

HOUSEHOLD ENERGY CONSUMPTION IN CHIKUN LOCAL GOVERNMENT AREA, KADUNA STATE

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ABSTRACT

This study which analyzed the pattern of domestic energy consumption of household in Chikun Local Government Area of Kaduna State was carried out in June 2009. The study assumed that the pattern of energy consumption in the study area would be influenced by the demographic and socio-cultural characteristics of household heads. In the study, household energy issues were examined and relevant data were collected from the sampled household heads. The data collected included the types and purpose of energy, demographic and socio-economic factors of household heads that influence their choice of domestic energy as well as the environmental implications. These data were obtained through direct field observation and measurement with the aid of questionnaire-based interview. The data were processed and analyzed using tables, percentages and chi-square statistical method. The study found that households in the study area consume more biomass (especially firewood and charcoal) than fossil fuel. The study also reveals the impact of socio characteristics of household heads on their preferred energy choice. Recommendations were made on the need to make alternative domestic energy especially kerosene and gas accessible and affordable to the people to reduce over dependent on fuel wood.

Keywords: Biomass, Fossil fuel, Energy, Consumption, Household

INTRODUCTION

Domestic energy (including the biomass, fossil fuel and electricity among others) are essential commodity needed in various homes all over the world. But the earliest energy that was discovered and domesticated by man was firewood. This energy type is still heavily relied on today in many parts of the world, especially in the developing countries. A large number of studies have been carried out on household energy use in different parts of the world. Resnicoff (2008) analyzed Bulgaria's domestic energy sector and concluded that the two dominant domestic energy used in Bulgaria was fossil fuel and biomass. In Tanzania, comparative studies of various energy types revealed that electricity and kerosene were the preferred choice of majority of respondents (Hosier and Kipondya, 1993), just as was the case and

reported in Kaduna, Nigeria by Ndukwe (2007).

However, in rural Mexico study revealed that one-third of the total households depended on fuel-wood. This view was corroborated by Brouwer, Houfweg and Ijere (1997) in their studies. Akarakiri (1991), Atiku & Bajpal

(1991), Morgan and Moss (1979) and Peter (1979), all supported this view in their various research findings on rural domestic energy consumption in various parts of Nigeria that fuel wood remains the predominant source of energy for rural populace. Oladosu and Adegbulugbe (2003) submitted that 81percent of domestic energy consumed in Nigeria was fuel-wood. A recent study suggested that the rate of biomass utilization in the urban centers is now increasing. Maconachie,

Tanko and Zakariya (2009) in their study on Oil Prices and Domestic Fuel Choices in Kano, Nigeria, found that Kano residents, especially the lower and middle income households, had shifted away from the use of fossil fuel to firewood (biomass).

But, the type of energy consumption and daily energy loading are highly accounted for by a number of factors. In China for instance, Sanjay and Qian (1992), noted that the consumption of fuel was determined by income, resource availability and household size. In Yobe State, as reported in Sunday Trust, March 15 (2009), all the respondents "contend that poverty was the 'striking force' which forced them to injure their own environment through indiscriminate felling of trees". Bhattarai, (1998) has observed that charcoal is considered user-friendly due to its clean burning and being less smoky and smelly and very useful in smaller quantities for domestic application. Therefore, this study aimed at providing quantitative empirical information on domestic energy consumption in the study area especially through the following objectives:

- Determine the type and purpose of various domestic energy consumed by households in the study area.
- To identify the socio-economic factors responsible for the choice of domestic energy consumed by households in the study area.
- determine the environmental effect of those domestic energies consumed by households in the study area.

STUDY AREA

Chikun Local Government Area (one of the 23 Local Government Areas in Kaduna State) with a total land area of 4,456/km² (Chikun Local Government Council, 2009), total population of 368,250 (National Population Commission, 1991 in National Gazette, 2007), and average population of 82.6/km², lies between latitudes 10°07'N and 10°36'N and longitudes 6°41'E and 8°05'E (Fig. 1). It's in the Guinea Savannah vegetation zone (Zubairu, 2007), and within

the tropical continental climate with relative humidity of 27°C and annual rainfall of 100cm - 150cm. It is bounded to the north by Igabi, Kaduna South and Birnin Gwari Local Government Areas, Niger state to the west, Kajuru and Kachia Local Government Areas to the south and east respectively.

