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Impact of Agricultural Mechanization on Commercial Timber Harvesting Among Etche People of Rivers State

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Abstract

This study examined the impact of agricultural mechanization on commercial timber harvesting among Etche people of Rivers State. The study areas were Omuma and Etche Local Government Areas of Rivers State. The study employed a descriptive survey design. The population of the study consists of all commercial timber producers in Omuma and Etche Local Government Areas. The sample size consists of 140 commercial timber producers in the study areas. Five research questions guided the study. Two hypotheses were formulated and tested at 0.05 level of significance. A research questionnaire consisting of two sections A, B, and C was structured to elicit response from the respondents. The instrument was structured using a 4-point rating scale of agreement. Cronbach alpha reliability coefficient was used to test the instrument and was found to have 0.81 reliability coefficient which was considered high enough to be used for the study. Instruments were administered by the researcher and four assistants and were retrieved within few days. Collected data were analysed using, percentage, mean statistics and standard deviation with mean value ≥2.50 as accepted whereas otherwise rejected. The null hypotheses were tested using *z-test* at 0.05 level of significance. Based on collected data it revealed that majority of the respondents (Omuma & Etche CTP's) were aged between 36-50years, married, with varied educational attainment, majority were timber loaders, off-loaders, sawyers, truckers, earn monthly income between ₦50,500-60,000 and above. The study revealed that agricultural mechanized tools such as chainsaw, harvester, processor, surface planer, among others were tools used by commercial timber producers in the study areas. It also revealed that agricultural mechanization have positive impact in that it quickens timber felling process, reduces wastage during harvesting, leads to reduction of drudgery during harvesting, among others. The study therefore recommended that commercial timber producers should ensure there is a proper operational and maintenance culture for agricultural equipment and farm machinery; government should ensure that machines and equipment for timber production are affordable by subsidizing the cost of machines.

Keywords: Impact, Agricultural Mechanization, Commercial Timber Production

I. INTRODUCTION

In the course of studies, researchers have acquired knowledge from nature hence natural things are being used for construction for the satisfaction of human wants (Riesco, 2004). One of the oldest natural things that have served man over the years is wood, otherwise referred to as timber when being processed. Wood is being used by man for several purposes, such as cooking, furniture making, housing construction (roof, doors, windows) and for several other heavy constructions such as building of brides. The Royal Swedish Academy of Agriculture and Forestry (2009) stressed that timber is the wood of trees cut and prepared for use as building material. Timber can also be called Lumber; both words are used to name standing trees and those ones that have been felled for construction uses.

However, the wood that is set aside for construction purposes is regarded as timber. According to Nneji, Okon, Nwachukwu, David and Ogbuanya (2010), timber is a wood that is suitable for civil engineering constructions. Also, Abimaje and Baba (2014) described timber as fibrous rigid materials of plant origin. When timber is still standing, it could be described as tree. Sometimes, it is possible to differentiate between unprocessed raw wood: - timber; and cut wood packaged for commercial sale: lumber (Fernando, 2012).

Timbers are grown in forest, but they do well in some forests deliberately established than the others. According to Fernando (2012), the plantation forests are the best alternative place to maintain a sustainable growth and high-quality timber. Furthermore, plantation forests produce more of the world's commercial timber (34%) than do old-growth forests (30%); followed by managed second-growth forest (22%) and minimally-managed second-growth forests (14%). An old natural forest takes from 65 up to 300 years to mature, and these kinds of forest are being harvested at a huge rate, just like Eastern white pine (Pinus strobus) and black walnut (Juglaus nigra) which takes about 10-30years before it matures (Self & Ezell, 2015).

According to Oni (2003) timber is natural and renewable. It has a high strength to weight ratio and is easy to work with, making it especially useful even where only basic technology and procedures are available (Apu, 2003). According to Abimaje and Baba (2014), timber remained the most predominant building material until the last half of 19th century. Although steel and concrete are the two most predominant materials used in construction of high buildings and bridges, wood is still used as a major interior material in buildings, furniture, and construction of small houses, paper production, among others (Food and Agricultural Organization, 2009).

