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Investigation of Energy Choice of Household Use in Mikang LGA of Plateau State, Nigeria

EKHUEMELO, D.O., GAKLIME, T. R. AND OKOCHI, A.E.

Department of Forest Production and Products, University of Agriculture Makurdi,Benue State, Nigeria.

ABSTRACT

The study assessed household energy utilization in Mikang Local Government Area of Plateau State. Mikang Local Government was purposively selected in Plateau State for the study. Among the 4 Districts in Mikang LGA, 30% of the towns/villages (12) including the District Headquarters were selected by simple random sampling out of the 36 towns/villages. In each of the towns/villages 15 households were randomly selected and 15 copies of questionnaire were administered to each household head to elicit information on sources of energy for domestic use. Data obtained was analyzed with aid of descriptive statistics such as tables, percentages, charts and figures. Results showed that firewood (62.2%) was the highest singled used energy source in the Mikang LGA while electricity and gas (3.3%) respectively was the least. Some respondents combined two energy as firewood and charcoal (57.8%), charcoal and kerosene (20.6%), firewood and kerosene (12.2%) and electricity and kerosene (1.1%). Preference of energy sources indicated that firewood (59.4%) was the most preferred energy source followed by charcoal (21.1%), kerosene (1.7%), electricity (3.9%) and sawdust stove (1.1%). The reasons for energy use were domestic (9.2%), business (6%), domestic and business (3.9%), others (1.7%) and for domestic and other (1.1%). 53.3% of respondents spent between ₦ 600 and ₦ 1,000 on energy per week. Global warming (13.3%), pollution (24.4%), domestic hazards (14.4%), health problems (33.9%) and global warming and pollution (0.6%) were indicated as environmental implications of burning by respondents. Firewood was found to be the most preferred energy source for domestic purposes among the rural households followed by charcoal, kerosene, electricity and sawdust/stove. This therefore calls for aggressive afforestation in Mikang LGA of Plateau state.

Keywords: *Energy, firewood, charcoal, forest, preference, kerosene*

1. INTRODUCTION

Energy and fuel use are important for the welfare of households in developing countries. Using an energy source for lighting and cooking is essential to human life and part of what first defined the human race as separate from animals in pre-historic times [1]. Purchase of energy claims a substantial portion of poor people's budgets, and collection of cooking fuels often absorbs a significant amount of time for women and children. Clean cooking fuels are important for combating the high levels of indoor air pollution encountered whenever traditional solid fuels are used for cooking or heating.

Household fuels constitute energy sources used for domestic cooking, space heating and lighting, but, according to [2] excludes fuels for transportation. Many of the different types of households' fuels in use in developing countries come under the category of "traditional", which include animal dung and agricultural residues, as well as wood fuel. Wood fuel, in the view of [3], comprises of charcoal, firewood and other wood-derived fuels; and also constitutes the most important form of non-fossil energy used in households [4].
In the urban areas, a wide selection of household fuels and equipment is available for use. Of all sectors, the household sector experiences the most pronounced changes in its pattern of fuel use over time. Typically, a household may shift from biomass to kerosene, gas, and finally to electricity for specialized cooking. This shift phenomenon is often referred to as 'fuel transition' from traditional (biomass-based) to modern household fuels [5]. Also, even within the biomass-based fuel, there is a shift from one to another.

For a number of developing countries, including Nigeria, issues relating to household energy choice and transitions are important from a policy standpoint. Efforts at encouraging households to make institutions that will result in more efficient energy use and less adverse environmental, social and health impacts are advocated in many of these countries. To achieve this requires research and analysis of the factors affecting household energy choices and use. Despite a major shift in the use of household energy, many households rely solely on charcoal as their primary source of cooking energy, especially in urban areas [4].

The popularity of the transition to charcoal was brought to the fore following the acute scarcity of firewood and kerosene as well as their exorbitant prices. [6] reports that the kerosene scarcity led to the invention of *Abacha Coal Pot* - a locally made stove that use charcoal. Over the years, the cooking technology of the coal pot became widely accepted and used. Also, the high initial investment cost of kerosene stove, gas and electric cookers, coupled with low generation, and cost of electricity discouraged the use of alternative fuels in favour of charcoal. Because of these, African ministers on African preparatory conference for the World Summit on Sustainable Development in 2001, submitted that at least 80% of African population continues to depend on traditional biomass fuels charcoal and firewood) for their energy needs [4].