The Gbagyis are the dominant ethnic occupants of the area but other minority inhabitants include the Hausa-Fulani, Bajju, and the Yoruba most of whom are predominantly peasant farmers while few are in trading, transportation (taxi and motor-cycle riding), animal/poultry farming, brick and furniture-making, among others. However, Kaduna Petroleum Refinery and Petrol Chemical (KRPC) industry which provides employment opportunities for both skilled and unskilled labour from far and near is located there. All the urban and some of the rural settlements in the area are provided with social facilities (electricity, parks and gardens, pipe borne water, Primary Health Care Centers, Schools, and railway etc).

MATERIALS AND METHODS

Material collected for the study included data on the type of domestic energy consumed by households and the likely purpose (s) of consuming it. Socio-economic details of the respondents and their views on the environmental effects of those domestic energies consumed by households in the study area were all collected and/or reviewed. However, data collection was done in phases (3phases), through the use of literature review, oral interviews, direct field observations and measurements and questionnaire-based interviews but comments and observations were also noted in the observatory note of the researcher. The preliminary phase was used to identify the potential respondents; testing of the suitability and validity of the data collection instrument (s) was done in the pilot study phase while the actual field data collection phase was the last.

The survey research design was adopted and used for the study. The Stratified

Random Sampling method was used in selecting two districts (Kasaya and Narayi). According to the National Population Commission, 1991 (National Gazette, 2007) there were a total population of 26,702, and 3,814 households (based on the national mean household size of 7) in both districts. From this targeted total households size (3,814), 150 households were sampled using availability sampling method out of which 144 returned questionnaires were found suitable for the study and hence, analyzed while six (6) were found unsuitable either due to inconsistency or incompleteness in the information provided. Tables and percentages were used to summarize the data and chi-square (X^2) statistical technique was applied in testing the data for association on the types of household energy consumed in the areas. Below is the formula:

$$x^2 = \frac{r \sum K \sum (O - E)^2}{E}$$

Where, $r \sum$ = row total $k \sum$ = Column total
O = observed E = expected

RESULTS AND DISCUSSION

Socio-Economic features of Respondents

Table 1 reports the socio-economic characteristics of all the respondents (144) who participated in the study. Information on the family size shows that the sampled households sizes ranges from one (1) to over fifteen (15) members. The highest percentage was 46.5% with 6 – 10 family members and the least was over 15 family members (9.7%). In addition, 36% of the respondents were post secondary school certificate holders. This is followed in descending order by secondary and primary/adult school certificate holders (28.5% and 22.2% respectively). Meanwhile, 19 respondents representing 13.2% claimed not to have any form of formal education at all.

Also revealed from table 1 was information on the respondent's occupation. Analysis shows their engagements as follows: farmers (44.4%), civil servants (34.7%) and businessmen (20.8%). On that note, while the highest monthly income earned by 11.1% of the total respondents was over #50,000, the least was below #10,000(25%). However, most of the respondents (63.3%) earned between #10,000 to #50,000 monthly.

Types and purpose of domestic energy consumed by households in the study area.

