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Descriptive Analysis of Household Energy Consumption for Cooking in Rural and Urban Areas of Kano State

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Abstract:

Energy plays an important role in the economic growth, progress, and development, as well as poverty eradication and security of any nation. The objective of the study is to provide a better understanding of household energy consumption for cooking in Rural and Urban areas of Kano State. For this study, field survey was carried out in which 768 Questionnaires were distributed to the households in three local government areas of Kano State namely; Tarauni, Dambatta and Garko each represented a particular Senatorial Zone. Multi stage cluster sampling technique was also employed. The study made use of Descriptive statistics to assess household energy consumption. The result of the study shows that Majority of the households depend to a large extent on the traditional sources of energy for their domestic energy requirements followed by multiple sources of energy for cooking. Firewood is the most used cooking fuel in Kano State. Among the firewood users, majority of them purchased the firewood use for cooking. The study therefore recommends among others. The State, Local government as well as Non-Governmental Organizations (NGO) should engage in enlightening the people through campaign and workshops on the

consequences of using unclean cooking fuels and the use of improved stoves provided sat subsidize prices.

Keywords: Energy Consumption, Solid fuels, Non solid fuels, Fire wood, Biomass

1. INTRODUCTION

Energy plays the most vital role in the economic growth, progress, and development, as well as poverty eradication and security of any nation. (Oyedepo, 2012). The household cooking sector is the largest consumer of energy in Nigeria, using around 80% of the total, 90% of which is derived from biomass, particularly fuel wood (International Energy Agency, 2015). In Nigeria, over 60% of people are earning less than $1 per day and biomass stands as the preferred source of household cooking energy in the country even though energy sources ranges from the traditional biomass (fuel wood and charcoal) to modern fuel types like Liquefied Petroleum Gas (LPG) and electricity. (Bello & Roslan, 2010).

The use of biomass fuels for cooking is a major cause of different health problems due to indoor air pollution (Bruce *et al.,* 2000; Ezzati & Kammen, 2001). The World Health Organization (WHO) estimates 1.5 million premature deaths per year due to indoor air pollution from the use of solid fuels (IEA 2006). Similarly, continuous felling of trees which leads to desert encroachment and decreases the availability of medicinal plants. Frequent sitting near firewood flame can cause hypertension and may damage the user's eyes. Despite all these problems, fire wood is still the predominant fuel for cooking in cities, towns and villages in Kano State. (Kano State ministry of science and technology, 2013).

It is because of the vital role that energy plays at the household level the researcher sees the need and interest to assess the household energy use in rural and urban areas of Kano State. This study therefore is divided into five sections. Section one is the background to the study. Section two include the literature review .section three is the methodology and four include results and discussions. Section five is the conclusion and recommendations.

2. LITERATURE REVIEW

Ojo, Bawa and Chuffer (2013) investigate the relationship of women's socioeconomic factors and household fuel wood consumption in Dambao Local Government Area (LGA) of Borno State, Nigeria. The result of the study shows that 97.5% of respondents used fuel wood solely or complimented with other sources of domestic energy. The quantity of fuel wood consumed by respondent households was determined by income, age, family size, and marital status of the respondents.

Also, Medayese *et al*(2012)in their study on Household Domestic Energy Consumption in Minna, Nigeria, indicated that over the years, the consumption of biomass has been on the increase due to its cheapness, availability, traditional affinity, while the consumption of alternative, clean, safer, environmental friendly an sustainable ones are dwindling. The analysis indicated that there is significant relationship between choice of energy and income as well as between energy use and household size. The increase in the price of LPG, Kerosene and Electricity tariff has dropped the number of household using these sources so as to reduce their expenditure on domestic energy use. The change in energy consumption types can be related to income level, poverty and the affordability of different types of sources.

Oyekale *et al* (2012), in their study on the Assessment of rural households 'cooking energy choice during kerosene subsidy in Nigeria: A case study of Oluyole Local Government Area of Oyo State compared the demand for different cooking energy sources before and after implementation of kerosene subsidy. The results revealed that the proportion of households that depended on kerosene increased from 49.2% before the subsidy to60. 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 results revealed that using fuel wood/charcoal as cooking fuel before subsidy significantly reduced the probability of choosing fuel wood/charcoal after subsidy. As the price of kerosene increased, the probability of using fuel wood/charcoal significantly decreased. 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 or charcoal.