The use of clean cooking fuels can also have positive effects on the external environment by reducing outdoor air pollution from venting of kitchen smoke as well as by combating forest degradation; collection of wood for firewood or charcoal production is thought to contribute to forest degradation in certain locations, especially near cities and major roads [7].

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Modern fuel and energy use can improve productivity in numerous ways, for example by re-directing scarce labor, biomass and land resources away from fuel collection and production towards agricultural and other uses.

In Mikang Local Government Area of Plateau State, urbanization and economic development are bringing about changes in consumption patterns, which in turn are leading to major changes in the household energy sector. A pronounced shift from petroleum products to firewood and charcoal in the area has raised some concerns, as witnessed in the increase in the number of traders on charcoal, charcoal shops, as well as charcoal users. The real effect of this problem is that the government's understating of household fuel sector in the area is minimal, and the ability to predict and plan household fuel agenda is woefully inadequate.

Attempts at such studies at the national level have been based on estimates, which are usually generalized. This implies that the factors that drive this household energy shift to charcoal are complex and location-specific. These factors should therefore be identified to serve as a basis for formulating a sustainable household fuel agenda, as well as to allow for the design of site-specific strategies and programmes to address wood development issues in the state.

The aim of the study was to assess the main source and combination of energy use for domestic purposes in Mikang LGA; evaluate energy preference and factors limiting energy use for domestic purposes in Mikang LGA; to appraise the cost of energy used for domestic purposes in in the study area and to evaluate awareness of environmental implication of burning biofuel in the study area.

2. MATERIALS AND METHODS

2.1 Study Area

Mikang is a Local Government Area (LGA) in Plateau State, Nigeria as showed in figure 1and 2. Its headquarters is in the town of Tunkus. It is located between Latitude $9° 0′ 0″$ N, and Longitude $9° 35′ 0″$ E. It has an area of 739 km² and a population of 97,411 at the 2006 census. Annual rainfall in Plateau State varies between 750 mm and 1500 mm although this is not distributed on a north-south gradient.

The lowest rainfall is in the east around Bashar, and the highest is in the south and west of the Plateau in the region adjacent to Kaduna State. The length of the rainy season varies from 160 days in the north to 220 days along the Benue River. Otherwise, Plateau State is not well supplied with groundwater, and the main affluent of the Benue River that cross it, the Dep and the Mada, can fail at the height of the dry season [8].

