

Public Perceptions and Willingness to use Sawdust Briquettes as Alternative Source of Energy in Bakeries at Abeokuta, Ogun State, Nigeria



Adekunle, M.F., Olorunfemi, O.Aina O.M and Adegbite A.A.

Department of Forestry and Wildlife Management,
Federal University of Agriculture, Abeokuta,
Ogun State, Nigeria.

Corresponding author: Email: ayo.favourmi@yahoo.com

Abstract

Public perceptions and willingness to use sawdust briquettes by bakeries in Abeokuta was investigated with the view to providing information on the possibility of using sawdust briquettes as an alternative source of fuel in bakeries. Data were collected using pretested and structured questionnaire and interview schedules in bakeries. Key informant interviews were conducted to probe into some of the issues that were not addressed during the questionnaire interviews. Descriptive statistical tools were used for the data collected, while Pearson correlation and Chi-square statistical tools were also used to establish the relationships and associations respectively among respondents, selected socio-economic variables and their levels of perception and willingness to use sawdust briquette. Of the total respondents, 98% were ignorant of sawdust briquettes as an alternative source of fuel for baking, 90% of them were willing to use and invest in its production. The analysis of the 5 point-likert scale revealed that 66% of the respondents perceived sawdust briquette favourably, 30% perceived it unfavourably while 4% were indifferent. The Pearson Correlation analysis showed a positive and significant relationship among respondents' levels of perception, years of existence and production capacity. The X^2 analysis indicated a strong association among their levels of perception, awareness, and years of existence, source of fund and production capacity. In conclusion, with enlightenment of campaign and promotion, the use of sawdust briquettes could be made popular and its production could be an avenue first, to dispose sawmill wastes and secondly to reduce environmental pollution from sawdust burning.

Keywords: Public perceptions, sawdust, sawdust briquette, bakery, bread bakers

Introduction

The area of land per capita has drastically reduced from about 360 hectares in 1960 to 90 hectares in 1999 (Ajakaiye, 2000) as a result of forest depletion. One of the major factors contributing to rapid forest depletion in Nigeria and in Ogun State in particular is the wastage of wood during log conversion, especially in sawmills (Aina, 2004). For instance massive logging and timber extraction in Omo forest reserve, Ogun state have been reported by Ola Adams (1996). Another notable source of wood waste is in the forest during timber harvesting with an unquantifiable wastes. This has constituted an impediment to the sustainable management of the forest and consequently sustainability of the forest industries in terms of raw material supply.

Some wood wastes are usually generated right from the point of harvesting up to final utilization point in sawmills. These include off-cuts, sawdust, slabs, wood shavings and log barks. These wastes have been classified into two that is avoidable and non-avoidable wood waste (F.A.C. 1972). Unavoidable wastes are those that cannot be avoided or prevented, even where the saw kerf is minimal and the mill workers are efficient, they include: sawdust, convertible slabs. Avoidable wastes are caused by poor harvesting techniques, saw maintenance, lack of pre-inspection of tree(s) and log(s).

In order to meet the internal and external wood demands and sustain the timber industries, there is the need to protect the forest against desertification, deforestation and coupled with this is the prevention of in-effective utilization of wood both at harvesting and processing stages to ensure a total utilization of harvested woods. Therefore, reduction of wood wastages and finding a rational use for wood wastes will result in less pressure on the forest.

Prominent among forest residues and sawmilling waste are sawdusts generated during wood conversion at sawmills. However, some products have been produced from sawdust such as fibre boards, particle boards, wood cement boards and floor tiles, but little or no information are available on the production and use of sawdust-briquettes especially in Abeokuta, Ogun state. Sawdust-briquettes (SDB) are produced when sawdusts are processed into a densified form. They are used as fuel energy especially for domestic cooking and heating. This form of wood wastes utilization is not new in the

advanced countries. It is gradually finding its way into Nigeria and Ogun state. The advantages of SDB over firewood as an alternative source of fuel energy has been reported in literature), these include ease of ignition, clean burning with little or no soots, high calorific values more than fire wood and ease of transportation and loading. The ability of SDB to be put off with water for reuse has also been reported.

