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3 **ASSESSMENT OF CHAINSAW MILLING ENTERPRISE IN BENUE STATE,**

4 **NIGERIA**

5

6 **Abstract-.**

7 The paucity of information on chainsaw milling enterprise has contributed to poor  
8 planning and development of timber resources in Nigeria. This study has accessed the  
9 marketing efficiency with a view of evaluating its potential contribution to the  
10 livelihoods and economic development of Benue State. Multistage sampling technique  
11 and purposeful sampling technique were applied to determine the study sample which  
12 was drawn from the three geopolitical zones in the State; Zone A, Zone B and Zone C.  
13 Applying a sampling intensity of 30%, seven (7) LGAs were sampled from the 23  
14 LGAs of the State for the study. Based on this arrangement 79 chainsaw millers were  
15 selected and interviewed on the trading activities. Data were collected and analyzed  
16 using descriptive statistics such as percentages and frequency distribution. Also gross  
17 margin analysis, marketing margin, marketing efficiency, Analysis of variance, T-test  
18 Statistics, Index of market concentration (IMC), and Rate of return on investment  
19 RORI, Gross Ratio GR were used in the determining the profitability and the efficiency  
20 of chainsaw millers trading efficiency in the study area. The study revealed that the  
21 trade is male dominated having 100% of the respondents as males. Similarly, the  
22 indigenous groups dominated the chainsaw milling and with the TIV having the  
23 majority of (65.8%), this was followed by the Idoma (13.7%), Igede, (12.5%) and Igbo  
24 (5.5%), Igala and Sura 1.4% each. The study identified 18 timber species that were  
25 marketed in the study area and that 2,411, 37,733, and 69,492 volumes were marketed  
26 in zones A, B and C respectively. The result of the gross margin and market efficiency  
27 showed that that the chainsaw milling activities are profitable and efficient. It revealed  
28 the mean monthly gross margin of 39,688.00, 128,730, and 84,000 with corresponding  
29 RORI of 84.19, 43.93, and 61.80 for the chainsaw millers. The ANOVA of GMs were  
30 significant with 0.013. The Total Revenue and Total Variable Cost (TVC) equally  
31 showed significance with 0.045, 0.000, 0.000. The IMC, Gini coefficient of 0.1891,  
32 0.3218 and 0.1829, indicating that the concentration was low with income inequality  
33 but with a competitive market.

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

35 **1 INTRODUCTION**

36 **Nigerian** forests support a wide range of forest industries, both the formal and informal  
37 sub-sectors, which a vast majority of the Nigerian populace depends on for their

38 livelihood (FAO, 2009; Akpabio *et al.*, 2013. According to Fuwape (2003) and FAO  
39 (2007), the sub sector has contributed significantly to the socio-economic development  
40 of Nigeria; ranking among the highest revenue and employment generating sectors.  
41 Ofoegbu, (2014) and Bichi (2011) asserts timber resources and timber trade has been a  
42 major contributor to the national gross domestic product (GDP) and thus a formidable  
43 tool for poverty alleviation. This is evident in the direct and far-reaching influences of  
44 the forest to livelihoods as the available forests are continually diminishing in the  
45 presence of rising human population and demand; this has unequivocally increase  
46 pressure on the forest resource base of the nation. (Adeyoju 1975; Kalu and Okojie,  
47 2009; Amiebenomo, 2002; Faleyimu, 2013).

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

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

59 In Nigeria, though the system is illegal, it is permitted under some regulations,  
60 restricted to domestic use only while in other countries it is only permitted for small-

61 scale commercial production. This operation is common mostly during illegal felling  
62 and flitching activities especially in the rainforest zone of Nigeria. According to Sambe  
63 (2015), chainsaw milling is rampant and dominates the timber trade in Benue State  
64 situated the guinea savanna zone. Its activities are often difficult to monitor due to the  
65 large number of people involved and the small size and mobility of its operations even  
66 when it is authorized, (Wit *et al.*, 2010).

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

74 The operation is very suitable in difficult terrain and areas that are inaccessible in the  
75 forest while the use of heavy equipment like tractors, skidders, and the cost of other  
76 installations are replaced by cheap and direct labour in the evacuation of sawn boards  
77 (Oksanen *et al.*, 2002). Chainsaw milling operations supplies cheap wood to local  
78 markets which in turn sells them at cheaper prices. A study by Ogunsanwo *et al.*, (2005)  
79 revealed that **sawn-chain** planks are sold at lower prices in local markets compared to  
80 those produced from conventional sawmills. This effect could be attributed to the fact  
81 that the boards produced from chainsaw milling operations are usually re-processed by  
82 consumers before they could be used effectively in production. In most states of

83 Nigeria, chainsaw milling has been identified as an illegal enterprise, however in Benue  
84 State its use is permitted under certain restrictions or regulations are adhered to.

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

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

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

103 The income from chainsaw operations represents a substantial proportion of  
104 household income which in some cases is much higher than income from alternative  
105 work. This corroborates report by Popoola (2010) in a study on chainsaw milling in  
106 Benue State that though chainsaw milling is illegal in the state, it provides employment  
107 for both families and hired labor, thereby improving household and social well-being.

