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ASSESSMENT OF DOMESTIC ENERGY USE BY SOME HOUSEHOLDS IN JOS NORTH LOCAL GOVERNMENT AREA OF PLATEAU STATE, NIGERIA

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ABSTRACT
Assessment of the major energy use for domestic purpose by some households in Jos North Local Government Area of Plateau State, North Central Nigeria was conducted in order to know the best energy option. Two thousand (2000) questionnaires were administered in four study sites which includes *Bauchi Road, Nasarawa Gwom, Congo Russia* and *Rikkos* with each site having 100 questionnaires per year for a period of five years (2005, 2006, 2007, 2008 and 2009). Percentages and ranges were used in analyzing the data. The result shows that, (531:26.6%) of respondents from the four (4) study sites used fuel-wood majorly, followed by charcoal (453:22.7%), kerosene (285:14.3%) and the least was gas (127:6.4%). However, the result from the possible combinations of the four energy sources indicated that majority of the respondents use fuel-wood and charcoal (209: 10.5%), followed by kerosene and charcoal (171:8.6%). However, fuel-wood and gas is the least (59:3%) followed by gas and charcoal (96: 19.2%). On the use of each of this fuel, respondents from Rikkos were highest (198:40%) in fuel-wood use, followed by Congo Russia (139:28%). However, Bauchi Road has the smallest number of respondents (83:17%) followed by Nasarawa Gwom with (111:22.2%). This indicates that the closer people are to their natural environment, the more dependable they are on the environment. In order to know the most desired tree species for fuel-wood and for conversion into charcoal; samples of charcoal were collected from market for identification. The result shows that common tree species for commercial and home fuel-wood were obtained from plant species including *Prosopis africana, Eucalyptus calmandulensis, Acacia sp, Gmelina aborea, Pilostigma recticulatum, Tectonia grandis, etc.*

KEY WORDS: Energy, Biomass, Fuel-wood, Charcoal, Jos, Domestic use and *Prosopis afrana.*

INTRODUCTION

Energy is the material basis upon which human beings rely and carry out almost all the daily activities. Man therefore depends hugely on fossil and biomass energy sources for survival. It is important to note that as prices of fossil fuel soar, and biomass is used overtly without any significant sustainable approach, the environment is stressed, degraded and all forms of pollution are correspondingly heightened. Essentially, human beings use different forms of energy for domestic and industrial uses including cooking, lighting, and heating. Energy is therefore very necessary in meeting the most basic needs of individuals and thus can be accepted as a prerequisite for good health (Mwewa and Shabbir, 2011). Providing clean and affordable energy for households in developing countries is a right step in the direction of poverty alleviation (Ekholm *et al*., 2010). Although, fossil fuels is a reliable source energy it has a finite supply, highly unstable market price and of devastating environmental concern. Fossil fuels do not emerge as the lone solution for the world's future energy needs. As the world's population increases, the demand for energy increases, thus there is an urgent need for alternative energy to fossil fuel. Lately there has been increased interest and research in the bioenergy sector for development of new, long-term energy sources. Bioenergy is a broad classification of energy production methods which utilize the physical and chemical properties of biomass - renewable plant-derived organic matter (Daron, 2008). Biomass has two properties that make it unique among all renewable energy sources – it covers the entire energy portfolio (heating/cooling, electrical power and fuels) and there is no storage problems associated with it (Walter, 2011).

In Nigeria, biomass is the major energy source contributing about 78 % of the primary energy supply. Sources of this energy include agricultural crops, wood, charcoal, grasses, shrubs, residues and wastes of municipal, industrial, and aquatic biomass origin (Edirin *et al.*, 2012). Biomass and has been burned for thousands of years for heating and cooking. Fuel-wood includes products such as wood, sawdust and bark that has not been chemically treated or finished. It can be obtained from number of places such as forest, saw mills and timber merchants in the form of logs, sawdust, woodchips, wood pellets and briquettes. The lower the moisture content the better the calorific value of the wood product as a fuel (BFAT, 2006).

In this study, some available energy sources (fuelwood, charcoal, kerosene, cooking gas and possible combination of all the four energy sources) were used to assess the energy use for domestic purposes by some households in Jos North Local Government Area of Plateau State, Nigeria. Fuel choice is directly linked with the socio-economic status of the county. Traditional fuel sources are

cheap and sometimes free of cost whereas commercial and other fuel source demand high investment to use it as an energy source.

METHODOLOGY

This study was carried out in Jos North Local Government Area in Plateau State, North Central, Nigeria. The Local Government has an area of 291 km² and a population of 429,300 as reported in the 2006 National Population Census. The city is located on the Jos Plateau at an elevation of about 1,238 metres / 4,062 feet high above sea level. It enjoys a more temperate climate than much of the rest of Nigeria (average monthly temperatures range from 70° to 77°F or 21° to 25°C).

Two thousand (2000) questionnaires were administered in four study sites that include Bauchi *Road, Nasarawa Gwom, Congo Russia* and *Rikkos* with each site having 100 questionnaires per year for five years 2005, 2006, 2007, 2008 and 2009, between the months of March and August. Percentages and ranges were used to analyze the data. The areas are densely populated mainly with average income earners.