3. METHODOLOGY

This study used the household survey research method as the study design, as it deals with the relationship between variables as well as the development of generalizations that have universal validity [9 -10]. Also a questionnaire was designed as the research tool to elicit information from the respondents on household socio-economic characteristics as they relate energy use in the household
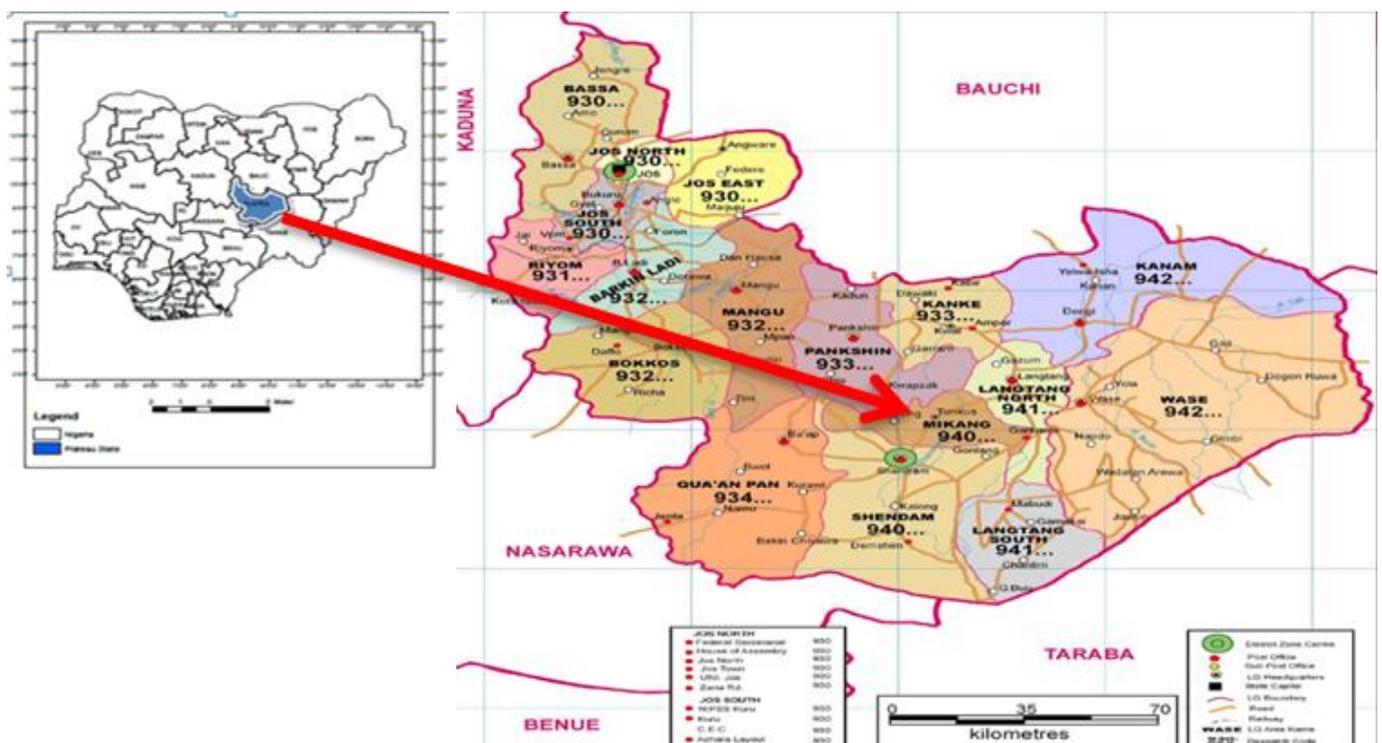
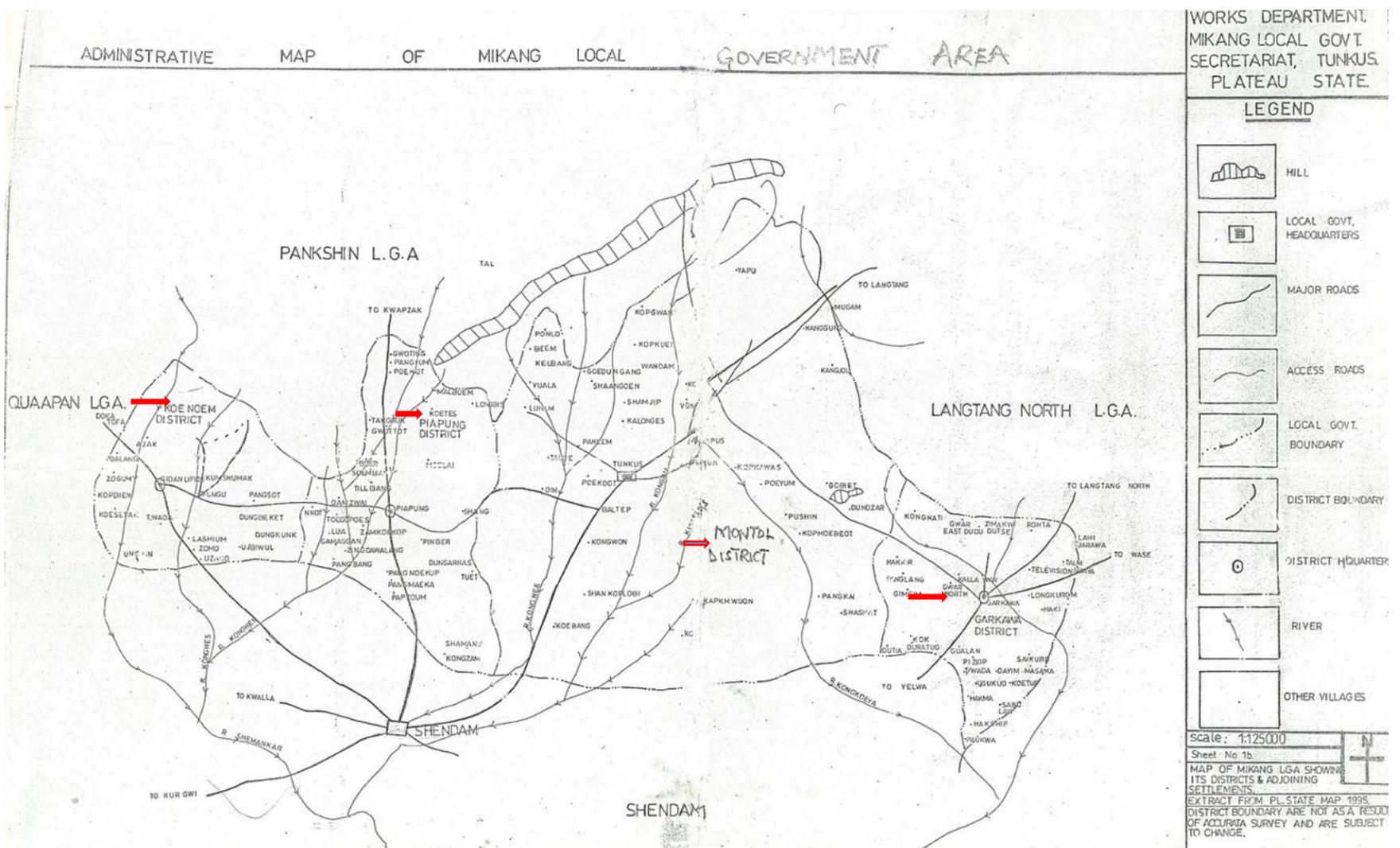**Source: [11]. Fig. 1: Map of Nigeria indication Plateau State**