108 He noted that, the wages earned compare favorably with those of the average skilled  
109 worker, and are far higher than the less than US\$1 on which more than 60% of  
110 Nigerians subsist. According to Ten Brink *et al* (2012) a healthy forestry sector can lead  
111 to the attainment of long-term socio-economic development that can promote social  
112 equity, poverty eradication, and human well-being of the people.

113 Studies on chainsaw milling activities are therefore invaluable and expedient in  
114 providing information relevant in repositioning the sector and addressing the challenges  
115 that chainsaw milling pose to sustainable development of the forestry sector of the  
116 economy. Thus, developing the forestry sector requires market information on the  
117 performance of marketing activities of this industry. Hence the lack of regular market  
118 information and data on the local, national and international markets is responsible for  
119 inefficient market system timber trade in Nigeria and Benue State in particular.  
120 Therefore, this impedes the drawing up of plans for sustainable forest management and  
121 development. According to FGN, (2006) inadequate data base remain a major constraint  
122 to forest policy formulation, project planning and implementation of forestry  
123 development program. Therefore, studies like this, tailored to provide and support the  
124 dissemination of reliable market information are invaluable and expedient.

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

## 130 2 METHODOLOGY

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

136 Benue State has a tropical sub-humid climate, with two distinct seasons, namely the  
137 wet and dry seasons. The wet season lasts for seven months; from April to October  
138 while the dry season lasts from November to March. The annual rainfall total ranges  
139 from 200 to 2,000 mm. Temperatures are generally very high during the day,  
140 particularly in March and April. Along the river valleys, these high temperatures plus  
141 high relative humidity produce clement/debilitating weather conditions. Benue State lies  
142 in the southern Guinea Savanna. The natural forest types and their distribution show  
143 three distinct types namely trees/woodland/shrubs, lowland rain forest and riparian  
144 forest. However, the percentage coverage of this natural forest is very small relative to  
145 the major land use in Benue state (Agbeja and Opii, 2005).

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

153 The study population comprised chainsaw operators in Benue State. Multistage  
 154 sampling technique, purposive sampling and complete enumeration were applied to  
 155 determine the study sample drawn from the three geopolitical zones in the state; Zone  
 156 ‘A’, Zone ‘B’ and Zone ‘C’. Applying a sampling intensity of 30%, seven (7) LGAs  
 157 were sampled from the 23 LGAs of the state for the study. Thus two (2) LGAs in zone  
 158 A, two (2) in B and three (3) in zone C were purposively sampled based on the  
 159 concentration of timber markets and trading activities. These LGA’s were Konshisha  
 160 and Kwande, in Zone A., Makurdi and Gboko in Zone B, Otukpo, Okpokwu, and Oju in  
 161 Zone C. From these LGAs, respondents from the population; chainsaw millers and were  
 162 sampled for data collection. Thus, Chainsaw millers were selected using 30% sampling  
 163 intensity in these locations Table 1.

164 **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%)
<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>

165 Note: L.G.A. = Local Government Area. Source: Field Survey, 2013

166 **2.1 Data Collection Techniques-** Data were collected from two sources: The primary  
 167 and secondary sources. The primary sources included questionnaires, personal  
 168 observations and focus group discussions. A semi-structured questionnaire was  
 169 designed and administered on chainsaw millers from the sampled LGAs namely  
 170 Kwande, Konshisha, Gboko, Makurdi, Otukpo, Okpokwu and Oju to elicit relevant

171 information for the study. Thus the chainsaw millers were interviewed for the required  
172 information.

173 *2.1.1 Analytical Techniques-*. Combinations of statistical and budgetary tools were  
174 used to analyze the data. The descriptive statistics: mean, percentage, tables, frequency  
175 distribution, and standard deviation were used. Marketing Efficiency, The Rate of  
176 Return on Investment (RORI), Gross Ratio, Gross Margin Analysis, Gini coefficient  
177 and Lorenze curve and T-test and Analysis of Variance (ANOVA) and were used.

178 *2.1.1.1 Determination of marketing efficiency-*. Marketing efficiency refers to  
179 maximization of the ratio of output in marketing. This study adopted Olukosi and Isitor  
180 (1990) technique in marketing efficiency. This is represented by equation 1 as:

181 
$$\text{Marketing Efficiency} = \frac{\text{Total Revenue}}{\text{Cost of Marketing}} \times 100\% \dots\dots\dots (1)$$

182 Total Revenue = Gross income  
183 Cost of Marketing = Total Variable Costs.

184  
185 *2.1.1.2 Gross margin-*. Gross margin is defined as the difference between Gross Income  
186 (GI) and Total Variable costs (*TVC*). According to Tee (2007), **the model is as follows.**

187 
$$GM = GI - TVC \quad (2)$$

188 Where: GM = Gross Margin; GI = Gross Income, an equivalent of Total revenue;  
189 TVC = Total Variable Costs (Transportation, Tariffs, Association levies,  
190 permits, tax, loading/offloading etc.).

