ISSN-L: 2223-9553, ISSN: 2223-9944
Vol. 4 No. 6 November 2013

PEOPLE'S AWARENESS AND ATTITUDE ON BIOGAS AS AN ALTERNATIVE DOMESTIC ENERGY IN URBAN KANO

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ABSTRACT

The ever-increasing demand for energy to meets domestic requirement and the lack of environment-friendly alternatives have devastating effect on the environment. Observation shows that many studies have been conducted in search of renewable energy sources that can mitigates against the negative consequences of using fuels that have an adverse effect on the environment; these include fuel-wood/charcoal which are commonly used in a majority of house-holds. The studies on the environment-friendly alternatives include those on a biogas as an energy source. This study assessed people's perception and attitude on biogas as an alternative domestic fuel in Urban Kano. The methodology used was primary (questionnaire) sources of data and descriptive statistics was used to present the outcome of the questionnaire survey. 150 respondents were used in five areas (Fagge, Yakasai, Gwauron Dutse, Soron Dinki, and Gwale). The findings show that less than 50% of the respondents were willing to adopt biogas as an alternative cooking fuel while a slightly higher percentage were willing to adopt it for other domestic purposes such as heating, lightning and ironing.

Keywords: Biogas, peoples perception, fuel wood, domestic energy, Kano metropolis

INTRODUCTION

Energy is one of the three most essential requirements for sustainable development; the other two being water and land (Barau, 2006). It is needed on daily basis for various activities which cover both industrial and domestic requirements. The domestic energy requirements cater for activities such as cooking, heating, lighting and other similar domestic chores. Biogas is the mixture of methane and carbon dioxide produced by bacterial degradation of organic matter and used as a fuel (The American Heritage® Dictionary of the English Language 2000).

According to the University of Florida, biogas is the gaseous emissions from anaerobic degradation of organic matter (from plants or animals) by a consortium of bacteria. Biogas is principally a mixture of methane (CH_4) and carbon dioxide (CO_2) along with other trace gases. Methane gas, the primary component of natural gas (98%), makes up 55-90% by volume of biogas, depending on the source of organic matter and conditions of degradation. Biogas is produced in all natural environments that have low levels of oxygen (O_2) and have degradable organic matter present. These natural sources of biogas include: aquatic sediments, wet soils, buried organic matter, animal and insect digestive tracts, and in the core of some trees.

The choice of energy sources to choose from depends largely on a family's level of income, size, and enlightenment on the various energy types available; for example, most people rely on electrical energy for domestic chores such as heating, ironing, cleaning, and etcetera,

however due to the epileptic nature of electricity supply; people are forced to seek for alternative sources of power to meet the requirements. For instance the use of power generating sets to light homes, heat, iron, etcetera or that of using local charcoal-iron to iron laundry in the absence of electricity.

The sources of domestic energy include electricity, gas, kerosene, solar, and etcetera.

However, Lekule (2001) noted that biomass is the main source of energy for domestic use in Africa. There is a trend of over-dependence on biomass for fuel, and fuel wood is widely consumed in Kano city and rural areas which is having a detrimental effect on most densely populated areas in the state Ahmad, (2006).

Out of several domestic energy sources to choose from, fuel-wood happens to be the popular choice. This can be attributed to the purchasing power of the majority of people living in the study area, and thus opting for fuel wood as a major domestic energy source. Ahmad (2006) noted that, the ever increasing demands for fuel wood to meet up energy requirements has made most parts of Sudano-Sahelian Nigeria under the threat of deforestation, and the catalysts of deforestation include lack of effective alternative options for energy for the majority of the people. Researchers such as Barau (2006), Ahmad (2006), and Cotthem (2010); identified lack of alternative as the main reason that forced many households to adopt biomass or fuel wood to meet up domestic energy requirements. Barau (2006) lamented that the energy crises and the lack of affordable alternatives due to changing government policies has forced majority of the population down the energy ladder. This means that people who previously could afford cooking gas were forced to adopt kerosene. Those who could previously afford kerosene were forced to adopt fuel wood/charcoal. This trend continues down the energy ladder affecting various income classes. The lowest in the energy ladder were those who previously used fuel wood can no longer afford it as an energy source and thus will be forced to adopt crop stumps, animal dung and other harvest residue that are left on the farm as soil cover. This leads to more lands been left bare and thus increasing the land's susceptibility to degradation (Yakubu, 2010). Barau (2006) also observed that fuel wood is widely consumed in the cities to the detriment of the environmental stability of high population density areas such as Kano. Apart from fuel wood, there are other fossil fuels and renewable energy sources (such as solar, biofuels, wind and etcetera), however, he argued that despite the fact Kano lacks means of self sufficiency in fossil fuels (because it lacks oil and huge forest belts), the State has good potentials for generation of alternative sources of energy which are cleaner and ecologically sound. However, some of these technologies are expensive and cannot be implemented by the average Nigerian, and thus the research for an affordable and environment friendly alternative necessitated this research.