Fig. 2: Map of Mikang Local Government Area indicating the four (4) Districts.

➡ **Districts in Mikang LGA**

3.1 Sampling Techniques

Mikang Local Government was purposively selected in Plateau State for the study. Among the four (4) Districts in Mikang LGA, 30% of the towns/villages which was about twelve (12) including the District Headquarters were selected by simple random sampling out of the thirty six (36) towns/villages. In each of the towns/villages fifteen (15) households were randomly selected and fifteen (15) copies of questionnaire were administered to each household head to elicit information on sources of energy for domestic use. This questionnaire was semi-structured in order to accommodate qualitative and quantitative information. The questionnaire consist of two sections, the first section contain questions on demographic information while the second bordered energy use in the study area.

3.2 Survey Procedure

A sample size of 180 respondents from 12 villages was selected was purposively chosen. Primary data were collected through household surveys with the aid of questionnaire. The adult male or female of the household was interviewed using a questionnaire consisting of both open- and closed-ended items. The study involved a socio-economic survey among rural households to explore their domestic energy use, types of difficulties during collection, whether they buy domestic energy or not; the reasons for the use of a particular domestic energy domestic energy preferences and awareness of environmental implication of burning energy.

3.3 Data Analysis

Descriptive statistics such as tables, percentages, charts and figures were used to present data obtained from the study.

4. RESULTS AND DISCUSSION

4.1 Demographic characteristics of Respondents

Demographic characteristics of respondents in the study area are presented in the Table 1. Respondents' gender was 57.8% female and 42.2% males. The religion of the respondents were Christian (80.6%), Islam (11.1%), traditional (6.7%) and other (1.7). The predominate occupation of respondents was civil service (41.1%) followed by Schooling (18.9%) and Farming (29.4%). The highest educational level of respondent was 38.9%, while primary (13.3%) education was the least. The highest marital status of the respondent was married 60.6% while the least (3.3%) were separated.

