Cooking Energy Consumption Pattern of Rural Households in Aiyetoro Community

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The main objective of this study was to understand the cooking energy consumption pattern of rural households in Aiyetoro village of Ilorin East local government area, and also to determine the composition and quality of gaseous emission from the cooking fuels. This will aid in providing information that may lead to improved energy consumption while also trying to minimize the fuel users' exposure to gaseous product of incomplete combustion.

The data used for the energy consumption study was obtained through a sampling procedure that resulted in a sample size of 76 households used for the study. The main tool used for this study was logistic regression procedure which was used to determine the energy consumption pattern and the factors affecting the energy usage. The tool was used to establish the relationship between the type of energy (modern or traditional) consumed by the households and variables such as age, household size, education status, household income, amount spent on fuel, distance covered to source the fuel and sex of fuel collector. The regression result shows that the sex of the fuel collector and household size were significant factors in explaining the variation in the type of energy consumed by the respondents. Observed energy consumption pattern reveals that most of the respondents (98.28%) consumed more of traditional energy type than the modern energy type.

Finally, the study suggests formulation and implementation of policies which will ensure the transition of rural household cooking fuels from traditional to modern while ensuring that such intervention does not in anyway interfere with rural energy systems.

Keywords: modern fuel, traditional fuel, energy consumption, rural households

1.0 INTRODUCTION

The pattern of energy consumption in Nigeria's economy is divided into various economic sectors which are: industrial, transport, services and household sectors (ECN, 2007). The household sector accounts for the largest share of energy consumption in the country with about 64%, with energy consuming activities such as: cooking, lightning and use of electrical appliances. Out of the 64% of total energy consumed in the household, cooking accounts for about 70%, lightning uses 3%, hot water boiling takes about 25% and the remaining 2% can be attributed to the use of electrical appliances.(ECN,2012 ; Kulla, Suleiman and Ishaya,2012).

In Nigeria, as it is all over the developing world, meals are cooked mainly with home-made traditional stoves or open fires. These stoves are fired by various forms of renewable non-commercial fuels such as wood, animal residue and charcoal. Solar energy is used in limited cases (Kulla, 2011).

It is estimated that as much as 70% of households in developing countries uses fuels such as woods, dung and crop residue for cooking (Rehfuess, 2006). In Nigeria, 65% of households uses the non-commercial fuel as against 35% that uses the conventional fuels like dual purpose kerosene(DPK),liquefied petroleum gas(LPG) and electricity(NPC, 2006). The seemingly "free" availability of these fuels from nature makes them the primary fuel source for household purpose.

Biomass is often the primary source of household energy in developing countries with a little below 4billion people using biomass fuel and coal. These statistics have been relatively stable over the last 15-20yrs and are expected to continue into the future (Rehfuess, 2006). However, there is a significant regional variation as well as difference between urban and rural areas. As observed by Rehfuess, (2006), In Africa, the use of biomass is common both in urban and rural areas and 89% of households surveyed depend on some types of solid fuels which include both biomass and charcoal. In rural areas in

Africa, virtually all households report the use of solid fuels. In Asia, 74% of household reports the use of solid fuels while 29% does so in Latin America (WHO, 2010; Kulla, 2004).

The transition from biomass fuel to modern fuels has been associated with improvement in economic prosperity and development (Rehfuess, 2006). At very low levels of income or development, households depend on biomass fuel such as agricultural waste, dung and firewood. As income rises or the country becomes more developed, households begin to convert to non-solid fuels such as kerosene, LPG or electricity. At the middle income levels, households typically use both solid & non-solid fuels.

Up to a decade or so ago, the assumption on which energy planning in the developing world has been based was that energy consumption pattern would evolve in more or less the same way as they had done in the industrial countries where a shift away from fuelwood occur as a result of economic growth and people changed from the use of fuelwood as their income increase. However, these have not been the case as virtually everywhere in the developing world, traditional wood fuel resources are being depleted even in the face of increasing economic growth. The challenge has then been to determine what are the factors that influence the use of modern fuel in place of fuelwood especially in rural communities? Studies have shown that these influencing factors differ from locality to locality (Olatinwo K.B and Adewumi M.O, 2012).