The use of SDB for domestic and industrial heating is environmental friendly as it is smokeless and produces little or no soot, it can easily be stored without constituting a menace to the environment. Aside from the foregoing, waste management in Nigeria has been a contemporary issue in the polity. Hence, finding a use for wastes generated by sawmills will go a long way in arresting one of the problems of waste disposal and management. Hence the relevance of this study. The use of SDB especially in Abeokuta is new among populace especially bread baking industries. Bread is one of the staple foods in Nigeria produced from either wheat flours, cassava flours and maize flours. Bread bakeries are small scaled agro allied cottage industries whose chief sources of energy include: fire wood, electricity and cooking gas.

In spite of the advantages of SDB, some of which are already enumerated, information on people's perception, knowledge and awareness and use of this renewable energy source is scarce in the study area. The need for adequate awareness and education in the use of natural resources and products cannot be overemphasized. The objectives of this study therefore, are to investigate public perception, awareness and willingness to use sawdust briquettes with bread bakers as a focus in Abeokuta Ogun state, Nigeria.

The information provided will assist decisionmakers and prospective investors in making informed decisions on the products. These will go a long way in solving one of the energy crises and also enhance the philosophy of waste to wealth in Nigeria.

Materials and Methods

Study area

This study was carried out in Abeokuta the capital of Ogun state and the traditional home of the Egbas stratified into Abeokuta North, Abeokuta south and part of Odeda local government. The Egbas have been traditionally divided into four namely Egba Ake, Oke-ona, Gbagura and Owu. Three types of religion are widely practiced by the people. These include Christianity, Islam and traditional religion. The Christians dominate the three religions in terms of number.

Geographically, Abeokuta lies on a latitude $7^{\circ}15'N$ and longitude $3^{\circ}25'E$. The town is about 81 km South-west of Ibadan, Oyo state capital and 106 km north of Lagos former Nigeria's capital city. Abeokuta lies at an altitude of about 157 m above sea level amidst isolated outcrop of natural formation of granite rocks which give the town's landscape its undulating characteristics. The ancient and historic Olumo Rock is a popular tourist and holiday resort in the town.

It is about 17,228 meters above sea level and is located in the central part of the town while the popular 'Itoku market' well known for traditional Adire cloth is located close to the Olumo rock. Abeokuta has a humid weather with an average temperature of about $27.4^{\circ}C$ and an annual rainfall of 128 cm in the Southern part of the city to 105 cm in the Northern part. The Ogun river transverses through the town from the south to the western part. The population of Abeokuta North and South local government area has been estimated at 451,607 people (NPC 2006). The town is a nerve centre of commercial activities such as banking, cloth weaving and dyeing, trading and carving. Both modern and traditional agriculture are widely practiced in the town. Some of the prominent agricultural products include maize, cassava, yam and livestock. The town is also an educational centre with educational institutions providing formal education up to University level.

Method of data collection

The sources of data for this study were both primary and secondary. Primary data were collected with the aid of well-structured pretested and validated questionnaire personally administered to the bread bakers in Abeokuta. The questionnaires were made to address issues apart from socio-economic characteristics of the respondents, years of existence, source of finance, income and production capacity, issues bothering on respondent's perception, awareness and willingness to use sawdust briquette (SDB) were also addressed by the questionnaire. Also, other notable informants such as sawmillers, researchers were contacted to probe into some of the issues that were not addressed by the questionnaire.

Data Analysis

The data in the study were encoded into the Microsoft excel computer programme for processing. Thereafter, the S.P.S.S. (Statistical package for social sciences) programme was employed to analyze the data. Descriptive statistical tool such as mean, media, percentage and frequency counts, were used to summarize the data collected.

