

## **INVESTIGATING THE LEVEL OF AWARENESS AND UTILIZATION OF BIOMASS BRIQUETTE AS ALTERNATIVE SOURCE OF ENERGY IN ISI-UZO LOCAL GOVERNMENT AREA OF ENUGU STATE, NIGERIA**

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**Abstract:** The study was carried out to determine the level of awareness and utilization of biomass briquettes as an alternative source of energy in Isi-Uzo local government area, Enugu State Nigeria. Descriptive survey method was used for the study. A questionnaire (LAUQ) based on a four-point Likert scale was formulated for the study. The population of the study comprised of all adults in Isi-Uzo local government area, Enugu State. The sample for the study comprised of two-hundred participants randomly selected from the twenty villages that make up Eha-Amufu and Ikem, the largest communities in Isi-Uzo local government area. Disproportionate sampling technique was used to select ten adults from different households in each of the villages that make up Eha-Amufu and Ikem. Data collected were analyzed using mean. It was identified that the people of Isi-Uzo Local Government Area are aware of the efficiency of biomass briquettes as an alternative source of energy and that biomass briquetting creates employment and generates income. It was also found out that the participants agreed that they do not make use of biomass briquettes to source energy even when they are aware of some of its benefits. It was recommended, among others, that massive campaign should be carried out to encourage the people of Isi-Uzo local government area to make use of biomass briquettes to source energy for domestic purposes.

**Keywords:** Biomass, briquette, briquetting, alternative, awareness, utilization.

### **Introduction**

Energy resource is needed in every country of the world for cooking and heating in the homes, power machines in the industries, move cars and lighting in houses among other uses. The sun is regarded as the source of all energies and from which plants source energy for photosynthesis. From plants, the sun's energy is distributed to all forms of life that consume them either directly or indirectly for food. In most parts of Nigeria energy is sourced from firewood, fossil fuels, charcoal, and electricity. Coal and other fossil fuels are described as exhaustible and non-renewable, while continuous cutting down of trees to obtain firewood and charcoal may lead to global warming and erosion among other environmental consequences. The cost of electricity supply, kerosene and gas in Nigeria is becoming high. Again, most of

these energy sources release dangerous substances into the atmosphere which affect humans, plants and other animals. Today and worldwide too, environment-friendly and renewable energy sources are highly considered because they cause minimal or no environmental problems (Sidamo, Vinyes and Arranz, 2016). In Nigeria, renewable energy is considered a viable solution to energy challenges facing the country especially in the rural areas (Danjuma, Maiwada & Tukur, 2013)

A major source of cheap and affordable energy is biomass briquette. A briquette, according to ISO 17225 STANDARD, is a densified biofuel made with or without additive produced from woody biomass compression or crushed herb (Sidamo, Vinyes & Arranze, 2016). Briquette is simply a block of flammable matter that is used as a fuel to start and maintain a fire (Lamido, Lawal & Salami, 2018). Briquettes are produced by a process called briquetting. Briquetting is a process which converts low-density biomass into high density and energy concentrated fuel briquettes (Ngumbi, Njagi, Samba, Papai, Sirima & Njenga, 2015). It can also be described as a compacting or densification process to increase the low bulk density biomass to high bulk density biomass (FAO, 2014). Briquettes are cheap, renewable, contains no sulphur and as such does not pollute the environment, have high thermal value, low ash content, and uniformly burn in oxygen (Sharma, S. K., Priyank and Sharma, N., 2015).

Briquettes can be sources of renewable energy if they are produced from biomass or agricultural waste materials (Danjuma, Maiwada & Tukur, 2013). Biomass is the material derived from photosynthesis: a process that involves the reaction between carbon iv oxide and water in the presence of sun's energy to produce carbohydrates that form the building components of biomass (McKendry, 2002). Biomass briquetting is a process in which biomass materials or agricultural residues are compressed or densified into solid fuel with or without binding agents to increase its density and to enhance its handling characteristics (Onuegbu, Ogbu & Ejikeme, 2011; Obi, Adebayo & Aneke, 2014). The use of biomass as an energy source has been with mankind. Among the rural dwellers in Nigeria grasses, shrubs, agricultural wastes, wood, coconut and palm kernel husks, fibrous exocarp of palm fruits obtained after palm oil extraction have been used for cooking or heating. Wood, grasses, animal and agricultural wastes among others are richly available in \Nigeria. Hence, the potential for the use of biomass as an energy source in Nigeria is high since about 80% of Nigerians are rural dwellers who make use of biomass on a large scale to source energy (Onuegbu, Ogbu & Ejikeme, 2011). Biomass energy is obtained by converting organic chemical energy into fuels (Solamo, Vinyes and Arranz, 2016). Biomass sources include agricultural field residues,

