



COMPARATIVE EVALUATION OF DOMESTIC ENERGY UTILIZATION BETWEEN RURAL AND URBAN DWELLERS IN EKITI STATE, NIGERIA

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ABSTRACT

This study examined domestic energy utilization in rural and urban settlements in Ekiti state. Two hundred and forty copies of semi-structured questionnaire were administered through multi-stage sampling technique to collect data from respondents in selected towns and villages. Descriptive statistical technique in form of frequencies and percentages was used to analyze data collected. The study revealed that majority of the respondents in both rural and urban settlements are women (80 and 68.3 %) and married, while 65 % and 81.7 % had at least secondary education in rural and urban settlements, respectively. The results show that most of the respondents are farmers (41.7 %) and traders (32.5 %) in rural and urban settlements, respectively. The study revealed that all (100 %) the respondents in rural settlements use firewood while in the urban settlements, 99.2 % use of hydro-electric power (HEP). The study also revealed that availability and cost are the major determinant of energy type utilized by the respondents. The study further revealed that smoke from firewood in the case of rural settlement and inflammability of cooking gas in the case of urban settlement constitute major hazards associated with the use of energy. The use of wood wastes such as briquettes and sawdust is recommended to reduce demand for firewood and consequently reduce deforestation and environmental degradation.

Keywords: Comparative, domestic energy, rural, urban, Ekiti-State

INTRODUCTION

Energy has been defined as a means of accomplishing various works in our society. In economic terms, energy has been mostly associated with fuels which are used for various industrial, social and household purposes. Over time, human beings have developed an understanding of energy that has allowed them to harness it for uses well beyond basic survival. This has started from the time when man understood the use of fire as a source of energy for cooking and heating thousands of years ago till the advent of coal and until recently the use of sun, wind, water, fossil fuels and other biomass products for the generation of necessary amount of energy (WWEA, 2009).

Domestic or household energy is the energy used in the home for carrying out various domestic activities such as cooking, lighting, ironing, washing, heating, cooling,

powering electronic devices, food and drinks preservation among others (Bala, 2012). Concerns for energy required for the running of homes, industries and the economy generally has been a thing of global concern over the decades and the difficulty in providing it is becoming one of the greatest constraints in the improvement of living conditions (UNCHS, 1984). In terms of utilization, household energy accounted for about forty percent of the total energy consumption in developing countries (Obueh, 2000).

As with many goods and services, the demand for energy and type of energy used depend on several factors. Several indices that determine choice of energy for domestic use have been identified by different authors. Conspicuous among them is poverty which is responsible for overdependence on fuel wood by most households (Taru *et al.*, 2011; Abd'razack *et al.*, 2012). In Nigeria, traditional energy sources account for over 70 % of household energy supply (Nnaji *et al.*, 2012). While rural households rely more on biomass fuels than those in urban areas, a substantial number of urban poor households in Nigeria rely on fuel wood, charcoal, or wood waste (sawdust) to meet their cooking needs (World Bank, 2005). It is believed that there is disparity in domestic energy consumption pattern by rural and urban households in Nigeria and this disparity is partly due to various socio-economic factors such as level of education, cost of energy (electricity, liquefied petroleum gas, petrol, fuelwood, charcoal and kerosene), household income and level of availability of these commodities (Akinola *et al.*, 2017).

More than half of Nigerians live in rural communities, where four in every five households go without Hydro-electric power (Akinola *et al.*, 2017). Due to incessant electricity outage in Nigeria and increase in the price of modern sources of energy, people in the rural communities usually go for traditional energy sources (fuelwood, charcoal and sometimes wood wastes). Available estimates show that Nigeria consumes over 50 million metric tons of fuelwood annually, a rate, which exceeds the replenishment rate through afforestation (IPCC, 2007). This trend in the demand for fuelwood for provision of domestic energy, has led to cutting down of trees in the remaining marginal forest, thereby leading to deforestation and consequently environmental degradation (Olori, 2008).

The alternatives and substitutes for fuelwood are often too expensive or too scarce, thereby creating serious fuelwood deficits (Owonubi and Otegbeye, 2004). Availability of clean, modern and affordable energy sources for domestic consumption both in rural and urban areas is of great concern. It is against this background that this study sought to investigate the household energy use patterns across selected urban and rural areas in Ekiti State putting into considerations the household energy uses attributable to different energy sources as well as some factors that influence the choice of energy consumption.

