

# Appraisal of Starch-Bonded Briquettes Utilization among User-Respondents in Port Harcourt, Rivers State, Nigeria

## ABSTRACT

The study appraised briquette users' opinions on the apparent properties and environment friendliness of the briquettes bonded by 30% and 40% starch composited saw dust collected from Marine and Illoabuchi Sawmills in Port Harcourt, Nigeria. Multistage sampling was used amongst 1000 plantain (Bo-lae) roasters, meat barbecue (Suya), Garri (carbohydrate based food – clarify also in methodology section) and Akara (bean cake-baking) respondents (1000) to elicit information on use of briquettes as an alternative source of energy on a 4-point Likert scale. The results showed that male user-respondents were 22 (88%) and 21 (84%) and female 3 (12%) from Marine & Illoabuchi Sawmills, respectively. The 41-50 respondent age bracket had the highest were the most represented in both sawmills-Marine Base and Illoabuchi 12 (48%) and 11 (44%) respectively, followed by 31-40 (7: 28%) and 51-60 (4: 16%) in Illaboachi sawmill, while the 51-60 and 31-40 age groups were 6 (24%) and 5 (20%), respectively. Amongst the businesses run carried out by respondents, users of briquettes from Marine Base, Port Harcourt, plantain roasting was highest of at 7 (28%), followed by fish barbecue and akara with 6 (24%), meat barbecue Suya had 5 (20%), while at Illoabuchi, meat barbecue Suya grillers had 9 (36%), followed by plantain roasters had 8 (32%), and Garri stewards and Beans eake (Akara) had the same 3 (12%). Environment friendliness and physical properties showed that briquettes smoked well with cut off Mark (M =3.04 and 3.80), smelled pleasantly (M=3.03 and 2.68), stuffy and choky smoke (M=0.4 and 1.00) and irritation of eyes had M=3.25 and 4.00 at Illaobuchi and Marine Base sawmills, respectively. While Darkening pots, burning with dark smoke and being affected by water had their cut off marks (M) had 1.33 and 1.40 (rejected), 2.63 and 2.50 (accepted) and 2.01 and 2.12 (rejected), portable, cheap and useful had M= 2.45 and 3.00, 3.60 and 3.60 and 3.40 and 3.09 from both mills respectively. This study recommends that Bbriquetting of sawdust from sawmills be promoted via is recommended and its automation to maximize its utilization status.