The relevance of agricultural mechanization in maximizing productivity could not be overemphasized. Diao, Cossar, Houssou and Kolavalli (2016) asserted that in a society where there are both large and small scale farmers, the use of tractors by the farmers can be essential for expanding the aggregate area cultivated by large farms, for which hired labour represents a high proportion of their production cost. Furthermore, where hired labour represents a relatively large share of production costs, even smaller farmers demand for mechanization technology when labour cost starts to rise in order to reduce their labour and total production costs. Besides, Aggarwal (2003) opined that agricultural mechanization improves production efficiency, encourages large scale production and improves the quality of farm produce.

In identifying agricultural mechanized tools, Hendrickson (2005) reviewed that when small scale farmers utilized mechanized equipment or tools, their production efficiency was maximized. Some of the tools and equipment used that led to sustainable increase in agricultural production according to the survey are disc harrow, disc plough, cultivator, ridger, feller-buncher, combine harvester, planters among others. This report closely related to this current study as it has identified some mechanized agricultural tools used in commercial production in both food crops and tree crops (timber). Also, among the tools identified by Wiswall (2009) include the rotary tillers, the affirmed that roto-tilling is a very good tool or agricultural machine for the preparation of seed beds for either tree crops and other food crops that undergoes nursery. This is because it goes underneath the soil, till it and increase the organic matter decomposition. This will however increase production to a commercial level. Spading machines as also identified is common in Europe as it is used to loosen the soil and incorporate residues turning the soil. Volk (2009) investigated the production capacity of some agricultural tools such as precision seeders, pinpoint seeders, jab-type seeders, drills, tool bar-mounted seeders. According to him the tools were effective in planting large quantities of seeds or grains in the field.

Agricultural mechanized tools and cultivation equipment for post-emergence weed control include: sweeps, basket weeders, spyders, hilling discs, finger weeders, row-crop cultivators and rolling cultivators (Schonbeck, 2010). His investigation reviewed that sweeps which is positioned at a deeper depth and used for hilling-up such crops as broccoli, sweet corn, and Irish potatoes increased their production capacity to a commercial level.

In recent years agricultural mechanization has contributed a lot in harvesting and processing of agricultural products both food and tree crops. Virginia (2008) opined that agricultural mechanized tools in timber harvesting are one of the several combinations of equipment used for filing and extracting timber. These tools lead to proper harvest layout which therefore encourages higher production. In the review, commonly used timber harvesting and processing systems was described. Conventional logging uses a chainsaw and cable skidder. Mechanized logging uses a feller-buncher, grapple skidder or other auxiliary equipment or tools as a loader, slasher, delimber, and chipper. Whole-tree harvesting is a type of mechanized logging which typically adds a chipper for processing whole trees into chips at the landing, a loader to feed the chipper, and a trailer into which the chips are blown. Also, in order to facilitate efficient harvest and processing of timber, mechanized tools or equipment using a processor and forwarder combination was used and this

falls under the cut-to-length system. Considering the fact that those tools and equipment that were used in both Europe and America led to quick and easy harvest and processing of timber, it should be clear that efficient harvesting and processing systems would be also achieved in the current study areas. UNH (2001) examined the safe timber harvesting and discovered that agricultural mechanized tools and equipment has contributed immensely on both harvesting and processing of timber in New Hampshire. In this study, feller bunchers were used. After felling, trees were piled into inches for removal to the landing by a skidder. These mechanized operations tend to be whole-tree operations that remove all the trees from the bush for processing at the landing

Statement of the Problem

Discovery and want of man have over the years led to the innovation of so many products from natural things like metal, wood, ceramics, plastics, rubber and the likes. Among these raw materials, Nneji, Okon, Nwachukwu, David and Ogbuanya (2010) opined that wood is the most common that can be found around human; hence it is most utilized for production. Wood for construction purposes known as timber has been very instrumental in the production of infrastructure and heavy construction in the industry, which means that it has to be made available always. However, Amapu (2008) asserted that, the number of timbers produced is not enough especially in local areas where timber production is done manually. According to Abimaje and Baba (2014) the reasons why Nigeria timber producers produce less than expected is as a result of lack of modern equipment in harvesting, transporting and processing of timber by local timber producers. However, in modern countries where modern equipment is utilized, timber dealers produce more that will be enough for production. Therefore, there is a call for Nigeria local timber producers to be more involve in mechanization as a means of enhancing their productivity. Basically, it will be worthwhile to venture into the impacts of agricultural mechanisation on commercial timber production in Nigeria. It is against this background that the researcher deemed it necessary to venture into the impacts of agricultural mechanization on commercial timber production among Etche people of Rivers State.