191 *2.1.1.3 Gross ratio (GR)-*. This is the total expenses divided by the gross income (GI),  
192 given as:

193 
$$GR = GC/GI \text{ or } TVC/GI \dots\dots\dots (3)$$



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

198 *2.1.1.4 Rate of return on investment (RORI)-*. The Rate of Return on Investment (RORI)  
199 depicts the level of profitability of an investment and is an important criterion in  
200 determining the choice of investment. According to McCarthy (1968), Arene (1998)  
201 and Alao and Kuje (2012), it is given by the following relationship:

$$202 \quad RORI = \frac{TR - TC}{TC} \times 100 \quad (4)$$

203 where: TR= Total revenue, an equivalent of Gross income (GI)

204 TC= Total cost, an equivalent of Gross cost (GC).

205 Thus, Eq. (4) becomes:

$$206 \quad RORI = \frac{GI - GC}{GC} \times 100 \quad \dots\dots\dots (5)$$

207 *2.1.1.4 Estimation Procedure for Market Concentration*

208 *Gini coefficient and Lorenz curve:* The Gini-coefficient along with Lorenz curve was  
209 used to examine the market concentration of chainsaw millers that is, the measurement  
210 of the level of their concentration in the market in order to determine the degree of  
211 competition or monopoly in the market. Okereke and Anthonio (1988), Bila and  
212 Bulama (2005) used Gini coefficient to determine the degree of market concentration of  
213 sellers of grains markets in Eastern Nigeria and Maiduguri Cattle Market respectively  
214 by using the formula:

217  $G = 1 - \sum x Y$  ----- (6)

218 Where:  $G$  = Gini – coefficient;

219  $X$  = Percentage of sellers per period of study; and

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

221  $G$  varies from 0 to 1 expressing the extent to which the market is concentrated. When  
222  $G$  is equal to zero, there is perfect equality in the size of the distribution of sellers  
223 however, when  $G$  is equal to one (1), there is perfect monopoly in the market.

224 The Lorenz curve shows the level of concentration in the market. The value of the  
225 coefficient is the same as the ratio of the area between the Lorenz curve and the 45° line  
226 to the total area above or below the line. When there is perfect equality in the size of  
227 distribution of sellers in the market, the curve coincides with the 45° line. The farther  
228 away the curve is from the 45° line, the greater the level of concentration in the market.  
229 A perfect equality in concentration (low) of sellers is expected if  $G.C$  tends towards  
230 zero, while perfect inequality in concentration (high) of sellers is expected if  $G.C$  tends  
231 towards one. If  $G.C = 1$ , market is imperfect and if  $G.C = 0$ , market is perfect and  
232 competitive. Lorenz Curve was used to give a visualized nature of the sellers’  
233 concentration in the markets through a graphical representation. The graph of  
234 cumulative percentage of total sales is plotted against the cumulative percentage of the  
235 sellers. It is used in economics to describe inequality in income or wealth (Damgaard  
236 and Weiner, 2000). If all individuals are the same size, the Lorenz Curve is a straight  
237 diagonal line (45°), called the line of equality, if there is any inequality in size then the  
238 Lorenz Curve falls below the line of equality (45°).

Variable/Category	Chainsaw Operators	
	Frequency	Percentage
<b>Age (Years)</b>		
≤ 30	27	37.0
31 – 40	32	43.8
41 - 50	12	16.5
≥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
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239 **3.**

240 **RESULTS AND DISCUSSION**

241 **3.1 Socio-Economic Characteristics of Respondents in Benue State-** The result on  
 242 socio-economic characteristics of respondents is presented in Table 2. The socio-  
 243 economic variables studied were age, marital status, gender, educational status as well  
 244 as ethnic group and work experience.

245 The age distribution of respondents showed that 80.8 % fell within the age bracket of ≤  
 246 30 to 40 years, and the remaining 19.2 % were between 41 years and above. Based on  
 247 gender, 100% of chainsaw millers were males.

248 Educational status distribution of the respondents shows that the highest proportion  
 249 (72.6%) of chainsaw millers had secondary education followed by those with primary  
 250 education (20.5%), tertiary education (6.9%) while 5.5% had no formal education. In  
 251 terms of ethnic composition distribution a higher proportion (65.8%) of the chainsaw  
 252 millers were Tiv, 3.7% were Idoma, 12.3% Igede, 5.5% Igbo while Igala and Sura,  
 253 constituted 1.4% each. The distribution based on years of experience showed that  
 254 chainsaw millers, a greater proportion of respondents of 69.8% had ≤ 5 to 10 years  
 255 while 30.1% had more than 10 years of experience.

256 **TABLE 2:** Socio Economic Characteristics of Respondents in the Study Area.