The search for alternative energy sources that will be cost-effective and applicable to third world nations (including Nigeria) is a priority of global concern. The choice of environment-friendly energy options is a giant step forward in arresting the menace of desert encroachment in sub-Saharan Africa in particular and climate change at the global scale, Zakariya'u (1999).

Studies in Nigeria showed that; the urban poor and the rural households still depend on biomass for their energy needs. Akingbami et al, (1996) in Mshendete and Parawira (2009), identified feedstock substrate for an economically feasible biogas in Nigeria to include water lettuce, water hyacinth, dung, cassava leaves and processing waste, urban refuse, solid (including industrial) waste, agricultural residues, and sewage. Due to this trend and its subsequent problems, an alternative energy source needs to be researched upon to be adopted especially in areas that are already affected by desert encroachment and drought as a result of deforestation for both industrial and domestic purposes.

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This study is aimed at evaluating people's perception and attitude towards biogas as an alternative fuel for domestic use.

MATERIALS AND METHODS

Study Area

The study was carried out in Kano Metropolis, five wards were used and these include; Fagge, Gwale Soron-Dinki, Gauron Dutse and Yakasai. See Fig. 1

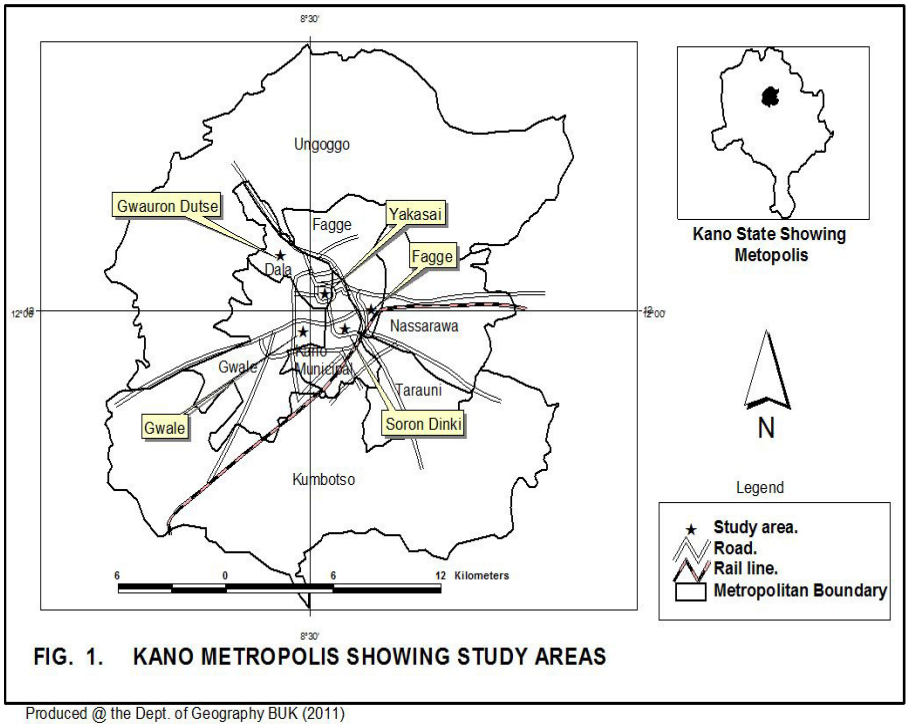

FIG. 1. KANO METROPOLIS SHOWING STUDY AREAS

Produced @ the Dept. of Geography BUK (2011)

Method of Data Collection

Questionnaire was administered in the study area aimed at assessing people's awareness and attitude on biogas as an alternative domestic fuel in Fagge, Gwale Soron-Dinki, Gauron Dutse and Yakasai. The reason is to ensure uniformity in the 150 respondents administered with the questionnaire. The respondents were divided into the following age groups: 18-35 years, 36-50 years, 51 and above. This was done in order to be able to examine the attitudes of various age groups towards accepting a new idea. This is because one of the major problems faced by biogas is lack of awareness and the problem of social acceptance towards generating cooking fuel from waste materials. The questionnaire is structured in such a way that that the respondent's level of enlightenment, levels of income, type of energy utilized for cooking and other domestic purposes were scrutinized. Accidental sampling technique (a non-probability method) was adopted for the purpose of this research. This is due to the convenience it offers when conducting the field exercise. It involved meeting people at random within the areas chosen for the study.