MATERIALS AND METHODS

The Study Area

The study was carried out in Ekiti State, south west Nigeria. The State is located between Longitudes 4° 47' and 5° 45' East and Latitudes 7° 15' and 8° 5' North. Ekiti State has 16 Local Government Councils with a population of 2,398,957 (NPC, 2006). The state covers about 7,500 km². The State enjoys a tropical climate with two distinct seasons: the rainy season characterized by strong wind and thunder storm (April - October) and the dry season characterized by cold wind of harmattan (November - March). Temperature ranges between 21 °C and 28 °C with high humidity. Tropical rainforest exists in the south with

trees such as *Milicia excelsa*, *Khaya ivorensis*, *Pycnanthus angolensis* and *Triplochiton scleroxylon*, while derived savanna predominates in the northern peripheries with trees such as *Azelia africana*, *Albizia zygia*, *Anthocleista vogelii* and *Voacanga africana*.

Sampling Technique

A multi-stage sampling technique was employed for the study. The study area was stratified into three Senatorial Districts. One rural and one urban settlement were purposively selected from each district. These settlements were classified into rural or urban on the basis of their population density and presence of social amenities such as hospitals, higher institutions, government offices, electricity and pipe-borne water among others. Forty respondents were randomly selected at the center of the respective towns and the villages where we have highest concentration of people with different professions and carriers (Table 1).

Data Collection and Analysis

Data were collected with the use of a pre-tested semi-structured questionnaire supplemented with oral interview. Administration of the questionnaire to the respondents was done through personal contact, this method allows for total retrieval of the questionnaire. Data collected from the study were analyzed using descriptive statistics expressed in frequencies and percentages and presented in tables.

Table 1: Distribution of respondents in the study area

Type of settlement	Senatorial district	Towns/Villages	No of respondents	
Urban	Ekiti Central	Ado-Ekiti	40	
	Ekiti South	Ikere-Ekiti	40	
	Ekiti North	Ido-Ekiti	40	
Rural	Ekiti Central	Erio-Ekiti	40	
	Ekiti South	Agbado-Ekiti	40	
	Ekiti North	Isan-Ekiti	40	
Total	2	3	6	240

RESULTS

Socio-economic Characteristics of Respondents

Table 2 presents socio-economic characteristics of respondents in the study area. The result shows that 80 % and 68.3 % of the respondents are female, while 20 % and 31.7 % of the respondents are male in the rural and urban settlements, respectively. The result also shows that 76.7 % of the respondents in the rural areas are married while in the urban settlements, 83.4 % of the respondents are married. On level of education, 5 % of respondents in rural settlements and 5.8 % of the respondents in urban settlements had no formal education. Respondents' family size revealed that family of 4 to 6 persons predominate in both the rural and urban settlements with 46.7 % and 61.7 %, respectively. Occupation of the respondents revealed that 41.7 % in the rural settlements are farmers,

23.3 % are traders and 21.7 % are artisans, while in urban settlements, 32.5 % are traders, 30.8 % are civil servants and 19.2 % are artisans. The result shows that 56.7 % of the respondents earn less than ₦20,000 per month in the rural settlements while in the urban settlements, 50 % of the respondents earn less than ₦20,000 per month.

Table 2: Socio-economic characteristics of respondents in the study area

Characteristics	Rural		Urban	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Gender				
Male	24	20	38	31.7
Female	96	80	82	68.3
Marital status				
Married	92	76.7	100	83.4
Single	22	18.3	18	15
Divorced	-	-	1	0.8
Widow	6	5	1	0.8
Educational background				
No formal education	6	5	7	5.8
Primary	36	30	15	12.5
Secondary	62	51.7	40	33.3
Tertiary	16	13.3	58	48.4
Family size				
1 to 3	22	18.3	29	24.2
4 to 6	56	46.7	74	61.7
7 to 9	30	25	15	12.5
10 and above	12	10	2	1.6
Occupation				
Civil servant	4	3.3	37	30.8
Farmer	50	41.7	1	0.8
Artisan	26	21.7	23	19.2
Trader	28	23.3	39	32.5
Others	12	10	20	16.7
Income (₦ '000)				
< 20	68	56.7	60	50
20 -50	48	40	41	34.2
50 -100	4	3.3	16	13.3
> 100		-	3	2.5
Total	120	100	120	100