Responses on issues bordering on the types of domestic energy preferred by households and the purposes for using each type was sought from the sampled respondents. Their claims are presented in table 2. Nearly all the respondents (99.3%) reportedly used kerosene but strictly for cooking (only 16.7%), and mostly for lightening (over 82%). Only one respondent representing 0.7% did not reveal his/her status on kerosene consumption. While just only 4.9% of the total respondents attested to using gas and strictly for cooking, many of them (68.1%) claimed to use electricity but only wherever and whenever it is available mostly for home lightening and, to a little extent, for cooking (100% and 30.6% respectively). This was due to the fact that electricity was not always on, even in those homes that were connected. In the case of firewood and charcoal respondents attested to using them for cooking only (74.3% and 60.4% respectively). This is more than those that used kerosene and electricity for the same purpose (cooking). These findings are therefore in agreement with that of Oladosu and Adegbugbe (2003) who reported that 81% of Nigeria consumed fuel-wood. It is also in line with the findings of Maconachie, Tanko and Zakariya (2009) which showed that most of Kano's middle and low income earners had shifted from fossil fuel to firewood consumption.

Likely factors that influenced respondents preferred domestic energy in the study area.

Respondents were asked to identify the socio-economic factors that might influence their choice of domestic energy in the study area. The results of chi-square analysis and responses are presented in Table 3 and Table 4 respectively. The chi-square analyses on Table 3, shows strong association ($P > 0.05$) between respondents' family size, nature of occupation and level of monthly income and their preferred household energy choice (X^2 cal. of 63.6 $>$ X^2 crit. of 21.03, cal. of 24.21 $>$ X^2 crit. of 15.51, and cal. of 35.1 $>$ X^2 crit. of 21.03 respectively). However, Table 3 also reveals that there is no significant association ($P > 0.05$) between the respondents' educational attainment (Qualification) and their preferred domestic energy (X^2 cal. of 16.52 $<$ X^2 crit. of 21.03).

As revealed from the result analyzed, family size, monthly income, and type of occupation of the respondents are major pointers towards the type of domestic energy consumed in the respondent's households except for only kerosene and electricity that were noticed not to be too influenced by these factors possibly because they were essentially used for lightening (Table 4). Hence, regardless of level of education, respondents mostly used those domestic energies that were readily available and affordable (especially firewood and charcoal for cooking). This findings are in line with the report of Sanjay and Qian (1992), which said income and household size were some of the determinants of the type of domestic fuel consumption in China; as well as the Sunday Trust Report, March 15 (2009), that blamed poverty as the main promoter of fuel-wood consumption and environmental destruction in Yobe State, Nigeria.

Environmental and health problems encounter by households in the use of their preferred domestic energy

Data on the problems that respondents encountered while using their preferred energy choice in the study area is presented in Table 5. All the respondents who claimed to use kerosene and gas unanimously complained of high cost of buying the two commodities (Table 5) and further identify kerosene related problems to include scarcity (86.7%) and smoky due to adulteration of the product (21.7%). Though, electricity was not reported to be expensive but rather, 98% of those that consumed it said, it was not regularly supplied and that it occasionally cause fire outbreak.

On the likely challenges of the fuel-woods (particularly firewood and charcoal), consumers of firewood and charcoal (100% and 87.04 respectively) agreed that forest is destroyed and which can cumulate in desertification in the study area. Also, they all agreed that while firewood is 100% smoky, charcoal is completely free. They concluded that the two (2) domestic fuels are sufficiently available, affordable, and are not associated with fire outbreaks. This explained the reason for the increase in the consumption of firewood and charcoal and the reduction in the consumption of the other types of domestic energies (especially cooking fuels like kerosene and gas) among the respondents in the study area. Amacher, Hyde and Jodhee (<http://www.informaworld.com/smpp/content-content=a787124178-db=all-order=page,30/07/> 2009) reported the same findings in their previous studies but this finding disagreed with that of Bense (2008), and Ali and Benjaminsen (2004) who claimed that local fuel-wood collection could not lead to deforestation.

Recommendations

In view of the result of this study, and its significance on the environments, the following recommendations are made:

1. Researches on how to make alternative domestic energies (especially electricity, gas and kerosene) easily available, accessible and affordable for household consumption should be conducted in order to save the environment from much degradation.
2. There is a need to determine the level of health risk posed by the use of charcoal and firewood on the users.