A total of 30 respondents were administered the questionnaire in each of the chosen locations; Fagge, Gauron-dutse, Gwale, Soron-dinki, and Yakasai areas of the old

Descriptive statistics was used to represent the results from the responses obtained from the respondents which are aimed at making the analysis of the trend much clearer. This includes the use of tables, bar charts and pie-charts.

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RESULTS AND DISCUSSION

Age of the Respondent

Figure 2 shows that 40% of the respondents were within the age bracket of 18-35, 36% were aged 36-50 while 24% were aged 51 and above.

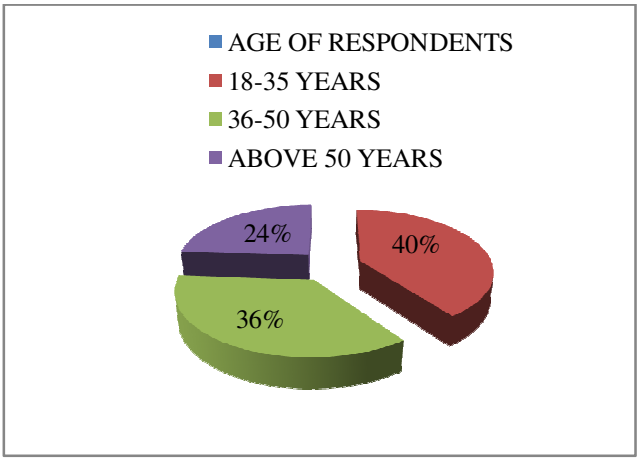

Figure 2. Age Distribution of Respondents

Level of Education

Table 1 shows the level of education of the respondents; 17.3% had Islamiyya education, 8% were of primary school level, 14.6% had secondary school education, 52% had tertiary level of education, while 8% stated that their level of education was not listed in the options.

Table 1. Level of Education

Location	*Islamiyya*	*Primary School Level*	*Secondary School Level*	*Tertiary Level*	*Others*	*Sub-Total*
Fagge	6	1	4	17	2	30
Gauron-Dutse	4	6	7	7	6	30
Gwale	7	3	2	16	2	30
Soron-Dinki	5	0	5	19	1	30
Yakasai	4	2	4	19	1	30
Total	26	12	22	78	12	150

Source: Field work 2012

Level of Income

Table 2 shows the level of income of the respondents; 40% earn less than N5000,13.3% earn between N5000-N10,000,41.3% earn above N10,000,while 5.3% stated that their levels of income were not specified in the options.

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Table 2. Level Income

Location	*Less Than N5000*	*Between N5001-N10,000*	*Above N10,000*	*Others*	*Sub-Total*
Fagge	14	4	11	1	30
Gauron-Dutse	12	3	13	2	30
Gwale	13	5	9	3	30
Soron-Dinki	11	4	14	1	30
Yakasai	10	4	15	1	30
Total	60	20	62	8	150

Source: Field work 2012

Type of Energy Utilized for Cooking

Table 3 shows that 23.9% of the respondents use electricity, 32% use gas, while 44% use fuel wood/charcoal for cooking. This indicates that a majority of the respondents use fuel wood for cooking in their individual homes. This trend was similarly noted in a study conducted by Zakariya'u (1999) and Barau (2006). More so, some people especially the elderly usually insist that food cooked with fuel wood tastes better thus more palatable. For such people, the idea of using any other fuel apart from wood to prepare food is absurd.