More so, Adepoju, Oyekale and Aromolaran (2012) examined the factors influencing choice of energy by rural households in Ogun State Nigeria. The Result showed that the largest proportion of the respondents used kerosene oil for cooking and lighting. Logit regression results showed that there was gender influence in fuel wood choice. Also, illiterate household heads had higher likelihood of choosing charcoal. Choices of kerosene oil and electricity were influenced by proximity. However, if prices of fuel wood and charcoal increase due to scarcity less of them would be bought. Household heads that were not formally educated reported higher likelihoods of using charcoal and fuel wood. Households that were headed by males had lower likelihood of using fuel wood. Female headed households may be poorer than their male-headed counterparts due to low access to production resources as a result of traditional gender issues in resource allocation. This can also be linked to the fact that female members of households are some time ago directly responsible for fuel wood gathering.

Ogwumike, Ozughalu and Abiona (2014) examined household energy use and its determinants in Nigeria .The result of the study shows that most households in Nigeria use firewood as cooking fuel. Kerosene is mostly consumed by households in the urban areas and most of the households use it for cooking through kerosene stoves. Among the factors that significantly influence household energy use for cooking are educational levels of father and mother, per capita expenditure and household size. The multinomial logit estimates indicate that the urban sector is inversely related to household firewood use but positively related to kerosene, LPG and electricity use. The estimates also reveal that household size is positively related to firewood and LPG use but inversely related to kerosene use. Male headship of household affects firewood use negatively and kerosene use positively; it does not significantly affect LPG and electricity use.
From the review of literature, there are virtually limited empirical researches on energy consumption for cooking considering the various households in rural and urban areas of Kano State. Therefore this study assess household energy consumption in Kano State.

3. METHODOLOGY

For this study, field survey was carried out to assess the household cooking fuel in Tarauni, Dambatta and Garko Local Government Areas. The field survey employed helped to generate the required data from primary sources using questionnaire. The research instrument was designed to elicit information on household's socio-economic characteristics and the data were used to address objective of the study.

Also, the population of the study includes all the households that are located in Kano State. Thus, the estimated number of Household in Kano State is 1,603,335 (NBS, 2012) which comprises high, low, and middle income households in the State. More so, a representative sample size of 384 was derived from Dillman (2011) sample size formula. However, to reduce mistakes in sampling and to take care of non-response rate issue, the sample size was multiplied by two (Hair *et al.,* 2008). Therefore, a total number of 768 questionnaires were administered for Tarauni, Dambatta and Garko Local Government Areas with heads of households or spouse been the targeted respondents. Furthermore, Multi stage cluster sampling technique was employed in the distribution of the questionnaire. The questionnaire for this study addressed various issues related to energy usage. Among the studies that used questionnaire are; Zaku *et al* (2015); Oyekale, Dare and Olugbire (2012); Kadiri and Alabi (2014) and Ampitan and Oyerinde (2015), Danlami (2017).More so, Data were also analysed using simple percentage.

4. RESULTS AND DISCUSSIONS

Table 1 exhibits the values of the summary statistics. Table 1 shows the descriptive statistics of variables. The mean, minimum and maximum values give information on the descriptive nature of the variables.

Table 1: Descriptive Statistics of Variables

Variable	Mean	SD	Min	Max
Location	-	-	0	1
Gender	-	-	0	1
Age	45.41	10.37	20	60
Marital status	-	-	0	1
Education	2.38	1.54	0	6
Household size	6.59	3.98	1	30
Income	43829.34	23369.98	10000	80000
Home ownership	-	.81	0	4
Dwellshre	-	-	0	1

Source: *Author's computation using Stata 14*

The table shows the value of location as 0 and 1 with the minimum as urban and maximum as rural areas. Similarly, the minimum value of gender is 0 and maximum value is 1 which denotes female and male respectively. The table also shows that the average years of household head is approximately 45years with an average income of N43, 829. A typical family in Kano State has an average number of 7 members under a single head with minimum and maximum values of 1 and 30 members respectively. More so, the average years of school experience of the head of household is approximately 3 years representing schooling experience up to Primary school level.

