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Evaluation of Methods Applied for Extraction and Processing of Oil Palm Products in Selected States of Southern Nigeria

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Abstract:- The study evaluated the methods applied for extraction and processing of oil palm products in the selected States of Southern Nigeria. The study adopted the use of cross sectional research design and made use of 560 structured copies of questionnaire to elicit information from the oil palm farmers and producers using purposive and random sampling techniques. Descriptive statistics were used for analyzing the data. Results showed that majority (74.2%) of respondents were females and majority (78.3%) were within the age of 36 and 55 years. More than 70% of respondents made use of maximum of one hectare of land for oil palm production. Findings also revealed that native method of oil palm extraction and processing dominated the entire study area; and followed by squeeze press; with small scale utilization dominating in terms of oil palm producers and methods applied for extraction in the study area. The study therefore recommended that government should support the oil palm farmers/producers with loans and adequate credit facilities that will aid crude oil palm extractions and productions because of its socio-economic benefits to rural livelihoods and food production processes in the study area and the increasing demands of crude oil palm.

Keywords:- *Methods, Extraction, Processing, Oil Palm, Southern Nigeria.*

I. INTRODUCTION

The Oil palm is as old as creation. Every part of the tree is useful economically and for domestic purposes. It is generally agreed that the Oil Palm originated in the tropical rain forest region of West Africa (Food and Agriculture Organization (FAO), 2014). The main belt runs through the southern latitudes of Cameroon, Côte d'Ivoire, Ghana, Liberia, Nigeria, Sierra Leone, Togo and into the equatorial region of Angola and the Congo (Agriculture Organization of Nigeria (AON), 2019). Processing oil palm fruits for edible oil has been practiced in Africa for thousands of years, and the oil produced, highly coloured and flavoured, is an essential ingredient in much of the traditional West African cuisine. The traditional process is simple, but tedious and inefficient (FAO, 2014). Mature palms are single-stemmed and grow to 20 m tall. The leaves are pinnate and reach between 3-5 m long. In Nigeria, it is cultivated in the South East Zone and the Niger Delta areas (Bassey, 2016). Oil palm is also an essential food item. About 90 percent of the palm oil produced ends in food products, while the remaining 10 percent is used for industrial production. As a result of its many uses demand is growing fast as the world's population increases and standards of living rise (FAO, 2014). Production of palm oil is more sustainable than other vegetable oils. It consumes considerably less energy in production, uses less land and generates more oil per hectare than other leading vegetable oils-rapeseed, Europe's leading oil, or soybeans (Onoja and Achike, 2015). Palm oil is used for preventing vitamin A deficiency and is rumored to be good for cancer sufferers, brain disease, aging; and treating malaria, high blood pressure, high cholesterol, and cyanide poisoning. Palm oil is used for weight loss and increasing the body's metabolism. As a food, palm oil is used for cooking and frying. Industrially, palm oil is used for manufacturing cosmetics, soaps, toothpaste, waxes, lubricants, and ink (Bassey, 2016). Palm oil can be used to produce biodiesel, which is also known as Palm Oil Methyl Ester (Federal Ministry of Agriculture and Rural Development, 2016). Oil palm is a typical crop of the rainy tropical lowlands. The plant belongs to the kingdom Plantae, family Arecaceae, sub family Arecoideae, tribe Cocoeae, genius Elaeis, and it is scientific name is *Elaeis guineensis* (Gledhill, 2008; FAO, 2014). It is in the family along with coconut and date palms.

Palm produce accounted for about 82.1 % of the Nigeria's total domestic export between 1966 and 1973 (Adeniyi et al., 2014) and about 22 % of the foreign exchange earnings up to the beginning of the civil war (Modebe, 1978). As at 1986, the Nigeria's domestic palm oil production was estimated to be 760,000 metric tonnes while her imports then stood at 179,000 metric tonnes. Palm kernel, a by-product of palm oil is also consequently produced in large quantities in Nigeria during the same period. Palm kernel output however declined from 419,000 metric tonnes during the period 1960 –1965 to 385,000 metric tonnes from 1985 –1987 probably due to poor market outlet for the product. The oil palm is one of the important economic crops in the tropics (Adeniyi et al., 2014). It is the most important source of oil and produces more oil per hectare than any of the oil producing crops. The primary products of the oil palm are palm oil (from the mesocarp) and palm kernel oil obtained from the kernels (seeds). Palm oil contains carotene, a precursor of vitamin A, a high prized energy vitamin rich food used for cooking in oil producing countries of Africa. Palm oil and palm kernel oil provide raw materials in the manufacture of soaps and detergents, margarine, candle, confectionery, epoxy resins, bakery trade, lubricants, pomades and cosmetics. Other uses include palm kernel cake obtained from the crushing of palm kernel to extract oil. It serves as additives in livestock feed manufacture.

