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ABSTRACT

The technological trend towards waste utilization and cost reduction in industrial processing has attracted the use of Biogas energy system. In Nigeria, like most developing countries energy issues has moved higher in the development agenda of policy makers. This study focused on assessment of biogas energy awareness and utilization in three Local Government Areas, namely: Victoria Island, Oshodi / Isolo and Ikorodu of Lagos State, Nigeria. A total of Two Hundred and Ten structured questionnaires were randomly administered to respondents and One Hundred and Sixty – Three copies were retrieved for analysis. Thirteen research questions were tested, which was used for data collection to evaluate the awareness of the people and extent to which biogas is used apart from Fossil fuels in the selected areas of Lagos State. Descriptive statistics using Frequency and Percentage were employed in processing the data for the study. Findings from the survey showed that 14.72 percent of the respondents are aware of biogas usage, 22.08 percent accepted to be using it if it is made available and 15.34 percent believed that it is relatively costly to other sources of energy such as Kerosene and Industrial Gas. From the analysis, none of the respondents use biogas energy presently and the reason for this is due to lack of knowledge.

Also, it was found that 83.44 percent of the respondents fall between age range of 11-40 years, this is an indication that biogas energy will be acceptable if it is encouraged and given priority. In addition, recommendations to overcome envisage challenges is to carry out a mass enlightenment campaign, to educate people by increasing public awareness of biogas energy technology through distributing simple explanatory pamphlets or using other media.

Keywords: Biogas Energy; Awareness; Utilization; Respondents; Structured Questionnaires.

1. INTRODUCTION

Biogas consists of about Seventy-Five percent Methane (CH_4), Twenty-Five percent Carbon dioxide (CO_2) and small amount of hydrogen sulphide (H_2S) and hydrogen (H_2). It is created by the decomposition of manure and other forms of organic waste from industries or households in anaerobic (that is oxygen free) tank where it is heated. (www.folkecontier.net/default.asp). Biogas technology represents one of a number of village-scale technologies that could offer a very attractive route to utilize certain categories of biomass partially for meeting energy needs in Nigeria. It also offers technical possibility of more decentralise approaches to development in Nigeria and provides significant benefits to human and ecosystem health (Solomon *et al*., 2012; UNEPA, 2007). Decentralized options for a rural energy supply based on renewable energies can provide opportunities to enhance economic productivity and income in rural areas, and also improves the sustainable management of natural resources (Herz, 2011).

Mustapha (2008) reported that rural development in Nigeria has not been encouraging as a result of the ability to harness the available energy resources especially renewable energies which are abundantly available. It is also a fact that the Socio-economic development of the rural areas relies heavily on the utilization of renewable energy conversion system which ranges from few watts to kilowatts have been found to the most suitable sources of energy supplies to the rural areas. However, little attention has been given towards exploiting this naturally endowed resource for electricity generation to the rural areas.

In the world today the energy demand has increases globally and it has continued to increase for these reasons. Fossil fuels like coal, crude oil and natural gas have been playing a great role in the global energy supply since the era of this industrial revolution; however with the increasing worldwide awareness of their negative environmental impact, continual price hike and gradual depletion have awoken the drive for environmentally friendly and renewable energy sources like biogas (Olebunne *et al.*, 2011).

In Africa (Nigeria Inclusive), a very large percentage of people live in the rural areas where fire woods are used as a cooking fuel. According to Tambawal *et al*. (1997), he noted that wood and other forms of biomass are renewable, but