Table 3. Energy Utilised for Cooking

Location	*Solar*	*Electricity*	*Gas*	*Kerosene*	*Fuel wood/ charcoal*	*Others*	*Sub-total*
Fagge	0	2	8	10	10	0	30
Gauron-Dutse	0	2	7	11	10	0	30
Gwale	0	1	5	13	11	0	30
Soron-Dinki	0	2	7	9	12	0	30
Yakasai	0	1	1	5	23	0	30
Total	0	8	28	48	66	0	150

Source: Field work 2012

Type Energy Utilized for other Domestic Purposes

Table 4 shows that; 78.6% use electricity, 6.67% use a power generating set, while 14.6% use fuel wood/ charcoal for domestic purposes such as heating, lighting and ironing. This trend could be attributed to the epileptic nature of electricity supply as obtain nationwide; this leaves the majority with no options other than to resort to other means of getting their domestic activities done. The usual choice for ironing is by the use of locally-made iron that requires charcoal as an energy source and thus the demand for the fuel wood/ charcoal increases with increasing population.

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Table 4. Energy Utilised for other Domestic Purposes

Location	*Solar*	*Electricity*	*Generating Set*	*Fuel wood/ charcoal*	*Gas*	*Kerosene*	*Others*	*Sub-Total*
Fagge	0	25	2	3	0	0	0	30
Gauron-Dutse	0	24	1	5	0	0	0	30
Gwale	0	23	2	5	0	0	0	30
Soron-Dinki	0	23	3	4	0	0	0	30
Yakasai	0	23	2	5	0	0	0	30
Total	0	118	10	22	0	0	0	150

Source: Field work 2012

Awareness on Environmental Consequences of Fuel Wood

Table 5 shows that an overwhelming majority of 72% of the respondents were aware of the environmental consequences of using fuel wood while only 28% of the respondents stated that they are unaware of the consequences. This trend is encouraging as it is an indication that people from various walks of life are becoming aware of the environmental impacts of fuel wood consumption.

Table 5. Awareness on the Environmental Consequences of Using Fuel Wood

Location	*Yes*	*No*	*Sub-Total*
Fagge	21	9	30
Gauron-Dutse	21	9	30
Gwale	22	8	30
Soron-Dinki	25	5	30
Yakasai	19	11	30
Total	108	42	150

Source: Field work 2012

Awareness on Biogas

Table 6 shows that only 48% of the respondents were aware of biogas while 52% of them were unaware of it. From this figure, it can be seen that, more than halve of the respondents are unaware of biogas itself talk less of considering it as an alternative source of domestic energy, more enlightenment is needed to ensure that people are made aware of environment-friendly alternatives that can also be cost effective, also noted by Mshendete and Parawira (2009).

Table 6. Awareness on Biogas

Location	*Yes*	*No*	*Sub-Total*
Fagge	17	13	30
Gauron-Dutse	16	14	30
Gwale	10	20	30
Soron-Dinki	21	9	30
Yakasai	8	22	30
Total	72	78	150

Source: Field work 2012

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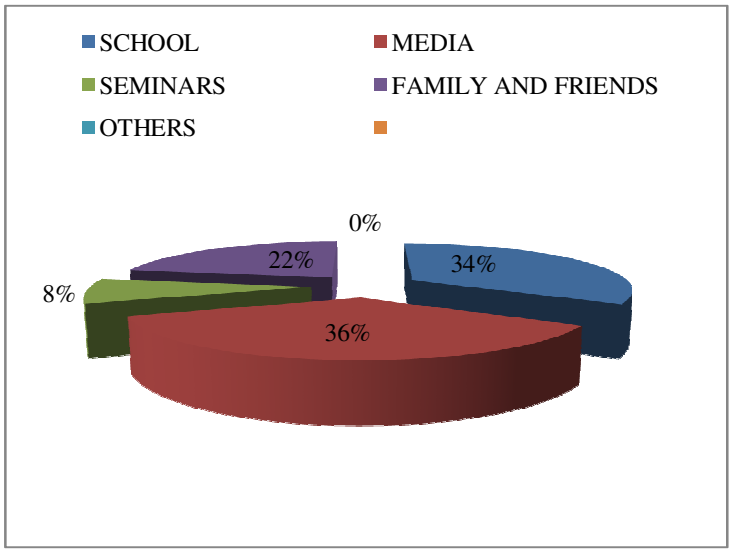
Source of Information on Biogas

Out of 48% of respondents that were aware of biogas, figure 3 shows that 24 respondents 33% stated that they learnt about biogas at school, 36% learnt about it through the media, 8.3% learnt through seminars, while 22.2% learnt about it through family and friends.

From these responses, it can be observed that school, media, family and friends are playing a major role in information dissemination and such outlets can be used to ensure environmental issues are known to the general public.