**Keywords:** Briquettes, user-respondents, environment friendliness (arrange keywords alphabetically)

## INTRODUCTION

35 ~~There is high and rapid demand for wood fuel consumption is considered as a major contributing~~  
36 ~~factor to the fuel wood crisis in Nigeria (Himraj, 1993 Cannot not use a 1993 [26 year old]~~  
37 ~~source to indicate the current [2019] situation). Africa accounts for 12% of the global population,~~  
38 ~~it consumes only 4% of global energy (Ardayio Schandorf, 1996). (Data already 23 years old –~~  
39 ~~not applicable anymore) FAO (2008) predication is that fuel wood is likely to remain an~~  
40 ~~important energy source in Africa in the coming decades while forecasts made 2001 even~~  
41 ~~suggested a 34% increase in wood fuel consumption from 2000 to 2020. (We are on the cusp of~~  
42 ~~beginning the year 2020, which is at the end of the forecast – thus this data is historically not~~  
43 ~~relevant anymore) The Energy Commission of Nigeria (ECN abbreviation not used again –thus~~  
44 ~~no reason for its inclusion)) asserted ~~that a~~ 92.2% consumption of fuelwood as ~~a~~ primary~~  
45 ~~alternative energy source in the country (cite ECN correctly as a source).; This is corroborated~~  
46 ~~by Aju & and Uwalaka (2010) that fuel-wood is a primary energy source of energy accounting~~  
47 ~~for over 90% of the total energy used for domestic purposes in Nigeria. Thies and Pfeil (2007)~~  
48 ~~estimated that fuel wood collection in Africa by 80%. (2007 was 12 years ago- source too old to~~  
49 ~~account for current scenario) The demand for fuel-wood is expected to ~~have risen~~ to about 213.4~~  
50 ~~x10<sup>3</sup> metric tonnes, while the supply ~~would have is expected to~~ decreased to about 28.4 x10~~  
51 ~~metric tonnes by the year 2030 (cite source for this data) (for which area is this? Nigeria?). Over~~  
52 ~~90% of the rural/peri-urban populations depend on fuel wood to meet their domestic energy~~  
53 ~~requirements Federal Department of Forestry (FDF) and Federal Ministry of Environment~~  
54 ~~(1999). (1999 too old to be of value; information (90%) already adequately captured via Aju and~~  
55 ~~Uwalaka as well as ECN source. No need to state it a third time) Fuel-wood energy used is~~  
56 ~~consumed mostly by the low ~~income~~ and lower- middle income ~~amongst the~~ urban households as~~  
57 ~~well as by ~~ownerperates~~ of cottage and small scale industries and commercial enterprises such as~~  
58 ~~pottery (cite source), hotels (cite source), schools (cite source), banks (cite source) and hospitals~~  
59 ~~(cite source). (It is unlikely that commercial enterprises such as hotels, banks and hospitals~~  
60 ~~would use fuelwood as their primary energy source. However, if you can cite credible sources~~  
61 ~~then it is OK to state it.) In Ogoni-land and other parts of Rivers State (Nigeria), ~~fuel~~-wood and~~  
62 ~~even twigs and leaflets of woody species are garnered and scavenged from newly exploited and~~  
63 ~~cultivated ~~primary, secondary and even~~ riparian and mangrove forests as well ~~asnd~~ polluted oil~~  
64 ~~sites ~~for fuel~~ (cite source). Rural dwellers troop in groups to forests with axes, machetes, ropes~~  
65 ~~and basins trekking long distances in search of the ~~aise~~ resources (cite source). The high cost~~  
66 ~~conventional sources of energy ~~haves~~ changed the paradigm to wood as ~~an energy source for~~~~  
67 ~~livelihood sustenance and as an income source ~~fuel wood and a source of livelihood as many sell~~~~  
68 ~~firewood in stacks and heaps depending on the sizes of firewood (cite source). For this reason, a~~  
69 ~~transition to a sustainable energy system is urgently needed in ~~the~~ developing countries such as~~  
70 ~~Nigeria (Stout & and Best, 2001 – this source way too old [18 years] to be of value in indicate CURRENT~~  
71 ~~need for transition to a sustainable energy system – update to more recent [2015-2019] source –~~  
72 ~~otherwise remove sentence). See journal guidelines on the use of “&” in citations~~

73 One of such energy source is wood waste or sawmill residue. Sawdust constitutes one of the  
74 most abundant waste or residue in wood industries. It was estimated that wood waste generated  
75 in ~~the country~~ Nigeria in 1998 was 1.72 million/m<sup>3</sup>, ~~out~~ of which sawdust was 15% (Badejo, 1990  
76 – cannot cite Badejo 1990 for 1998 data – correction needed). However, inefficient wood  
77 conversion and low biomass recovery from the ~~Nigerian~~ timber ~~process in Nigerian forest~~  
78 industry have led to ~~the prevalence of~~ sawdust hills around sawmills, ~~thereby~~ constituting –a  
79 visual blight ~~onte~~ the local environment and a breeding ground for wood decaying organisms  
80 (Emerhi, 2011). Sawdust hills could be compacted into briquettes ~~as a source of ~~for~~ fuel energy~~

81 | supply (Wilaipon, 2007). -Briquettes made from sawdust can possibly reduce forest degradation  
82 | and deforestation to mitigate these problems.

83 | Briquetting, which is aggregation of micro- or minute- wood waste, costs little or no money  
84 | compared to like other wastes such as newspaper or, partially decomposed plant waste. ~~or~~  
85 | Ssawdust can be an alternate source of domestic and industrial energy to charcoal, firewood, gas,  
86 | coal and electricity. Briquettes made from charcoal and sawdust is a desirable fuel because it  
87 | produces a hot, long-lasting and virtually smokeless fire, and are is produced when charcoal and  
88 | sawdust are combined with other materials, and it is formed into uniform chunks (Emerhi, 2011).  
89 | Thus far nothing has been stated about Starch-bonded briquettes. Globally, the  
90 | overdependence by humans on fossil fuel has led to environmental degradation hazards. Thus  
91 | there is a need for a sustainable, in- and not enough, expensive , there is need for cheap  
92 | alternative energy source such as from wood micro waste (sawdust). Therefore, this study aimed  
93 | at appraising briquette users' opinion on the apparent properties and environmental friendliness  
94 | of the briquettes bonded by 30% and 40% starch. Indicate value of this study to the study area, as  
95 | well as other similar areas.