Table 1: Demographic characteristics of Respondents

Variables	Frequency	Percent (%)
Gender		
Male	76	42.2
Female	104	57.8
Total	180	100.0
Religion		
Christian	145	80.6
Islam	20	11.1
Traditional	12	6.7
Others	3	1.7
Total	180	100.0
Occupation		
Civil service	74	41.1
Schooling	34	18.9
Farming	53	29.4
Business	13	7.2
Private	4	2.2

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Variables	Frequency	Percent (%)
Gender		
Male	76	42.2
Female	104	57.8
Others	2	1.1
Total	**180**	**100.0**
Educational level		
Non formal	40	22.2
Primary	24	13.3
Secondary	46	25.6
Tertiary	70	38.9
Total	**180**	**100.0**
Marital status		
Married	109	60.6
Single	53	29.4
Widow(er)	12	6.7
Separated	6	3.3
Total	**180**	**100.0**

Source: Field survey, 2015

Table 2 shows single use of energy source in the study area. It was observed that firewood (62.2%) was the highest singled used energy source in the Mikang LGA while electricity and gas (3.3%) respectively was the least. Table 2 also shows combined use of two energy sources in the study area. Firewood and charcoal (57.8%) was the highest, followed by charcoal and kerosene (20.6%); firewood and kerosene (12.2%) while electricity and kerosene (1.1%) was the least.

Table 2: Use of energy sources in Mikang LGA

Variable	Frequency	Percent (%)
One use of energy source		
0	2	1.1
Electricity	6	3.3
Fuel wood	112	62.2
Coal	34	18.9
Kerosene	20	11.1
Gas	6	3.3
Total	**180**	**100.0**
Combination use of energy sources		
Variable	**Frequency**	**Percent (%)**
No response	15	8.3
Fuelwood and charcoal	104	57.8
Fuelwood and kerosene	22	12.2

Variable	Frequency	Percent (%)
One use of energy source		
0	2	1.1
Electricity	6	3.3
Fuel wood	112	62.2
Coal	34	18.9
Kerosene	20	11.1
Gas	6	3.3
Charcoal and kerosene	37	20.6
Electricity and kerosene	2	1.1
Total	**180**	**100.0**

Figure 3 shows order of preference for the energy sources in the study area. The result indicated that firewood (59.4%) was the most preferred energy source followed by charcoal (21.1%), kerosene (1.7%), electricity (3.9%) and sawdust stove (1.1%) as the least preferred.
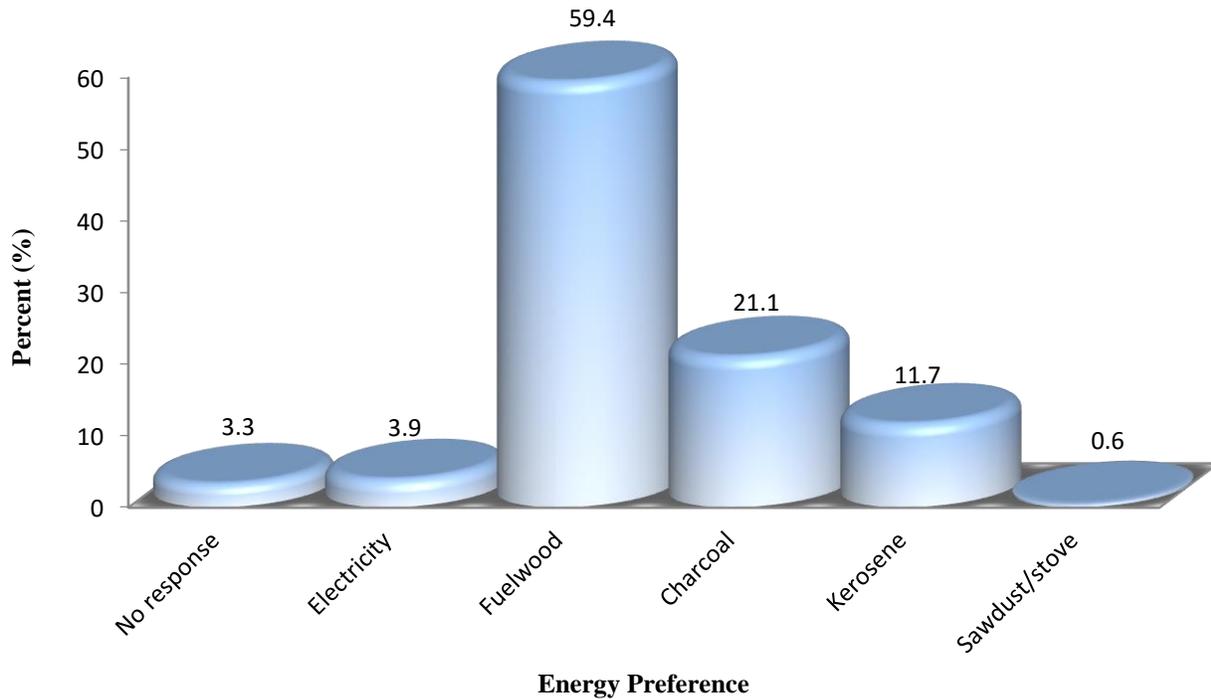