CONCLUSION

In conclusion, from the data collected and analyzed for this study, it is evident that rate of biomass consumption (especially firewood and charcoal) in the study area (Chikun Local Government Area) is on the increase than one would have expected. Mostly due to high rate of poverty (including low income earning and large family sizes), among others, which ultimately promotes environmental destruction. Hence, proper environmental education for the whole populace on forest management and harvesting methods is therefore desirable and suggested. Also, poverty alleviation programs should be embarked on especially by the government for the whole state residents.

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Table 1: Socio-Economic Characteristic of the Respondents

Influencing factors	No of Households	Percentage (%)
FAMILY SIZE		
01 - 05 members	21	14.6
06 – 10 members	67	46.5
11 - 15 members	42	29.2
Over 15 members	14	09.7
TOTAL	144	100
QUALIFICATION		
None	19	13.2
Adult/Primary	32	22.2
Secondary	41	28.5
Post Secondary	52	36.1
TOTAL	144	100
OCUPPATION		
Farming	64	44.4
Business	30	20.8
Civil Service	50	34.7
TOTAL	144	100
INCOME/MONTH		
Below #10,000	37	25.6
#10,000 - #25,000	52	36.1
#26,000 - #50,000	39	27.2
Over #50,000	16	11.1
TOTAL	144	100

Source: Field work (2009)

Table 2: Types and Purposes of Energy Consumed by Households

Type of Energy Consumed	Purpose					
	No	%	COOKING		LIGHTENING	
			No	%	No	%
Kerosene	143	99.3	33	16.7	111	82
Charcoal	87	60.4	87	100	-	-
Gas	07	04.9	07	100	-	-
Electricity	98	68.1	30	30.6	98	100
Firewood	107	74.3	107	100	-	-

Source: Field work (2009)

Table 3: Results of Chi-square analysis of the effects of socio-economic features of respondents on their preferred energy

Influencing factors	No of Respondents	Significance level	Df	X ² Cal.	X ² crit.	Remark
Family Size	144	0.05	12	63.6	21.03	Significant
Income/Month				35.1		
Qualification				16.52		
Occupation			08	24.21	15.51	Significant

TABLE 4: Household's Preferred Energy Type (s) Based on Their Socio-Economic Characteristics

INFLUENCING FACTORS	KEROSINE	FIREWOOD	CHARCOAL	GAS	ELECTRICITY (NEPA)
FAMILY SIZE					
01 - 05 members	21	10	21	07	21
06 – 10 members	67	41	45	-	62
11 - 15 members	42	42	17	-	10
Over 15 members	13	14	04	-	05
TOTAL	143	107	87	07	98
QUALIFICATION					
None	19	14	05	-	11
Adult/Primary	32	25	14	-	25
Secondary	41	29	21	02	29
Post Secondary	51	39	47	05	33
TOTAL	143	107	87	07	98
OCCUPATION					
Farming	64	63	18	-	24
Business	30	15	21	05	29
Civil Service	50	29	48	02	45
TOTAL	143	107	87	07	98
INCOME/MONTH					
Below #10,000	37	35	17	-	19
#10,000 - #25,000	52	45	24	01	29
#26,000 - #50,000	39	21	33	02	34
Over #50,000	15	06	13	04	16
TOTAL	143	107	87	07	98