The study therefore describes the pattern of the farming household energy consumption in Aiyetoro Village of Ilorin east local government, examines the factors affecting energy consumption of the rural farming households and highlights the major challenges facing the present energy use of the farming households in rural areas.

2.0 METHODOLOGY

2.1 AREA OF STUDY

Aiyetoro Village, Ilorin East Local Government Area of Kwara State, is located on latitude 13.49N and longitude 8.30E; it is situated in the zone between the northern and southern parts of Nigeria. (Ilorin East, 2012)

Ilorin East Local Government area is one of the 16 local government areas of the state. The local government, which shares border with Ilorin south, Ilorin west, Moro and Ifelodun local government area has 2 districts namely Iponrin and Gambari. It has Twelve (12) political wards.

Aiyetoro village falls under Iponrin district and is surrounded by communities which includes Ajelende, Marafa, Pepele, Ajibowo and Ojoge. It has an estimated population of 1700 inhabitant spread across 150 households which is the result of an interview with the president of the Aiyetoro community youth development association in March 2013

2.2 SAMPLING METHOD

The population for this study consists of rural farming households in Aiyetoro village, Ilorin East local government area of Kwara state. The Village was subdivided into various units based on existing polling units within the village. Rural households were randomly selected from various sub-divisions of the village. These selected households which amounted to 76, was used as the sample for this study.

2.2.1 Data Collection

The data collected was tailored to get adequate information to achieve the objectives of this research work. The primary data for this study was obtained by using structured questionnaire (see appendix D). The questionnaire was divided into two sections, A and B.

Section A seeks to obtain data on the socio-economic characteristics of the rural households. The information collected includes the sex of respondents, age of respondents,

respondents' marital status, household size, educational level of household heads, occupation of household heads, total number of hours spent working in a week and the total monthly income of households.

Section B obtains information on energy use and its pattern. Information obtained includes the source of energy in households, quantity consumed per month, amount spent on cooking energy, distance covered in search of fuel, time spent in sourcing the fuel, reasons for the choice of cooking energy, constraints encountered in acquisition and usage of energy type. The level of exposure of users to the fuel usage, types of cooking space and cooking implements employed were also collected.

The questionnaires were administered by trained facilitators.

Secondary data was obtained from related literature like journals, reports and publications.

2.2.2 Data Analysis.

In the analysis of the socio-economic characteristics of households, descriptive analysis tools were employed. Descriptive statistical tools such as the frequency distribution, percentages, mean, median and mode were used to analyse households captured and results of the analysis are presented in table 1.

Similarly, in the analysis of the consumption pattern of the various energy sources and the reason for sourcing fuel from different sources, frequency distribution and percentages were employed. The result for the consumption pattern analysis was presented in table 2 while that of the reason for sourcing fuels was presented in table 3. Linear relationship was used to project the quantity of energy consumed in table 2.

Frequency distribution and percentages were also employed in the analysis of the major challenges that have to do with the use of various energy sources in farming households and the results are presented in table 4 and table 5.

Logistic regression procedure was used to estimate the models of energy use and SPSS software was used to aid the analysis.

Parameters from logistic regression model for

this study are specified as follows (Kmenta1986):

$Si = \beta Xi + Vi$ …….(1)

Where:

Si = binary energy consumption status. It takes 1 if the household uses improved (modern) sources and 0 otherwise.

β = vector of the respective parameter, which is estimated using maximum likelihood method.

Vi= error term.

In logistic regression, the probability of an

event occurring is estimated as (Norusis,

1993): $prob(event) = e^z / 1 + e^z$.....(2)

The cut-off value is 0.014 and it was calculated thus:

$$\text{Cut-off Value} = \frac{\text{Total modern energy consumed (toe)}}{\text{Total energy consumed by the household (toe)}}$$

…….(3)

In general, if the estimated probability of the event is less than the cut-off value, we predict that the event will not occur, if it is greater than the cut-off value, we predict that the event will occur. In the unlikely event that the probability is exactly cut-off value, we can flip a coin for our prediction (Norusis, 1993).

$$\text{The odds that an event will happen} = \frac{\text{Probability of event occurring}}{\text{Probability of event not occurring}}$$ .....…….(4)

z is the linear combination and expressed as

$z = \beta 0 + \beta 1X1 + \beta 2X2 + \ldots\ldots \beta pXp$ ..... (5)

For this study, the event is a household using the modern energy types

$\beta 0$ and βi are the estimated coefficient of the parameters i= 1,2,3 and 4

Xi= the in dependent variables. And they are as follows:

X1= Education status of the respondents in number of years spent in school, X2= Household size of the respondents, X3= Age of the respondents in years, X4= Totalmonthly income of the respondents, X5= Total amount spent on fuel in naira/month, X6= Distance travelled per week to obtain fuel in Km (Heltberg, 2003).

