

**Assessment of Chainsaw Milling Enterprise in Benue State, Nigeria**

**Abstract**

The paucity of information on chainsaw milling enterprise has contributed to poor planning and development of timber resources in Nigeria. This study has accessed the marketing efficiency with a view of evaluating its potential contribution to the livelihoods and economic development of Benue State. Multistage sampling technique and purposeful sampling technique were applied to determine the study sample which was drawn from the three geopolitical zones in the State; Zone A, Zone B and Zone C. Applying a sampling intensity of 30%, seven (7) LGAs were sampled from the 23 LGAs of the State for the study. Based on this arrangement 79 chainsaw millers were selected and interviewed on the trading activities. Data were collected and analyzed using descriptive statistics such as percentages and frequency distribution. Also gross margin analysis, marketing margin, marketing efficiency, Analysis of variance, T-test Statistics, Index of market concentration (IMC), and Rate of return on investment RORI, Gross Ratio GR were used in the determining the profitability and the efficiency of chainsaw millers trading efficiency in the study area. The study revealed that the trade is male dominated having 100% of the respondents as males. Similarly, the indigenous groups dominated the chainsaw milling and with the TIV having the majority of (65.8%), this was followed by the Idoma (13.7%), Igede, (12.5%) and Igbo (5.5%), Igala and Sura 1.4% each. The study identified 18 timber species that were marketed in the study area and that 2,411, 37,733, and 69,492 volumes were marketed in zones A, B and C respectively. The result of the gross margin and market efficiency showed that that the chainsaw milling activities are profitable and efficient. It revealed the mean monthly gross margin of 39,688.00, 128,730, and 84,000 with corresponding RORI of 84.19, 43.93, and 61.80 for the chainsaw millers. The ANOVA of GMs were significant with 0.013. The Total Revenue and Total Variable Cost (TVC) equally showed significance with 0.045, 0.000, 0.000.

The IMC, Gini coefficient of 0.1891, 0.3218 and 0.1829, indicating that the concentration was low with income inequality but with a competitive market.

**Keywords:** Chainsaw milling, marketing efficiency, market concentration.

## 39 1.0 INTRODUCTION

40 The Nigerian forests support a wide range of forest industries, both the formal and  
41 informal sub-sectors, which a vast majority of the Nigerian populace depends on for  
42 their livelihood (FAO, 2009; Akpabio *et al.*, 2013. According to Fuwape (2003) and  
43 FAO (2007), the sub sector has contributed significantly to the socio-economic  
44 development of Nigeria; ranking among the highest revenue and employment  
45 generating sectors. Ofoegbu, (2014) and Bichi (2011) asserts timber resources and  
46 timber trade has been a major contributor to the national gross domestic product (GDP)  
47 and thus a formidable tool for poverty alleviation.

48 This is evident in the direct and far-reaching influences of the forest to livelihoods as  
49 the available forests are continually diminishing in the presence of rising human  
50 population and demand; this has unequivocally increase pressure on the forest resource  
51 base of the nation. (Adeyoju 1975; Kalu and Okojie, 2009; Amiebenomo, 2002;  
52 Faleyimu, 2013).

53 Chain sawmilling in Nigeria is a fully fledged economic informal sector that generates  
54 income for a range of participants in the timber trade chain, including rural people,  
55 transporters and urban traders (Wit *et al.*, 2010). Chainsaw milling is the method used  
56 in log conversion into boards after felling at the stump site before evacuation from the  
57 forest using the chainsaw machine. According to Popoola (2010), chainsaw milling is  
58 unauthorized and illegal in Nigeria but the operators illegally gain access to the forest,  
59 fell the trees, convert them to boards of various dimensions and hurriedly hand-carry  
60 them to the nearest road for transportation to timber markets.

61 According to Muthike *et al.* (2013) chainsaw milling is a legal and important subsector  
62 of the forest industry that supports rural livelihoods in some countries while in many  
63 others, it is associated with illegal forest activities.

64 In Nigeria, though the system is illegal, it is permitted under some regulations, restricted  
65 to domestic use only while in other countries it is only permitted for small-scale  
66 commercial production. This operation is common mostly during illegal felling and  
67 flitching activities especially in the rainforest zone of Nigeria. According Samba  
68 (2015), chainsaw milling is rampant and dominates the timber trade in Benue State  
69 situated the guinea savanna zone. Its activities are often difficult to monitor due to the  
70 large number of people involved and the small size and mobility of its operations even  
71 when it is authorized, (Wit *et al.*, 2010).

72 Chainsaw milling operation though illegal has some advantages. The operation requires  
73 little investment and the cost of purchase of equipment is very low compared to that of  
74 establishing a sawmill. It could be used in conversion of low quality logs and isolated  
75 trees. Aside that this operation is illegal; it is a wasteful practice that produces low  
76 quality timber, reduces the revenue accruable to the government, causes a great harm to  
77 the environment and loss biodiversity and sustainability of forest resources (Marfo,  
78 2010, Marieke *et al.*, 2010).

79

80 The operation is very suitable in difficult terrain and areas that are inaccessible in the  
81 forest while the use of heavy equipment like tractors, skidders, and the cost of other  
82 installations are replaced by cheap and direct labour in the evacuation of sawn boards  
83 (Oksanen *et al.*, 2002). Chainsaw milling operations supplies cheap wood to local

84 markets which in turn sells them at cheaper prices. A study by Ogunsanwo *et al*, (2005)  
85 revealed that chainsawn planks are sold at lower prices in local markets compared to  
86 those produced from conventional sawmills. This effect could be attributed to the fact  
87 that the boards produced from chainsaw milling operations are usually re-processed by  
88 consumers before they could be used effectively in production. In most states of  
89 Nigeria, chainsaw milling has been identified as an illegal enterprise, however in Benue  
90 State its use is permitted under certain restrictions or regulations are adhered to.

91 Legislations that disapprove the activities of chainsaw milling operators are already  
92 being compromised and standards have been lowered. Several factors that resulted in  
93 this development were identified by Popoola (2010) as;

- 94 • Depletion of timber resources that made investments in establishment of formal  
95 sawmills unattractive.
- 96 • Rising transportation cost of logs to the sawmill
- 97 • Huge capital requirement for the establishment of formal sawmills have  
98 increased by 1,000 – 5,000% since 1985;
- 99 • Unreliable power supply from the national grid and ever-increasing cost of  
100 diesel and petrol;
- 101 • Increasing fees and charges paid by timber contractors and formal sawmilling  
102 operators without commensurate returns; and corruption among forestry  
103 officials.

104 He posited that as result of these factors, many sawmills in Nigeria have resorted to the  
105 use of chainsaws to the extent that they now seek to be recognized by their respective  
106 State Forestry Departments. He also noted that while many are seeking to legalize the  
107 operation of chainsaw milling in Nigeria, another West African country like Ghana  
108 have placed a ban on it since 1998.

109 The income from chainsaw operations represents a substantial proportion of household  
110 income which in some cases is much higher than income from alternative work. This  
111 corroborates report by Popoola (2010) in a study on chainsaw milling in Benue State  
112 that though chainsaw milling is illegal in the state, it provides employment for both  
113 families and hired labour, thereby improving household and social well-being. He noted  
114 that, the wages earned compare favourably with those of the average skilled worker,  
115 and are far higher than the less than US\$1 on which more than 60% of Nigerians  
116 subsist. According to Ten Brink *et al* (2012) a healthy forestry sector can lead to the  
117 attainment of long-term socio-economic development that can promote social equity,  
118 poverty eradication, and human well-being of the people.

119 Studies on chainsaw milling activities are therefore invaluable and expedient in  
120 providing information relevant in repositioning the sector and addressing the challenges  
121 that chainsaw milling pose to sustainable development of the forestry sector of the  
122 economy.

123 Thus developing the forestry sector requires market information on the performance of  
124 marketing activities of this industry. Hence the lack of regular market information and  
125 data on the local, national and international markets is responsible for inefficient market  
126 system timber trade in Nigeria and Benue State in particular.

127 This therefore impedes the drawing up of plans for sustainable forest management and  
128 development.

129 According to FGN, (2006) inadequate data base remain a major constraint to forest  
130 policy formulation, project planning and implementation of forestry development  
131 programme.

132 Therefore, studies like this, tailored to provide and support the dissemination of reliable  
133 market information are invaluable and expedient.

134 The information on income can serve as a springboard for addressing inefficiencies in  
135 the marketing system and hence stimulate policy measures for repositioning trade of  
136 timber in the state. It will also encourage and trigger investment in the development of  
137 the sector, and stimulate policy response for the sustainable management of forest  
138 resources. These considerations therefore justify the need for this study.

