of fuelwood utilization per household

Amount (₦)	Frequency	Percentage
100 - 250	16	18
251 - 400	15	7.5
401 - 550	29	14.5
551 - 700	36	18
>700	104	52
Total	200	100

Quantity (kg)	Frequency	Percentage (%)
10-15	10	5
16-21	30	15
22-27	100	50
>27	60	30
Total	200	100

The results in Table 8 showed the total number of species sold as fuelwood by wood vendors. Majority of species sold by the traders were *Hevea brasiliensis* representing 36.4% of the species while *Pentaclethra macrophylla* represented 9.4%, *Dienbollia pinnata* (9.1%), *Ceiba petanda* (7.7%), *Rhizophora racemosa* (7.4%) and *Brachystegia eurycoma* (7.1%). Other species include *Parkia biglobosa* (94.5%), *Bombax buonopozense* (4.5%), *Leucaena leucocephala* (3.6%), *Eucalyptus calmaldulensis* (3.4%) and *Causuarina equisetifolia* (3.4%) while *Terminalia cattappa* was the least utilized species with 3.4%.

Table 8: Species of fuelwood sold by wood vendors

Trade name	Species	Frequency	Percentage
Iron wood	*Causurina equisetifolia*	12	3.4
Odonwe	*Rhizophora racemosa*	26	7.4
Obokha	*Bombax buonopozense*	16	4.5
Owen	*Brachystegia eurycoma*	25	7.1
Okhu	*Ceiba petanda*	27	7.7
Egbegogo-gbo	*Dienbollia pinnata*	32	9.1
Leucaena	*Leucaena leucocephala*	13	3.6
Eucalyptus	*Eucalyptus calmaldulensis*	12	3.4
Alrhaba-nofua	*Hevea brasiliensis*	128	36.4
Ugbore	*Parkia biglobosa*	16	4.5
Okpagha	*Pentaclethra macrophylla*	33	9.4
Ebelebo	*Terminalia catappa*	12	3.4
Total		352	100

One sample test of mean difference in the quantity of fuelwood consumption among communities
From the result, since the level of significant at a=0.01 is greater than the sig (2 tailed value) = 0.00. It is concluded that there was significant difference in the consumption of fuelwood for all local government areas. This therefore, indicates that there was significant difference between the local government areas and quantity of fuelwood utilized weekly per household ($p < 0.05$).

Table 9: One-sample test of mean difference in the quantity of fuelwood consumption among communities
One sample test

	N	Mean	Std Deviation	Std Error Mean
Local Government	200	1.9900	.80819	.05715
Quantity utilized per household per week	200	3.0500	.80669	.05704

One-sample test

	Test value=0					
	T	Df	Sig. (2-tailed)	Mean difference	95% confidence interval of the difference	
					Lower	Upper
Local Government	34.822	199	.000	1.99000	1.8773	2.1027
Quantity utilized per household per person per week	53.470	199	.000	3.05000	2.9375	3.1625

Pearson correlation moment coefficient of household size and Level of Fuel wood consumption in the study area
From the result, since the level of significant at a = 0.01 is greater than p value = 0.00. We conclude that the correlation is significant and that there is enough evidence to say that the correlation does exist in the population. This therefore means that the number of household size determines the quantity of fuelwood consumption per week (p<0.05).

Table 10: Pearson Correlation of household size and level of fuelwood consumption in the study area

		Quantity of fuel wood utilized per household	Household size
Quantity of fuel wood utilized per household	Pearson correlation	.718**	1
	Sig (2-tailed)		.000
	N	200	200
Household size	Pearson correlation	.718**	1
	Sig. (2-tailed)		.000
	N	200	200

**correlation is significant at the 0.01 level (2-tailed).

CONCLUSION
Fuelwood utilization serves as a major source of household energy among residents of Benin Metropolis. Most of the residents utilizing fuelwood as their domestic energy source do so mainly because of its ready availability, relative cheapness and affordability compared to other alternative sources of domestic energy such as kerosene, gas, charcoal and electricity. *Hevea brasiliensis* was the most abundant fuelwood species sold by wood vendor due to high consumers' preference for the species basically because of its high combustion value when used for cooking. The weekly expense and quantity of fuel wood consumed by residents depends largely on household size, type of food cook and the general purpose of utilization. Fuelwood remains the dominant and the cheapest source of providing household energy needs by resident of Benin metropolis. Therefore effort should be made by relevant stake holders to encourage residents of the metropolis to utilized alternative energy sources and reduce the over dependence on fuelwood in order to conserve the forest and minimize the problem of deforestation.

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