The Pearson correlation and Chi-square analysis were used to establish the relationship and associations respectively between the respondents' perceptions of sawdust briquette and some of their selected socio-economic characteristics. The models are specified below:

The model specification for Chi-square analysis is

$$\chi^2 = \sum_{i=1}^n \frac{(O_i - E_i)^2}{E_i}$$

χ^2 = the test statistic that asymmetrically approaches a χ^2 distribution

O_i = an expected frequency

E_i = an expected (theoretical) frequency asserted by the null hypothesis

n = the number of possible outcomes of each event

The model specification for Pearson correlation coefficient is

$$r_{xy} = \frac{\sum_{i=1}^n (x_i - \bar{x})(y_i - \bar{y})}{(n-1) \sqrt{\sum x^2 \sum y^2}}$$

Where \bar{x} and \bar{y} are sample means of x and y

Applied statistics for scientific studies by T.A.T. WAHUA 1999

Results and Discussion

Some of the characteristics of bread bakeries in Abeokuta, the study area are summarised in Table 1.

The bulk of the bakeries (84%) were situated in Abeokuta south LGA while the least number were in Odeda LGA. The presence of a large number of bakeries in Abeokuta south local government area could be because the LGA with the headquarters at Ake is the core area of the Egbas. Also history had it that the three LGAs constituted the then Egba Province in the former Western State of Nigeria.

The table also reveals that bread baking is an age-long cottage small-scale industry in the study area with about 38% of them being in existence for over twenty years. This might be due to the fact that Ogun state, especially Egba land happens to be the gateway to western civilization and by implication of western foods. This is because bread is an exotic kind of food usually linked to people doing white collar jobs.

The general source of fund by the respondents was by personal savings. This could be because all the bakeries were privately owned; it could also be because of the stress involved in securing bank loans. This is an indication that bread baking enterprises is a source of employment to the people, although, self-financing in most cases.

Public ownership of bread bakeries is not common in the study area; as observed from the table. This could be because most food industries belong to the private sector of the economy.

With respect to production capacity, 44% of the bakeries were found to be producing 100 different sizes of bread per bread oven while only 2% had 150 bread oven capacities

Bread baking in the study area was observed not to be an indigenous business as all the respondents came into the business through apprenticeship. This further led credence to the fact that bread is not an indigenous food of the 'Egbas' but it has naturalized as a staple food for almost everybody in the society.

With respect to respondent's sources of energy, firewood or fuelwood was the predominant source as 98% were involved in the use of firewood with natural forest as their main source of supply. This result agreed with Asiodu (2007) who stated that more than 70% of the Nigerian populace depend on firewood as domestic source of fuel energy. In the same vein, sourcing of firewood (42%) and sourcing of energy (40%) were the major problems encountered by the respondents. This could be due to rapid urbanisation, as most of the natural sources of firewood especially the forest must have been converted to other uses.

Table 1: *Some of the Descriptive characteristics of the bread bakeries in Abeokuta Metropolis*

Characteristics	Frequency	Percentage	Mode
<i>Location:</i>			
Abeokuta South	42	84	Abeokuta South
Abeokuta North	2	4	
Odeda	6	12	
TOTAL=	50	100	
<i>Year of Existence:</i>			
Below 5 years	10	20	
6-10 years	21	42	6-10 years
11-15 years	15	30	
16-20 years	3	6	
21 years and above	1	2	
TOTAL=	50	100	
<i>Source of found:</i>			
Personal savings	50	100	Personal savings
Others	0	0	
TOTAL=	50	100	
<i>Production capacity no of bread/oven:</i>			
80	15	30	
100	22	44	
110	6	12	
120	6	12	
150	1	2	
TOTAL=	50	100	
<i>Source of energy:</i>			
Fuelwood	49	98	Fuelwood
Electricity	1	2	
Industrial gas	0	0	
Solar energy	0	0	
Others	0	0	
TOTAL=	50	100	
<i>Ownership of Bakeries:</i>			
Privately owned	50	100	Private ownership
Publicly owned	0	0	
TOTAL=	50	100	

Acquisition of baking knowledge:

Apprenticeship	50	100	Apprenticeship
Family business	0	0	
Inheritance	0	0	
TOTAL=	50	100	
Problems / Constraints in bakeries			
Sourcing of fuel wood	23	42	
Sourcing of energy	20	40	
Competition	3	6	
Labour supply	2	4	
Transportation problem	1	2	
Smoke from fuel wood	1	2	
Total=	50	100	

Source – Field survey, 2010

Respondent's awareness information and willingness to use sawdust briquettes

Table 2 Summarizes respondent's source of information, awareness and willingness to use and invest in the production of SDB in the study area.