Energy Utilization by Respondents

Table 3 Indicate multi choices of energy sources by the respondents with 100 % of the respondents utilizing fuelwood as the major source of energy; this was followed by kerosene (95.8 %), petrol (70.8 %), charcoal (66.7 %) and hydroelectric power (HEP) (65 %), while 33.3 % had access to liquefied natural gas (LNG). In the urban settlements, 99.2 % of the respondents made use of HEP, 86.7 % use kerosene, 97.5 % use petrol, and 70 %

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use LNG, while 53.3 % and 47.7 % use charcoal and firewood, respectively. Result on types of energy used for cooking in the rural settlements shows that 100 % of the respondents made use of firewood, this was followed by kerosene (76.7 %) and charcoal (63.3 %). 85.8 % of the respondents in urban settlements use of kerosene for cooking, 70 % use LNG, 49.2 % use charcoal and 47.5 % use firewood.

Table 3: Energy utilization by respondents

Energy for household uses	Rural		Urban	
	*Frequency	Percentage (%)	*Frequency	Percentage (%)
Sources of Energy				
HEP	78	65	119	99.2
Solar	-	-	23	19.2
LNG	40	33.3	84	70
Kerosene	115	95.8	104	86.7
Charcoal	80	66.7	64	53.3
Firewood	120	100	57	47.5
Sawdust	22	18.3	33	27.5
Petrol	85	70.8	117	97.5
Battery	70	62.5	114	95
Energy for Cooking				
HEP	22	18.3	36	30
LNG	40	33.3	84	70
Kerosene	92	76.7	103	85.8
Charcoal	76	63.3	59	49.2
Firewood	120	100	57	47.5
Sawdust	22	18.3	33	27.5
Energy for Lighting				
Kerosene	110	91.7	69	57.5
HEP	78	65	119	99.2
Petrol	85	70.8	117	97.5
Solar	-	-	23	19.2
Battery	70	58.3	112	93.3
Energy for Powering Electronics				
HEP	60	50	119	99.2
Solar	-	-	21	17.5
Battery	62	51.7	100	83.3
Petrol	71	59.2	117	97.5
Energy for Laundry				
HEP	78	65	119	99.2
Charcoal	54	45	53	44.2
Petrol	61	50.8	94	78.3

*Multiple responses

Result on types of energy for lighting shows that 91.7 % use kerosene in the rural settlements, while 99.2 % use HEP in urban settlements. Type of energy used by respondents for powering electronics shows that 59.2 % use petrol in the rural settlements, while 99.2 % use HEP in urban settlements. Results on the type of energy used for laundry shows that 65 % and 99.2 % of the respondents use HEP in rural and urban settlements respectively.

Respondents’ Reasons for Choice of Energy

Table 4 shows respondents’ reasons for the type of energy source for domestic use, the result revealed that in rural settlements, 85 % of the respondents made their choice based on cost, 83.3 % was based on availability while 68.3 % was based on cleanness. The result follows the same trend in urban settlements with 100 % cost, 95 % availability, and 86.6 % cleanness.

Table 4: Respondents’ reasons for choice of energy

Reasons	Rural		Urban	
	*Frequency	Percentage (%)	*Frequency	Percentage (%)
Availability	100	83.3	114	95
Ease of use	40	33.3	70	58.3
Cost	102	85	120	100
Safety	56	46.6	99	82.5
Cleanness	82	68.3	104	86.6

*Multiple responses

Constraints to the Use and Problems Associated with Energy Utilization by Respondents

Table 5 shows constraints to preferred source of energy by the respondents. The result shows that 68.8 % of the respondents were constraint by high cost followed by irregular supply (48.3 %) and lack of access (31.7 %) in rural settlements. In urban settlements, 86.7 % of the respondents identified irregular supply as major constraint to their preferred energy source; 79.2 % due to high cost while 2.5 % were constrained by lack of accessibility. Table 6 shows problems associated with the use of various domestic energy sources. Seventy five percent of respondents in rural settlements identified smoke as major hazard in relation to firewood, 20 % mentioned electrocution in relation to electricity and 10 % identified flammability in relation to cooking gas. In urban settlements, inflammability accounted for 44.2 % of the respondents’ energy utilization problem. Smoke, electrocution and weather had 32.5 %, 14.2 % and 10 % respectively.