## 139 **2.0 METHODOLOGY**

### 140 **The Study Area**

141 The study was carried out in Benue State, located at longitudes 6°35' E and 10°E and  
142 latitudes 6° 30' N and 8° 10' N within the guinea savanna area of Nigeria with a total  
143 land mass area of 30,955 km<sup>2</sup> (BENSEED, 2004). The state has twenty-three local  
144 government areas (LGAs) with a total population of 4,219,244 as against 2,780,398 in  
145 1991 (NPC, 2007).

146 Benue State has a tropical sub-humid climate, with two distinct seasons, namely the wet  
147 and dry seasons. The wet season lasts for seven months; from April to October while  
148 the dry season lasts from November to March. The annual rainfall total ranges from  
149 1,200mm to 2,000mm. Temperatures are generally very high during the day,  
150 particularly in March and April. Along the river valleys, these high temperatures plus  
151 high relative humidity produce clement/debilitating weather conditions. Benue State lies  
152 in the southern Guinea Savanna. The natural forest types and their distribution show  
153 three distinct types namely trees/woodland/shrubs, lowland rain forest and riparian

154 forest. However, the percentage coverage of this natural forest is very small relative to  
155 the major land use in Benue state (Agbeja and Opii, 2005).

156 Dense forests are few and far apart, except in a few local government areas such as  
157 Vandeikya, Kwande, and Okpokwu (Hula, 2009). In these forests, typical rainforest  
158 trees such as *Khaya grandifoliola* (mahogany), *Terminalia superba*, (Afara) *Milicia*  
159 *excelsa* (Iroko), *Triplochiton scleroxylon* (Obeche), etc. occur and are used for timber.  
160 Other economic trees in these forests include *Dacryodes edulis* (African pear), *Irvingia*  
161 *gabonensis* (bush mango or ogbono), bamboo, raffia palm, *Elaeis guineensis* (oil palm),  
162 orange, and *Cocus nucifera* (coconut) (Keay, 1989).

163 The study population comprised chainsaw operators in Benue State. Multistage  
164 sampling technique, purposive sampling and complete enumeration were applied to  
165 determine the study sample drawn from the three geopolitical zones in the state; Zone  
166 'A', Zone 'B' and Zone 'C'. Applying a sampling intensity of 30%, seven (7) LGAs  
167 were sampled from the 23 LGAs of the state for the study. Thus two (2) LGAs in zone  
168 A, two (2) in B and three (3) in zone C were purposively sampled based on the  
169 concentration of timber markets and trading activities. These LGA's were Konshisha  
170 and Kwande, in Zone A., Makurdi and Gboko in Zone B, Otukpo, Okpokwu, and Oju in  
171 Zone C. From these LGAs, respondents from the population; chainsaw millers and were  
172 sampled for data collection. Thus, Chainsaw millers were selected using 30% sampling  
173 intensity in these locations Table 1.

174 Table 1: Sampling Layout

Type of Timber Dealer/Sampled Zones	No. of LGAs in a Zone	Sampled LGAs in each Zone (30%)	LGAs sampled Zone	Sub-population of Respondent LGA	Sampled Respondent per LGAs (30%)
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<b>Chainsaw Millers</b>					
Zone A	7	2	Kwande	47	14
			Konshisha	41	12
Zone B	7	2	Gboko	34	10
			Makurdi	46	14
Zone C	9	3	Otukpo	33	10
			Okpokwu	30	9
			Oju	32	10
<b>Total</b>	<b>23</b>	<b>7</b>		<b>263</b>	<b>79</b>

175 Note: L.G.A. = Local Government Area.

176 Source: Field Survey, 2013

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## 180 **2.1 Data Collection Techniques**

181 Data were collected from two sources: The primary and secondary sources. The primary  
 182 sources included questionnaires, personal observations and focus group discussions. A  
 183 semi-structured questionnaire was designed and administered on chainsaw millers from  
 184 the sampled LGAs namely Kwande, Konshisha, Gboko, Makurdi, Otukpo, Okpokwu  
 185 and Oju to elicit relevant information for the study. Thus the chainsaw millers were  
 186 interviewed for the required information.

187

### 188 **2.1.1 Analytical Techniques**

189

190 Combinations of statistical and budgetary tools were used to analyze the data. The  
 191 descriptive statistics: mean, percentage, tables, frequency distribution, and standard  
 192 deviation were used. Marketing Efficiency, The Rate of Return on Investment (RORI),  
 193 Gross Ratio, Gross Margin Analysis, Gini coefficient and Lorenze curve and T-test and  
 194 Analysis of Variance (ANOVA) and were used.

#### 195 **2.1.1.1 Determination of marketing efficiency**



196 Marketing efficiency refers to maximization of the ratio of output in marketing. This  
197 study adopted Olukosi and Isitor (1990) technique in marketing efficiency. This is  
198 represented by equation 1 as:

199 
$$\text{Marketing Efficiency} = \frac{\text{Total Revenue}}{\text{Cost of Marketing}} \times 100\% \dots\dots\dots (1)$$

200 Total Revenue = Gross income  
201 Cost of Marketing = Total Variable Costs.

202  
203  
204  
205

206 **2.1.1.2 Gross margin**

207 Gross margin is defined as the difference between Gross Income (GI) and Total  
208 Variable costs (*TVC*). According to Tee (2007), the model is as shown follows.

209 
$$\text{Gross margin} = \text{GI} - \text{TVC} \dots\dots\dots (2)$$

210 GM = Gross Margin  
211 GI = Gross Income, an equivalent of Total revenue  
212 TVC = Total Variable Costs (Transportation, Tariffs, Association levies,  
213 permits, tax, loading/offloading etc.).

214 **2.1.1.3 Gross ratio (GR)**

215 This is the total expenses divided by the gross income (GI), given as

216 
$$\text{GR} = \text{GC}/\text{GI} \text{ or } \text{TVC}/\text{GI} \dots\dots\dots (3)$$

217 The ratio shows the percentage or proportion of total physical cost that constitutes the  
218 gross income. A less than 1 ratio is desirable for any production business. The lower the  
219 ratio the higher the return per Naira invested. The gross cost and gross income values  
220 calculated above are applied in this equation for the determination of gross ratio.

221 **2.1.1.4 Rate of return on investment (RORI)**

222 The Rate of Return on Investment (RORI) depicts the level of profitability of an  
 223 investment and is an important criterion in determining the choice of investment.  
 224 According to McCarthy (1968), Arene (1998) and Alao and Kuje (2012), it is given by  
 225 the following relationship:

$$226 \quad \text{RORI} = \frac{\text{TR} - \text{TC}}{\text{TC}} \times 100 \quad \dots\dots\dots (4)$$

228 where:

229 TR= Total revenue, an equivalent of Gross income (GI)

230 TC = Total cost, an equivalent of Gross cost (GC). Thus equation (4) becomes;

$$231 \quad \text{RORI} = \frac{\text{GI} - \text{GC}}{\text{GC}} \times 100 \quad \dots\dots\dots (5)$$

233 **2.1.1.4 Estimation Procedure for Market Concentration**

234 **Gini coefficient and Lorenz curve**

235 The Gini-coefficient along with Lorenz curve was used to examine the market  
 236 concentration of chainsaw millers that is, the measurement of the level of their  
 237 concentration in the market in order to determine the degree of competition or  
 238 monopoly in the market. Okereke and Anthonio (1988), Bila and Bulama (2005) used  
 239 Gini coefficient to determine the degree of market concentration of sellers of grains  
 240 markets in Eastern Nigeria and Maiduguri Cattle Market respectively by using the  
 241 formula:

$$242 \quad G = 1 - \sum x Y \quad \dots\dots\dots (6)$$

243 Where,

244  $G$  = Gini – coefficient

245  $X$  = Percentage of sellers per period of study

246  $Y$  = Cumulative percentage of total sales (revenue)

247 The  $G$  has a value ranging from 0 to 1 expressing the extent to which the market is  
248 concentrated. When  $G$  is equal to zero (0), there is perfect equality in the size of the  
249 distribution of sellers however, when  $G$  is equal to one (1), there is perfect monopoly in  
250 the market.

251 The Lorenz curve shows the level of concentration in the market. The value of the  
252 coefficient is the same as the ratio of the area between the Lorenz curve and the  $45^\circ$  line  
253 to the total area above or below the line. When there is perfect equality in the size of  
254 distribution of sellers in the market, the curve coincides with the  $45^\circ$  line. The farther  
255 away the curve is from the  $45^\circ$  line, the greater the level of concentration in the market.