Purpose of the Study

The study examined the impact of agricultural mechanization on commercial timber harvesting among Etche people of Rivers State. Specifically, the study sought to;

1. ascertain the socio-economic characteristic of commercial timber producers in the study area.

2. identify the agricultural mechanized tools used in commercial timber production in the study area.
3. ascertain the impact of agricultural mechanized tools on harvesting of timber in the study area.

Research Questions

Based on the stated purpose of the study, the following research questions guided the study:

1. What are the socio-economic characteristics of commercial timber producers in the study area?
2. What are the agricultural mechanized tools used in commercial timber production in the study area?
3. What are the impacts of agricultural mechanized tools on harvesting of timber in the study area?

Hypotheses

The following null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference in the mean responses of Etche and Omuma commercial timber producers on agricultural mechanized tools used in commercial timber production in the study area.
2. There is no significant difference in the mean responses of Etche and Omuma commercial timber producers on the impacts of agricultural mechanized tools on harvesting of timber in the study area.

II. METHODOLOGY

The study adopted a descriptive survey research design. Nworgu in Nwankwo (2013) described descriptive surveys as studies which aim at collecting data for the purpose of describing systematically the characteristics, features and facts about a given population. The present study is a descriptive survey based on the fact that it gathered information from commercial timber producers in the study areas in order to describe the impact of agricultural mechanization on their timber production. The study was carried out in Omuma and Etche Local Government Areas of Rivers State, Nigeria which is named after the Echie people of South-South Nigeria. The Etche people speak their own native language which is similar to the Igbo language. They inhabit Omuma and Etche Local Government Areas of Rivers State. The Etche people are known for farming; hence, they are fully involved in agricultural production which involves the production of arable

crops, cash crops, forest products (timber), livestock farming among others. Timber is produced in almost all the communities in Etche and Omuma Local Government Areas. Therefore, the areas are suitable for this research work, which seeks to investigate the impact of agricultural mechanization on commercial timber production among Etche people of Rivers State.

The population of the study comprised all commercial timber producers in the selected communities in both Omuma and Etche Local Government Areas of Rivers State. A sample of 140 commercial timber producers was used for the study. The study sample was achieved by taking a simple random sampling of commercial timber producers in Omuma and Etche Local Government Areas respectively. The sample size in the selected communities in Omuma was 54, while that of Etche was 86, which therefore serve as the respondents for this study. The instrument for the study was a survey questionnaire title "Impact of Agricultural Mechanization on Commercial Timber Processing (IAMCTP)", which was used to elicit information on the impact of agricultural mechanization on commercial timber production among Etche people of Rivers State. The questionnaire was structured in the pattern of 4-point Likert rating scale of Strongly Agree (SA-4), Agree (A-3), Disagree (D-2) and Strongly Disagreed (SD-1). The instrument was face validated by the research supervisor and two experts in the Department of Vocational and Technology Education in Rivers State University, Port-Harcourt. The reliability of the instrument was established using Cronbach Alpha Reliability Coefficient method for a measure of internal consistency of the instrument. The coefficient value obtained was 0.81 which was used to judge the reliability of the instrument and was considered high enough for the study. Copies of the instrument were administered directly to the respondents by the researcher and four research assistants. Percentage, mean and standard deviation was used to answer the research questions while z-test was employed to test the hypotheses at 0.05 level of significance. Mean values less than 2.50 was rejected, while Mean values ≥ 2.50 was accepted. The data was analysed with SPSS 23.0 version and Excel software.

III. RESULT

Research Question 1: What are the socio-economic characteristics of commercial timber producers in the study area?