257 Source: Field survey, 2013.

258  
 259

260 **3.2 Mean Monthly Volume of Trade by Chainsaw millers in the Three**  
 261 **Geopolitical Zones of Benue State**

262 Table 3 presents the mean monthly volume of timber trade by chainsaw millers in  
263 Benue State. The highest mean volume (9,877m<sup>3</sup>) of timber traded was recorded in  
264 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  
265 case with Timbershed dealers, different numbers of tree species were found among  
266 chainsaw millers across the study area. For instance while only 9 and 11 tree species  
267 were marketed in Zones 'B' and 'C' respectively, 18 species were marketed in Zone  
268 'A'. Of the species marketed a greater volume of 6,657m<sup>3</sup> from *Milicia excelsa* was  
269 traded in Zone 'C', followed by *Gmelina arborea* (1,859m<sup>3</sup>) in Zone 'B', *Daniellia*  
270 *olliveri* in Zone 'C' (1,386m<sup>3</sup>), *Gmelina arborea* (1,308m<sup>3</sup>) and *Lennea bateri* (1,298  
271 m<sup>3</sup>) in Zone 'A', *Daniellia olliveri* (1,243m<sup>3</sup>) in Zone 'B', in that order. The least  
272 volume of timber species marketed was *Anogeissus leiocarpa* with 5m<sup>3</sup> in Zone C.

273 Based on grand mean volume of the trade across the Zones , *Milicia excelsa* with  
274 2,287.67m<sup>3</sup>, had the highest mean volume of timber species marketed per month,  
275 followed by *Gmelina arboreal* (1,260.67m<sup>3</sup>), *Daniellia oliveri* (1,192.00m<sup>3</sup>),  
276 *Pterocarpus erinaceus* (4,86.33m<sup>3</sup>), *Tectona grandis* (439.33m<sup>3</sup>), *Lennea bateri*  
277 (432.67m<sup>3</sup>), and *Parkia biglobosa* (273.67m<sup>3</sup>). The least volume of tree species  
278 marketed across the zones was *Afzelia africana* with 4.67m<sup>3</sup> per month. This was  
279 available only in Zone 'A'.

280 On average 7,289.67m<sup>3</sup> of wood (timber) was traded by a timber dealer every month.  
281 The highest volume of timber trade was in zone C represented by 9,877m<sup>3</sup>. This was  
282 followed by 6,188m<sup>3</sup> and 5,804m<sup>3</sup> respectively in zones 'A' and 'B'. A total of  
283 21,869m<sup>3</sup> of timber was traded monthly by the chainsaw millers.

284  
285

286  
287

**TABLE 3:** Mean monthly Volume of Timber Trade by Chainsaw millers across the three 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>

288

Source: Field Survey, 2013

289

**3.3 Analysis of Income of Chainsaw millers in the study area-** The result of income

290

of chainsaw millers is presented in Table 4. The monthly average gross margin (GM)

291

for chainsaw millers was obtained to be ₦39, 688.00, ₦ 128,730.00 and ₦ 84,480.00,

292 for zones A, B, and C respectively. Chainsaw millers in zone ‘B’ generated the highest  
 293 mean GM followed by those in zone ‘C’ and then ‘A’. This means chainsaw millers in  
 294 zone B generated higher incomes followed by those in Zone C while chainsaw millers  
 295 in Zone A generated the least. This has a positive socio-economic implication for the  
 296 timber dealers, as this high gross margin is capable of improving the status of the  
 297 respondents.

298 Similarly, chainsaw millers RORI of zone A is the highest (84.19 %) but the lowest  
 299 GR of 0.54 among the zones, followed by those in zone C with a RORI of 61.80 % with  
 300 the highest GR of 0.62 while zone ‘B’ had the least RORI in the three zones with a  
 301 corresponding higher GR of 0.56.

302 RORI measures the speed at which the capital invested is able to yield dividends or  
 303 profit, GR measures the proportion of the capital in hand that is utilized in off-setting  
 304 costs. In essence, RORI measures profit level, GR measures the entrepreneur or  
 305 producer’s ability to minimize costs or efficiency in inputs utilization and other costs in  
 306 production to improve profit. The lower the GR the better is the business, conversely,  
 307 the higher the GR the lower the profit margin.

308 **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

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**Total**

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309 Source: Field Survey, 2013

310 **3.4 Result of analysis of variance (ANOVA) Test for Gross Margin of Chainsaw**

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

314 The implication of this result is that the null hypothesis is rejected and the alternative  
315 hypothesis that there is significance difference in the incomes of chainsaw millers from  
316 timber trade is accepted. This means income of chainsaw millers from timber trade across  
317 the study area are different; income from one zone being higher than that from other  
318 zones. Thus the post- hoc multiple comparisons analysis presented in Table 6 showed that  
319 income of chainsaw millers from zone B and is significantly ( $P < 0.05$ ) higher than that of  
320 A. It also shows that income from zone B in turn is higher than that of zone C but without  
321 a significant difference ( $P > 0.05$ ). From all the profitability indices applied, it is evident  
322 that business in the study area was highly profitable.

323 **TABLE 5** Results of one way ANOVA of Gross Margin of Chainsaw Millers

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	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	$8.204 \times 10^{11}$			

---

324 Source: Computed from Field Data, 2013.

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

326 \* = Significant at 5% Probability level.