Fig. 3: Order of preference for the energy sources

Table 3 shows the reasons for preference for a particular energy source for domestic use. The results indicated that cost effective (65.6%) was the major reason for preference for domestic energy use in the study area while 34.4% asserted that convenience was responsible for their choice of energy.

Table 3: Reasons for Preference for a particular energy source for domestic uses

Reasons for Preference	Frequency	Percent (%)
Convenience	62	34.4
Cost effective	118	65.6
Total	**180**	**100.0**

Source: Field survey, 2015

Sources of collection/purchase of energy of domestic energy in the study area are shown in Figure 4. 81.7% of the respondent asserted that forest was their source of energy, 11.7% said the purchase their energy in the market and 6.7% of the respondent reported they buy at the filling station.
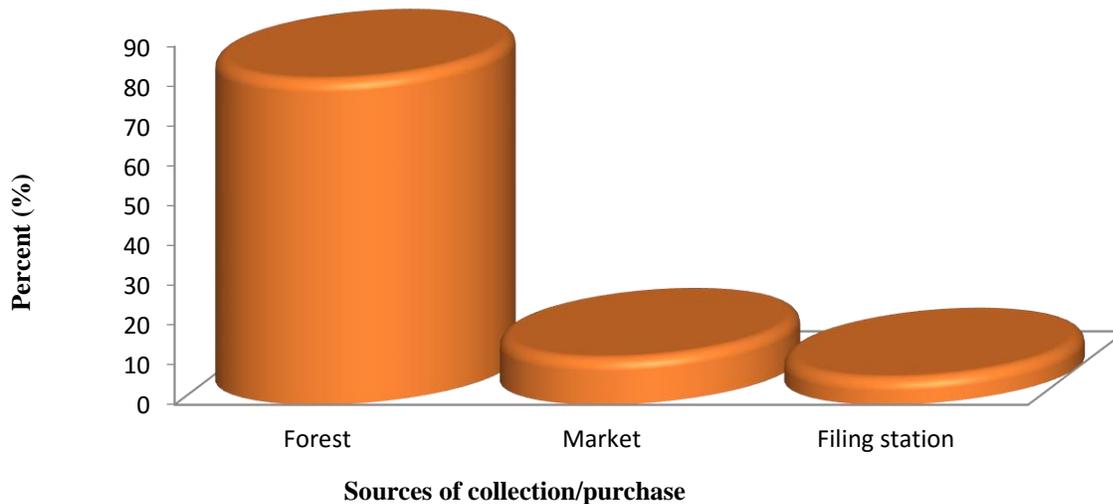

Figure 4: Sources of collection/purchase of energy of domestic energy

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Table 3 shows areas of domestic use of energy sources in the study area as reported by the respondents. Their result reveals that 9.2% use energy for domestic purposes, 6% use energy for business, 3.9% use energy for domestic and business, 1.7% use energy for other purposes and 1.1% use energy for domestic and other uses.