Socio-Economic Characteristics of Households in Kano State

Socio-economic characteristics relates to the respondents experience, gender, age, marital status, household size and education. These characteristics are presented in Table 2

Table 2: Socio Economic Characteristics of Energy Consumers in Kano State

Characteristics	Freq	Percent	Cum
Location			
Urban	242	31.84	31.84
Rural	518	68.16	100
Gender	77	10.13	10.13
Female	683	89.87	100.00
Male			
Age	4	0.53	0.53
Below 20	54	7.14	7.67

20-29	180	23.81	31.48
30-39	231	30.56	62.04
40-49	203	26.85	88.89
50-59	84	11.11	100.00
60 above			
Education	154	20.59	20.59
Non formal	56	7.49	28.07
Primary School	138	18.45	46.52
Secondary School	182	24.33	70.86
Diploma/NCE	189	25.27	96.12
Degree/HND	26	3.48	99.60
Post Graduate	3	0.40	100.00
Others			
Household size	402	53.67	53.67
1-5	248	33.11	86.78
6-10	72	9.61	96.40
11-15	21	2.8	99.20
16-20	6	0.80	100
21 and above			
Income	56	7.90	7.90
Below 10000	103	14.53	22.43
10000-19999	175	24.68	47.11
20000-39999	174	24.54	71.65
40000-59999	106	14.95	86.60
60000-79999	95	13.40	100.00
80000 Above			

Source: *Author's computation using Stata 14*

Location of Household: Table 2 above shows that 68.16 percent of the respondents are from rural area while 31.84 percent are from urban area .This shows that majority of the respondents are from the rural area. This is because the three local government areas namely; Tarauni, Dambatta and Garko which were selected to represent Kano state based on geo-political zonal categorization of the state were further categorized into rural and urban with Tarauni from metropolis as urban, Dambatta and Garko as rural areas. Therefore, two local government areas made up the rural area and constitute the majority.

Gender of the Respondents: the study sample comprised of both male headed and female headed households. Male headed constitutes

the majority. Male constitute 89.87 percent while female constitute 10.13 percent. This could be attributed to the culture of the people in the study area in which male occupy the position of the household head. Except in some areas where females function as household's head either as widows or divorcees.

Age of the Respondents: Age is an important criterion in accessing the socio-economic effects of household energy. Examining household heads age distribution, the study shows that most of the respondents are within the age interval of 40-49 years of which 30.56 percent of the respondents fall within the interval followed by 50-59 years of which 26.85 percent of the respondents fall within the interval.23.81 percent fall within 30-39 years, 11.11 percent are within the age of 60 and above. More so, 7.14 percent are within the age of 20-29 years and 0.53 percent is below 20 years of age. Therefore, most of the respondents are within the age interval of 40-49 years because adult people are more likely to engage in energy issues than dependent age group

Household Size: More often, the family size of respondents determines the quantity of energy to be consumed in a house usually large family are expected to cook several times in a day, hence demand for energy. Households which have majority number of family members fall within 1-5 members which constitute 53.67 percent of the respondents. This is followed by 33.11 percent of the respondents which have 6-10 members,9.61 percent of the respondents have 11-15 members,2.8percent have 16-20 members and only 0.80 percent of the respondents have 21 and above members.

Educational Status of the Respondents: As to the educational status of the household heads 20.59 percent have no formal education while 7.49 percent and 18.45 percent have primary school and secondary school respectively. Also, 24.33 percent have Diploma or NCE and 25.27 percent have Degree or HND. Nevertheless, 3.48 percent have post graduate and only 0.40 percent constitute others. Majority of the respondents therefore have formal education looking at the level of development even in the rural areas.

Income of the Respondents: Income refers to earnings received by household and social status in the community. The result of the study also shows that most of the respondents 24.68 percent earned between 20,000 to 39,999 and 24.54 percent earned between 40,000 to 59, 999.similarly, 14.95 percent of the household heads monthly income is between 60,000 to 79,999 and 14.52 percent monthly income is between 10,000 to 19,999 while 13.40 percent monthly income is between ₦80,000 and above. Only 7.90 percent of the respondent's monthly income is below ₦10,000. This indicates that monthly earning of the respondents majority of who are living in rural areas of the state is relatively not high. This can be as a result of the nature of economic activities which consist mainly of primary economic production.

Dwelling Characteristics of Households

Dwelling characteristics refers to the structure and state of the building and weather it is occupied by the owner or not. The Dwelling characteristics include dwelling share, home ownership.