agricultural-based industrial and plantation residues among others. The materials from these sources such as leaves, coconut shells and sugar-cane husks are collected, crushed, soaked in water, pounded, compacted into briquettes, dried, packaged, stored and subsequently used (Ngumbi, Njagi, Semba, Papai, Sirima & Njenga, 2015).

Isi-Uzo local government area is a local administrative area whose people are rural dwellers and they predominantly make use of firewood for domestic cooking or heating. Firewood is obtained by cutting down trees from the nearby forests and allowing them to dry before use. However, the massive use of firewood for cooking and, as well, heating in the area may lead to an increase in deforestation, erosion and desertification. Isi-Uzo local government area is made up of communities whose major occupation is farming. Rice, maize, cassava and yam, and other agricultural plants are cultivated in fairly large quantities using traditional methods. Agricultural materials which are usually thrown away as undesirable wastes are, therefore, readily available for briquette production. The questions that emerged are: Do the people of Isi-Uzo local government area make use of biomass briquette in their households for domestic purposes? Are the people of Isi-Uzo local government area aware of the benefits of using biomass briquettes as energy sources? And are they aware that briquetting creates employment and generates income? The researchers made attempts to provide answers to these emerging questions.

### **Research Method**

The design of the study was a descriptive survey design. A descriptive survey design was found appropriate for the study because peoples' opinion was sort. The study area was Isi-Uzo local government area of Enugu State, Nigeria. Isi-Uzo local government area is a sub-administrative area in Enugu State, a state located in the southern region of Nigeria. It is comprised of five communities, with Eha-Amufu and Ikem the largest communities. The indigenes are predominantly farmers, applying mainly traditional farming methods. Eha-Amufu and Ikem were selected for the study because they are the largest communities in the local government area, with ten (10) villages each. The population of the study consisted of all the adult indigenes of Isi-Uzo local government area. The sample of the study comprised of two-hundred (200) participants randomly selected from the twenty villages that make up Eha-Amufu and Ikem. Each participant was selected from different households. Disproportionate stratified random sampling technique was used to select ten adults from different households in each of the twenty villages that make up Eha-Amufu and Ikem.

The instrument that was used for data collection was a questionnaire (Level of Awareness and Utilization Questionnaire, LAUQ). The researchers designed the questionnaire to provide answers to the research questions formulated for the study. The questionnaire was designed based on the four-point Likert scale of Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The instrument (LAQ) was validated by two experts in science education.

The researchers involved two assistants selected from each of the ten villages in Eha-Amufu and Ikem. The basic qualification of the assistants was the possession of at least senior school certificate (SSC). The researchers educated the assistants of the objectives of the study and trained them on what they were expected to do, and the processes and precautions to take in administering and collecting the questionnaire. The assistants were paid some money to encourage them to participate in the study. The questionnaires were administered to the participants directly by the assistants and they were collected immediately after completion. The educated participants completed the questionnaire by themselves, while the uneducated ones were assisted by explaining the question items to them while they make their choices of responses. The participants were visited during the evening time when they were expected to have come back from farm work or their businesses. The study lasted for one month.

#### **Data Analysis Method:**

The data collected were analyzed by mean ( $\bar{X}$ ). The mean of every item in the questionnaire was calculated by using the relationship,  $\bar{X} = \frac{\sum fx}{\sum f}$  where  $\bar{X}$  = mean,

$\sum fx$  = sum of the value of the individual rating value, and

$\sum f$  = the sum of the frequency.