During the study period, one-hundred nuclear households were purposively selected, which contained an average of four to six household members. Structured interview Schedule was used to collect information on the socioeconomic characteristics of the respondents, while a chart was designed to collect information on the fuel type(s) daily used for cooking food.

RESULTS

The result as shown in Table 1 and Fig 1 below indicated that (531:26.6%) of respondents from the four study sites used fuel-wood majorly, followed by charcoal (453:22.7%), kerosene (285:14.3%) and the least was gas (127:6.4%).

TABLE 1: Domestic energy use in the study sites

Study Sites	f	c	k	g	f+g	f+c	g+k	g+c	k+c	Total
Rikkos	198	113	62	5	14	50	11	16	31	500
Congo Russia	139	128	61	20	12	57	11	24	48	500
Bauchi Road	83	94	80	65	17	50	21	37	53	500
Nasarawa Gwom	111	118	82	37	16	52	26	19	39	500
Total	531	453	285	127	59	209	69	96	171	2000

Hints : f = fuel-wood, c = charcoal, k = kerosene, g = gas

The result from the possible combinations of the four energy sources indicated that majority of the respondents use fuel-wood and charcoal (209: 10.5%), kerosene and charcoal (171:8.6%), gas and charcoal (96: 19.2%), fuel-wood and gas is the least (59:3%) see figure 1 below. The most desired tree species for fuel-wood and for conversion into charcoal were obtained from *Prosopis africana* and *Eucalyptus calmandulensis*. Charcoal from *Prosopis Africana* was observed to be on a high demand.

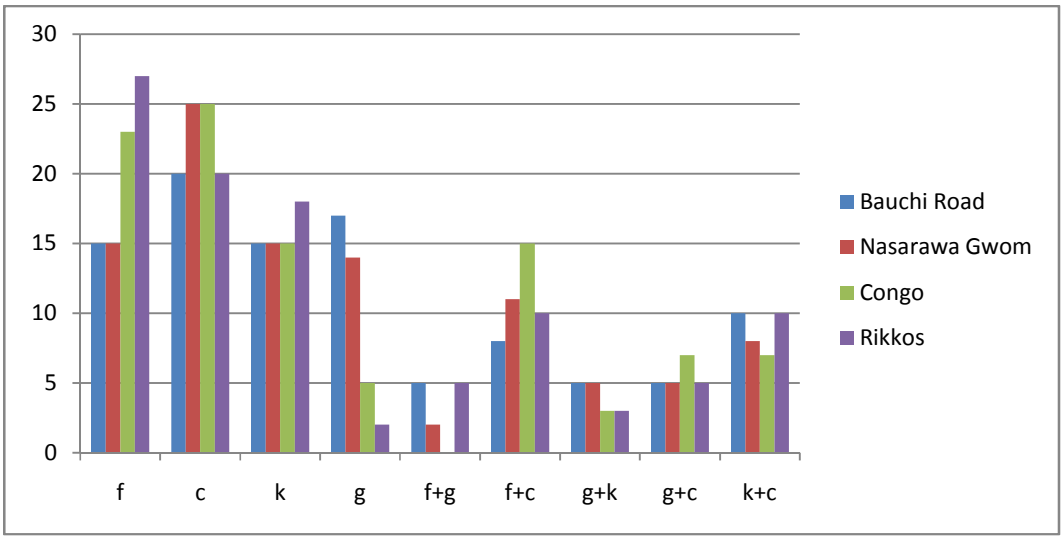

Fig 1: Domestic energy use in the study sites

DISCUSSION

Fuel-wood is the most common and widely used domestic renewable energy resource in rural Nigeria and especially by low income groups in the urban areas. Though, the world is chatting a course towards the use of solar and nuclear energies for domestic purposes, most developing countries have a long way to this point, there is need therefore to work on what is available abundantly to make life comfortable for people before arriving there. Sufficient efforts must be geared towards improving the energy type, biomass that is accessible. The fuelwood and charcoal industries must be developed. Charcoal and firewood will continue to be the primary energy sources for many households and will continue to dominate the energy sector in both the short and long term perspectives. The government must emphasize that charcoal and

firewood should be produced from the sustainably managed plantations and to take immediate actions over the illegal harvesting of forest resources (Mwewa and Shabbir, 2011). People should be educated on diverse biomass resources and their potential in generating clean and affordable energy both for households as well as small scale industries.

Charcoal, which is produced by heating wood or other organic substances, is traditionally used as a fuel, filter and absorbent and has become very popular for domestic use in cooking by many households which explains why the production has become a thriving business. Charcoal became even more popular with the increasing price of kerosene which many average women could barely afford and therefore resorted to using it for cooking in metal cookers made by welders. With the rising number of households using charcoal, the traders have made fortunes through the proceeds from processing and production of charcoal.

CONCLUSION

Biomass energy provides an attractive alternative to fossil fuels, in developing countries, as it readily available and when properly managed the resource is renewable and has little adverse environmental impact. Making biomass available can, therefore, create jobs in rural areas and help stem rural-to-urban migration. Firewood and charcoal were the most frequently used biomass fuel. Incomplete combustion of biomass in the traditional cooking stove poses severe epidemiological consequences to human health and contributes to global warming; improving the design of the cooking stoves can help to reduce such consequences.

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