The bulk of the respondents (98%) were not aware of SDB and were seeing it for the first time and many could not identify the product. This is an indication that they are only aware of the use of conventional firewood for bread baking and in unusual cases, electricity and gas fuel.

The only respondent who was aware SDB got the information from the news-paper commentaries. The management implication is that SDB has not been made popular in the study area. This has some management implications on the forest as their main source of fuel energy. In spite of lack of awareness; 80% of the respondents were willing to use and even invest on its production. This trend could be due to the fact that firewood from the natural forest is becoming scarce as most of the areas where firewoods are being sourced have been converted to houses and other developmental projects. This observation agreed with Asiodu (2007) observed that 70% of Nigeria's populations depend on firewood or fuelwood which are in most cases inefficiently utilized.

Table 2- Respondent's awareness, source of information and willingness to use SDB.

Variables	Frequency	Percentage	Mode
Awareness			
Yes	1	2	
No	49	98	
Source of information			
News paper	1	2	
No information	49	98	
Willingness to use			
Yes	40	80	
No	10	20	

Source: Field survey, 2010

Respondent's perception of sawdust briquette in study area

In order to determine the way sawdust briquette was perceived by the bakers, 8 positive and 2 negative validated perceptual statements against a 5-point likert scale ranging from strongly agreed (5), agreed (4), disagreed (3), strongly agreed (2), undecided (1) for positive and vice-versa for negative was administered to the respondents as shown in Table 3. The level of perception of sawdust briquette was further determined using the mean perception score to classify the perception of the respondents into favourable, indifferent, and un-favourable perceptions in line with, (Toromiro and Dionco-Adetayo, 2004)

The result of the 5-point Likert scale ranging are summarized in Table 3. All the respondents strongly disagreed that SDB is cheap or will be procured at a cheap price; 96% of them strongly disagreed with its ease of availability. This could be because the product and technology is new and SDB is not common in Abeokuta. However, 80% of them agreed that it will be easy to handle and use probably because they saw a sample of the SDB. With respect to availability, 94% strongly agreed that SDB is very scarce in the market. This shows that an early investor could take advantage of this trend and monopolize the market for SDB. The scarcity in the market could also be due to the fact that sawmills in Abeokuta might not be aware of this new technology of converting waste to wealth. Sixty-six percent (66%) of the respondents agreed to SDB releasing more heat than firewood while 94% strongly agreed to its ease of transportation

Table 3: Distribution of respondents according to their perception of Sawdust Briquette

S/N	Perceptual statement on sawdust briquette	Strongly Agree	Agree	Disagree	Strongly Disagree	Undecided
	Positive scale	5	4	2	1	
	Negative scale	1	2	1	5	
1	Sawdust briquette is easily available	0	0	2(4)	48(96)	0
2	Sawdust briquette is cheap	0	0	0	50(100)	0
3	Sawdust briquette is easy to use	40(80)	10(20)	0	0	0
4	Sawdust briquette burns easily	0	22(44)	0	0	3(6)
5	Sawdust briquette is scarce in the market	47(94)	2(4)	0	0	1(2)
6	Sawdust briquette burns faster	1(2)	7(14)	0	0	2(4)
7	Sawdust briquette produces much smoke	0	1(2)	45(90)	0	4(8)
8	Sawdust briquette is easy to load into the oven	45(90)	3(6)	0	0	2(4)
9	Sawdust briquette is easily transported	47(94)	1(2)	0	0	2(4)
10	Sawdust briquette release more heat	1(2)	33(66)	1(2)	0	3(6)

Source: Field survey, 2010

Respondent's perceptual level of sawdust briquette

Table 4 shows that a large percentage (66%) of the respondents perceived sawdust briquette favourably; 30% perceived it unfavourably while only (4%) of the respondents were indifferent. These show that these categories that is those indifferent to SDB and those who had unfavourable disposition still needed to be enlightened about the usefulness and advantages of SDB over other source of energy especially firewood.