Expenditure on Energy Used for Cooking

Figure 4 shows the weekly expenditures on the energy used for cooking; 33.3% spend less than N500, 45.3% spend between N501-N1400, 10.6% spend between N1401-N2400, while 10.6% spend above N2500. This indicates that a significant portion of people's income is spent on energy requirements for cooking and such a trend is not encouraging as families do have other obligations to take care of apart from eating.

Weekly Expenditure on Energy Utilized for Cooking

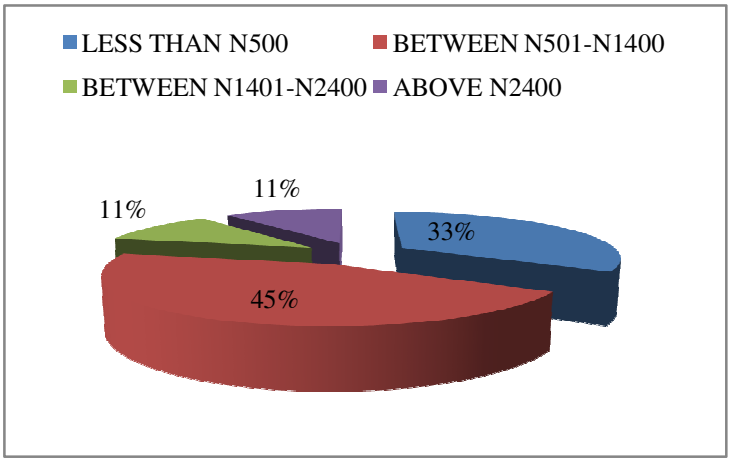


Figure 4. Expenditure on domestic energy

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Adopting Biogas for Cooking

Table 7 shows the responses given when the respondents were asked if they can consider adopting biogas to the present energy source used for cooking; 38.6% stated 'yes', 26.6% said 'no' while 34.6% were undecided. The response is fair with the hope that with more enlightenment more people will be able to decide in affirmative.

Table 7. Consideration for Adoption of Biogas for Cooking

Location	*Yes*	*No*	*Undecided*	*Sub-Total*
Fagge	13	5	12	30
Gauron-Dutse	7	3	20	30
Gwale	11	13	6	30
Soron-Dinki	14	8	8	30
Yakasai	13	11	6	30
Total	58	40	52	150

Source: Field work 2012

Adopting Biogas for other Domestic Purposes

Table 8 shows the responses to the question of whether the respondents were willing to adopt biogas for domestic purposes other than cooking; 41.3% stated 'yes', 17.3% stated 'no', while 41.3% of the respondents were undecided. This indicates that a slightly higher percentage of the respondents were willing to utilize biogas to cater for domestic purposes other than cooking, thus people might be inclined towards considering biogas to provide energy for other purposes such as electricity.

Table 8. Consideration for Adoption Biogas for other Domestic Purposes

Location	*Yes*	*No*	*Undecided*	*Sub-Total*
Fagge	12	4	14	30
Gauron-Dutse	13	5	12	30
Gwale	11	8	11	30
Soron-Dinki	17	4	9	30
Yakasai	9	6	15	30
Total	62	26	62	150

Source: Field work 2012

Availability of Space to Install Biodigesters in Homes

Figure 5 shows that 42.6% of the respondents indicated that, they have enough space to install a bio-digester while 57.3% stated that they do not have enough space in their houses. This question is geared towards finding out about space availability because it is a deciding factor in installing either a community-size digester or a family sized digester.

Availability of Space to Install a Biodigester

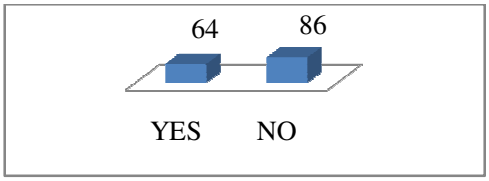

Figure 5. Availability of Space

ISSN-L: 2223-9553, ISSN: 2223-9944
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Willingness to adopt the use of Biodigester

Figure 6 shows that responses about whether the responses were willing to install a bio-digester;40% indicates 'yes', 14.6% stated that if their landlords will allow it,22.6% think it will be too dangerous to install in a home, while 22.6% stated that they had reasons other than those mentioned. This indicates that less than half of the respondents might be willing to have a bio-digester installed in their homes; this trend might improve if more research is conducted in order to ensure that safer and more efficient biogas plants are designed to suit homes with limited space.