327

328 **TABLE 6** Post Hoc Multiple Comparisons Test of Gross Margin of chainsaw millers in

329

the 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

330 Source: Computed from Field Data, 2013.

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

332 **3.5 T-test for profitability of Chainsaw milling in Benue State**333 **3.5.1 T-test for profitability of Chainsaw milling in Zone A of Benue State-**.The result of334 chainsaw millers for Zone A, revealed a significant difference ( $p < 0.05$ ) in the gross

335 incomes and Gross Cost of chainsaw millers in zone 'A'. This means income from

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

337 three zones of the study area, Table 7.

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

339 significant difference between Incomes and Costs.

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

340 Source: Computed form Field Data, 2013

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

342 \* = Significant at 5% Probability level.

343 3.5.2 *T-test for profitability of Chainsaw milling in Zone B of Benue State-*. The result of  
 344 chainsaw millers revealed a significant difference ( $P < 0.05$ ) in the gross incomes and  
 345 Gross Cost of chainsaw millers in zone 'B'. This means income from chainsaw milling is  
 346 significantly higher than the gross cost from this operation in the three zones of the study  
 347 area (Table 8).

348 **TABLE 8** T-Test for Chainsaw Millers in Zone B of Benue State. Hypothesis: there is no  
 349 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*

350 Source: Computed from Field Data, 2013

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

352 \* = Significant at 5% Probability level.

353 3.5.3 *T-test for profitability of Chainsaw milling in Zone C of Benue State-*. The result of  
 354 chainsaw millers in Zone 'C' revealed a significant difference ( $P < 0.05$ ) in the gross  
 355 incomes and Gross Cost of chainsaw millers in zone 'C'. This means income from  
 356 chainsaw milling is significantly higher than the gross cost from this operation in the  
 357 three zones of the study area (Table 9).

358 **TABLE 9:** T-Test for Chainsaw Millers in Zone C of Benue State.  
 359 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			

360 Source: Computed from Field Data, 2013

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

362 \* = Significant at 5% Probability level.

363 **3.6 Market Concentration of Chainsaw Millers in Benue State-**. For chainsaw  
364 millers the Gini- coefficient values were 0.18912 or 18.91% for Zone A, 0.321828 or  
365 32.185 for Zone B and 0.18289 or 18.28% for Zone C (Table 30). This shows low market  
366 concentration of timber traders. This reveals an economically fairly equitable distribution  
367 of volume of trade among chainsaw millers in the study area. However, based on the  
368 values of Gini-coefficient in each case, trade in zone C was less un-equally distributed  
369 followed by zone A and lastly B. The size and distribution of sales of timber flichtches or  
370 planks from timber traders is presented in Tables 10, 11 and 12. The illustration of this  
371 distribution by the Lorenze curve shown in figures 1, 2 and 3 does not skew far away  
372 from the line of equal distribution (LED).

373 **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
Zone B	0.32184737	0.14255092	0.04245269	0.60124204	95
Zone C	0.18289433	0.05110957	0.08272141	0.28306724	95

374 Source: Computed from Field Data.

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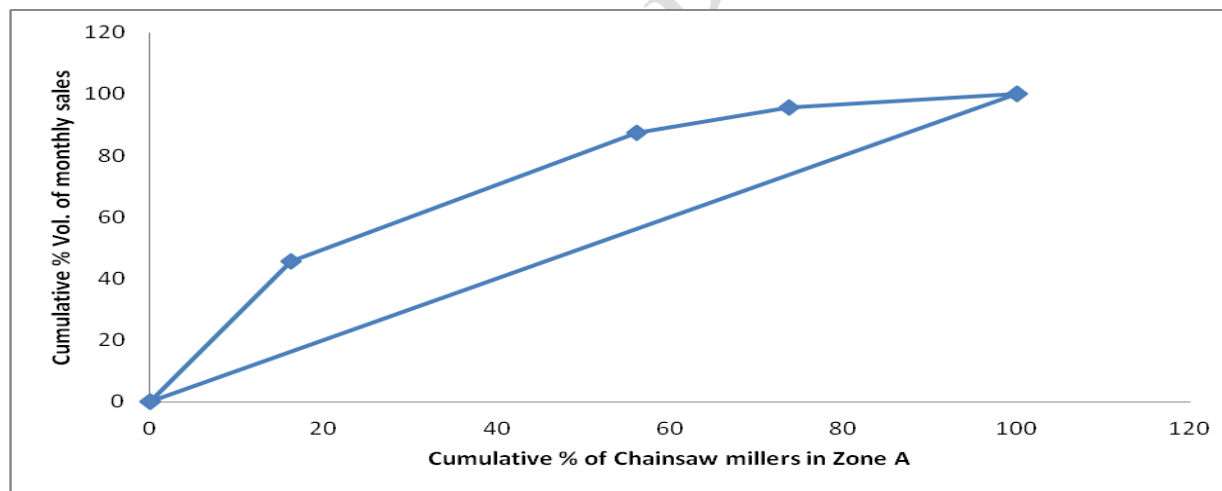
**TABLE 11** Distribution of Chainsaw Millers' by Size of Monthly Sales in Zone A, Benue State