96 | Ideally one would expect to see much more recent (2015-2019) sources cited in the above  
97 | introductory section. The use of more recent sources eliminates the problem of sketching/stating  
98 | a current scenario by employing very old data.

## 99 | **METHODOLOGY**

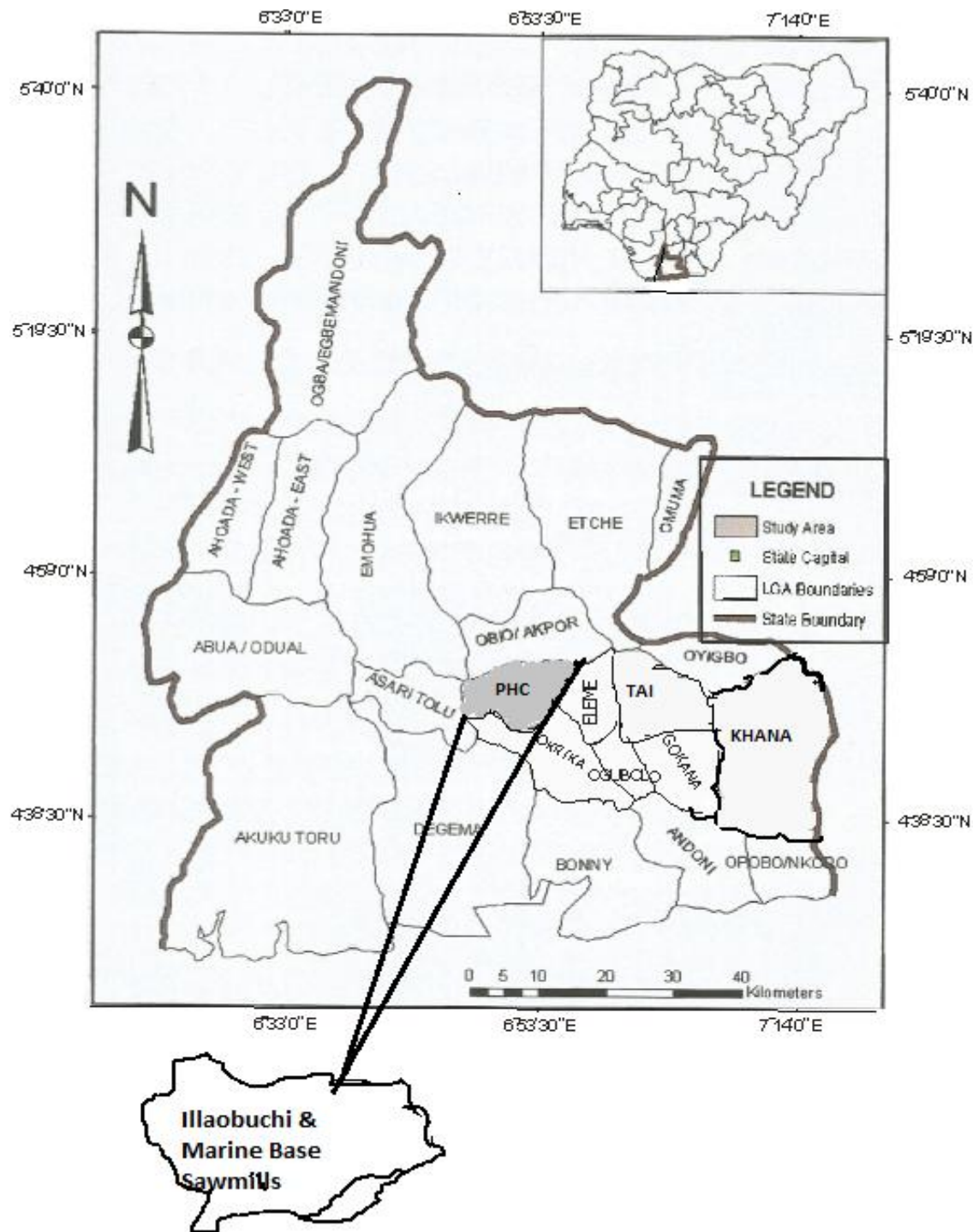
### 100 | Study area

101 | S~~The~~ saw-dust was sourced from Marine and Illoauchi sawmills in Port Harcourt, Rivers State,  
102 | Nigeria on Latitude 4.51°N, and longitude 7.01°E (Plate-Figure 1) and average annual rainfall of  
103 | above 2000 mm (???) at altitude above the sea level-(Tariah *et al.*, 1991 – due to climate change  
104 | you must update climatic data to newest figures and sources – cannot use near 30 year old data as  
105 | illustrating current [2019] climate of the area-). Why do we absolutely NEED to know the mean  
106 | annual rainfall or the altitude in order to understand the results? If not critical, then remove.

107 | Describe the socio-economic conditions of the populations around Marine and Illoauchi sawmills  
108 | who utilize the briquettes and/or fuelwood. This is to illustrate dependence on fossil fuel for  
109 | livelihood sustenance.

110 | Indicate wood/trees used by the two sawmills (same/different tree species?) - This is to illustrate  
111 | composition of sawdust used for briquettes, which will influence data on perception of  
112 | briquettes.

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115 **Plate-Figure 1: Map of Rivers State indicating the study areas** (Source: Rivers State Ministry of  
 116 Environment, indicate date)- (See figure key box (right hand side of figure – brownish area =  
 117 study area – not indicated as such in figure)

118 **Research ~~d~~Design**

119 How was sawmills selected? Multistage sampling (cite source of this sampling technique) was  
120 used in the by-identification of target respondents and their locations: the respondents were  
121 identified by spotting-identifying their various locations (5 at each sawmill where briquettes were  
122 produced) purposively to assess the business they do. Questionnaires were administered (how?)  
123 amongst energy-using respondents-plantain and fisher roasting or barbecue otherwise known as  