Table 1: Socio-Economic Characteristics of commercial timber producers (CTPs) (ΣN = 140)

S/No	Items	Omuma CTP's Respondents (n=54)	%	Etche CTP's Respondents (n=86)	%
1.	**Age Range (years)**				
	21-35	15	27.8	12	14.0
	36-50	20	37.0	40	46.5
	51 and Above	19	35.2	34	39.5
2.	**Marital Status**				
	Single	10	18.5	15	17.4
	Married	32	59.3	60	69.8
	Separated	4	7.4	2	2.3
	Widowed	8	14.8	9	10.5
	Divorced	-	-	-	-
3.	**Educational Attainment**				
	MSc/MBA/M.Ed	-	-	-	-
	B.Sc/B.Ed/HND	10	18.5	26	30.2
	NCE/OND	4	7.4	15	17.4
	SSCE	24	44.4	27	31.4
	FSLC	10	18.5	10	11.6
	Non-formal education	6	11.1	8	9.3
4	**Production Unit / Activities:**				
	Harvester	10	18.5	15	17.4
	Loader	10	18.5	10	11.6
	Off-loader	13	24.1	15	17.4
	Maintenance	5	9.3	9	10.5
	Truckers	6	11.1	15	17.5
	Sawyers	10	18.5	22	25.6
5.	***Monthly income (₦)**				
	≤10,000	4	7.4	9	10.5
	10,500 - 20,000	6	11.1	8	9.3
	20,500 – 30,000	6	11.1	11	12.8
	30,500 – 40,000	8	14.8	10	11.6
	40,500 - 50,000	9	16.7	14	16.3
	50,500 – 60,000	11	20.4	16	18.6
	≥ 60,500	10	18.5	18	20.9
6.	***Membership of organization**				
	Religious	54	100	86	100
	Social	43	79.6	62	72.1
	Traditional	14	25.9	30	34.9
	Political	31	57.4	47	54.7
	Professional	15	27.8	27	31.4

Source: Field Survey, 2017 ***Multiple responses recorded**

The study in Table 1 shows that the sample size used for the study was one hundred and forty (n=140) respondents. Fifty-four (n=54) of the respondents were commercial timber producers in Omuma Local Government Area while Eighty-Six (n=86) of the respondents were commercial timber producers in Etche Local Government Area of Rivers State. The age range (years) shows that commercial timber producers in Omuma that falls between 21-35 years are 15 while the percentage is 27.81. In Etche, 12 have the age range of 21-35 years with percentage of 14.0. Also, in Omuma 36-50 years of age are 20 commercial timber producers with percentage of 37.0, while in Etche 40 commercial timber producers fall between the same range and the percentage is 46.5. Lastly, 51 years and above are 19 commercial timber producers in Omuma with 35.2 percent. In Etche, 34 commercial timber producers fall between 51 years and above and the percentage is 39.5. The marital status shows that in Omuma, 10 are not married, 32 are married, 4 separated while 8 are widowed. The percentages are 18.5%, 39.3%, 7.4%, and 14.8% respectively. In Etche Local Government Area, 15 are single, 60 are married, 2 are separated while 9 are widowed. The percentages are as follows; 17.4%, 69.8%, 2.3% and 10.5% respectively.

Also in the table 1, the educational attainment of the commercial timber producers in both Omuma and Etche were analysed as follows; none of the respondents had M.sc/MBA/M.Ed. In Omuma, 10 had B.Sc/B.Ed/HND, 4 had NCE/OND, 24 had SSCE, 10 had FSLC while 6 fall under non-formal education. The percentages are as follows; 18.5%, 7.4%, 44.4%, 18.5% and 11.1% respectively. In Etche Local Government Area, 26 commercial timber producers had B.Sc/B.Ed/HND with percentage of 30.2%, 15 had NCE/OND with percentage of 17.4%, 27 had SSCE with 31.4%, 10 had FSLC with 11.6% and 8 fall under non-formal education with percentage of 9.3%. Under Production Unit / Activities, the analysis shows that, In Omuma, the number of harvesters are 10, loaders 10, off-loaders 13, maintenance 5, truckers 6 and sawyers 10. The percentages are as follows; 18.5%, 18.5%, 24.1%, 9.3%, 11.1% and 18.5% respectively. In Etche, harvesters are 15, loaders 10, off-loaders 15, maintenance 9, truckers 15 and sawyers 22 with percentage of 17.4%, 11.6%, 17.4%, 10.5%, 17.5% and 25.6% respectively.