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>		

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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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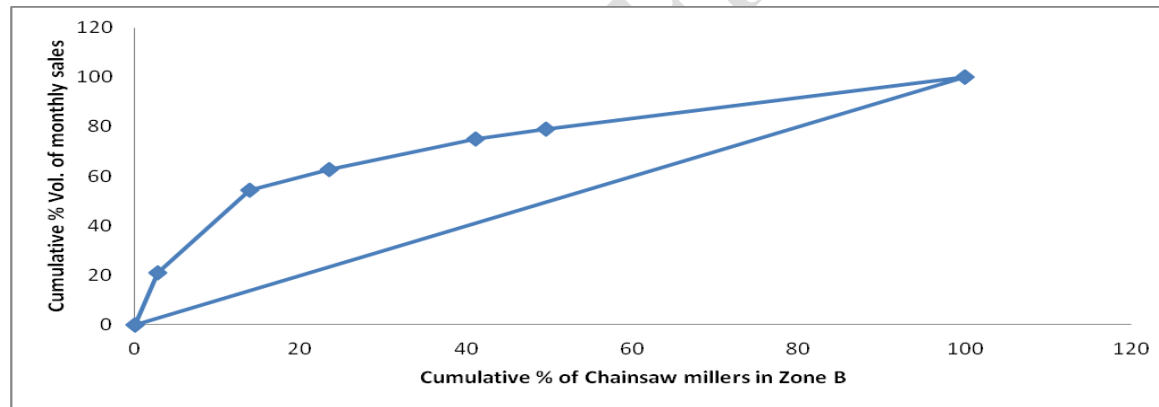
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**TABLE 12** Distribution of Chainsaw Millers by Size of Monthly Sales in Zone B, Benue State

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	<b>100.0</b>
<b>Total</b>	<b>24</b>	<b>100.0</b>		<b>7031000.00</b>		

387 Source: Computed from Field Data, 2013

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**FIG. 2** Lorenz curve for Chainsaw millers in Zone B, Benue State

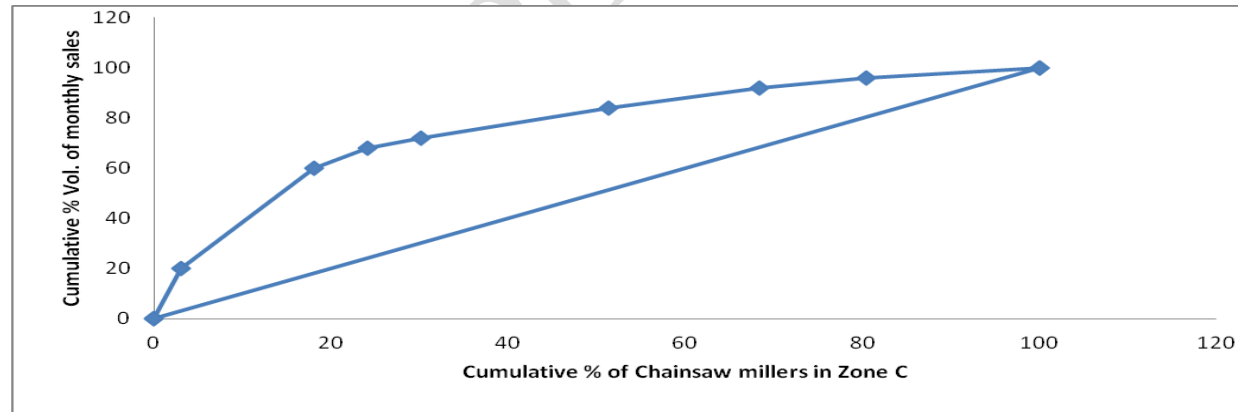
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**TABLE 13** Distribution of Chainsaw millers by size of monthly sales in Zone C, Benue State

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>	

Source: Field Data, 2013



**FIG. 3** Lorenze curve for chainsaw millers in Zone C, Benue State.

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411 **3.7 Chainsaw millers marketing efficiency in Benue State-** The respective revenues  
412 and marketing costs of chainsaw millers presented in Table 14. The mean marketing  
413 efficiency of chainsaw millers sampled in zones A and C in Table 14. The result  
414 revealed that chainsaw millers in zone 'A' received the total sum of as 86,828.00  
415 average gross revenue per month. The mean total marketing costs was ₦ 47,140  
416 representing 54.29% of the mean gross income. A breakdown of the marketing costs  
417 revealed that loading and offloading had the highest cost (30.35), followed by  
418 expenditure on timber (25.38%), wages (19.24%), and transport (16.93%). The least  
419 cost of 0.75% was incurred on others.