256 A perfect equality in concentration (low) of sellers is expected if G.C tends towards  
257 zero, while perfect inequality in concentration (high) of sellers is expected if G.C tends  
258 towards one. If G.C =1, market is imperfect and if  $G.C =0$ , market is perfect and  
259 competitive. Lorenz Curve was used to give a visualized nature of the sellers'  
260 concentration in the markets through a graphical representation. The graph of  
261 cumulative percentage of total sales is plotted against the cumulative percentage of the  
262 sellers. It is used in economics to describe inequality in income or wealth (Damagaard  
263 and Weiner, 2000). If all individuals are the same size, the Lorenz Curve is a straight  
264 diagonal line ( $45^\circ$ ), called the line of equality, if there is any inequality in size then the  
265 Lorenz Curve falls below the line of equality ( $45^\circ$ ).

266 **3. Results and Discussion**

267 **3.1 Socio-Economic Characteristics of Respondents in Benue State**

268 The result on socio-economic characteristics of respondents is presented in Table 2. The  
269 socio-economic variables studied were age, marital status, gender, educational status as  
270 well as ethnic group and work experience.

271 The age distribution of respondents showed that 80.8 % fell within the age bracket of  $\leq$   
272 30 to 40 years, and the remaining 19.2 % were between 41 years and above. Based on  
273 gender, 100% of chainsaw millers were males.

274 Educational status distribution of the respondents shows that the highest proportion  
275 (72.6%) of chainsaw millers had secondary education followed by those with primary  
276 education (20.5%), tertiary education (6.9%) while 5.5% had no formal education. In  
277 terms of ethnic composition distribution a higher proportion (65.8%) of the chainsaw  
278 millers were Tiv, 3.7% were Idoma, 12.3% Igede, 5.5% Igbo while Igala and Sura,  
279 constituted 1.4% each. The distribution based on years of experience showed that  
280 chainsaw millers, a greater proportion of respondents of 69.8% had  $\leq$  5 to 10 years  
281 while 30.1% had more than 10 years of experience.

282 Table 2: Socio Economic Characteristics of Respondents in the Study Area.

Variable/Category	Chainsaw Operators	
	Frequency	Percentage
<b>Age (Years)</b>		
$\leq$ 30	27	37.0
31 – 40	32	43.8
41 - 50	12	16.5
$\geq$ 51years	2	2.7
Total	73	100.0
<b>Marital Status</b>		
Married	55	75.3
Single	15	20.5

Widowed	3	4.2
Total	73	100.0
<b>Gender</b>		
Male	73	100.0
Female	0	0.0
Total	73	100.0
<b>Educational Status</b>		
No formal Education	4	5.5
Primary	15	20.5
Secondary	53	72.6
Tertiary	5	6.9
Total	73	100.0
<b>Ethnic Composition</b>		
Tiv	48	65.8
Idoma	10	13.7
Igede	9	12.3
Igala	1	1.4
Igbo	4	5.5
Sura	1	1.4
Total	73	100.0
<b>Working Experience ( years)</b>		
≤ 5	22	30.1
6 – 10	29	39.7
11 – 15	16	21.9
≥16	6	8.2
Total	73	100.0

283 Source: Field survey, 2013.

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285

### 286 **3.2 Mean Monthly Volume of Trade by Chainsaw millers in the Three**

#### 287 **Geopolitical Zones of Benue State**

288 Table 3 presents the mean monthly volume of timber trade by chainsaw millers in

289 Benue State. The highest mean volume (9,877m<sup>3</sup>) of timber traded was recorded in

290 Zone C, this was followed by 6,188m<sup>3</sup> in Zone A and 5,804 m<sup>3</sup> in Zone B. As is the

291 case with Timbershed dealers, different numbers of tree species were found among

292 chainsaw millers across the study area. For instance while only 9 and 11 tree species

293 were marketed in Zones 'B' and 'C' respectively, 18 species were marketed in Zone

294 'A'. Of the species marketed a greater volume of 6,657m<sup>3</sup> from *Milicia excelsa* was  
 295 traded in Zone 'C', followed by *Gmelina arborea* (1,859m<sup>3</sup>) in Zone 'B', *Daniellia*  
 296 *olliveri* in Zone 'C' (1,386m<sup>3</sup>), *Gmelina arborea* (1,308m<sup>3</sup>) and *Lennea bateri* (1,298  
 297 m<sup>3</sup>) in Zone 'A', *Daniellia olliveri* (1,243m<sup>3</sup>) in Zone 'B', in that order. The least  
 298 volume of timber species marketed was *Anogeissus leiocarpa* with 5m<sup>3</sup> in Zone C.

299 Based on grand mean volume of the trade across the Zones , *Milicia excelsa* with  
 300 2,287.67m<sup>3</sup>, had the highest mean volume of timber species marketed per month,  
 301 followed by *Gmelina arboreal* (1,260.67m<sup>3</sup>), *Daniellia oliveri* (1,192.00m<sup>3</sup>),  
 302 *Pterocarpus erinaceus* (4,86.33m<sup>3</sup>), *Tectona grandis* (439.33m<sup>3</sup>), *Lennea bateri*  
 303 (432.67m<sup>3</sup>), and *Parkia biglobosa* (273.67m<sup>3</sup>). The least volume of tree species  
 304 marketed across the zones was *Afzelia africana* with 4.67m<sup>3</sup> per month. This was  
 305 available only in Zone 'A'.

306 On average 7,289.67m<sup>3</sup> of wood (timber) was traded by a timber dealer every month.  
 307 The highest volume of timber trade was in zone C represented by 9,877m<sup>3</sup>. This was  
 308 followed by 6,188m<sup>3</sup> and 5,804m<sup>3</sup> respectively in zones 'A' and 'B'. A total of  
 309 21,869m<sup>3</sup> of timber was traded monthly by the chainsaw millers.

310 Table 3: Mean monthly Volume of Timber Trade by Chainsaw millers across the three  
 311 Geopolitical Zones in Benue State Between August and October, 2013.

Scientific Name	Zone A Mean Volume (m <sup>3</sup> )	Zone B Mean Volume (m <sup>3</sup> )	Zone C Mean Volume (m <sup>3</sup> )	Total Volume	Mean of Means Across the Zones
1. <i>Milicia excelsa</i>	62	144	6,657	6,863	2287.67
2. <i>Gmelina aborea</i>	1,308	1,859	615	3,782	1260.67
3. <i>Daniellia oliveri</i>	947	1,243	1,386	3,576	1192.00
4. <i>Pterocarpus erinaceus</i>	436	352	671	1,459	486.33
5. <i>Tectona grandis</i>	353	869	96	1,318	439.33

6.	<i>Lennea bateri</i>	1,298	0	0	1,298	432.67
7.	<i>Parkia biglobosa</i>	85	724	12	821	273.67
8.	<i>Syzgium guineese</i>	466	0	0	466	155.33
9.	<i>Khaya gradifoliola</i>	313	138	14	465	155.00
10.	<i>Dichrostachys cinerea</i>	0	394	0	394	131.33
11.	<i>Bombax constatum</i>	370	0	0	370	123.33
12.	<i>Anthocliesta djalonensis</i>	278	0	0	278	92.67
13.	<i>Ceiba patandra</i>	40	0	235	275	91.67
14.	<i>Vitex doniana</i>	28	0	152	180	60.00
15.	<i>Anogeissus leiocarpa</i>	48	81	5	134	44.67
16.	<i>Tripolchiton sclerexylen</i>	85	0	0	85	28.33
17.	<i>Erythrophloem suaveolens</i>	0	0	34	34	11.33
18.	<i>Belinia gradiflora</i>	30	0	0	30	10.00
19.	<i>Terminalia ivorensis</i>	27	0	0	27	9.00
20.	<i>Afzelia africana</i>	14	0	0	14	4.67
	<b>Total</b>	<b>6,188</b>	<b>5,804</b>	<b>9,877</b>	<b>21, 869</b>	<b>7,289.67</b>

312 Source: Field Survey, 2013

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314

### 315 3.3 Analysis of Income of Chainsaw millers in the study area.

316 The result of income of chainsaw millers is presented in Table 4. The monthly average  
317 gross margin (GM) for chainsaw millers was obtained to be ₦39, 688.00, ₦ 128,730.00  
318 and ₦ 84,480.00, for zones A, B, and C respectively. Chainsaw millers in zone ‘B’  
319 generated the highest mean GM followed by those in zone ‘C’ and then ‘A’. This means  
320 chainsaw millers in zone B generated higher incomes followed by those in Zone C  
321 while chainsaw millers in Zone A generated the least. This has a positive socio-

322 economic implication for the timber dealers, as this high gross margin is capable of  
 323 improving the status of the respondents.

324 Similarly, chainsaw millers RORI of zone A is the highest (84.19 %) but the lowest GR  
 325 of 0.54 among the zones, followed by those in zone C with a RORI of 61.80 % with the  
 326 highest GR of 0.62 while zone 'B' had the least RORI in the three zones with a  
 327 corresponding higher GR of 0.56.