124 bo-lae, meat barbecue (suya), garri and akara baking respondents (100 per business category?  
125 Explain how many respondents per category) to elicit information on the produced briquettes  
126 used as source of energy. The number of respondents for the study was 1000 respondents, 100  
127 per each location (how many locations [2? Marine & and Illoabuchi Sawmills??]). This data on  
128 number of respondents do not correspond with results section (25 for Marine Sawmill and 24 for  
129 Illoabuchi Sawmill) (total 49 people interviewed)

130 The age categories and any other categories must be explained in this section via appropriately  
131 used sources. Also see cut off Mark categories

132

133 **Sampling Procedure and Sampling Size**

134 The number of respondents for the study was one thousand (1000) respondents, hundred (100)  
135 copies for each locations.

136 **Data collection (example)**

137 Data was collected between [date] and [date] using a semi-structured questionnaire. The  
138 questionnaire was designed to capture the following information: (i) biographical data of  
139 respondents, (ii) Users assessment of briquettes, and (iii) Assessment of problems  
140 associated with briquettes utilization.

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142 **Experimental Design/Data ~~a~~Analysis**

143 Multistage sampling method (cite source of sampling technique) was employed and obtained  
144 data were subjected to descriptive statistics and a 4-point Likert scale which ranged from  
145 strongly agreed=4, agree=3, disagree=2 and strongly disagree=1. What software was employed  
146 to capture and analyze the data (e.g. MS Excel 2010)?

147

148 Environment friendliness and physical properties showed that briquettes smoked well with cut off  
149 Mark (M =3.04 and 3.80), smelled pleasantly (M=3.03 and 2.68), stuffy and choky smoke  
150 (M=0.4 and 1.00) and irritation of eyes had M=3.25 and 4.00 at Illaobuchi and Marine Base  
151 sawmills, respectively. Darkening pots, burning with dark smoke and being affected by water



152 had their cut off marks at 1.33 and 1.40 (rejected), 2.63 and 2.50 (accepted) and 2.01 and 2.12  
153 (rejected), portable, cheap and useful had M= 2.45 and 3.00, 3.60 and 3.60 and 3.40 and 3.09  
154 from both mills respectively. This method must be explained in detail here.