2.3 Tested hypothesis.

The study aimed at testing the following hypothesis:

NULL HYPOTHESIS, H0 : Age, Household size, Years of Education, Household income, Amount spent on fuel, Distance travelled to get fuel and Sex of fuel collector are not significant determinants for the type of cooking energy consumed

ALTERNATE HYPOTHESIS

H1 : Age is a significant determinant for the type of cooking fuel consumed.

H2 : Household size is a significant determinant for the type of cooking fuel consumed.

H3 : Years of education is a significant determinant for the type of cooking energy consumed

H4 : Household income is a significant determinant of the type of cooking fuel consumed.

H5 : Amount spent on fuel is a significant determinant of the type of cooking fuel consumed.

H6 : Distance travelled to source for fuel is a significant determinant of the type of cooking fuel consumed.

H7 : Sex of the fuel collector is a significant determinant of the type of cooking fuel consumed.

3.0 Result and Discussion

The socio-economic characteristics of the households in the study area are presented in Table 1.

Table 1: Socioeconomic characteristics of respondents

SEX	FREQUENCY	PERCENTAGE
MALE	19	25.00
FEMALE	57	75.00
TOTAL	76	100.00
AGE	FREQUENCY	PERCENTAGE
0-20	0	0.00

21-40	5	6.58
41-60	55	72.37
61-80	15	19.74
81- ABOVE	1	1.32
TOTAL	76	100.00
MARITAL STATUS FREQUENCY PERCENTAGE		
SINGLE	6	7.89
MARRIED	29	38.16
WIDOWED	34	44.74
DIVORCED	7	9.21
TOTAL	76	100.00
HOUSEHOLD SIZE FREQUENCY PERCENTAGE		
0-5	6	7.89
6-10	29	38.16
11-15	34	44.74
16- ABOVE	7	9.21
TOTAL	76	100.00
SCHOOL YEAR FREQUENCY PERCENTAGE		
0-5	53	69.75
6-10	20	26.32
11-15	3	3.95
16- ABOVE	0	0.00
TOTAL	76	100.00

HOUSEHOLD TYPE	FREQUENCY	PERCENTAGE
MUD HOUSE WITH THATCH ROOF	6	7.89
MUD HOUSE WITH ZINC ROOF	26	34.21
WOOD AND MAKE SHIFT STRUCTURE	1	1.32
BRICK HOUSE WITH ZINC ROOF	43	56.58
TOTAL	76	100.00
OCCUPATION	FREQUENCY	PERCENTAGE
FARMING	38	50.00
TRADING	29	38.16
TAILORING	7	9.21
HAIR DRESSING	2	2.63
TOTAL	76	100.00
INCOME ('000)	FREQUENCY	PERCENTAGE
0-10	43	56.58
11-20	24	31.58
21-30	4	5.26
31- ABOVE	5	6.58
TOTAL	76	100.00
EDUCATION	FREQUENCY	PERCENTAGE
NO EDUCATION	34	44.74
PRIMARY	14	18.42
SECONDARY	14	18.42

QURANIC	14	18.42
POST SECONDARY	0	0.00
TOTAL	76	100.00
RELIGION	FREQUENCY	PERCENTAGE
ISLAM	69	90.79
CHRISTAINITY	7	9.21
TOTAL	76	100.00

Appendix A contains the result of descriptive statistical analysis (mean, median, mode). Majority of the respondents (75%) in the study area are female and 25% are male. The mean age of the respondents is 54 years with 48.7 48 years and the % of the total respondents below the mean* age and 48.7% above the mean age. About 2.6% are at the mean age. The modal* age is median* age is 54 years.

The mean household size is 10. The modal household size group is 11 – 15; 44.8% of the respondents fall in this age group. About 46% of the respondents are below the mean household size and 9% are above the mean household size.