328 RORI measures the speed at which the capital invested is able to yield dividends or  
 329 profit, GR measures the proportion of the capital in hand that is utilized in off-setting  
 330 costs. In essence, RORI measures profit level, GR measures the entrepreneur or  
 331 producer's ability to minimize costs or efficiency in inputs utilization and other costs in  
 332 production to improve profit. The lower the GR the better is the business, conversely,  
 333 the higher the GR the lower the profit margin.

334 Table 4: Gross Margin Analysis of Timber Trade Participants in Benue State

Market Location	Mean Gross Income (₦)	Mean Total Variable Cost (₦)	Mean Gross Margin (₦)	Rate of Return to Investment	Gross Ratio
	<i>Chainsaw millers</i>	<i>Chainsaw millers</i>	<i>Chainsaw millers</i>	<i>Chainsaw millers</i>	<i>Chainsaw millers</i>
Zone A	86,828.00	47,140.00	39,688.00	84.19	0.54
Zone B	292,970.00	164,240.00	128,730.00	43.94	0.56
Zone C	221,170.00	136,690.00	84,480.00	61.80	0.62
<b>Total</b>					

335 Source: Field Survey, 2013.

336

337

**338 Result of analysis of variance (ANOVA) Test for Gross Margin of Chainsaw**

**Millers**



340 The result of chainsaw millers is presented in Table 5 showed a significant value of 0.013  
341 at 5% level of significance. This means there is a significant difference ( $P < 0.05$ ) in the  
342 gross income of chainsaw millers across the study area.

343 The implication of this result is that the null hypothesis is rejected and the alternative  
344 hypothesis that there is significance difference in the incomes of chainsaw millers from  
345 timber trade is accepted. This means income of chainsaw millers from timber trade across  
346 the study area are different; income from one zone being higher than that from other  
347 zones. Thus the post- hoc multiple comparisons analysis presented in Table 6 showed that  
348 income of chainsaw millers from zone B and is significantly ( $P < 0.05$ ) higher than that of  
349 A. It also shows that income from zone B in turn is higher than that of zone C but without  
350 a significant difference ( $P > 0.05$ ).

351 From all the profitability indices applied, it is evident that business in the study area was  
352 highly profitable.

353 Table 5: Results of one way ANOVA of Gross Margin of Chainsaw Millers

	Df	Sum of Squares	Mean Square	F	Sig.
Between Groups	2	$9.513 \times 10^{10}$	$4.756 \times 10^{10}$	4.591	0.013*
Within Groups	70	$7.253 \times 10^{11}$	$1.036 \times 10^{10}$		
Total	72	$8.204 \times 10^{11}$			

354

355 Source: Computed from Field Data, 2013.

356 Note: Ns = Not Significant at 5% Probability level.

357 \* = Significant at 5% Probability level.

358

359 Table 6: Post Hoc Multiple Comparisons Test of Gross Margin of chainsaw millers in the

360 Zones

(I) ZONE	(J) ZONE	Mean			95% Confidence Interval	
		Difference (I-J)	Std. Error	Sig.	Lower Bound	Upper Bound
ZONE A	ZONE B	-8.90356E4*	3.01928E4	.015	-1.6389E5	-14185.9921
	ZONE C	-44788.25388	2.68249E4	.272	-1.1111E5	21531.4586
ZONE B	ZONE A	89035.58583*	3.01928E4	.015	14185.9921	163885.1796
	ZONE C	44247.33195	3.05321E4	.390	-31375.0004	119869.6643
ZONE C	ZONE A	44788.25388	2.68249E4	.272	-21531.4586	111107.9663
	ZONE B	-44247.33195	3.05321E4	.390	-1.1987E5	31375.0004

Source: Computed from Field Data, 2013.

Note \* = The mean difference is significant at the 0.05 level.

361

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364 **3.5 T-test for profitability of Chainsaw milling in Benue State.**

365 **3.5.1 T-test for profitability of Chainsaw milling in Zone A of Benue State.**

366 The result of chainsaw millers for Zone A, revealed a significant difference ( $p < 0.05$ ) in

367 the gross incomes and Gross Cost of chainsaw millers in zone 'A'. This means income

368 from chainsaw milling is significantly higher than the gross cost from this operation in the

369 three zones of the study area, Table 7.

370 Table 7: T-Test for Chainsaw Millers in Zone A of the Study Area. Hypothesis: there is no

371 significant difference between Incomes and Costs.

Mean	N	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)
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Gross income	86828	24	108691	22186.54121			
Total variable cost	47140	24	39067.52460	7974.62507	1.123	23	0.045*

---

372 Source: Computed from Field Data, 2013

373 Note: Ns = Not Significant at 5% Probability level.

374 \* = Significant at 5% Probability level.

375 **3.5.2 T-test for profitability of Chainsaw milling in Zone B of Benue State.**

376 The result of chainsaw millers revealed a significant difference ( $P < 0.05$ ) in the gross  
 377 incomes and Gross Cost of chainsaw millers in zone 'B'. This means income from  
 378 chainsaw milling is significantly higher than the gross cost from this operation in the  
 379 three zones of the study area (Table 8).

380

381

382 Table 8: T-Test for Chainsaw Millers in Zone B of Benue State. Hypothesis: there is no  
 383 significant difference between Incomes and Costs.

---

	Mean	N	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)
Gross income	292970	24	268903	54889.63052			
Total variable cost	164240	24	186644	38098.45155	5.429	23	0.000*

---

384 Source: Computed from Field Data, 2013

385 Note: Ns = Not Significant at 5% Probability level.

386 \* = Significant at 5% Probability level.

387

388 **3.5.3 T-test for profitability of Chainsaw milling in Zone C of Benue State.**

389 The result of chainsaw millers in Zone ‘C’ revealed a significant difference ( $P < 0.05$ ) in  
 390 the gross incomes and Gross Cost of chainsaw millers in zone ‘C’. This means income  
 391 from chainsaw milling is significantly higher than the gross cost from this operation in the  
 392 three zones of the study area (Table 9).

393

394 Table 9: T-Test for Chainsaw Millers in Zone C of Benue State.

395 Hypothesis: there is no significant difference between Incomes and Costs.

	Mean	N	Std. Deviation	Std. Error Mean	T	Df	Sig. (2-tailed)
Gross income	221170	25	254778	50955.57841	4.391	24	0.000*
Total variable cost	136690	25	180085	36016.91501			

396 Source: Computed from Field Data, 2013

397 Note: Ns = Not Significant at 5% Probability level.

398 \* = Significant at 5% Probability level.

399

### 400 3.6 Market Concentration of Chainsaw Millers in Benue State.

401 For chainsaw millers the Gini- coefficient values were 0.18912 or 18.91% for Zone A,  
 402 0.321828 or 32.185 for Zone B and 0.18289 or 18.28% for Zone C (Table 30). This  
 403 shows low market concentration of timber traders. This reveals an economically fairly  
 404 equitable distribution of volume of trade among chainsaw millers in the study area.  
 405 However, based on the values of Gini-coefficient in each case, trade in zone C was less  
 406 un-equally distributed followed by zone A and lastly B. The size and distribution of sales  
 407 of timber flichtches or planks from timber traders is presented in Tables 10, 11 and 12. The

408 illustration of this distribution by the Lorenze curve shown in figures 1, 2 and 3 does not  
409 skew far away from the line of equal distribution (LED).