Table 5: Constraints to energy utilization by respondents

Constraints	Rural		Urban	
	*Frequency	Percentage (%)	*Frequency	Percentage (%)
High cost	82	68.3	95	79.2
Irregular supply	58	48.3	104	86.7
Lack of access	38	31.7	3	2.5

*Multiple responses

Table 6: Problems associated with the use of energy by respondents

Problem	Rural		Urban	
	*Frequency	Percentage (%)	*Frequency	Percentage (%)
Electrocution	24	20	17	14.2
Inflammability	12	10	53	44.2
Smoke	90	75	39	32.5
Weather dependent	26	21.7	12	10
Health hazards	6	5	10	8.3
Dirtyness	8	6.7	6	5

*Multiple responses

DISCUSSION

The preponderance of married female respondents observed in this study (Table 2) might not be unconnected with the role women are playing in household affairs in terms of provision and utilization of energy for food preparation, washing of cloth and other domestic duties that keep the family going. This observation is in agreement with the submission that female are more involved in fuel procurement and cooking in a household (Adeyemi and Adereye, 2016). The observed heavy dependence of the rural dwellers on firewood as major source of energy for cooking, compare to high demand for kerosene and Liquefied Natural Gas (LNG) by urban dwellers could be attributed to the interplay of several factors; such as educational status, occupation, family size and income. Most of the respondents in the rural settlements are low income farmers (Table 2) who cannot afford more expensive and less available source of energy like LNG in their locality. What they do was to fetch firewood which is readily available on their farm at no cost for their household energy requirement. This assertion is in harmony with the reports that most rural households use fuelwood and other more polluting and less efficient energy sources for domestic purposes (Ibidun and Afeikhena, 2006; Yaqub *et al.*, 2011).

The observed high no of respondents using kerosene and LNG in urban settlements could be attributed to high population of traders, civil servants and artisans with better income who can afford the cost. It could also be as a result of availability of these energy sources in the urban settlements coupled with other factors such as high level of literacy and smaller family sizes of the respondents household as compare with that of rural settlements (Table 2). This observation further confirm the earlier report that urban households rely more on several energy sources than rural households (Desalu, 2012). The considerable high consumption level of kerosene observed in both urban and rural settlements in the study area could be traced to the fact that it is a major source of fuel for lantern to provide light at night in virtually all the households in the rural settlements, while in urban settlements people use kerosene to power their stove for cooking whenever there is power outage. Similar assertion has been reported by Onyekuru and Eboh (2011). Also, in the area of lighting, most of the rural and urban residents depend on battery-powered systems such as torch and lamp. The major reason for this might be due to the erratic supply of electricity. This is in consonance with the report that electricity supply in Nigeria is highly epileptic in nature (Arowosoge and Faleyimu, 2011).

The study revealed that the choice of energy used by the respondents in both urban and rural settlements in the study area is dictated by respondents' ability to afford these

sources of energy and their level of availability. For example, many rural residents collect firewood which is their main energy source at little or no cost, whereas easy access to HEP and LNG as energy sources dictate their choice by urban dwellers. This submission is in agreement with the finding of Adedayo (2005), who opined that the use of firewood among rural dwellers was due to their relatively low prices and easy accessibility. The study also revealed that respondents' use of modern energy sources such as HEP and LNG in rural settlements is constrained by high cost while irregular supply was the major constraint to the use of these modern forms of energy in urban settlements. Similar observations have been reported that the type of energy used by a household is a function of economic development and civilization attained (Wickramasinghe, 2011; Akinola *et al.*, 2017). The result on various problems associated with the use of different sources of energy, revealed that smoke from wood constitute a major hazard to respondents in the rural settlement while high inflammability of cooking gas and smoke from generators and other industrial machines constitute health and environmental hazards in urban settlements.

CONCLUSION

Findings from the study revealed that respondents in both rural and urban settlements in the study area make use of energy from different sources for domestic purposes. The study further revealed variations in the level of the type of energy utilized for a particular purpose between the rural and urban dwellers. While there was preponderance of the use of firewood for cooking by rural dwellers, kerosene and liquefied petroleum gas were mostly used by respondents in urban settlements. The study also revealed that respondents' ability to afford a particular type of energy and its availability are the major factors that dictate the choice of energy utilized by the respondents in the study area. Also, the study revealed that the different energy sources have their peculiar problem associated with their usage. For instance smoke in the case of firewood and high inflammability in the case of cooking gas. The over-dependency of respondents in the rural settlements on firewood as revealed in this study is a major threat to the environment as it may lead to deforestation. In the light of the above, it is recommended that government should develop energy policies that would ensure availability of energy at an affordable cost and at the same time environmentally friendly. Also the use of wood wastes such as briquettes and sawdust should be encouraged to reduce pressure on the demand for firewood and charcoal, thereby reducing deforestation and environmental degradation.

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