The mean monthly farm income is N14, 066; modal income is N10, 000 while the minimum and maximum income is N5, 000 and N60, 000 respectively. Majority of the respondents in the study area (50%) derive their income solely from farming and about 29% derive their income from trading, 7% from tailoring and the remaining 2% from hair dressing.

The married respondents are 61% of the total sample and 44% of the total respondents are with no form of education at all. Of those with education, 69% spent between 0-5 years in school. About 18% are with Quranic education as their highest level and just a minimal 18% attended a secondary school. None of the respondent attended any form of post-secondary education. These low literacy level (formal education) may hinder the adoption of modern energy use as well as modern agricultural production techniques.It can also be inferred that the study area is predominantly Muslim dominated as 90.8% are Muslims.

Majority (43%) lives in brick houses with zinc roofs. The respondents spent an average of 6 hours on the farm and go to farm 5 days a week on the average. The households in the study area spend an average of N11, 161 naira per month on cooking fuel.

Table 4.2: Energy types and the quantity of energy consumed

FUEL TYPE	QUANTITY CONSUMED (toe/month)**	% QUANTITY CONSUMED	FREQUENCY	PROJECTED QUANTITY CONSUMED***(toe/month)
FUELWOOD	1.730	42.28	70(92.1)	3.415
CHARCOAL	2.304	56.31	52(68.4)	4.548
KEROSENE	0.026	0.63	9(11.8)	0.051

ELECTRICITY	0.032	0.79	1(1.3)	0.064
TOTAL	4.092	100.00		8.076

*Figures in parenthesis ( ) are percentages

**Refer to Appendix B

***Projection for the entire village population

The major types of fuel consumed include: Fuelwood, Charcoal, Kerosene and Electricity. 92.1% of the respondents uses fuelwood, 68.4% uses charcoal, while kerosene and electricity are used by 11.8% and 1.3% of the population respectively. 56% of the energy consumed by the respondent is sourced from charcoal while fuelwood provides 42.28% of energy consumed. 0.63% and 0.79% of energy consumed is sourced from kerosene and electricity respectively.

With traditional energy making up 98.59% of cooking energy in the study area, it can be inferred that traditional energy is the major source of cooking energy in the study area. Despite established advantages of modern fuels over traditional fuels, which include but not limited to cleanliness and convenience, it only accounts for 1.42% of cooking energy in the study area.

The respondents advanced various reasons for sourcing their energy from various sources. These reasons are shown in Table 3

Table 3: Reasons for sourcing of fuel from different sources

REASON	FREQUENCY				
	FUELWOOD	CHARCOAL	CROP RESIDUE	KEROSENE	ELECTRICITY
AVAILABILITY	58 (82.9)	52 (85.3)	1 (100)	2 (22.2)	
CHEAPNESS	13 (18.6)	17 (27.9)	1 (100)		
CULTURE	33 (47.1)				
FASTNESS		21 (34.4)		9 (100)	
CONVENIENCE				8 (88.9)	1 (100)

*Figures in parenthesis ( ) are percentages

The respondents encounter different obstacles in obtaining the different types of energy. These obstacles are shown in Table 4.

TABLE 4: Constraints Encountered in Obtaining the Various Energy Types

CONSTRAINT	FREQUENCY			
	FUELWOOD	CHARCOAL	KEROSENE	ELECTRICITY
FAR	15 (21.1)		6(66.7)	
HARD TO CUT	10 (14.1)			
BODY PAIN	31 (43.6)			
INJURIES	6 (8.4)			
RAIN	42 (59.2)			
COST		37 (60.7)	5 (55.6)	
NIL	8 (11.3)	24 (39.3)	3 (33.3)	1 (100)

Majority, about 45% of the users of fuelwood, complain of body pain whenever they go in search of the fuel, likewise about 60% complain of difficulty in sourcing for the fuelwood especially during the raining season when it's hard for them to get to the bush and even when they can, the wood is always wet and not suitable for use. The only respondent using electricity had no difficulty in getting electricity while about 67% of kerosene users have to go a long distance in order to get the kerosene. 60% of charcoal users had challenges with the cost of charcoal while 40% just admit they had no problem whatsoever with charcoal usage.