From the scale (Likert scale), the average mean, ( $\bar{X}$ ), was calculated by using the relationship

$$(\bar{X}) = \frac{4+3+2+1}{4} = \frac{10}{4} = 2.50.$$

Hence, any value of  $\bar{X}$  equal to or greater than 2.50 was accepted, while any value of  $\bar{X}$  less than 2.50 was rejected. The four-point Likert scale was rated as follows:

Strongly Agree (SA) = 4, Agree (A) = 3, Disagree (D) = 2, and Strongly Disagree (SD) = 1.

#### **Research Questions:**

- ❖ Are the people of Isi-Uzo local government area aware that biomass briquettes are efficient sources of energy?
- ❖ Do people of Isi-Uzo local government area make use of biomass briquettes to source energy?

- ❖ Are the people of Isi-Uzo local government area aware that biomass briquetting creates employment and generates income?

### Results

**Research Question 1:** Are the people of Isi-Uzo local government area aware that biomass briquettes are efficient sources of energy?

**Table 1:** Responses on the awareness that biomass briquettes are efficient sources of energy (N=200)

S/N	Item	SA <sup>4</sup>	A <sup>3</sup>	D <sup>2</sup>	SD <sup>1</sup>	X	Decision
1	Biomass briquettes last longer than firewood during cooking or heating.	36	114	0	20	2.53	Accepted
2	Biomass briquettes burn fast when used for cooking or heating.	20	30	110	40	2.15	Rejected
3	Biomass briquettes are less effective in cooking food than kerosene.	0	20	162	18	2.03	Rejected
4	Firewood and kerosene cook food faster than biomass briquettes.	10	40	123	27	2.16	Rejected
5	The ash produced by biomass briquettes is less than that produced by firewood.	20	90	78	12	2.59	Accepted
6	Biomass briquettes produce less amount of smoke when compared to firewood and fossil fuels	28	162	10	0	3.09	Accepted
	<b>Total Mean</b>	<b>236</b>	<b>524</b>	<b>403</b>	<b>117</b>	<b>2.58</b>	<b>Accepted</b>

Table 1 shows that item 2, 3, and 4 were rejected, while others were accepted. The total mean score of 2.58 is above 2.50, implying that the people of Isi-Uzo are aware that biomass briquettes are efficient energy sources.

**Research Question 2:** Do the people of Isi-Uzo local government area make use of biomass briquettes to source energy?

**Table 2:** Responses on the use of biomass briquettes to source energy in Isi-Uzo local government area, Enugu State Nigeria (N=200)

S/N	Item	SA <sup>4</sup>	A <sup>3</sup>	D <sup>2</sup>	SD <sup>1</sup>	X	Decision
1	Biomass briquettes are common in my village.	54	11	30	105	2.07	Rejected
2	Biomass briquette-making machines are available in my village.	11	69	120	0	2.48	Rejected
3	I make use of firewood to heat and cook food frequently.	120	65	15	0	3.25	Accepted
4	Most women in my village make use of biomass briquettes for cooking or heating.	20	25	115	40	2.12	Rejected

5	I am aware that biomass briquettes are good sources of energy.	75	90	25	10	3.15	Accepted
6	Most of the women in my village have an idea about biomass briquettes as sources of energy.	0	18	110	72	1.73	Rejected
7	I have used agricultural briquettes such as sawdust briquettes before for cooking or heating.	10	28	50	112	1.73	Rejected
	<b>Total Mean</b>	<b>290</b>	<b>306</b>	<b>465</b>	<b>339</b>	<b>2.39</b>	<b>Rejected</b>

As shown in table 3, item 5 and 6 were accepted while other items were rejected. The total mean score of 2.39 is below 2.50, implying that women in Isi-Uzo local government area do not make use of biomass briquettes to source energy.

**Research Question 3:** Are the people of Isi-Uzo local government area aware that biomass briquetting creates employment and generates income?

**Table 3:** Responses on the awareness of people of Isi-Uzo local government area that biomass briquetting creates employment and generates income (N=200).