Table 4: Distribution of respondents according to the perceptual level of sawdust briquette

Level of perception	Frequency	Percentage
Unfavorable perception	15	30
Indifferent perception	2	4
Favourable perception	33	66
Total	50	100

Source: Field study, 2010 (n = 50)

Relationship between the respondent's perception of sawdust briquette and some selected socio-economic variables

In order to determine the relationship between the bakers' level of perception of sawdust briquette and some selected socio-economic characteristics, Pearson correlation was used (Table 5). The result of the Pearson revealed a significant and positive relationship between bakers' perceptual level and their years of existencethat is age of bakeries ($R = 0.26^{**}$) at 0.01 probability level. This implies that the longer they stay in the business, the more favourably they are likely to perceive sawdust briquette. Similarly, respondents perceptual level was found to be positive and had a significant relationship with their production capacity ($R = 0.69^{**}$) at 0.01 probability level, showing that as their production capacity increases they are likely to perceive sawdust briquette more favourably. While the source of fund ($R = -0.13$) and awareness of sawdust briquette ($R = -0.49$) were found to have negative and no significant relationship with the level of perception at 0.01 probability level, which implies that these two socio-economic variables may inversely influence the level of people's perception of SDB in the study area.

Table 5: Pearson correlation showing the relationship between the respondents' perception of sawdust briquette and some of their selected socio-economic characteristics

VARIABLES	R	R ²
Years of existence	0.26**	0.07
Production Capacity	0.69**	0.47
Source of Fund	-0.13	0.02
Awareness	-0.49	0.24

Source: Generated from the field survey, 2010, **significant at 0.01 level =correlation coefficient, R²=co-efficient of determination.

Result of the Chi-square analysis

The results of the Chi-square analysis are summarized in (Table 6). The table revealed that all the selected variables that are years of existence, production capacity, source of fund, and awareness of sawdust briquette were significantly associated with the respondents' level of perception of sawdust briquette at 93, 91, 96, 96% strength of association respectively.

Table 6: Chi-square analysis showing relationship between bakers' level of perception of sawdust briquette and some of their selected socio-economic characteristics

Variables	Chi-square calculated (χ^2_0)	Chi-square tabulated (χ^2_1)	Degree of freedom	Contingency coefficient t	Sig
Age	27.6**	9.49	4	0.934568201	0.05
Production Capacity	25.7**	9.49	4	0.914950026	0.05
Source of Fund	50**	3.84	1	0.962250449	0.05
Awareness	46.08**	5.99	3	0.95923292	0.05

Source: Generated from the survey, 2010, **significant at 0.05 level.

Conclusion

It can be concluded from this study that a large number of the public especially breadbakers in Abeokuta have positive perceptions on SDB and may probably adopt its use as an alternative source of energy. This is in spite of the fact that the production innovation is new to them while a good number of them were unaware of the SDB. The management implication is that there is a dearth of publicity and enlightenment on this product which are responsible for unfavourable perception of SDB. In the light of the above, there is the need to step up a wide extension service on this new innovation so as to make it attractive and popular. This will go a long way to reduce the pressure on the natural forest for the exploitation of fire wood.

The need to have an alternative energy source cannot be overemphasized. This is because of the alarming rate of deforestation especially in Ogun state. The stepping up the production and enlightenment campaign programme on other alternative sources like SDB is highly recommended. However, this requires strong publicity and enlightenment as the innovation is novel and unpopular.

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