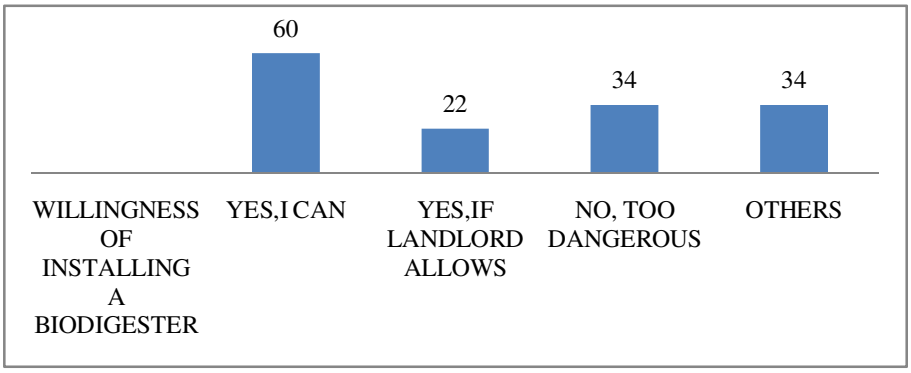

Figure 6. Willingness to install biodigester

CONCLUSION AND RECOMMENDATIONS

The following conclusions could be raised from the aforementioned facts from the study. The importance of energy in everyday life cannot be overemphasized. The search for alternative energy sources is a necessity aimed at mitigating the negative consequences of our present energy sources. Biogas is one of the environmentally friendly alternatives that will hopefully alleviate environmental degradation to a minimum, and aid the reduction of emissions of greenhouse gases.

The availability of environment-friendly options of renewable energy has to be communicated to people so as to keep them informed about the options they can choose from. The mis-perception or mis-conception of people about the phobia of biogas and its usage need to be adequately addressed so that the cultural use of fuel woods can be reduced to minimum. All findings including this study need to be adopted and adapted be put into use in collaboration with institutions that are involved in promoting indigenous engineering projects that can solve present problems.

It had been observed that level of income, level of education and age play a significant role in the choice of energy utilized for cooking and other domestic purposes.

Due to the nature of anaerobic digestion to produce biogas and the versatility of materials that can be used as a feedstock for the gas especially human faeces and waste water, a lot of people are somewhat reluctant to use such a gas to cook the food they are going to eat although some other more enlightened respondents stated that it does not matter. A higher number of respondents were however willing to utilize biogas for other domestic purposes such as lighting, heating and ironing. This involves converting the biogas fuel to electrical energy. It had been observed that the major problem with adoption of biogas in this part of the world is that of the social acceptability problem. Perhaps the issue of converting waste to electricity might be more readily acceptable, so if the dumpsites are to be taken care of; conversion of biogas to electricity should be considered as an option. Further research on this is required.

The ministry of environment has been active in sensitization programs that involve the collaboration of telecommunications industries asking people to stop cutting down trees to avoid deforestation/desertification. The truth is, such a campaign will not work if people were not supplied with options that are affordable and simple enough to adopt. The engineers are saddled with the task of providing such an option to be promoted by the government agencies and other donor organizations so as to ensure that such an option is made available to the average Nigerian.

RECOMMENDATIONS:

There is need for more research to be done in the area of renewable energy sources in order to reduce over-dependence on fuel-wood as an energy source. Such a strategy will go a long way in ensuring that fewer trees are cut down and done only when it is absolutely necessary. This will ensure that our forest reserves are restored, the ecological balance maintained and the negative effects of anthropogenic activities were militated against.

The majority of waste in this part of the world comprises of bio-degradable portion which can be used to anaerobically produce biogas. Major cities across the country in general and within the study area in particular are affected by indiscriminate disposal of waste (Lambu 2011) such that rubbish dumps are now blocking access roads and drainages leading to traffic congestion and flooding among other vices. The utilization of the bio-degradable portion of municipal solid waste to produce energy is a very profitable venture that will simultaneously eliminate the dumpsites that are affecting the aesthetic potential of our surrounding while also affecting our health in numerous ways. The prospect of utilizing waste to produce energy should be seriously looked into as it could solve our environmental problems while providing a source of livelihood to unemployed members of the community.

Enlightenment campaigns need to be mounted for people to become aware about the suitability, safety and affordability of such innovations to protect the innocent users especially the household women that suffer various respiratory and eye problems as a result of smokes and gases.

ISSN-L: 2223-9553, ISSN: 2223-9944
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