410

411 Table 10: Gini Coefficient Values of Timber Marketers in Benue State.

Type of Marker	Gini Coefficient Value	Standard Error (STE)	Lower Bound Gini Coefficient	Upper Bound Gini Coefficient	Confidence Level
Chainsaw millers					
Zone A	0.18912742	0.05081262	0.08953651	0.57378351	95.00000000
Zone B	0.32184737	0.14255092	0.04245269	0.60124204	95.00000000
Zone C	0.18289433	0.05110957	0.08272141	0.28306724	95.00000000

412 Source: Computed from Field Data.

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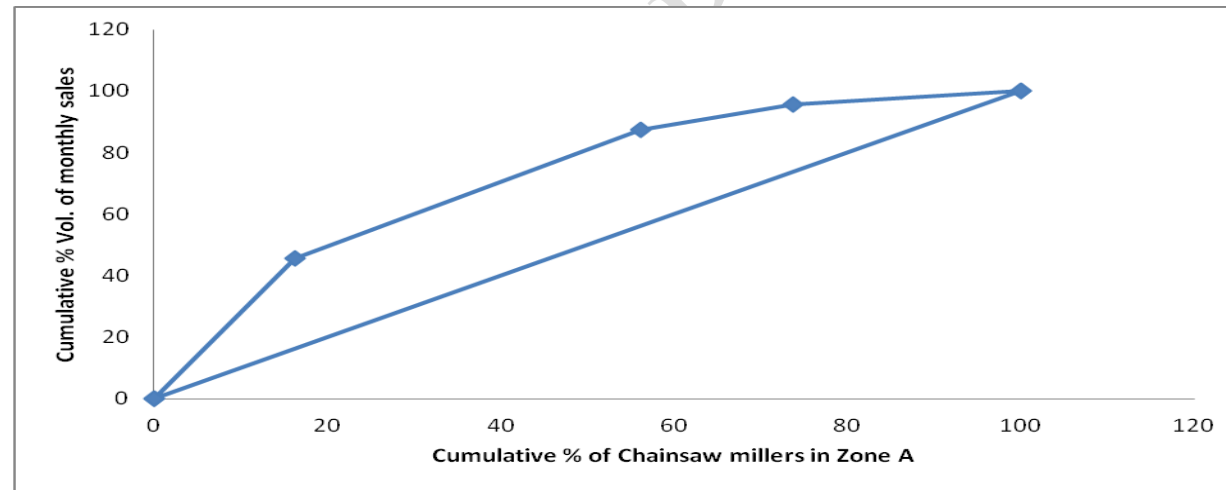
Table 11: Distribution of Chainsaw Millers' by Size of Monthly Sales in Zone A, Benue State.

Sales ₦	Frequency of Sellers	Percentage of Sellers	Cumulative Percentage of sellers	Total sales (₦)	% Sales	Cumulative % of Sales
<= 50000.00	11	45.8	45.8	339000.00	16.3	16.3
50000.01 - 150000.00	10	41.7	87.5	832000.00	39.9	56.2
150000.01 - 250000.00	2	8.3	95.8	365000.00	17.5	73.8
450000.01+	1	4.2	100.0	548000.00	26.3	<b>100.0</b>
<b>Total</b>	<b>24</b>	<b>100.0</b>		<b>2084000.00</b>		

418

Source: Computed from Field Data, 2013

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Fig. 1: Lorenze curve for Chainsaw millers in Zone A, Benue State.

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426 Table 12: Distribution of Chainsaw Millers by Size of Monthly Sales in Zone B, Benue State.

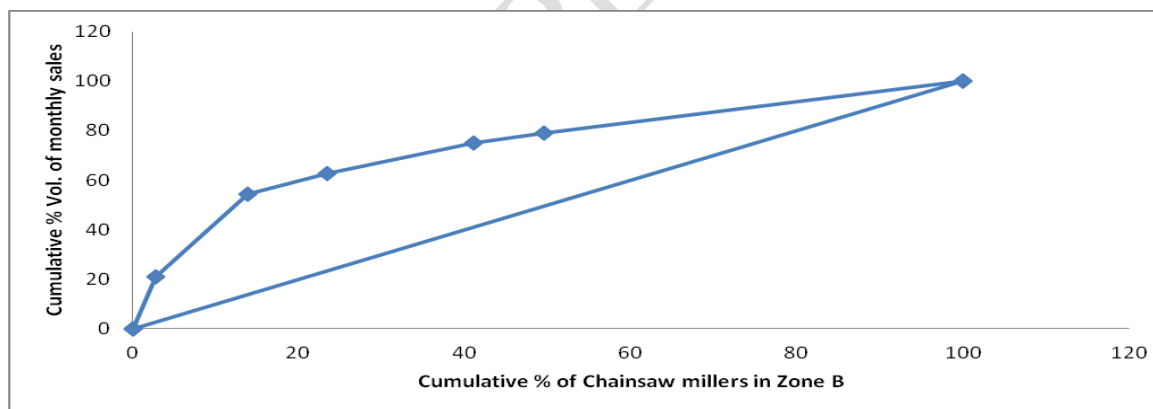
427

Sales ₦	Frequency of Sellers	Percentage of Sellers	Cumulative Percentage of Sellers	Total Sales (₦)	% Sales	Cumulative % of Sales
<= 50000.00	5	20.8	20.8	195000.00	2.8	2.8
50001.00 - 200000.00	8	33.3	54.2	779000.00	11.1	13.9
200001.00 - 350000.00	2	8.3	62.5	667000.00	9.5	23.4
350001.00 - 500000.00	3	12.5	75.0	1240000.00	17.6	41.0
500001.00 - 650000.00	1	4.2	79.2	600000.00	8.5	49.5
650001.00 - 800000.00	5	20.8	100.0	3550000.00	50.5	100.0
<b>Total</b>	<b>24</b>	<b>100.0</b>		<b>7031000.00</b>		

428 Source: Computed from Field Data, 2013

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Fig. 2: Lorenz curve for Chainsaw millers in Zone B, Benue State

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434 Table 13: Distribution of Chainsaw millers by size of monthly sales in Zone C, Benue State

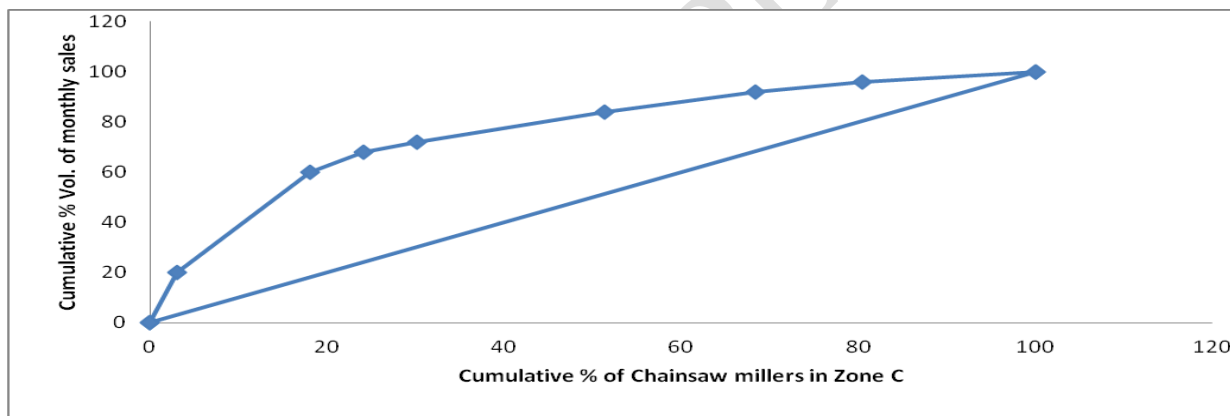
Sales ₦	Frequency of Sellers	Percentage of Sellers	Cumulative Percentage of Sellers	Total Sales (₦)	% Sales	Cumulative % Sales
<= 50000.00	5	20.0	20.0	170000	3.07	3.07
50001.00 - 150000.00	10	40.0	60.0	777000	14.04	18.11
150001.00 - 250000.00	2	8.0	68.0	386000	6.98	24.09
250001.00 - 350000.00	1	4.0	72.0	338000	6.11	30.20
350001.00 - 450000.00	3	12.0	84.0	1170000	21.14	51.34
450001.00 - 550000.00	2	8.0	92.0	940000	16.98	68.32
650001.00 - 750000.00	1	4.0	96.0	673000	12.16	80.48
750001.00+	1	4.0	100.0	1080000	19.52	100
<b>Total</b>	<b>25</b>	<b>100.0</b>		<b>5534000</b>	<b>100 .0</b>	

435

445

446 Source: Field Data, 2013

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448

449 Fig. 3 Lorenze curve for chainsaw millers in Zone C, Benue State.



450 **3.7 Chainsaw millers marketing efficiency in Benue State.**

451 The respective revenues and marketing costs of chainsaw millers presented in Table 14.  
452 The mean marketing efficiency of chainsaw millers sampled in zones A and C in Table  
453 14. The result revealed that chainsaw millers in zone 'A' received the total sum of as  
454 86,828.00 average gross revenue per month. The mean total marketing costs was ₦  
455 47,140 representing 54.29% of the mean gross income. A breakdown of the marketing  
456 costs revealed that loading and offloading had the highest cost (30.35), followed by  
457 expenditure on timber (25.38%), wages (19.24%), and transport (16.93%). The least  
458 cost of 0.75% was incurred on others.

459 For zone B the average gross revenue per month for Zone B was 292,970.00 while the  
460 cost was N164,240 representing 56.06% of the mean gross income. Expenditure on  
461 timber (33.01%) possessed the highest cost followed by wages (30.35%), transport  
462 (19.66%) and taxes (5.99%) while the least cost was incurred on others.