Table 3: Dwelling Characteristics of Respondents

Characteristics	Frequency	Percentage	Cum
Dwelling share			
No	464	67.64	67.64
Yes	222	32.36	100
Home ownership			
Self owned dwell	590	78.88	78.88
Rented dwelling	106	14.17	93.05
Dwelling provided by employer	13	1.74	94.79
Free Dwelling	29	3.88	98.66
Other	10	1.34	100

Source: *Author's computation using Stata 14*

Dwelling Share: In both the rural and urban areas of Kano State dwelling share plays an important role in energy consumption. Table 3 shows that 67.64 percent of the respondents share dwelling with other households while 32.36 percent do not share dwelling with other households.

Home ownership

There is also some influence of house ownership towards the choice of household cooking fuel use. Table 3 above shows that 78.88 percent of the respondents live in self owned houses, 14.17 percent live in rented houses and 1.74 percent live in dwelling provided by their employer. Similarly, 3.88 percent of the respondents live in free dwelling and only 1.34 percent lives in other types of home ownership. This means that majority of the respondents live in self owned houses.

Household Energy Use

The different aspects of household cooking fuel consumption and the respondents' awareness of the effects of modern energy on the environment are illustrated in Table 4 below.

Table 4: Households Cooking Fuel Sources and Consumption

Characteristics	Frequency	%	Cumulative frequency
Cooking fuel type			
Solid	464	61.21	61.21
Mixed	182	24.01	85.22
Non Solid	112	14.78	100
Firewood use			
No	159	21.06	21.06
Yes	596	78.94	100
Fire wood source			
Purchased firewood	471	78.89	78.89
Collected firewood	123	20.6	99.50
Others	3	0.50	100
Modern fuel challenge			
Higher cost of initial installation	77	10.29	10.29
Higher price	243	32.49	42.78
Far Distance to the place of purchase	53.88	83	11.10
Shock	86	11.50	65.37
Flame	241	32.22	97.59
Others	18	2.41	100

Source: *Author's computation using Stata 14*

Table 4 above gives the summary of household energy consumption for cooking.

Cooking fuel type: The cooking fuel types found in the study areas were firewood, charcoal, sawdust, cornstalk, kerosene, gas and Electricity. Households fuel choice therefore, were categorized into three namely; solid, non solid and mixed of solid and non solid. Solid fuels include traditional fuels such as firewood, charcoal, sawdust and cornstalk. Non solid fuels are modern and clean energy. These include; kerosene, gas and Electricity The result of the study shows that 61.21 percent of the respondents use solid fuel, 24.01 percent of the respondents use mixed fuel and 14.78 percent use non solid fuel. This indicates that majority of the respondents use solid fuels. Solid fuels are available at little or no cost. Similarly, some households find it difficult to change their consumption when they are used to certain commodity.

Firewood Usage: In the sample data, majority of the respondents use solid fuels for cooking and firewood is the most used cooking fuel among the solid fuels type in Kano State with 78.94 percent usage while 21.06 percent use other types of energy for cooking. This indicates that despite the availability of other solid fuels most of the households use firewood for cooking.

Firewood Source: From table 4 above, among the firewood users 78.89 percent purchased firewood, 20.60 percent collected the firewood from their farmland and 0.50 percent got the firewood free from people.

Modern fuel challenge

On the challenges faced for using modern or clean energy table 4 above shows that 10.29 percent of the respondents associate the problems with high cost of initial installation, 32.49 percent of the respondents associate it with high prices and 11.10 percent associate it with far distance to place of purchase. Other challenges include shock of which 11.50 percent associate the problem of using modern energy, 32.22 percent associate it to flame and 2.41 percent with other problems

5. CONCLUSION AND RECOMMENDATIONS

The study assesses household energy consumption in rural and urban areas of Kano State. Energy consumed by households includes electricity, gas, kerosene, firewood, charcoal, sawdust and cornstalk. In rural areas, traditional fuels such as firewood, charcoal and cornstalk constitute a major portion of energy consumption. Majority of the households depend to a large extent on the traditional sources of energy for their domestic energy requirements followed by multiple sources of energy for cooking.Firewood is the most used cooking fuel in Kano State. Among the firewood users, majority of them purchased the firewood use for cooking.

Therefore, in line with the findings of the study the following recommendations were made.

The State, Local government as well as nongovernmental organizations (NGO) should engage in enlightening the people through campaign and workshops on the consequences of using firewood for cooking .An improved fuel wood stove should be provided by the state and local government at an affordable prices.

The state government should also provide adequate electricity, good roads and credit facilities. This will reduce the use of unclean energy for cooking.

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