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### 156 Ethical considerations

157 This aspect MUST be clarified as the intellectual property of these people was used in this  
158 research paper. (e.g. Participants gave their informed consent before commencing with the  
159 interview schedules as required by the University of ???'s ethics committee.)

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## 161 RESULTS AND DISCUSSION

### 162 Socio-economic Biographical Characteristics of Briquette Users from Marine and 163 Illoabuchi, Port Harecourt participants

164 The Results of the socio-economic characteristics of briquettes user respondents showed that  
165 across different enterprises males were dominant more involved (cannot state more involved as  
166 your sampling techniques was purposively administered) than the females: 22 (88%) and 21  
167 (84%) and 3(12%), male and female at Marine & and Illoabuchi Sawmills respectively (Figure  
168 Table 1 – incorporate this data into Table 1). (Here it looks like 22 males +3 females = 25 total  
169 for Marine sawmill) and (21 males + 3 females = 24 total for Illoabuchi Sawmill) Total=  
170 (22+3+21+3 = 49) But Sampling Procedure and Sampling Size in methodology section states  
171 1000 was selected. Also see Table 1, which indicate 24 and 24 for each sawmill, respectively.

172 GENDER: It is unclear how 22 MALES can constitute 88% of the sample size at Marine  
173 sawmill. This is because 1000 people were interviewed (see Sampling Procedure and  
174 Sampling Size in methodology section) in total (although not explicitly stated: possibly 500  
175 from Marine sawmill) and possibly 500 from around Illoabuchi sawmill. 22/500 = 4.4%

176

177 The age of respondents that used the briquettes showed that the 41-50 age bracket were the most  
178 active in using briquettes had the highest in both sawmills-Marine Base and Illoabuchi 12 (48%)  
179 and 11 (44%) respectively, followed by the 31-40 (7:28%) and 51-60 age group (4:16%) in  
180 Illoabuchi sawmill. The while 51-60 and 31-40 age groups were represented by were 6 (24%)  
181 and 5 (20%) respondents respectively (Figure-Table 1– incorporate this data into Table 1).

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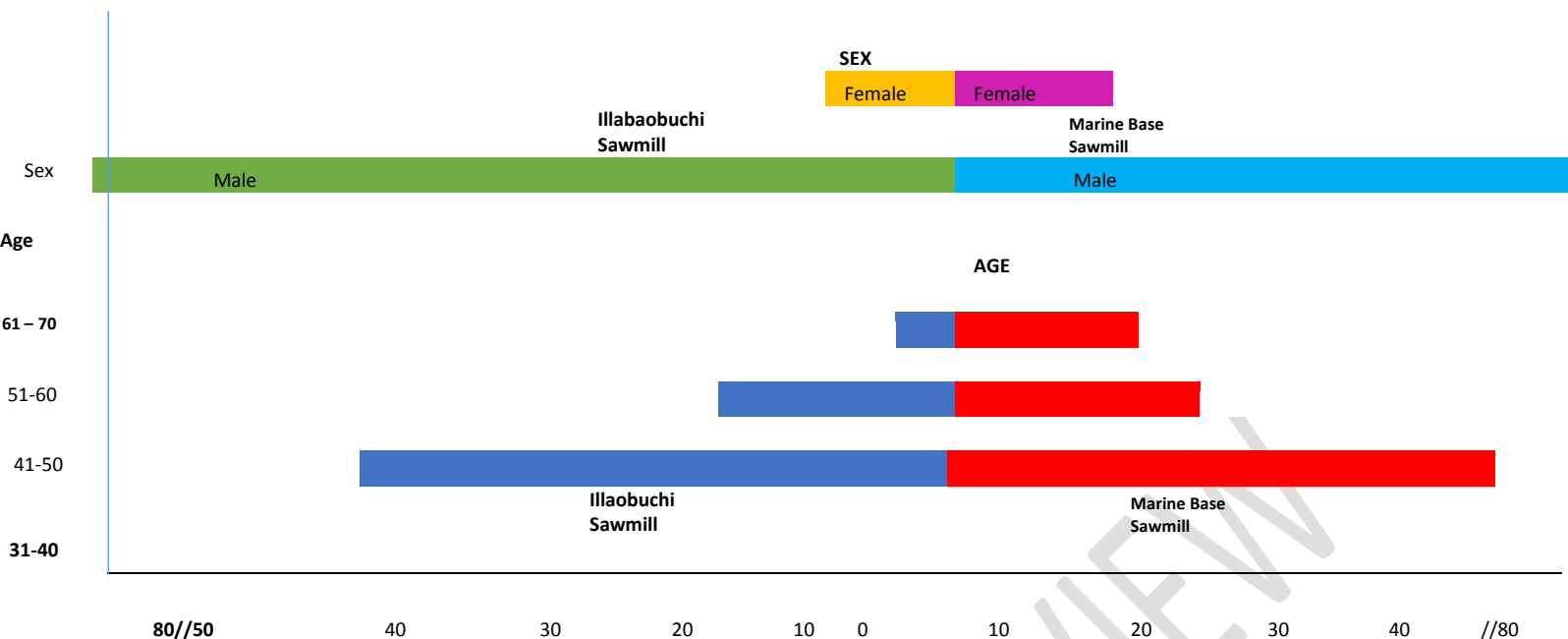
183 The data below cannot therefore not be scientifically assessed for correctness due to a dis-  
184 connect between Methodology and Results informant numbers – Thus the review stopped here.