463 Similarly the study showed that all chainsaw millers sampled in Zone C received the  
464 total sum of ₦221,170.00 average gross revenue per month while the mean total costs  
465 was  
466 ₦136,690.00 representing 61.80% of the mean gross income. In the same vein  
467 expenditure on timber (30.64%) possessed the highest cost followed by transportation  
468 (25.79%), wages (22.10%), loading and offloading 18.48% while the least cost of  
469 0.83% was recorded on dues.

470 The coefficient or marketing efficiency of chainsaw milling was highest for Zone A,  
471 followed by 184.19% for Zone B 179.38% and 161.80% for Zone C, Table 14. The  
472 implication of this result is that in Benue State, chainsaw milling is highly efficient.

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UNDER PEER REVIEW

483  
 484 Table 14: Profitability and Marketing efficiency of Timber Trade by Chainsaw Millers in Benue state

	Total Revenue B (₦)	Expenditure on Timber (Wood) (₦)	Transportation (₦)	Taxes (₦)	Dues (₦)	Loading/ Offloading (₦)	Wages	Other Costs* (₦)	Total Marketing Cost C	Net Margin (₦)	Efficiency $\frac{B}{C} \times 100$ (%)
ZONE A	86,828.00	11,963.71 (25.38)	7,979.34 (16.93)	1,554.20 (3.29)	1,915.27 (4.06)	14,303.87 (30.35)	9,069.00 (19.24)	354,07.00 (0.75)	47,140.00 (100)	39,688.00	184.19
ZONE B	292,970.00	54,210.70 (33.01)	32,292.00 (19.66)	9,833.30 (5.99)	1,558.30 (0.95)	16,470.90 (10.03)	49,854.00 (30.35)	20.83 (0.01)	164,240.00 (100)	128,730.00	179.38
ZONE C	221,170.00	58,738.00 (30.64)	49,440.00 (25.79)	2,020.00 (1.05)	1,582.00 (0.83)	35,418.00 (18.48)	42,372.00 (22.10)	2,120.00 (1.11)	136,690.00 (100)	84,480.00	161.80

485

486 Source: Computed from Field Data, 2013.

487 NB: (1) \*Others Miscellaneous (Monetary and material gifts given to the village heads, Informants on timber species are available in the  
 488 forests, road expenses, dues).

489 (2) Values in bracket are components of costs in rows as a proportion of total marketing cost 'C'.

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501 **4.1 Socio Economic Characteristics of Timber dealers in Benue State, Nigeria.**

502 The study revealed that all of the chainsaw millers that were male were involved in the timber  
503 business enterprise. It is thus a male- dominated occupation. The lack participation of female  
504 in timber business could be attributed to the tedious nature of the business. This finding  
505 corroborate the earlier view expressed by Kalu and Ani (2009) and Sekumade and Oluwatayo  
506 (2011), that dominance of the trade by men is due to the fact that it's operation is tedious, and  
507 this tends to discourage most women from engaging in the enterprise.

508 The fact that majority of the timber merchants fall within the active age distribution of 30 -  
509 40 years further justify the above claim. These youths are gainfully employed and can earn  
510 their livelihood from timber business in spite of the enormous strength and energy required  
511 for this kind of business; their youthful exuberance can match the toils involved. The study  
512 revealed that a greater proportion of the timber traders, chainsaw millers were married. The  
513 larger proportion of married families implies that timber trade is perhaps a secured livelihood  
514 activity in the area; and could sustain their responsibilities to wives, children, and other  
515 family members under their care.

516 The relatively larger proportion of literate respondents over the illiterate in timber business  
517 seems to be a blessing. According to Aiyeloja *et al.* (2012) timber business requires some  
518 degree of literacy due to measurements and simple calculation involved in plank processing  
519 from round wood into different sizes. The respondents would also be more amenable to  
520 development policies required to be implementable.

521 This also implies that timber trade is perhaps a profitable venture that engages the educated  
522 and provides alternative source of income and employment.

523 The implication is that greater proportions of these market actors are educated and can  
524 communicate in English. The higher profitability and income from the enterprise may have  
525 attracted individuals with higher educational status to get involved in the enterprise compared  
526 to income from white collar jobs that in most cases do not guarantee above average quality of  
527 life in Nigeria (Aiyeloja *et al.* 2013).

528 Data on ethnic composition implies that timber market is dominated by the indigenes. The  
529 relatively dominant proportions of the Tiv, Idoma, and Igede, could be attributed perhaps to  
530 their familiarity with the terrain and locations of raw timber.

531 Furthermore, the formation of co-operative societies by timber dealers will also give them  
532 more enablement to source for credit facilities. This agrees with the finding by Sidiku and  
533 Oyerinde (2010), on the analysis of sawn timber market in Ondo State that sawn timber  
534 traders solely depend on personal savings.

535 The relatively larger proportion of timber merchants with moderate trading experience of less  
536 than 10 years; and very few with 10 years and above, is an indication that timber business has  
537 been in existence in Benue State for a long time now. However, only recently that many  
538 people, including non-indigenes, are getting into the business.

#### 539 **4.2 Volume of Timber Trade in Benue State.**

540 Variations were observed in the volume of timber traded across the three geopolitical zones  
541 in Benue State. These observed variations were attributable to species availability and  
542 settlement pattern. For instance the higher number of timber species marketed in Zone B  
543 were because of the Urban nature of the sampled LGAs, high population density and large  
544 market for timber products coupled with higher incomes of the urban dwellers in these  
545 zones. The study ostensible trade in species regarded as Non-timber tree species was due to  
546 the scarcity of the timber species and growing demand for timber for construction works and  
547 others services.

548 The larger volume of *Daniellia oliveri* marketed in Benue State was partly due to its relative  
549 abundance from the forests in Benue State and partly due to extensive demand for its wood in  
550 the construction industry. The relatively larger volume marketed of species like *Gmelina*  
551 *arborea*, *Khaya grandifoliola*, *Pterocarpus erinaceus* and *Tectona grandis* among others was  
552 due primarily to demand for their wood. These species possess preferred qualities like  
553 strength needed for construction works in Benue State. They were mainly imported into  
554 Benue State from neighbouring states. Ogunwusi, (2012) noted that in nearly all ecological  
555 zones, the wood species mostly found in the timber market are those widely available within  
556 the forest zones. He also stated that *Irvingia gabonensis* wood is very popular in the planks  
557 markets in the south east and south west zones while *Prosopis africana* and *Detarium*  
558 *senegalense* are now very prominent in markets in the Northern parts of the country.  
559 According to the classification of timber species by Arowosage (2010), the following are  
560 commonly used species; *Khaya grandifoliola*, *Azalia africana*, *Mansonia altissima*, *Ceiba*  
561 *patandra*, *Milicia excelsa*, *Tectona grandis*, *Anogeissus leiocarpa*, *Isobertinia doka*,  
562 *Terminalia ivorensis*, *Terminalia ivorensis*, *Ceiba patandra*, *Tripolochiton scleroxylon* are  
563 used for ends uses as building construction and flooring, furniture construction and

564 decoration, veneer and house fitting, roofing, doors, window frames, stair cases, boat  
565 building, coarse packing and form work.

566 The timber species and volumes traded have serious implication on the sustainable supply of  
567 timber resources in Benue State especially in the long run. This is because the market demand  
568 far outstripped the supply. Agbeja and Opii (2005), reported that the plantation establishment  
569 target of 400 ha per year of stands from 1999 to 2003 was a far cry from reality as only 335.5  
570 ha of *T. grandis*, *G. arborea*, *E. guineensis*, *A. occidentale*, and *K. grandifoliola* were planted  
571 in the span of five years. They further stated that the demand and supply of wood in Benue  
572 State shows a deficit in supply; and this portend a danger especially for sawnwood and  
573 veneers for industrial development of the state. The consequence of such deficit will be  
574 increased pressure on the existing forests. The increasing timber logging activities in the  
575 savanna region spells doom for timber supply in Nigeria if adequate and more serious  
576 measures or decisions are not taken. Deliberately injecting external funds in to the system to  
577 replenish timber stock as they are removed will ensure its sustainable development and  
578 supply in the state, and the country.

#### 579 **4.3 Comparisons of Income from Timber Trade in Benue State.**

580 Gross margin measures (GM) the level profit generated from a business or any production  
581 activity, after all expenses are deducted. Monthly Gross Margins (GM) was calculated for  
582 timber fitches or lumber traded. These were derived from the differences between monthly  
583 Gross (GIs) and monthly Total Variable Costs (TVCs) of timber marketed respectively.