420 For zone B the average gross revenue per month for Zone B was 292,970.00 while  
421 the cost was N164,240 representing 56.06% of the mean gross income. Expenditure on  
422 timber (33.01%) possessed the highest cost followed by wages (30.35%), transport  
423 (19.66%) and taxes (5.99%) while the least cost was incurred on others. Similarly the  
424 study showed that all chainsaw millers sampled in Zone C received the total sum of ₦  
425 221, 170.00 average gross revenue per month while the mean total costs was ₦  
426 136,690.00 representing 61.80% of the mean gross income. In the same vein  
427 expenditure on timber (30.64%) possessed the highest cost followed by transportation  
428 (25.79%), wages (22.10%), loading and offloading 18.48% while the least cost of  
429 0.83% was recorded on dues.

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

433

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435

**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

436 Source: Computed from Field Data, 2013.

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

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

440



#### 441 **4 DISCUSSION**

442 **4.1 Socio Economic Characteristics of Timber dealers in Benue State, Nigeria-** This  
443 study revealed that all of the chainsaw millers that were male were involved in the timber  
444 business enterprise. It is thus a male- dominated occupation. The lack participation of female  
445 in timber business could be attributed to the tedious nature of the business. This finding  
446 corroborates the earlier view expressed by Kalu and Ani (2009) and Sekumade and  
447 Oluwatayo (2011), that dominance of the trade by men is due to the fact that it's operation is  
448 tedious, and this tends to discourage most women from engaging in the enterprise.

449 **The fact that the** majority of the timber merchants fall within the active age distribution of  
450 30 -40 years further justify the above claim. These youths are gainfully employed and can  
451 earn their livelihood from timber business in spite of the enormous strength and energy  
452 required for this kind of business; their youthful exuberance can match the toils involved. The  
453 study revealed that a greater proportion of the timber traders, chainsaw millers were married.  
454 The larger proportion of married families implies that timber trade is perhaps a secured  
455 livelihood activity in the area; and could sustain their responsibilities to wives, children, and  
456 other family members under their care.

457 The relatively larger proportion of literate respondents over the illiterate in timber business  
458 seems to be a blessing. According to Aiyelaja *et al.* (2012) timber business requires some  
459 degree of literacy due to measurements and simple calculation involved in plank processing  
460 from round wood into different sizes. The respondents would also be more amenable to  
461 development policies required to be implementable. This also implies that timber trade is  
462 perhaps a profitable venture that engages the educated and provides alternative source of  
463 income and employment.

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

469 **Data on the ethnic** composition implies that timber market is dominated by the indigenes.  
470 The relatively dominant proportions of the Tiv, Idoma, and Igede, could be attributed perhaps

471 to their familiarity with the terrain and locations of raw timber. Furthermore, the formation of  
472 co-operative societies by timber dealers will also give them more enablement to source for  
473 credit facilities. This agrees with the finding by Sidiku and Oyerinde (2010), on the analysis  
474 of sawn timber market in Ondo State that sawn timber traders solely depend on personal  
475 savings.

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

480 **4.2 Volume of Timber Trade in Benue State-** Variations were observed in the volume of  
481 timber traded across the three geopolitical zones in Benue State. These observed variations  
482 were attributable to species availability and settlement pattern. For instance the higher  
483 number of timber species marketed in Zone B were because of the Urban nature of the  
484 sampled LGAs, high population density and large market for timber products coupled with  
485 higher incomes of the urban dwellers in these zones. The study ostensible trade in species  
486 regarded as Non-timber tree species was due to the scarcity of the timber species and growing  
487 demand for timber for construction works and others services.

488 The larger volume of *Daniellia oliveri* marketed in Benue State was partly due to its  
489 relative abundance from the forests in Benue State and partly due to extensive demand for its  
490 wood in the construction industry. The relatively larger volume marketed of species like  
491 *Gmelina arborea*, *Khaya grandifoliola*, *Pterocarpus erinaceus* and *Tectona grandis* among  
492 others was due primarily to demand for their wood. These species possess preferred qualities  
493 like strength needed for construction works in Benue State. They were mainly imported into  
494 Benue State from neighbouring states. Ogunwusi, (2012) noted that in nearly all ecological  
495 zones, the wood species mostly found in the timber market are those widely available within  
496 the forest zones. He also stated that *Irvingia gabonensis* wood is very popular in the planks  
497 markets in the south east and south west zones while *Prosopis africana* and *Detarium*  
498 *senegalense* are now very prominent in markets in the Northern parts of the country.  
499 According to the classification of timber species by Arowosage (2010), the following are  
500 commonly used species; *Khaya grandifoliola*, *Azalia africana*, *Mansonia altissima*, *Ceiba*

501 *patandra*, *Milicia excelsa*, *Tectona grandis*, *Anogeissus leiocarpa*, *Isobertinia doka*,  
502 *Terminalia ivorensis*, *Terminalia ivorensis*, *Ceiba patandra*, *Triplochiton scleroxylon* are  
503 used for ends uses as building construction and flooring, furniture construction and  
504 decoration, veneer and house fitting, roofing, doors, window frames, stair cases, boat  
505 building, coarse packing and form work.