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**Figure 21: Percentage distribution of sex & age of user respondents in Port Harcourt Sawmills**



208 The businesses were dominated by the married briquettes users 11 (44%) from Marine Base  
 209 sawmill but at Illoabuchi married and single users had the same frequency and percentage with  
 210 10 (40%) while separated users had the lowest (1:4% and 3: 12%, MB and IB sawmills  
 211 respectively (Table 1).

212 The result on education status of briquettes users showed that secondary leavers were almost the  
 213 same at both MB and Illoabuchi sawmills with 12 (48%) and 11 (44%) respectively, followed by  
 214 those without education with 7 (28%) and 5 (20%) and lowest was primary school leavers. Even  
 215 university graduates were involved in this petty entrepreneurial business with 5 (20%) for both  
 216 sawmill (Table 1).

217 The year of experience of respondent users matters as 11-12 years had the highest (12:48%)  
 218 followed by 1-10 years with 10 (40%) at MB while 1-10years was the highest with 9 (36%)  
 219 followed by 11-20years with 8 (32%) and 21-30years with 4 (16%) (Table 1).

220 Amongst the businesses carried out by respondents, users of briquettes from Marine Base, Port  
 221 Harcourt, plantain roasting was highest of 7 (28%) followed by fish barbecue and akara with 6  
 222 (24%), meat barbecue had 5(20%) while at Illoabuchi, meat barbecue had 9 (36%) followed by  
 223 plantain had 8 (32%) and garri and akara had the same 3 (12%) (Table 1).

224 **Table 1: Socio-economic Biographical Characteristics of Briquette Users, from Marine**  
 225 **and Illoabuchi, Port Harcourt**

Socio-economic Characteristics		Marine Base Sawmill		Illoabuchi Sawmill	
		Frequency	Percentage	Frequency	Percentage
<b>Marital Status</b>	Married	11	44	10	40
	Single	9	36	10	40
	Divorced	3	12	1	4
	Separated	1	4	3	12
<b>Education Status</b>	Tertiary education	5	20	5	20
	Secondary school	12	48	11	44



	Primary school	2	8	3	12
	No Education	7	28	5	20
<b>Year of Experience</b>	1-10	10	40	9	36
	11-20	12	48	8	32
	21-30	1	4	4	16
	31-40	2	8	2	8
	41-50	0	0	1	4
<b>Kinds of Business:</b>	Plantain Roasting	7	28	8	32
	Meat Barbecue	5	20	9	36
	Fish Barbecue	6	24	2	8
	Garri	1	4	3	12
	Beans Cake (Akara)	6	24	3	12