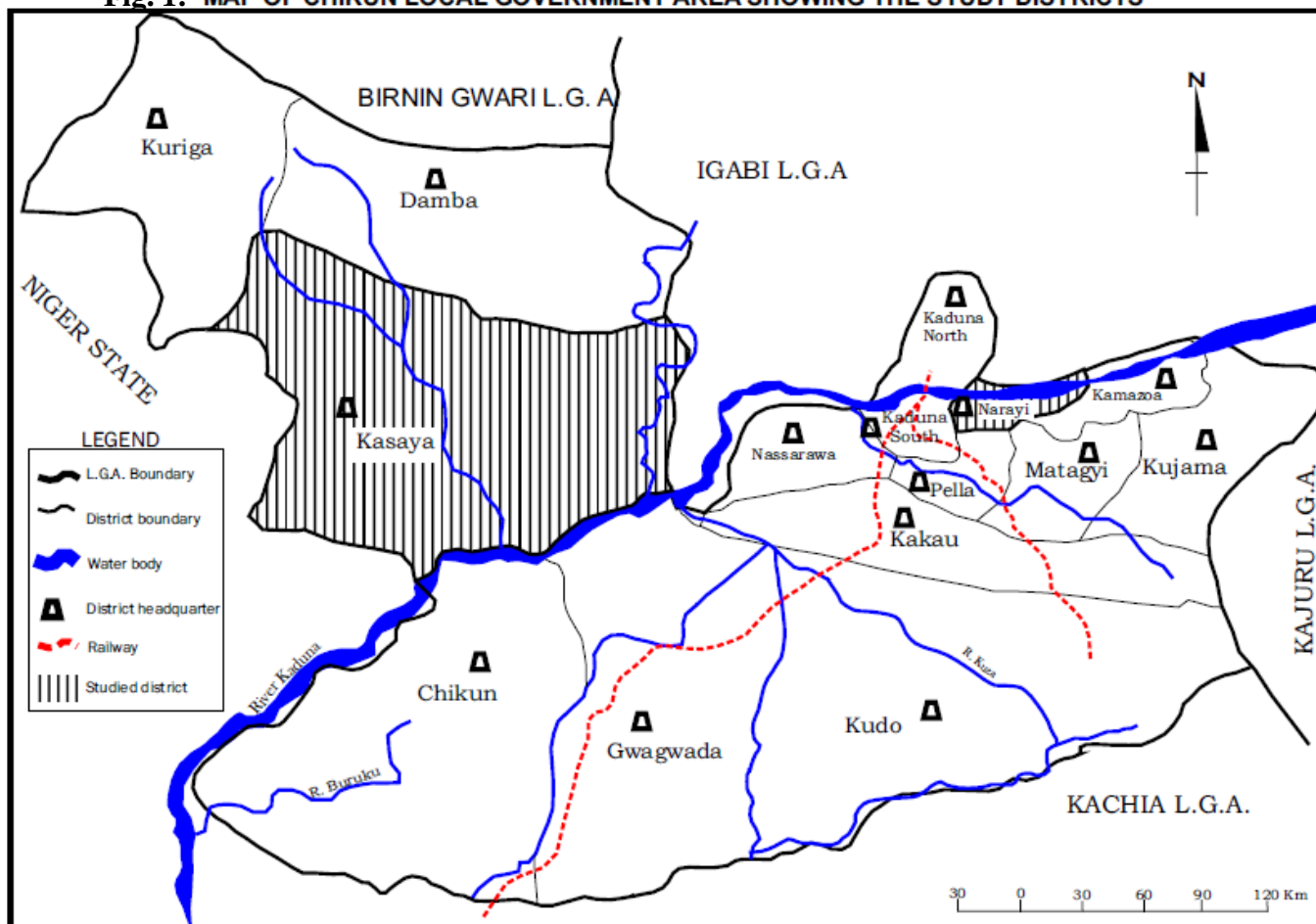
Source: Field work (2009)

Table 5: Reported Problems of Preferred Domestic Energy

Type of Energy	KEROSINE		FIREWOOD		CHARCOAL		GAS		ELECTRICITY (NEPA)	
	No	%	No	%	No	%	No	%	No	%
Fire out break	-	-	-	-	-	-	02	28.6	19	19.4
Desertification	-	-	107	100	76	87.04	-	-	-	-
Expensiveness	143	100	-	-	-	-	07	100	-	-
Short supply (Erratic)/ Scarcity	124	86.7	-	-	-	-	-	-	96	98
Smoke/Adulteration	31	21.7	107	100	-	-	-	-	-	-

Source: Field work (2009)

Fig. 1: MAP OF CHIKUN LOCAL GOVERNMENT AREA SHOWING THE STUDY DISTRICTS



Source: Authors field work (2009)