It can thus be inferred that the use of modern fuel is not accompanied by any stress at all unlike the traditional fuels, even though kerosene cannot be gotten within the locality, locals do buy in bulk and store for usage hence reducing the associated challenge of distance. Similarly, electricity is readily available and there seems to be no challenge with accessibility.

In using the energy types obtained, households also encounter various problems. These problems are shown in Table 5

TABLE 5: Problems Encountered in the Usage of the Energy Types

USAGE PROBLEM ENCOUNTERED	FREQUENCY			
	FUELWOOD	CHARCOAL	KEROSENE	ELECTRICITY
DUST	20 (28.1)	16 (26.2)	2(22.2)	
SMOKE	68 (95.8)	50 (81.9)		
WET	40 (56.3)	41 (67.2)		
SHOCK				1 (100)
NIL		12 (19.7)	7 (77.8)	

Majority of the respondents (96%) have problems with smoke when using fuelwood, these have led in many instances to coughing as well as eye problem for the users. This situation is also true with the use of charcoal where around 82% of respondents complain of smoke. Respondents using fuelwood, charcoal and kerosene all complain of dust (dirt) which arises from storage of the fuel source as well as in its usage through the blackening of cooking utensils. About 56% of respondent using fuelwood as well as 67% using charcoal complain of them being wet and not suitable for use especially during the raining season. 78% of kerosene users have no problem with its usage while the only respondent using electricity admits he has encounter the problem of electric shock many times.

Considering the fact that women and children are the major household energy user and also considering the various domestic uses of the various energy types several issues can be inferred; the use of the traditional energy types has negative impacts on the health of the users. It may cause eye irritation, running nose, skin irritation, and difficulties in breathing,

wheezing, chest pain, abortion and even death (Grant and Angela 2010).

3.1 Factors Affecting Energy Consumption of the Rural Farming Households

To identify the factors affecting energy consumption of the rural farming households, logistic regression model was fitted. The result of the logistic model is as summarised in Table 6.

Table 6a: Summarised result of logistic regression model

Observed			Predicted		
			TYPES OF FUEL		Percentage Correct
			Traditional	Modern	
Step 1	TYPES OF FUEL	Traditional	43	23	65.2
		Modern	0	10	100.0
	Overall Percentage				69.7

a. The cut value is .014

Table 6b: Regression output table

		B	S.E	Wald	df	Sig.	Exp(B)
Step 1[a]	AGE	-.184	.125	2.187	1	.139	.832
	HH_SIZE	-1.394	.236	.486	1	.048	.248
	SCH_YRS	.005	.404	.000	1	.991	1.005
	INCOME 000	.014	.137	.011	1	.918	1.014
	AMNT_FUEL 000	-.450	.377	1.428	1	.232	.638
	DISTANCE	.014	.067	.047	1	.828	1.015
	COLLECTOR (1)	-3.108	2.245	1.917	1	.016	.045
	Constant	7.128	7.597	.880	1	.348	1246.594

a. Variable(s) entered on step 1: AGE,HH_SIZE, SCH_YRS, INCOME 000, AMNT_FUEL 000, DISTANCE, COLLECTOR.

As it follows from equation 3.5 and 3.8, the output of this study can be expressed as:

Z = 7.128 – 3.108(Collector) + 0.014 (Distance, m) -0.45 (fuel cost, N'000) + 0.014 (Household income, N'000) + 0.005 (Education) + 1.394 (Household size) – 0.184 (Age).

This equation can be used to predict the type of energy consumed by any household in the community.

Given a cut off of 0.0142 (see appendix B) for z, a household with above 0.0142 for z will likely use the modern the modern energy type and values of z below 0.0142 will use the traditional energy.

4.0 Conclusion.

This study shows that the rural households are very much dependent on traditional fuels for their cooking needs in spite of various problems associated with its usage. This attitude is traced to the availability of such fuels within and around them as opposed to modern fuels that are not readily available to them. The issue of large family size also aid the use of traditional fuel since there is always a member of the family available for the seemingly strenuous job of searching for the fuel especially the females.

5.0 Recommendation

It is hereby suggested, as a result of the findings presented in the thesis, that due to the importance of rural farmer as a major food and fibre producer, the prevailing trend of economic development with respect to the energy use type does not facilitate the actualisation of the national development plans. Hence, the need for the government to get involved in the rural energy systems so as to provide an enabling environment while ensuring that such intervention does not in anyway interfere with rural energy systems.