The monthly income of the CTPs in both Omuma and Etche Local Government Areas are explained as follows. In Omuma, 4 earn between ₦10,000 and below (≤₦10,000), 6 commercial timber producers earn between ₦10,500-20,000, at the same time, 6 also earn between ₦20,500 – ₦30,000. 8 commercial timber producers earn between ₦30,500- ₦40,000 while 9 earn between ₦40,500- ₦50,000. 11 CTPs earn between ₦50,500 – ₦60,000 and 10 CTPs earn between

₦60,500 and above (≥₦60,500). The percentages are as follows; 7.4%, 11.1%, 11.1%, 14.8%, 16.7%, 20.4% and 18.5% respectively. In Etche Local Government Area, 9 commercial timber producers earn between ₦10,000 and below (≤₦10,000), with percentage of 10.5%, 8 CTPs earn between ₦10,500-₦20,000 (9.3%), 11 earn between ₦20,500 – ₦30,000 (12.8%), 10 earn between ₦30,500- ₦40,000 (11.6%), 14 commercial timber producers earn between ₦40,500- ₦50,000 (16.3%). Also 16 commercial timber producers earn between ₦50,500 – ₦60,000 with percentage of 18.6%, while 18 CTPs earn between N60,500 and above (≥₦60,500) with percentage of 20.9%. Under membership of organization, all the commercial timber producers in both Omuma and Etche belong to religious organization i.e 54 (100%) and 86 (100%) respectively. In Omuma 43 belong to Social Organization, while in Etche, 62 belong to Social Organization. The percentages are 79.6% and 72.1% respectively. In Omuma 14 CTPs belong to traditional Organization with percentage of 25.9% while 30 CTPs in Etche belong to traditional organization with percentage of 34.9%. 31 commercial timber producers in Omuma belong to political organization with percentage of 57.4%. at the same time, 47 in Etche also belong to political organization with the percentage of 54.7%. Lastly, in Omuma 15 commercial timber producers are members of professional organization with percentage of 27.8% while in Etche 27 are members of professional organization with the percentage of 31.4%.

Research Question 2: What are the agricultural mechanized tools used in commercial timber production in the study area?

Table 2: Mean responses of Commercial Timber Producers (CTPs) on the Agricultural Mechanized Tools Used in Commercial Timber Production

S/N	Variables	Omuma CTP's Response			Etche CTP's Response		
		$\bar{x}_1$	SD_1	Remark	$\bar{x}_2$	SD_2	Remark
1.	Chainsaw	3.11	.88	Accepted	2.98	.81	Accepted
2.	Harvester	2.81	.97	Accepted	2.60	.87	Accepted
3.	excavator with harvesting head	2.87	1.08	Accepted	2.69	1.01	Accepted
4.	tracked feller-buncher	2.89	1.06	Accepted	2.67	1.01	Accepted
5.	pull-through	2.72	1.16	Accepted	2.57	1.06	Accepted
6.	gate delimber	2.78	1.13	Accepted	2.62	1.01	Accepted
7.	Slasher	2.83	1.09	Accepted	2.56	1.01	Accepted
8.	Processor	2.74	1.12	Accepted	2.52	1.00	Accepted
9.	Skidder	2.80	1.14	Accepted	2.57	1.02	Accepted
10.	Grappler	2.59	1.11	Accepted	3.00	.99	Accepted

11.	clam skidders	2.67	1.13	Accepted	2.56	1.02	Accepted
12.	Chipper	2.67	1.17	Accepted	2.72	.93	Accepted
13.	band saw	2.72	1.07	Accepted	2.77	1.05	Accepted
14.	surface planer	2.72	1.11	Accepted	2.72	1.07	Accepted
15.	Thicknesser	2.89	1.11	Accepted	2.88	1.08	Accepted
16.	circular saw	2.81	1.12	Accepted	2.70	1.07	Accepted
17.	drill press	2.74	1.15	Accepted	2.72	1.11	Accepted
18.	wood lathe	2.74	1.13	Accepted	2.78	1.10	Accepted
19.	Router	2.78	1.14	Accepted	2.80	1.11	Accepted
20.	belt sander	2.93	1.13	Accepted	2.95	1.07	Accepted
21.	jointer machine	2.85	1.12	Accepted	2.69	1.05	Accepted
22.	radial arm saw	2.70	1.22	Accepted	2.52	1.12	Accepted
	Grand Mean & SD	**2.79**	**1.11**		**2.71**	**1.03**	