226 **Field Survey, 2019**

227 **Users Assessment of Briquettes from Illaobuchi and Marine Base Sawmills**

228 The result on the use of briquettes from both sawmills in terms their environment friendliness  
 229 and physical properties showed that briquettes smoked well (M=3.04 and 3.80), smelled  
 230 pleasantly (M=3.03 and 2.68) Illaobuchi and Marine Base respectively, but contrariwise the  
 231 briquettes smoke was stuffy and choky smoke (M=0.4 and 1.00) and irritation of eyes had  
 232 M=3.25 and 4.00 respectively (Table 2). This finding provides energy solution to user  
 233 respondents which agrees with Ogunsanwo (2001) that application of briquetting technology of  
 234 saw dust is promising solution to the problems of unutilized agricultural residues. The  
 235 environment friendliness properties of briquettes also agrees with Yaman *et al.*, (2000) and  
 236 Olorunnisola (2004) reported that greater heat intensity, cleanliness, convenience in use, and  
 237 relatively smaller space requirement for storage are notable merits of briquettes. The use of  
 238 briquettes from sawdust ubiquitous at sawmills in urban, towns, villages and other rural dwellers  
 239 living close to them may reduce the energy, time and danger trekking to the forests to harvest  
 240 fuel wood which a pragmatic paradigm shift to exploration of alternative source of energy. This  
 241 agrees with Barrow *et al.*, (2007) who reported that restoration of woodland around the  
 242 communities reduced the time taken to collect fuel wood by up to four hours and this has  
 243 potential to free up time for women to engage in other productive activities that can improve  
 244 gender empowerment, equity and sustainability of woodland. Applying this concept to  
 245 availability of briquettes, the time would be less than four hours, the limitation of briquetting is  
 246 the manual production method used.

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249 **Table 2: Assessment of Environmental Friendliness and Physical Properties of Briquettes**

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	Illaobuchi	Marine Base
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<b>Physical Properties</b>	Mean	Mean	Remarks
Friability and Easily Breaks	1.78	2.00	Reject
Weighty and Heavy	1.71	2.00	Reject
Smokes well	3.04	3.80	Accept
Smell Pleasantly	3.03	2.68	Accept
Stuffy and Choky Smoke	0.4	1.00	Reject
Smoke Irritates Eyes	3.25	4.00	Accept

250 **Cut off Marks (M): Accept if  $M \geq 2.50$ , Reject if  $M \leq 0.05$**

### 251 **Assessment of Problems Associated with Briquettes Utilization**

252 The results of respondents users problems like darkening pots, burning with dark smoke and  
 253 being affected by water had their cut off mark (M) ranged from 1.33 and 1.40 (rejected), 2.63  
 254 and 2.50 (accepted) and 2.01 and 2.12 (rejected) from Illaobuchi and Marine Base respectively  
 255 (Table 3). The briquettes were portable, cheap and useful had  $M = 2.45$  and  $3.00$ ,  $3.60$  and  $3.60$   
 256 and  $3.40$  and  $3.09$  from Illaobuchi and Marine Base sawmills respectively (Table 3). In terms of  
 257 cost and ease of use, it agrees with Yaman *et al.*, (2000) and Olorunnisola (2004) reported that  
 258 greater heat intensity, cleanliness, convenience in use, and relatively smaller space requirement  
 259 for storage are notable merits of briquettes.

260 **Table 3: Assessment of Problems Associated with Briquettes Utilization**

Problems	Illaobuchi	Marine Base	Remarks
	Mean	Mean	
Darkness or Blackens pots	1.33	1.40	Reject
Lack of other Alternatives	2.44	2.20	Reject
Burns with Smoke	2.63	2.50	Accept
It is Cheap	3.60	3.60	Accept
Affected by water	2.01	2.12	Reject
Portability	2.45	3.00	Accept
Smokes well	3.01	4.00	Accept
It is Useful	3.40	3.09	Accept

261 **Cut off Marks (M): Accept if  $M \geq 2.50$ , Reject if  $M \leq 0.05$**

### 262 **Conclusion**

263 The properties of briquettes analyzed and appraised by product users showed that the produce  
 264 briquettes had positive environment qualities, though some properties were not all that useful and  
 265 friendly but the overall use of the briquettes were promising as an alternative to conventional  
 266 fossil energy sources. Briquetting of sawdust from sawmills is recommended in order to reduce  
 267 deforestation, degradation and environmental hazards caused by the use of other sources of  
 268 energies especially petroleum products. There should be automation of production of briquettes  
 269 in order to maximize its utilization status.