584 The results from the analyses, as presented in Table 4, revealed that the trading activities in  
585 timber marketing in Benue State were profitable. At the end of every month of trading, a  
586 chainsaw miller goes home on average with ₦39,688.00, ₦128,730.00 and ₦84,474.00 in  
587 zones A, B and C respectively. The GM values are far higher than the national minimum  
588 wage. This justifies timber trade as a viable enterprise for sustainable livelihood. Based on  
589 the gross margins (GMs), and their trend in all the timber traded, the study revealed that  
590 timber merchants in zone 'B' had the highest average GM which implies that the timber

591 market in the zone is more efficient compared to trader in timber markets. This could also be  
592 attributed to its high population and cosmopolitan nature compared to the other zones. This  
593 could result to higher demand, construction activities and higher magnitude of trading  
594 activities which could in turn lead higher rates of returns. This in turn is followed by timber  
595 traders in one 'C' and then 'A'. This means, all things been equal timber traders in zone 'A'  
596 generated higher profits from sales compared to those in zones and A and B. The RORI and  
597 GR values also support the above conclusion.

598 Therefore, GR of 0.54 for timber traders in zone 'A' means 54% of the total income  
599 generated is used in off-setting marketing costs. By implication the profit made from timber  
600 sales is 46% over the capital invested. That is one naira invested will generate fifty kobo or  
601 0.46 naira as profit thus raising the amount invested to ₦1.46. The result showed low values  
602 of GR and high values of RORI but the GM was positive and high. The implication of these  
603 results is that, high profit margin does accrue to timber merchants because the low GR value  
604 implies that not too much expenses were incurred in offsetting marketing costs;  
605 transportation, loading, off-loading, taxes, purchasing costs among others except for zone B.  
606 This cost gulped as high as 54% of the gross benefits realized by timber trader.

607 Now based on the GR, RORI and GM concepts together with their observed values in Table  
608 4, it can be safely concluded that, the observed differences in the level of profit generated and  
609 hence efficiency in marketing across the three market segments is due to the interaction  
610 between quantities of wood supplied, producer prices and marketing cost components. These  
611 factors are the parameters that can affect returns from any marketing activity.

612 Generally, the marketers had a fair profit margin, but relatively those in Zones A and B  
613 realized higher profit margins as the GM indicates. This is similar to Bichi's (2011) findings  
614 in Kano State which revealed that timber business can generate between N5, 000 to 450,000  
615 per month and can generate even one hundred thousand naira per day based on demand and

616 season. According to the findings by Popoola (2010) in Benue state, incomes from chainsaw  
617 milling range between \$2.50 and \$80 per day, and range between \$75 and \$2,400 per month.  
618 This captures mean income from this study of ₦39,688 which amounts to \$110.24 per month.  
619 Akinyemi *et al.* (2011) also made a similar observation from the study on profitability,  
620 prospect and constraints of Sawmill Industry in Kaduna State. His finding revealed a monthly  
621 net income to be ₦118,789.40 while the rate of return on investment was calculated to be  
622 50.18%. This is therefore an indication that timber business is generally profitable in Benue  
623 State.

624 Based on the magnitude of GMs of chainsaw millers in the zones, the zone A is more  
625 efficient followed by zone B and then zone C. This means that all things being equal, timber  
626 traders in zone A generated higher profits from their sales compared to traders in other zones.  
627 This variation in the gross margin between the zones could be attributed to greater risk and  
628 differences in costs incurred, high demand and high turnover rates.  
629 From the profitability index applied, it is evident that the enterprise in the study area was  
630 highly profitable for lumber marketers.

## 631 **5.6 Concentration and Efficiency of Timber Trade in the Study Area.**

632 Market concentration in market structure is concerned with the organizational characteristics  
633 of a market which influence the nature of competition and pricing within the market.  
634 According to Tee (2007) an efficient marketing system is relevant in stimulating and  
635 producing forestry development and economic growth. According to Todaro (1981), for  
636 economic variables with relatively equitable distribution, the Gini coefficient value should be  
637 between 0.20 and 0.35.

638 UNDP (1992) reported that Gini-coefficient with high inequality typically lie between 0.5  
639 and 0.7. This suggests that saw miller and chainsaw operators were not able to control large



640 shares of wood supply or sales in the study area. As such none could influence supplies by  
641 increasing or decreasing the quantity supplied. Each of the participant's output was an  
642 insignificant part of the volume of trade in the market such that it could not affect market  
643 price.

644

645 The low Gini coefficient value of 0.2885 showed that small sawmills were evenly distributed  
646 in Benue State and none of the market participants have control on significant proportion of  
647 the timber market. Similarly the Gini coefficient of chainsaw millers in zone B also revealed  
648 that none had significant control since both market actors had their Gini coefficient value  
649 within the same range. In the same manner the result of the analysis showed that among the  
650 chainsaw millers in the zones, none of the market actors also had control of the market. This  
651 implies that timber market is monopolistic competitive in structure in the study area. Thus  
652 the concentration of sales volume among chainsaw millers was low although higher than the  
653 others. This shows that none of the timber market actors controlled significant proportion of  
654 the timber trade.

655 The overall structure of timber market indicates that there are many small-scale dealers such  
656 that none could control the market. This type of market structure is competitive, because the  
657 individual dealers have little influence on the market price. Tee (2007) and Enete (2008)  
658 made similar observations with *Borassus aethiopum* in North-Eastern Nigeria and charcoal in  
659 Abia State Nigeria respectively.

660 The concentration for chainsaw millers are presented in Tables 11, 12 and 13. The illustration  
661 of this distribution by the Lorenze curve shown in figures 1, 2 and 3 is not skewed far away  
662 from the line of equal distribution (LED), depicting equitable distribution.

663 This results of marketing efficiency of timber trader indicates timber trade in the study area  
664 provides a profitable market where the all the market actors and traders get a high return on  
665 their investments. This finding is in conformity with the results obtained by other researchers  
666 on marketing margin and efficiency of agricultural and forestry products (Kudi *et al* 2006;  
667 Kola-Oladiji *et al* 2006).

## 668 **Conclusion**

669 Chainsaw milling is economically important and viable, it is a profitable and efficient  
670 business enterprise with good financial returns to the marketers. The structure of timber trade  
671 in Benue State exhibited features that were competitive. Thus the distribution of the volume  
672 of the trade was economically equitable.

## 673 **Recommendations**

674 Thus, Benue state government should development policy framework ploughing backs some  
675 of the profit in developing the timber resource in the state.

## 676 **References**

- 677 1. Akpabio, G., Akachi, A.P., Wilcox, R.I. (2013). The Socio Economic Impact of  
678 Forestry in Nigeria. *International Journal of Social Sciences and Humanities Reviews*.  
679 4 (3): 198 – 202.  
680
- 681 2. Adeyoju, S. K. (1975). Forestry and the Nigerian Economy. Ibadan University Press,  
682 Nigeria, 308pp.  
683
- 684 3. Kalu, C. and Okojie, C.E.E. (2009). Economic contributions of forests in Nigeria,  
685 1970-2000, *research journal of social science*, vol. (4): 59-73.  
686
- 687 4. Amiebenomo, O. 2002. Tropical secondary forest management in Africa: Reality and  
688 perspectives Nigeria Country Paper. *Written for the fao/ec lnv/gtz workshop on*  
689 *tropical secondary forest management in Africa: Reality and perspectives In*  
690 *collaboration with ICRAF and CIFOR Nairobi, Kenya, 9-13 December 2002*.  
691
- 692 5. Faleyimu, O.I. (2013). The Declining Forestry Contribution to Gross Domestic  
693 Product. Causes and Cure. *Resources and Environment*. 2013 3(4): 83-86.  
694
- 695 6. Wit, M., Dam V. D, Cerruti, O.P., Lescuyer, G., Mackeown, J.P. (eds.) (2010):  
696 Chainsaw milling: Supplier to local markets: A synthesis. Tropenbos International,