Source: Field Survey, 2017; $\bar{x}$ = Mean; ≥2.50 accept, otherwise reject; SD= Standard deviation

Result in table 2 shows the mean response of respondents on the agricultural mechanized tools used in commercial timber production among Etche people of Rivers State. In Omuma, majority of the respondents accepted that the agricultural mechanized tools used in commercial timber production are chainsaw (mean = 3.11), harvester (mean=2.81), excavator (mean=2.87), tracked feller buncher (mean=2.89),pull through (mean=2.72), gate delimber (mean=2.78) slasher (mean=2.83), processor (mean=2.74), skidder (mean=2.80),grappler (mean=2.59), clam skidder (mean=2.67), chipper (mean=2.67), band saw (mean=2.72), surface planer (mean=2.72), thicknesser drill press (mean=2.74), wood lathe (mean=2.74), router (mean=2.78), belt sender (mean=2.93), jointer machine (mean=2.85), and radial arm saw (mean=2.70). The Grand mean and SD in Omuma are 2.79 and 1.11 respectively. Also, in Etche, respondents accepted that all the tools mentioned above are agricultural mechanized tools used in commercial timber production in the study areas. The following are the means; 2.98, 2.60, 2.69, 2.67, 2,57, 2.62, 2.56, 2.52, 2.57, 3.00, 2.56, 2.72, 2.77, 2.72, 2.88, 2.70, 2.72, 2.78, 2.80, 2.95, 2.69 and 2.52 respectively. The grand mean is 2.71 while the SD is 1.03.

Research Question 3: What are the impacts of agricultural mechanized tools on harvesting of timber in the study area?

Table 3: Mean responses of commercial Timber Producers (CTPs) on the Impacts of Agricultural Mechanized Tools on Harvesting of Timber

S/N	Variables	Omuma CTP's Response			Etche CTP's Response		
		$\bar{x}_1$	SD_1	Decision	$\bar{x}_2$	SD_2	Decision
1.	quickens felling process	2.83	.84	Accepted	3.01	.87	Accepted
2.	helps in safe harvest	2.80	.88	Accepted	2.92	.92	Accepted
3.	ensure efficient harvesting process	2.74	.87	Accepted	2.91	.94	Accepted
4.	facilitates the removal of wood branches	2.80	.90	Accepted	2.94	.94	Accepted
5.	facilitates the loading of harvested timbers into trucks	2.81	.89	Accepted	3.00	.93	Accepted
6.	enhances the assessment of standing timber	2.81	.83	Accepted	3.00	.87	Accepted
7.	improvement of timeliness	2.63	.98	Accepted	2.85	1.00	Accepted
8.	leads to reduction of drudgery during harvesting	2.72	.90	Accepted	2.87	.90	Accepted
9.	enhances the quality of timber produce	2.74	.91	Accepted	3.03	.96	Accepted
10.	increases working capacity	2.85	.88	Accepted	3.09	.89	Accepted
11.	reduction in timber wastage during harvesting	2.69	.93	Accepted	3.02	.95	Accepted
12.	reduces human hazard	2.91	.76	Accepted	3.21	.80	Accepted
13.	it saves labour	2.76	.82	Accepted	3.09	.88	Accepted
14.	increases output of timber	2.78	.86	Accepted	2.97	.90	Accepted
15.	discourages unsustainable cultural practices like the use of simple hand tools	2.81	.91	Accepted	2.95	.96	Accepted
	Grand Mean & SD	**2.78**	**0.88**		**2.99**	**0.91**	

Source: Field Survey, 2017 $\bar{x}$ **= Mean; ≥ 2.50 accept, otherwise reject; SD= Standard deviation**