Table 3: Areas of domestic use of Energy

Area of energy use`	Frequency	Percent (%)
Domestic	167	92.8
Business	1	.6
Others	3	1.7
Domestic and business	7	3.9
Domestic and others	2	1.1
Total	**180**	**100.0**

Source: Field survey, 2015

Figure 5 shows type of major energy used for domestic purposes in the study area. It was observed that fuelwood (68%) was the highest followed by charcoal (21%) and kerosene (11%).
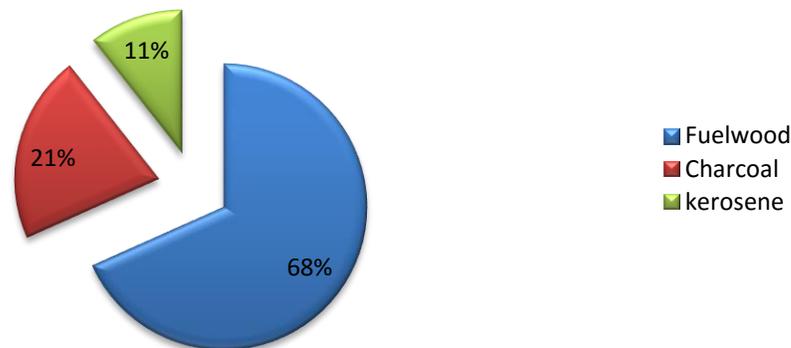

Figure. 5: Major types of energy used for domestic purposes in the study area

Table 4 shows frequency of use of household energy in the study area. It was observed that 80% of respondents used energy in the morning, afternoon and evening; 11.7% used energy in the morning and evening; 7% of respondents were not frequent using energy and 1.1% used energy on in the morning hours.

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Table 4: Frequency of use of household energy

Frequency of Energy Use	Frequency	Percent (%)
Morning, afternoon and evening	144	80.0
Morning	2	1.1
Not frequent	13	7.2
Morning and evening	21	11.7
Total	**180**	**100.0**

 Source: Field survey, 2015

Factors that influence preferred energy type in the study area as reported by respondent are presented in table 5. 52.8% of the respondents attributed the factor to seasonal variation, 22.8% to scarcity or availability of petroleum products and 8.9% said it was Government policy.

Table 5: Factors influencing preferred energy type

Factor	Frequency	Percent
No response	28	15.6
Seasonal Variation	95	52.8
Government policy	16	8.9
Scarcity of petroleum products	41	22.8
Total	**180**	**100.0**

 Source: Field survey, 2015

Results on accessibility to preferred energy type for domestic use in the study area are presented in the table 6. Most respondents 58.3% claimed that accessibility of energy for domestic purposes was easy and convenience, 27.8% of respondents asserted that accessibility was very difficult, 2.2% believed accessibility was patricianly difficult and 11.7% said accessibility of energy for domestic use was difficult.

Table 6: Factors responsible for preferred Energy types

Accessibility	Frequency	Percent (%)
Easy and convenient	105	58.3
Very Difficult	50	27.8
Partially difficult	4	2.2
Difficult	21	11.7
Total	**180**	**100.0**

Source: Field survey, 2015

Challenges faced in accessing preferred domestic energy sources in the study area are presented fig. 6. The results from respondents show that distance covered (45%) to access energy was the highest encountered by the respondents followed by cost of transportation (32%) and availably (23%) as the least challenge.
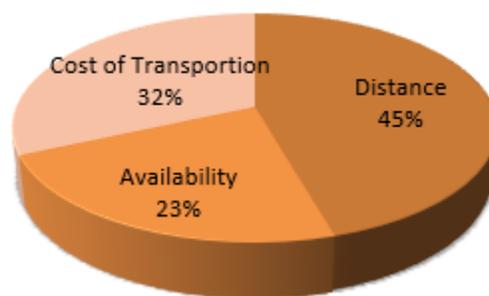

Fig. 6: Challenges in accessing preferred domestic energy sources

Table 7 shows estimated cost of energy use per week as reported by respondents in the study area. 17% of respondents spent between ₦ 0 and ₦ 500; 53.3% of respondents spent between ₦ 600 and ₦ 1,000; 25% of respondents spent between ₦ 1,100 and ₦ 1,500, 6.7% of respondents spent between ₦ 1,600 and ₦ 2,000, 0.6% of respondent spent between ₦ 2,100 and ₦ 2,500 and 5% of respondents spent between ₦ 2, 600 and ₦ 3,000 respectively on energy per week in the study area respectively.