worldwide deforestation for fuel, lumber and papers in developed countries, has resulted in wood being depleted much faster than it can grow back, which means this energy source is exhaustible. McMurry (1992) says, "the use of coal creates serious erosion problems together with a lot of accidents at the mining site which can result in the loss of many lives. It also produces more greenhouse gas emissions for the energy it gives than any other major fuel". Electricity supply to rural area is insufficiently low and only about 18 percent of the power generated is made available to them (Oparaku, 1998). Although a lot of financial resources are being expended towards rural electrification by way of grid extension, less attention has been paid to other sources of electrification such as solar, wind and biomass resources. The resultant effect of this trend is largely responsible for the recent electricity crisis facing the country as a result of insufficient generation to meet up with the country's growing load demand (Imoke, 2000). Apart from electricity generation, renewable energy resources are being harnessed for both domestic and commercial activities particularly for the benefit of the rural areas. Biogas production has advanced so much in many countries in the world like India, China, Middle East, Germany, Britain and United States to the extent that Artificial Neural Networks (ANNs) and Geometric Algorithms (GA) are now being employed to solve complicated problems associated with its production (Gelegenis *et al.*, 2007; Abu *et al.*, 2009).

However, in Nigeria, research works have been developed at the various research centres and educational institutions and are being popularized through demonstration projects with the aim of full commercialization in collaboration with the private sector (Musthapha, 2008). Since biogas production from different sources varies from country to country and is dependent on many factors like the nature of the animals 'feed, breed age of the waste, climate and season (Makki and Eliack, 2003; Stege, 2006; Olebunne *et al.*, 2011).

The main objective of the study is to investigate the awareness of the people and extent to which biogas is utilized apart from fossil fuels in these selected areas of Lagos State, Nigeria. Also, to create awareness that the policy orientation of the government should be focused on the development of all the viable energy resources and integrating them for and optional National Energy – Mix. Since biogas technology is increasingly seen as the forward alternative to many Nigerian and Community development problems.

2. METHODOLOGY

This study was aimed at investigating the awareness and utilization of biogas energy use in three government areas in Lagos State, Nigeria. This study is a description survey. It involve collecting data through a structured response questionnaire conducted between June – October, 2013 among 163 respondents in three different local government areas of Lagos State, Nigeria, namely Victoria Island, Oshodi/Isolo and Ikorodu Local Government Areas.

2.1 Validation of Research Instrument

Semi-structured response questionnaire was the research instrument used in this study. To ensure that the instrument used was appropriate for the purpose of the research. The researchers postulated some questions which guided the course of undertaking the study.

2.2 Research Questions

1. Socio-Economic Status (SES): This include gender and age distributions, occupation, level of education, total monthly income were used as the criterion for SES classifications as adopted from Famurewa (2009). The respondents were grouped into three Socio-Economic Strata, that is, those who have a highly paid occupation (above N200,0000) and tertiary education were classified as high Socio-Economic status (HSEs) group, while those with Secondary Education, with monthly income between the range of N50,000 to N200,000 were categorised as medium Socio-Economic status and those with income less than N50,000 in a month with primary or no educational background were classified as low Socio-Economic Status(LSES).

Also, in order to evaluate the appropriate and practicality of the instrument used for data collection, the researchers took the questionnaire to fellow colleagues for examined and necessary suggestions on the questionnaire. After that the researchers then took the drafted questionnaire to research experts for necessary guidance and correction in order to ensure that the instrument was appropriate for the purpose of the study. On the basis of the information gathered items that are not relevant were deleted as proposed by Ogundele (2008).

2.3 Awareness and Utilization of Alternative Energy

The awareness and utilization of alternative energy was investigated and examined using the modified Likertscale technique (Ijarotimi and Famurewa, 20 0 6) , to enable the respondents to indicate the extent of agreement and disagreement of the supplied statements. Thus the response was supplied with three points modified rating scale of not sure, Agree and Disagree.

2.4 Data Gathering Procedure

All the three Local Government Areas selected as mentioned above were sampled for the purpose of this research study. Information for the research was gathered by the use of questionnaire. The researchers distributed the copies of the questionnaires to the students and respondents selected at random from the examined areas. This was done to ensure thoroughness of the exercise and quick return of the questionnaire.