Result in table 3 above shows the mean response of respondents on the impact of agricultural mechanized tools on harvesting of timber among Etche people of Rivers State. In Omuma Local Government Area, majority of the respondents accepted that agricultural mechanized tools quickens felling process with the mean of 2.83, helps in safe harvest (mean=2.80), ensure efficient harvesting process (mean=2.74), facilitates the removal of wood branches (mean=2.80), facilitates the loading of harvested timbers into trucks (mean=2.81), enhances the assessment of standing timber (mean=2.81), improves timeliness (mean=2.63), leads to reduction of drudgery during harvesting (mean=2.72), enhances the quality of timber produced (mean=2.74). Others include, increase in working capacity (mean=2.85), reduction in timber wastage during harvesting

(mean=2.69), reduction in human hazard (mean=2.91), saving of labour (mean=2.76), increase in output of timber (mean=2.78) and discouragement of unsustainable cultural practices (mean=2.81). However, majority of the respondents in Etche also accepted that all the above-mentioned tools have positive impact on harvesting of timber with the grand mean of 2.99 and SD of 0.91

Test of Hypotheses

Hypothesis 1: There is no significant difference in the mean responses of Etche and Omuma commercial timber producers on agricultural mechanized tools used in commercial timber production in the study area.

Table 4: *z-test* for Omuma and Etche Commercial Timber Producers on Agricultural Mechanized Tools Used in Commercial Timber Production

Categories	$\bar{x}$	SD	N	df	Level of Sign	z_{cal}	z_{crit}	Decision
Omuma CTP's	2.79	1.11	54	138	0.05	0.43	1.96	Accepted
Etche CTP's	2.71	1.03	86					

Source: Field survey, 2017. **z-cal (z-test calculated), z-crit (z-test critical)**

The result in Table 4 shows that Omuma commercial timber producers have mean and standard deviation scores of 2.79 and 1.11, while Etche commercial timber producers have mean and standard deviation scores of 2.71 and 1.03 at 0.05 level of significance, with *z-cal* value of 0.43 and *z-crit* value of 1.96. The result shows that the *z-cal* value is less than *z-crit* value. Since the *z-cal* value of 0.43 is less than the *z-crit* value of 1.96, therefore the null hypothesis is accepted. This implies that there is no significant difference in the mean response of Omuma and Etche commercial timber producers on agricultural mechanized tools used in commercial timber production in the study areas. More so, this is evident in the fact that the mean response of commercial timber producers in Omuma is 2.79 as against 2.71 for commercial timber producers in Etche in table 4 above.

Hypothesis 2

There is no significant difference in the mean responses of Etche and Omuma commercial timber producers on the impacts of agricultural mechanized tools on harvesting of timber in the study area.

Table 5: *Z-Test* for Omuma and Etche Commercial Timber Producers on the Impacts of Agricultural Mechanized Tools on Harvesting of Timber

Categories	$\bar{x}$	SD	N	df	Level of Sign	z_{cal}	z_{crit}	Decision
Omuma CTP's	2.78	0.88	54	138	0.05	1.36	1.96	Accepted
Etche CTP's	2.99	0.91	86					

Source: Field survey, 2017. **z-cal (z-test calculated), z-crit (z-test critical)**

The result in Table 5 shows that Omuma commercial timber producers have mean and standard deviation scores of 2.78 and 0.88, while Etche commercial timber producers have mean and standard deviation scores of 2.99 and 0.91 at 0.05 level of significance, with *z-cal* value of 1.36 and *z-crit* value of 1.96. The result shows that the *z-cal* value is less than *z-crit* value. Since the *z-cal* value of 1.36 is less than the *z-crit* value of 1.96, therefore the null hypothesis is accepted. This implies that there is no significant difference in the mean response of Omuma and Etche commercial timber producers on the impact of agricultural mechanized tools on harvesting of timber in the study areas. More so, this is evident in the fact that the mean response of commercial timber producers in Omuma is 2.78 as against 2.99 for commercial timber producers in Etche in table 5 above.