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APPENDIX A

STATISTICAL ANALYSIS OF SOCIO-ECONOMIC CHARACTERISTICS OF HOUSEHOLD

Table A1: Mean, median and modal values of variables

	HH_SIZE	SCH_YRS	INCOME ('000)	AMNT_FUEL ('00)	DISTANCE	AGE
N Valid	76	76	76	76	76	76
Missing	0	0	0	0	0	0
Mean	10.88	3.88	14.066	11.611	163.96	54.34
Median	11.00	5.00	10.00	13.000	26.00	54.00
Mode	14	0	10.0	14.0	26[a]	48
Minimum	1	0	5.0	2.0	0	22
Maximum	22	12	60.0	21.0	1500	82

a. Multiple modes exist. The smallest value is shown

APPENDIX B

ESTIMATED QUANTITY OF FUEL CONSUMED

FUELWOOD ENERGY CONSUMED

805 packs of fuel wood is consumed

1 pack of fuel wood = 6kg

Total mass of fuel wood = 805 x 6 = 4830kg

Energy content of wood fuel = 15MJ/kg

Total energy content = 4830 x 15 = 72450MJ

From energy conversion table: 1MJ = 2.388E-05 toe

Energy content in toe = 72450 x 2.388E-05

= 1.730 toe

CHARCOAL ENERGY CONSUMED

67 bags of charcoal is consumed

1 bag of charcoal = 48kg

Total mass of charcoal = 67 x 48 = 3216kg

Energy content of charcoal = 30MJ/kg

Total energy content = 30 x 3216 = 96480 MJ

Energy content in toe = 96480 x 2.388E-05

= 2.304 toe

KEROSENE ENERGY CONSUMED

31 ltr of kerosene consumed

Energy content of kerosene = 34.72MJ/ltr

Total energy content = 34.72 x 31 = 1076MJ

Total energy content in toe = 1076 x 2.388E-05

= 0.0257 toe

ELECTRICITY ENERGY CONSUMED

375kWh of electricity was consumed

From energy conversion table: 1kWh = 8.598E-05 toe

Total energy in toe = 375 x 8.598E-05

= 0.0322 toe

CUT-OFF VALUE

$$\text{Cut-off Value} = \frac{\text{Total modern energy consumed (toe)}}{\text{Total energy consumed by the household (toe)}}$$

From Table4.2;

Total modern energy = 0.058toe

Total energy consumed = 4.092toe

Cut-off = $0.058/4.092$

= 0.0142

APPENDIX C

QUESTIONNAIRE

DEPARTMENT OF MECHANICAL ENGINEERING,

AHMADU BELLO UNIVERSITY ZARIA

ENERGY CONSUMPTION PATTERN OF RURAL HOUSEHOLDS IN ILORIN SOUTH LG OF KWARA STATE

This questionnaire is designed to collect information on the energy consumption of rural households in Ilorin south LG of Kwara State. Strict confidentiality of all information is guaranteed.

SECTION A

Socio economic characteristics of the rural households

Please **tick (√)** appropriately where necessary.

1. Name of Local Government Area. _____
2. Name of the community._____
3. Sex of respondent (a) Male.
   (b) Female.
4. Age of respondent. _____
5. Marital status. (a) Single.

(b) Married.

(c) Widowed.

(d) Divorced.

(f) Separated.

6. Household size: Number of wives _____

Number of children: (a) Male. _____. (b) Female. _____

Number of dependents: (a) Male. _____ (b) Female._____

7. What is your level of education?

a) No education.
b) Adult literacy.
c) Quranic.
d) Primary.
e) Secondary.
f) Post secondary.

8. Total number of years spent in school. _____

9. What type of residence?

a) Mud house with thatch roof.
b) Mud house with zinc roof.
c) Wood and make shift structure.
d) Brick house and zinc roof.
e) Others (specify).

10. Kindly fill the following table:

Total number of work hour.

Occupation	Hours/day	Days/week	Monthly income
Farming			
Others (specify)			

SECTION B

Information on energy use and pattern, including the sources of energy, the factors affecting energy choice and the constraints or challenges affecting the use of energy

Kindly fill the following table to answer the questions. Please **tick (√)** the appropriate column.