Table 7: Estimated cost of energy per week

Cost Energy (₦ :K)	Frequency	Percent (%)
0 - 500	17	9.4
600 – 1,000	96	53.3
1,100 – 1, 500	45	25.0
1,600 – 2,000	12	6.7
2,100 – 2,500	1	0.6
2,600 – 3,000	9	5.0
Total	**180**	**100.0**

Source: Field survey, 2015

Results on awareness of environmental implication of burning energy by the respondents are showed on table 8. 87.8% of the respondents sampled asserted that they were aware that burning energy has environmental implication while 12.2% of the respondents said they were not aware that burning energy has environmental implication.

Table 8: Awareness of environmental implication of burning energy

Variable	Frequency	Percent (%)
Yes	158	87.8
No	22	12.2
Total	**180**	**100.0**

Source: Field survey, 2015

Results on the awareness of the type of environmental implications of burning energy by the respondents are presented on table 9. The result shows that respondents were aware of the following environmental implications: global warming (13.3%), pollution (24.4%), domestic hazards (14.4%), health problems (33.9%) and global warming and pollution (0.6%).

Table 9: Awareness of the type of Environmental implications of burning energy

Environmental implication	Frequency	Percent (%)
No response	24	13.3
Global warming	24	13.3
Pollution	44	24.4
Domestic hazards	26	14.4
Health problems	61	33.9
Global warming and pollution	1	0.6
Total	**180**	**100.0**

Source: Field survey, 2015

5. DISCUSSION

The aim of this study was to assess household energy utilization in Mikang Local Government Area of Plateau State. The study indicated that female use energy for domestic purpose than men in the study area. This was expected because, traditionally, women were more involved in cooking for the household, running restaurant, selling cooked and fried food along the road. This conforms to [4] who reported that women are better managers of kitchen items (including charcoal) than men, where they are the main actors. Conversely, this is at variance with a study by [12] in Ethiopia, where charcoal consumption was higher in male-headed households than female-headed households.

Wood is one of the oldest sources of energy and commonest service material known to man and has been used for over 500 000 years [13]. This study revealed that firewood was the most single used energy source in the study area followed firewood and charcoal as combined energy use. This supports the assertion of [14] that firewood as a source of energy plays a vital role in household energy requirements.

It was also observed that among the various form of energy source available in Mikang LGA, the respondents preferred firewood to any other source of energy. This invariably implies that the major source of this energy if the forest which was similarly revealed in the results. This again confirms [13-14] that firewood as a source of energy plays a vital role in household energy requirements.

Felling down of trees and shrubs by households due to unrestricted access and the desire (preference) to cook with firewood imply that the fertility of soil will drop because the trees and shrubs will no longer be there to perform their natural roles. It will also accelerate soil degradation and create desert-like conditions [15].

To portray the extent of deforestation in Nigeria, a study conducted by [16] in the Northern Nigeria indicated that the annual deforestation of woodland ran to about 93, 000 km while Nigeria, as a country, consumes 50-55 million cubic meters of woods annually. This according to [14] approximately reflects accessibility and preference of households to forest resources. This has to be addressed because the over reliance on traditional energy sources according to [17] leads to low level of energy efficiency, deforestation and biodiversity loss among other things.

The major factors limiting energy use for domestic purposes in Mkang LGA was distance. This was expected since the major a source of energy in the area was firewood. Women and children would have to go far and wide into the forest in search of firewood for those who could have the cash to buy. Most respondents spent between ₦ 600 and ₦ 1,000 every week on domestic energy consumption. That is about an average of ₦ 800 per week. In a Month, ₦ 3,200 would have spent on domestic energy alone in a hold.

6. CONCLUSION

Firewood was found to be the most preferred energy source for domestic purposes among the rural households followed by charcoal, kerosene, electricity and sawdust/stove. Serious efforts therefore must be made by Government at all levels,

forest and energy stakeholders to mitigate the pressure on the forest and its effects as result of biomass as the major source of energy for domestic purposes in Mikang Local Government of Plateau state.

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