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

519 **4.3 Comparisons of Income from Timber Trade in Benue State-** Gross margin measures  
520 (GM) the level profit generated from a business or any production activity, after all expenses  
521 are deducted. Monthly Gross Margins (GM) was calculated for timber fitches or lumber  
522 traded. These were derived from the differences between monthly Gross (GIs) and monthly  
523 Total Variable Costs (TVCs) of timber marketed respectively.

524 The results from the analyses, as presented in Table 4, revealed that the trading activities  
525 in timber marketing in Benue State were profitable. At the end of every month of trading, a  
526 chainsaw miller goes home on average with ₦39,688.00, ₦128,730.00 and ₦84,474.00 in  
527 zones A, B and C respectively. The GM values are far higher than the national minimum  
528 wage. This justifies timber trade as a viable enterprise for sustainable livelihood. Based on

529 the gross margins (GMs), and their trend in all the timber traded, the study revealed that  
530 timber merchants in zone 'B' had the highest average GM which implies that the timber  
531 market in the zone is more efficient compared to trader in timber markets. This could also be  
532 attributed to its high population and cosmopolitan nature compared to the other zones. This  
533 could result to higher demand, construction activities and higher magnitude of trading  
534 activities which could in turn lead higher rates of returns. This in turn is followed by timber  
535 traders in one 'C' and then 'A'. This means, all things been equal timber traders in zone 'A'  
536 generated higher profits from sales compared to those in zones and A and B. The RORI and  
537 GR values also support the above conclusion. Therefore, GR of 0.54 for timber traders in  
538 zone 'A' means 54% of the total income generated is used in off-setting marketing costs. By  
539 implication the profit made from timber sales is 46% over the capital invested. That is one  
540 naira invested will generate fifty kobo or 0.46 naira as profit thus raising the amount invested  
541 to ₦1.46. The result showed low values of GR and high values of RORI but the GM was  
542 positive and high.

543 The implication of these results is that, high profit margin does accrue to timber merchants  
544 because the low GR value implies that not too much expenses were incurred in offsetting  
545 marketing costs; transportation, loading, off-loading, taxes, purchasing costs among others  
546 except for zone B. This cost gulped as high as 54% of the gross benefits realized by timber  
547 trader.

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

554 Generally, the marketers had a fair profit margin, but relatively those in Zones A and B  
555 realized higher profit margins as the GM indicates. This is similar to Bichi's (2011) findings  
556 in Kano State which revealed that timber business can generate between N5, 000 to 450,000  
557 per month and can generate even one hundred thousand naira per day based on demand and  
558 season. According to the findings by Popoola (2010) in Benue state, incomes from chainsaw  
559 milling range between \$2.50 and \$80 per day, and range between \$75 and \$2,400 per month.  
560 This captures mean income from this study of ₦39,688 which amounts to \$110.24 per month.  
561 Akinyemi *et al.* (2011) also made a similar observation from the study on profitability,  
562 prospect and constraints of Sawmill Industry in Kaduna State. His finding revealed a monthly  
563 net income to be ₦118,789.40 while the rate of return on investment was calculated to be  
564 50.18%. This is therefore an indication that timber business is generally profitable in Benue  
565 State.

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

573 **5.6 Concentration and Efficiency of Timber Trade in the Study Area-.** Market  
574 concentration in market structure is concerned with the organizational characteristics of a  
575 market which influence the nature of competition and pricing within the market. According to  
576 Tee (2007) an efficient marketing system is relevant in stimulating and producing forestry  
577 development and economic growth. According to Todaro (1981), for economic variables with  
578 relatively equitable distribution, the Gini coefficient value should be between 0.20 and 0.35.

579 UNDP (1992) reported that Gini-coefficient with high inequality typically lie between 0.5  
580 and 0.7. This suggests that saw miller and chainsaw operators were not able to control large  
581 shares of wood supply or sales in the study area. As such none could influence supplies by  
582 increasing or decreasing the quantity supplied. Each of the participant's output was an  
583 insignificant part of the volume of trade in the market such that it could not affect market  
584 price.

585 The low Gini coefficient value of 0.2885 showed that small sawmills were evenly  
586 distributed in Benue State and none of the market participants have control on significant  
587 proportion of the timber market. Similarly the Gini coefficient of chainsaw millers in zone B  
588 also revealed that none had significant control since both market actors had their Gini  
589 coefficient value within the same range. In the same manner the result of the analysis showed  
590 that among the chainsaw millers in the zones, none of the market actors also had control of  
591 the market. This implies that timber market is monopolistic competitive in structure in the  
592 study area. Thus the concentration of sales volume among chainsaw millers was low  
593 although higher than the others. This shows that none of the timber market actors controlled  
594 significant proportion of the timber trade.

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

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

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

## 608 **CONCLUSIONS and RECOMMENDATIONS**

609 Chainsaw milling is economically important and viable, it is a profitable and efficient  
610 business enterprise with good financial returns to the marketers. The structure of timber trade  
611 in Benue State exhibited features that were competitive. Thus the distribution of the volume  
612 of the trade was economically equitable. Thus, Benue state government should development  
613 policy framework ploughing backs some of the profit in developing the timber resource in the  
614 state.

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