11. What are the energy sources, quantity consumed, amount spent, mode of obtaining and if stored?

What are the sources of energy in your	Purchase		Searching		Others (specify)		If stored and how stored
	Qty	Naira	Qty	Naira	Qty	Naira	

household?		spent		spent		spent	yes	no
i Fuel wood								
ii Charcoal								
iii Crop residue								
iv Animal residue								
v Electricity								
vi Solar								
vii LNG								
viii Kerosene								
ix Others (specify)								

Qty = quantity of energy consumed in Kilogrammes or local measure.

2. If you search for any of these energy sources, what distance do you cover in getting each. And how many hours (time) does it take you to search for each of the energy sources you consume.

Energy sources	Distance(km)	Mode of transporting the energy home.	Time (hours)
i Fuel wood			
ii Charcoal			
iii Crop residue			
iv Animal residue			
v Electricity			
vi Solar			
vii LNG			
viii Kerosene			
ix Others (specify)			

3. How often do you collect fuel weekly? _____

4. Who collects fuel? _____

When do you collect it? (a) Day (b) Afternoon (c) Night

Why do you use each of these energy sources?

Energy sources	Reason for use				
	Availability	Cheapness	Renewable	Convenience	Others (specify)
i Fuel wood					
ii Charcoal					
iii Crop residue					
iv Animal residue					
v Electricity					
vi Solar					
vii LNG					

viii Kerosene					
ix Others (specify)					

7. Do you face any constraints in acquiring your energy types? What are these constraints and the coping strategies? What is the transportation mode?

Energy sources	List the constraints you face in the usage of energy from the following sources.	Coping strategies	Transportation Mode
i Fuel wood			
ii Charcoal			
iii Crop residue			
iv Animal residue			
v Electricity			
vi Solar			
vii LNG			
viii Kerosene			
ix Others (specify)			

18. What do you use each of these energy sources for and how many hours of the day do you use it for?

Energy sources	Use and how long it is used daily			
	Cooking (hour/day)	Heating and cooling (hour/day)	Lighting (hour/day)	Others (specify) (hour/day)
i Fuel wood				
ii Charcoal				
iii Crop residue				
iv Animal residue				
v Electricity				
vi Solar				
vii LNG				
viii Kerosene				
ix Others (specify)				

19. What types of cooking space have you in your house?

a) Built-in kitchen
b) Outside in open air (indicate if in front or at the back of the house)
c) Kitchen detached from the main house
d) Kitchen yard
e) Inside room
f) Corridor (passage inside the building)

20. What type of stove do you use? a) Three stone.

b) Kerosene stove

c) Coal pot

d) Improved stove

e) Electric Stove

f) Others (specify)

21. Does the energy type you consume affect the type of food you consume? (a)Yes (b)No

22. Give reasons for your answer. _____

23. Do you encounter any problem in the use of any of the energy sources? Tick (√)

	What are the Problems you encounter in the use of the energy									
Energy sources	Smoke	Dust	Flame	Shock	Injuries	Rain	Body pain	Far distance	Others (specify)	No Problem
i Fuel wood										
ii Charcoal										
iii Crop residue										
iv Animal residue										
v Electricity										
vi Solar										
vii LNG										
viii Kerosene										
ix Others (specify)										

24. Do you change the use of energy seasonally? (a) Yes (b) No

25. Give reasons for your answer. _____

26. What is the percentage increase in prices of energy sources in the year, 20011 compared to 2013?

Energy sources	Change (%)
i Fuel wood	
ii Charcoal	
iii Crop residue	
iv Animal residue	
v Electricity	
vi Solar	
vii LNG	
viii Kerosene	
ix Others (specify)	

27. Has the increase or decrease in price affected in any way the consumption of household energy? Please state the effects.

_____

28. What are the Local or State government interventions in household energy issues in your area? _____

29. And are you satisfied with the interventions? (a) Yes (b) No

30. What are the interventions from other organizations (non-governmental, private organizations)? _____

31. Are you satisfied with the intervention? (a) Yes (b) No

What do you think or feel should be done to improve your condition in terms of energy issues (including sources and types).

_____