3. DISCUSSION OF RESULT

Data for this study were analysed and presents in Tables 1-13 based on the research questions that guided the study. Frequency and percentage of the occurrence were used in the presentation. The Socio-Economic Characteristics of the respondents' results showed that 59.51 percent of the total respondents are male, while 40.49 percent are female as illustrated in Table 1. Table 2 shows that 9.80 percent of the respondents were between 11-20years, 46.63 percent between 21-30years, 26.99 percent between 31-40years, and 9.82 percent between 41-50years and 6.74 percent above 50 years of age. Table 3 shows that 35.58 percent of the respondents are students, 26.38 percent are government workers, 25.15 percent work with private company and 12.88 percent are other workers unspecified. From Table 4, it was observed that more than half of the respondents have acquired tertiary education. Table 5, 20.25 percent uses kerosene, 38.04 percent uses more than one source of energy, 18.40 percent uses industrial gas, while relative low percent uses wood and coal type of energy sources and this may be because of the knowledge and enlightenment of the respondents to the harmful effects of these sources of energy on human health and environment. Reasonable percent of the respondents use kerosene, which may be because of its available source and also lack of awareness of the health and indoor pollution kerosene usage can cause to human health.

Table 6 reveals that more than half of the respondents are fully aware of alternative energy sources. About 25.77 percent of the respondents mentioned coal, 14.72 percent mentioned biogas and most of the respondent mentioned solar energy (39.26%), 2.45 percent mentioned sawdust, a non alternative source, 5.52 percent mentioned hydro electric, alcohol and briquettes have equal percentage of usage of 3.06 percent while 6.13 percent did not respond. All these information is on Table 7. Table 8 shows the reasons why the respondents accepted the use of biogas. 17.17 percent accepted it because biogas will be cheap, 19.02 percent accepted it because they believed it will be more effective than other sources of energy, 20.85 percent believe there is need for alternative energy since the available ones are insufficient, 5.52 percent accepted, because they believe it will be available for use, 4.29 percent of the respondent believe it will be easier to produce than normal energy source while 11.04 percent did not give any response. This implies that more than half of the respondents proposed the use of alternative energy source. From Table 9, it can be observed, reasons why alternatives energy is not yet popular and the reason proposed mostly by the respondents is lack of knowledge which represent more than half of the total respondents. This implies that if other alternative sources of energy are introduced and encouraged majority of the people will accept it. Table 10 shows that 61.35 percent are already aware of biogas usage, while 38.65 percent are yet to be aware of it.

Table 11 shows that 74.85 percent said "YES" to the use of biogas, 8.59 percent said "NO" and 16.56 percent were "UNDECIDED" that biogas if made available to them, whether they will use it or not. This means that more than half of the respondents agree to the use of biogas and also the percentage that responded "NO" and "UNDECIDED" may be due to lack of knowledge about the biogas technology and usage. Table 12 reveals the proposed reason why people in the selected areas may not agree with the use of biogas. 6.75 percent believe that people will not like it. 57.66 percent opined that people are not aware of it, 15.34 percent believe people will see it to be costly while 20.25 percent are undecided. This result shows that most people will like to use it if made available. Table 13 shows that the different kind of problems that users may likely face are being envisaged by the respondents. Few of the respondents only envisaged that users may face some problems. The most proposed problem envisaged is lack of technology. Hence, if the technology can be perfected to the users of the biogas energy and safety assurance is given, most people will like to use it.

4. SUMMARY OF ANALYSIS OF RESPONDENTS TO QUESTIONNAIRE

Table 1: Gender Distribution

SEX	FREQUENCY	PERCENTAGE
Male	97	59.51
Female	66	40.49
TOTAL	**163**	**100**

Table 2: Age Distribution

AGE	FREQUENCY	PERCENTAGE
11-20	16	9.82
21-30	76	46.63
31-40	44	26.99
41-50	16	9.82
50 & Above	11	6.74
TOTAL	**163**	**100**

Table 3: Occupation

OCCUPATION	FREQUENCY	PERCENTAGE
Student	58	35.58
Civil Servant	43	26.38
Private Company	41	25.15
Others	21	12.88
TOTAL	**163**	**99.99**