- 697 Wageningen, the Netherlands. The European Tropical Forest Research Network  
698 (ETFRN) News Issue No.52: December 2010. Pp vii-xxii.  
699
- 700 7. Marfo, E. (2010). Chainsaw Milling in Ghana: Context, drivers and impacts.  
701 Tropenbos  
702 International, Wageningen, the Netherlands. xii + 64 pp.  
703
- 704 8. Marieke W., Jinke Van Dam, Paolo O.C., Guillaume L., Rohini K. and James P. M.  
705 (2010): Chainsaw milling: Supplier to local markets - a synthesis. ETFRN News 52:  
706 December 2010. 16pp
- 707 9. Popoola, L. (2010). Chainsaw Milling and Lumber Trade In Nigeria. Technical  
708 Report submitted to Tropenbos International, Center for International Forestry  
709 Research (CIFOR) 2010 ETFN and Tropenbos International, Wageningen the  
710 Netherlands.  
711
- 712 10. Muthike, G. M, Shitanda, D., Kanali, L. C. Muisu, N.F (2010): Chainsaw milling in  
713 Kenya. Tropenbos International, Wageningen, the Netherlands. Pp 166-173.  
714
- 715 11. Oksanen, T., B. Pajari and T. Tuomasjukka (eds.). 2002. Forests in Poverty Reduction  
716 Strategies Capturing the Potential. Proceedings No. 47. Proceedings of a workshop in  
717 Tuusula, Finland, October 1–2, 2002, 206 pp.  
718
- 719 12. Ogunsanwo, O.Y., Aiyeloja, A.A. and Filani, G.S. (2005). Assessment of offsite  
720 waste associated with timber flicthing in Ibadan, Nigeria. Proceedings of the 30<sup>th</sup>  
721 annual conference of the Forestry Association of Nigeria, FAN in (Eds) Popoola, L.  
722 Fen P.M and P.I Oni. Pp 335-342.  
723
- 724 13. Ten Brink P., Mazza L., Badura T., Kettunen M., and Withana S. (2012) Nature and  
725 its Role Meeting Basic Needs in the Developing Countries, Oxford: Oxford  
726 University Press.  
727
- 728 14. Federal Government of Nigeria (FGN), (2006). National Forest Policy: Federal  
729 Ministry of Environment, Abuja.  
730
- 731 15. BENSEEDS (2004). Benue State Economic Empowerment and Development  
732 Strategy. Benue State Planning Commission, Makurdi.  
733
- 734 16. Agbeja, B.O and Opii E.E (2005). Assessment of Demand and Supply of Timber  
735 Products in Benue State of Nigeria. Implication for Forest Policy Implementation.  
736 *Journal of Environmental Extension* Vol. 5, (Dec. 2005): 1-10.  
737
- 738 17. Hula, M.A. (2010). Population Dynamics and Vegetation Change in Benue State,  
739 Nigeria. *Journal of Environmental Issues and Agriculture in Developing Countries*  
740 Vol. 2 No. 1 17pp.  
741
- 742 18. Olukosi, J.O., Isitor, S.U., and Ode, M.O. (2005). Introduction to Agricultural  
743 Marketing prices: Principles and Applications. 3<sup>rd</sup> Edition. Living Book Series GU  
744 publications Abuja, Nigeria, pp. 2-47.  
745

- 746 19. McCarthy, J.E. (1968). *Basic marketing, a management approach*, 3<sup>rd</sup> edition, New  
747 York.
- 748  
749 20. Arene, C.J. (1998). *Introduction to Economic Analysis of Projects in Tropical*  
750 *Agriculture*. Fulladu Publishing Company. Nsukka; Nigeria.
- 751  
752 21. Alao, J.S. and Kuje, E.D. (2012). Economics of Small-Scale Furniture Production in  
753 Lafia Metropolis, Nasarawa State. *Journal of Economics*. 3 (1): 49-54. Kamla-Raj  
754 2012.
- 755  
756 22. Okereke O, Anthonio Q.B.O (1988). The structural characteristics of the market for  
757 grains in Eastern Nigeria. In: TO Adekanye (Ed.): *Readings in Agricultural*  
758 *Marketing*. Nigeria: Longman, pp. 116-124. In Reuben J. and Mshelia S.I 2011 :  
759 structural Analyses of Yam Markets in Southern Taraba State. *J AgriSci*, 2(1): 39-44  
760 (2011), Kamla-Raj 2011.
- 761  
762 23. Bila Y, Bulama, Y. (2005). Structure of Maiduguri Cattle Market, Borno State  
763 Nigeria. *Global Journal of Agricultural Science*, 4(2): 159 – 164.
- 764  
765 24. Okereke O, Anthonio Q.B.O (1988). The structural characteristics of the market for  
766 grains in Eastern Nigeria. In: TO Adekanye (Ed.): *Readings in Agricultural*  
767 *Marketing*. Nigeria: Longman, pp. 116-124. In Reuben J. and Mshelia S.I 2011 :  
768 structural Analyses of Yam Markets in Southern Taraba State. *J AgriSci*, 2(1): 39-44  
769 (2011), Kamla-Raj 2011.
- 770  
771 25. Kalu, C; Ani, P. I. (2009). Marketing of round logs in Benin City, Edo state, Nigeria.  
772 *Journal of applied sciences research*. Vol. 5 (7): 785-789.
- 773  
774 26. Sekumade, A. B. and Oluwatayo, I. B. (2011) Economic Analysis of Plank Production  
775 in Gbonyin Local Government Area of Ekiti State, Nigeria. *International Journal of*  
776 *Agricultural Economics and Rural Development*, 4 (1) pp 36-40.
- 777  
778 27. Aiyeloja, A.A, Oladele A.T. and Ezeugo O.E (2012). Evaluation of Non-Timber  
779 Forest Products Trade in Ihiala Local Govt. Area, Anambra State, Nigeria.  
780 *International Journal of Science and Nature*, 3(2): 55-60.
- 781  
782 28. Aiyeloja, A.A., Oladele, A.T., and Furo, S.B (2013). Sustaining Livelihood Through  
783 Sawn Wood Marketing in Portharcourt, Nigeria. *International Journal of Science and*  
784 *Nature*, 4(1): 84-89.
- 785  
786 29. Sidiku, N. A. and Oyeride, O. V. (2010). Analysis of sawn timber marketing in Ondo  
787 state, Nigeria in: climate change and forest resources management the way forward  
788 proceedings of the 2<sup>nd</sup> biennial national conference of the forests and forest products  
789 society of Nigeria (Onyekwelu, J. C., Adekunle, V. A. J. and Oke, D. O. (Eds)). 26 –  
790 29<sup>th</sup> April, 2010; 339 - 346pp.
- 791  
792 30. Ogunwusi, A. A. (2012). Forest Products Industry in Nigeria. African Research  
793 Review, *An International Multidisciplinary Journal*, Ethiopia. Vol. 6 (4) Serial No.  
794 27, October, 2012 Pp.191-205. Online at <http://dx.doi.org/10.4314/afrev.v6i4.13>

795  
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824  
825  
826  
827  
828  
829  
830  
831  
832  
833  
834  
835  
836

31. Arowosege O.G.E (2010) Lesser used wood species and their relevance to sustainability Of tropical forests. In S.Kolade Adeyoju and S.O Bada (ed) Readings in Sustainable Tropical Forest Management pp. 305-322.
32. Bichi, A.M. (2011). Timber and Non Timber Products as Tools For the Eradication of Poverty: A Millennium Development Goal Approach. Proceedings of the 38<sup>th</sup> annual conference of forestry association of Nigeria held in Osogbo, Osun State, Nigeria.(ed) L. Popoola. Pp147-155.
33. Akinyemi, O., Obadimu, O., Sodimu, A.I., Obadimu, O.D. (2011). Profitability, Prospect and constraints, of Sawmill Industry in Kaduna state. Proceedings of the 38<sup>th</sup> annual conference of forestry association of Nigeria held in Osogbo, Osun State, Nigeria.(ed) L. Popoola. Pp 486-491.
34. Todaro, M.P. (1981). *Economic development in the third World*. Longman Inc. New York, 2<sup>nd</sup> Edition in: Tee, N.T (2007). Marketing and Utilization of *Borassus aethiopum* (Mart) In Northeastern Nigeria. Ph.D thesis. Department of Forest Resources Management, University of Ibadan. 210pp.
35. United Nations Development Programme (1992). The importance Forestry Statistics in: Anete, A. A. and Agbugba, K. I. (2008). Charcoal marketing in Abia State. In: Farm Management Association of Nigeria (Famam) 22<sup>nd</sup> Annual Conference. 2008 (ed). Umeh, J.C, Obinne, C.P, and Lawal, Wuraola. Pp338-346.
36. Tee, N.T (2007). Marketing and Utilization of *Borassus aethiopum* (Mart) In Northeastern Nigeria. Ph.D thesis. Department of Forest Resources Management, University of Ibadan. 210pp.
37. Enete, A. A. and Agbugba, K. I. (2008). Charcoal marketing in Abia State. In: Farm Management Association of Nigeria (Famam) 22<sup>nd</sup> Annual Conference. 2008 (ed). Umeh, J.C, Obinne, C.P, and Lawal, Wuraola. Pp338-346.
38. Kudi T. M., J. O. Olukosi and A. O. Ogungbile 2006: Econoimc Analysis of sesame marketing in Jigawa state. *Journal of Agriculture, Forestry and the social sciences* (JOAFSS) Vol. 4 No. 1. 2006.
39. Kola-Oladiji K. I., A. A. A. Adesope and A. F. Adio 2006: Profit ability of marketing African bread Fruit (*Treculia Africana* Decne) in Ibadan metropolis. *Journal of Africulture Forestry and the social sciences* (JOAFSS). Vol. 4 No. 1 2006.