S/N	Item	SA <sup>4</sup>	A <sup>3</sup>	D <sup>2</sup>	SD <sup>1</sup>	X	Decision
1	Biomass briquette producers are in my community	10	30	55	105	1.72	Rejected
2	Biomass briquettes can be bought and sold in our community market	18	35	57	90	1.9	Rejected
3	Some households in my village buy briquettes from the producers in the city.	84	54	52	10	3.02	Accepted
4	Biomass briquetting business fetch income	75	115	10	0	3.32	Accepted
5	Biomass briquetting creates employment.	99	54	30	17	3.17	Accepted
6	Biomass briquettes are generated in my community using briquetting machines,	20	90	50	40	2.45	Rejected
7	Youths in my village can be employed and earn money if they are involved in producing briquettes using agricultural wastes available in my community.	128	40	20	12	3.42	Accepted
	<b>Total Mean</b>	<b>454</b>	<b>475</b>	<b>397</b>	<b>274</b>	<b>2,69</b>	<b>Accepted</b>

In table 2 item 1, 2 and 6 were rejected, while other items were accepted. The total mean score is 2.69 which is above 2.50, implying that the people of Isi-Uzo local government area are aware that biomass briquetting creates employment and generates income.

### Discussion

The result of the study showed that the people of Isi-Uzo local government area are aware that biomass briquettes are efficient sources of energy. Biomass briquettes have high

thermal value and as well produce a low amount of ash (Sharma, M. K., Priyank & Sharma, N., 2015). It has a calorific value of about 6243.58kcal/Kg – 6592.52Kcal/Kg (Lamido, Lawal & Salami, 2018). However, most of the participants agreed that they do not make use of biomass briquettes to source energy either for cooking or heating. This finding implies that most households in Isi-Uzo local government area will continue to depend on firewood for energy, and as such, the forest areas within Isi-Uzo local government area may face massive deforestation as dwellers search for firewood. Over-deforestation exposes the soil to flooding, erosion, overheating by the sun and leaching. In other words, desertification may be imminent in the area of alternative energy sources such as biomass briquettes are not used to source energy for cooking or heating.

The findings of the study also showed that the people of Isi-Uzo local government area are aware that biomass briquetting creates employment and generates income. This is in agreement with observations of Ngumbi, Njagi, Semba, Papai, Sirima and Njenga, (2015), Lamido, Lawal and Salami (2018) and Danjuma, Maiwada and Tukur (2013) that briquetting creates employment for the youths and generates income. The total number of people classified as unemployed in Nigeria as at third quarter of 2018 stood at 20.9 million (NBS, 2018). The unemployment rate increased from 18.8% in the third quarter of 2017 to 23.1% in the third quarter of 2018 (NBS 2018). According to the World Bank, an individual or person that lives or earn below \$1.9 per day is considered to be extremely poor (Saheed, Grace, Tope, Femi (2018). In Nigeria, the approved minimum wage of thirty- thousand nairas is inadequate and cannot be taken as a living wage considering the prevailing rate of inflation in the country. Unemployment and poverty are twin economic and social problems that lead the youths into armed robbery, kidnapping, ritual killings, cybercrimes among others. Hence, since briquetting was found to create employment and generate income the unemployed youths of Isi-Uzo local government area has a good opportunity of being employed if they engage in briquetting business. They have the raw materials for that purpose obtained from agricultural practices, of which they are massively involved.

### **Conclusion**

Biomass briquettes are good sources of renewable energy for domestic cooking or heating. Briquetting is also a legitimate business that creates employment and generates income. Since the people of Isi-Uzo Local Government Area are aware that biomass briquettes are efficient energy sources and briquetting creates employment and generate income it is important that

they embrace biomass briquettes to source their energy and also engage in briquetting as a legitimate business.

### **Recommendations**

Based on the findings of the study the researchers recommend as follows:

- ❖ A massive campaign should be carried out to encourage the people of Isi-Uzo local government area to use biomass briquettes as energy sources for cooking or heating. This will prevent them from travelling long distances to fetch firewood and save the environment from deforestation, desertification and erosion.
- ❖ The people of Isi-Uzo local government area should engage in the business of briquetting as it creates employment and generates income. This will help to create wealth and reduce the unemployment rate in the area and Nigeria generally.

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