Discussion of Findings

The study on the impact of agricultural mechanization on commercial timber production among Etche people of Rivers State revealed the socio-economic characteristics of commercial timber producers in Omuma and Etche Local Government Area of Rivers State. Among the socio-economic characteristics are the age range (years), marital status, educational attainment, production unit/activities, monthly income (₦) and membership of organization. This agreed with the view of Musa, Idrissa, Yahaya and Abdulsalam (2012) who affirmed that majority of people who involve in timber operations are not well educated. Also, the people involved are mainly young people in their middle age. This study also agreed with the findings of Antoine and Chastity (2004), on the age and highest degree for North Carolina Secondary Agricultural Education Teachers (Age mean= 40, 74 Bachelor's degree, 32 Master's degree and 4 specialists).

The result of the study on the impact of agricultural mechanization on commercial timber production among Etche people of Rivers State revealed that, agricultural mechanized tools used in commercial timber production include; Chainsaw, harvester, excavator, tracked feller-buncher, pull-through, gate delimbed, slasher, processer, skidder, grappler, clam skidder, chipper, and band

saw. Others include; surface planer, thicknesser, circular saw, drill press, wood lathe, router, belt sander, jointer machine and radial arm saw. This agreed with Hendrickson (2005) who reviewed that when small scale farmers utilized mechanized tools, their production efficiency increased. Also, this study is in-line with Wishall (2009), Volk (2009) and Schonbeck (2010), who identified rotary tillers, precision seeders, pin point seeders, tool bar-mounted seeders, rolling cultivators, hilling discs among others as agricultural mechanized tools and equipment.

Study on the impact of agricultural mechanization on commercial timber production among Etche people of Rivers State revealed that agricultural mechanized tools on harvesting and processing of timber have a positive impact. This is because all the variables were accepted by the respondents.

On harvesting of timber, agricultural mechanized tools quicken felling process, helps in safe harvest, ensures efficient harvesting process, facilitates the loading of harvested timbers into the trucks, enhances the assessment of standing timber, improves timeliness, leads to reduction of drudgery during harvesting, enhances the quality of timber produced. Others include; increase in working capacity, reduction in timber wastage, during harvesting, reduction in human hazard, saves labour, increases the output of timber and discourages unsustainable cultural practices like the use of simple hand tools.

On processing of timber agricultural mechanized tools encourages specialization of labour, contributes to the quality of wood, ensures accuracy in the production of timber, encourages reliability, makes processing of timber easier. Others include enhancing efficiency in timber processing, encourages fast processing of timber, reduces wastage of timber among others. This study confirms the work of Virginia (2008) who opined that agricultural mechanized tool encourages felling and extracting of timbers as it increases output to a commercial level. Also UNH (2001) confirms this, as the study revealed that timber harvesting and processing using agricultural mechanized tools and equipments have contributed immensely on both harvesting and processing of timber in New Hampshire.

This research work is also in line with Jirousek, Klvac and Skoupy (2007), whose review on harvesting productivity of 13.5 – 60.5 m^3/PMH (productive machine hour) recorded a tremendous increase as three different harvesters ranging from 80hp (horse power) to 150hp were used.

IV. CONCLUSION

Based on the findings of the study, it was deduced that majority of timber producers among Etche people (Omuma and Etche), Rivers State were married, attained various levels of academic pursuit, involve in agricultural machine maintenance, loading and off-loading of timber produce, sawyers, belong to different social organisation among others. It was also revealed that agricultural mechanized tools such as chainsaw, router, jointer machine, radial arm saw, clam skidders, belt sander, circular saw, harvester, drill press, among others were some of the agricultural mechanized tools used in commercial timber production in the study areas. The study more so revealed that the use of agricultural machines quickens the felling process of timbers, leads to reduction in timber wastage in the process of harvesting, it helps in safe harvesting of timbers, increases output of timber, it saves labour, reduces human hazard, increases working capacity, discourages unsustainable cultural practices like the use of simple hand tools, enhances the assessment of standing timber, improvement of timeliness, leads to reduction of drudgery in the process of harvesting.

V. RECOMMENDATION

Based on the findings of the study, the following recommendations were made:

1. Timber producers should ensure there is a proper operational and maintenance culture for agricultural equipment and farm machinery. This includes system maintenance and administration including proper selection, application and maintenance/repair of equipment.
2. Government should ensure that there is an urgent policy initiative relating to agricultural machinery and equipment development and manufacture. Government should also endeavour to protect local manufacturers of agricultural machinery and equipment from foreign imports as to encourage local users.

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