### 270 **References**

271

272 Aju, PC, Uwalaka, RE. (2010). Forest resources and the economy of rural Nigerians. Practical  
273 issues. In: Ijeomah HM, Aiyeloja, AA, editors. Forest and wildlife resources management.  
274 2<sup>nd</sup> ed. Top Press, Port Harcourt, 2010; 172-186.  
275

276 Ardayfio-schandorf E, The fuel wood/energy crises in sub-Saharan Africa. In: George B,  
277 William B. Morgan, Juha IU, editors. Sustaining the future economic, social and  
278 environmental change in sub-Sahara African. The United Nations University, ISBN:  
279 0585229996. 1996; 365-380.  
280

281 Badejo SO. Sawmill wood residues and their utilization. A paper presented at the National  
282 Forestry Workshop Management Strategies for Self Sufficiency in Wood Production held  
283 at Ibadan June.1990.  
284

285 Barrow E, Fisher RJ, Emerton L, Ingles A. Forests Livelihood and Millennium Development  
286 Goals (MDGs) in Tanzania and Lao PDR. In: Mayers J, editor. Forest, and the MDGs.  
287 EFFRN News No. 47-48; Winter 2006-2007: 7.  
288

289 Emerhi, E.A., (2011). Physical and Combustion Properties of Briquettes Produced from Sawdust  
290 of Three Hardwood Species and Different Organic Binders. *Journal of Advances in*  
291 *Applied Science Research*. 2011;2 (6): 236-46 (ISSN: 0976-8610) indexing CODEN  
292 (USA) AASRFC.  
293

294 FAO. Forests and Energy. Key Issues. FAO Forestry Paper No. 154. Rome: 2008.  
295

296 Federal Department of Forestry FDF, and Federal Ministry of Environment FME. Energy  
297 consumption in Nigeria. 1999.

298 Himraj D. (1993). Fuel substitution in Sub-Saharan Africa. *Environmental management*. 1993;  
299 19 (3): 283-288.  
300

301 Ogunsanwo OY. Effective management of wood waste for sustainable wood utilization in  
302 Nigeria. In: Popoola L, editor. Proceeding of the 27<sup>th</sup> Annual Conference of Forestry  
303 Association of Nigeria Abuja, FCT 17-21, Sept., 2001: 225-234.  
304

305 Olorunnisola AO. Briquetting of rattan furniture waste. *Journal of Bamboo and Rattans*.  
306 2004;3(2): 139-149.  
307

308 Stout BA, Best G. Effective energy use and climate change: needs of rural areas in developing  
309 countries. *Agricultural engineering international the CIGR. Journal of Scientific Research*  
310 *and Development*. 2001; 3:19.  
311

312 Tariah NW, Zuofa K, Doughlas D C (1991). Diagnostic survey in Rivers State. A cropping  
313 system case study of Nchia in Eleme Districts. *Nigerian Journey of Crop Science and*  
314 *Forestry*. 1991; 1(1):13-18.  
315

316 Thies W, Pfeil EO. Do Forests Contribute to achieving the MDGs? Some arguments from  
317 German Development Co-operation. In: Mayers J editor. Forests and MDGs. EFFRN  
318 News No. 47-48; Winter 2006-2007.  
319  
320 Wilaipon P. Physical Characteristics of Maize Cob Briquettes under Moderate Die Pressure.  
321 *American Journal of Applied Science*. 2007; 4:995-998.  
322  
323 Yaman SM, Sahan-Sesen H, Haykiri-acma K, Kucukbayrak S. Production of fuel briquettes from  
324 olive refuse and paper mill waste. *Fuel Processing Technology*. 2000; 68:2331.  
325 .  
326  
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