Table 4: Level of Education

EDUCATION	FREQUENCY	PERCENTAGE
Secondary	15	9.20
Technical Col.	20	12.27
Tertiary	82	50.31
Others	46	28.22
TOTAL	**163**	**100**

Table 5: Type of Energy Sources Use

ENERGY	FREQUENCY	PERCENTAGE
Wood	07	4.29
Kerosene	33	20.25
Industrial Gas	30	18.41
Electricity	18	11.04
Biogas	NIL	NIL
More than one source	62	38.04
Coal	13	7.97
TOTAL	**163**	**100**

Table 6: Awareness of Alternative Energy Sources

AWARENESS	FREQUENCY	PERCENTAGE
Yes	135	82.82
No	28	17.18
TOTAL	**163**	**100**

Table 7: Respondents Awareness of Alternative Energy Sources

ALTERNATIVE	FREQUENCY	PERCENTAGE
Coal	42	25.77
Biogas	24	14.72
Solar Energy	64	39.26
Saw Dust	04	2.45
Hydro-Electric	09	5.52
Alcohol	05	3.06
Briquette	05	3.06
No Response	10	6.13
TOTAL	**163**	**100**

Table 8: Reasons for Accepting Alternative Source

ALTERNATIVE	FREQUENCY	PERCENTAGE
Cheap	28	17.18
Effective	18	11.04
Need for Alternative	34	20.85
Available	36	22.08
Easy to produce	07	4.29
More than one source	31	19.02
No reason	0.9	5.52
TOTAL	**163**	**100**

Table 9: Reasons for not Popularity Acceptance

ACCEPTANCE	FREQUENCY	PERCENTAGE
No Knowledge	87	53.37
Too Many Alternatives	12	7.36
Too Expensive	23	14.11
Stressful	16	9.82
People will not buy the idea	04	2.45
No Technology	05	3.07
Dangerous	01	0.61
No Reasons	15	9.20
TOTAL	**163**	**99.99**

Table 10: Respondents Awareness of Biogas Alternative

AWARENESS	FREQUENCY	PERCENTAGE
Yes	100	61.35
No	63	38.65
TOTAL	**163**	**100**

Table 11: Response to use of Biogas

RESPONSE	FREQUENCY	PERCENTAGE
Yes	122	74.85
No	14	8.59
Undecided	27	16.56
TOTAL	**163**	**100**

Table 12: Reason for not Accepting the use of Biogas

REASON	FREQUENCY	PERCENTAGE
Do not like it	11	6.75
Do not have knowledge about it	94	57.66
Costly	25	15.34
Undecided	33	20.25
TOTAL	**163**	**100**

Table 13: Envisage Problems of Biogas Technology and Usage

PROBLEMS	FREQUENCY	PERCENTAGE
Accident	26	15.95
Ineffectiveness	8	4.91
Pollution	13	7.97
Lack of Technology	42	25.7
Low Production	7	4.29
Difficulty in Production Process	9	5.52
Undecided	20	12.26
More than one problems	38	23.31
TOTAL	**163**	**99.91**

5. CONCLUSION

This review has shown that the use of biogas energy is at its Primitive Stage. The technology of renewable energy conversion is relatively new in Nigeria and not much is being done to catch up with the new developments in these areas. Although various researchers and institution of higher learning has carried out intensive researches on the biogas energy, no attempts have been made to integrate the new emerging technology into National development program of the country.

However, the use of biogas has no wide spread in Nigeria due to a number of reasons such as economic, technical and non-technical barriers, due to lack of public awareness on the relevance of the system. Therefore, the incorporation of Biogas energy is a welcome development and the provision of proper orientation, knowledge and usage will help reduce and alleviate the problems of energy provisions, waste disposal like kitchen waste, human waste etc. in Nigeria. Unless definitive measure are implemented soon enough the world is heading towards a severe and prolonged energy crunch in the non-too-distant future.

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