Processing oil palm fruits for edible oil has been practiced in Africa for thousands of years, and the oil produced, highly coloured and flavoured, is an essential ingredient in much of the traditional West African cuisine. The method used to extract vegetable oil depends on the type of raw material available. Raw materials may be grouped according to the part of the plant that contains the fat or oil (seed, bean, nut or fruit). The main difference in raw materials is the moisture content. Raw materials with low moisture content include seeds and beans and some nuts, which are dried on harvest. Palm fruit, olive fruits and some coconuts are processed wet (Adebiyi et al., 2017). Only seeds, nuts and fruits that contain considerable amounts of edible oil are used for small-scale oil extraction. Other types (for example maize) may contain edible oil, but the quantities are too small for economic processing on a small-scale. However, not all oil-rich seeds and fruits have edible oil; some contain toxins (poisons, usually of bacterial origin) or have unpleasant flavours; these are used only for varnishes, paints, etc. Others, (for example castor oil) need very careful processing to make them safe for use as medicines. These are not suitable for small-scale processing (FAO, 2014).

Palm fruit contains about 56 percent oil (25 percent on a fresh fruit bunch basis) which is edible with no known toxins. It is thus suitable for small-scale processing. Research and development work in many disciplines - biochemistry, chemical and mechanical engineering - and the establishment of plantations, which provided the opportunity for large-scale fully mechanized processing, resulted in the evolution of a sequence of processing steps designed to extract, from a harvested oil palm bunch, a high yield of a product of acceptable quality for the international edible oil trade. The oil winning process, in summary, involves the reception of fresh fruit bunches from the plantations, sterilizing and threshing of bunches to free the palm fruit, mashing the fruit and pressing out the crude palm oil. The oil is further treated to purify and dry it for storage and export (FAO, 2014; Federal Ministry of Agriculture and Rural Development, 2015).

Large-scale plants, featuring all stages required to produce palm oil to international standards, are generally handling from 3 to 60 tonnes of FFB/hr. The large installations have mechanical handling systems (bucket and screw conveyers, pumps and pipelines) and operate continuously, depending on the availability of FFB. Boilers, fuelled by fibre and shell, produce superheated steam, used to generate electricity through turbine generators. The lower pressure steam from the turbine is used for heating purposes throughout the factory. Most processing operations are automatically controlled and routine sampling and analysis by process control laboratories ensure smooth, efficient operation. Although such large installations are capital intensive, extraction rates of 23 - 24 percent palm oil per bunch can be achieved from good quality Tenera (PIND, 2011).

Conversion of crude palm oil to refined oil involves removal of the products of hydrolysis and oxidation, colour and flavour. After refining, the oil may be separated (fractionated) into liquid and solid phases by thermo-mechanical means (controlled cooling, crystallization, and filtering), and the liquid fraction (olein) is used extensively as a liquid cooking oil in tropical climates, competing successfully with the more expensive groundnut, corn, and sunflower oils.

Extraction of oil from the palm kernels is generally separate from palm oil extraction, and will often be carried out in mills that process other oilseeds (such as groundnuts, rapeseed, cottonseed, shea nuts or copra). The stages in this process comprise grinding the kernels into small particles, heating (cooking), and extracting the oil using an oilseed expeller or petroleum-derived solvent. The oil then requires clarification in a filter press or by sedimentation. Extraction is a well-established industry, with large numbers of international manufacturers able to offer equipment that can process from 10 kg to several tonnes per hour (Poku, 2002). Alongside the development of these large-scale fully mechanised oil palm mills and their installation in plantations supplying the international edible oil refining industry, small-scale village and artisanal processing has continued in Africa. Ventures range in throughput from a few hundred kilograms up to 8 tonnes FFB per day and supply oil to the domestic market (Poku, 2002).

Efforts to mechanise and improve traditional manual procedures have been undertaken by research bodies, development agencies, and private sector engineering companies, but these activities have been piecemeal and uncoordinated. They have generally concentrated on removing the tedium and drudgery from the mashing or pounding stage (digestion), and improving the efficiency of oil extraction. Small mechanical, motorized digesters have been developed in most oil palm cultivating African countries. Palm oil processors of all sizes go through these unit operational stages. They differ in the level of mechanization of each unit operation and the interconnecting materials transfer mechanisms that make the system batch or continuous. The scale of operations differs at the level of process and product quality control that may be achieved by the method of mechanization adopted (Singh et al., 2013; FAO, 2014).

There are several works done on oil palm processing and extraction. Ezeoha et al. (2012) reviewed literature on the problems and prospects of indigenous design and manufacture of palm kernel oil screw press in Nigeria; while Akande et al. (2013) examined the level oil palm production mechanization in selected local government areas of Oyo and Osun States, Nigeria. Oke (2002) evaluated palm oil processing in Egbedore LGA of Osun State, Nigeria. Oil

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palm resources have been undergoing different ways of being extracted and processed as recognised by different studies but most of these studies did not undergo quantification in terms of methodological approach used; and also most of the studies have been restricted to a particular region aside the Niger Delta. The present study is examining the extraction and processing methods for palm oil in the core Niger Delta, Nigeria with a view to adopting quantification approach.

II. MATERIALS AND METHODS

The study was carried out in communities in Akwa Ibom, Imo and Rivers State, Southern Nigeria. They are located geographically within latitude 4º 02’ 00’’N and 6º 00’ 00’’N and longitude 6º 00’ 00’’E and 8º 30’00’’E (Figure 1). The study areas experience a tropical climate consisting of rainy season (usually from April to November) and dry season (December to March). High temperatures and humidity as well as marked wet and dry seasons characterize the climate of the area (Kuruk, 2004).

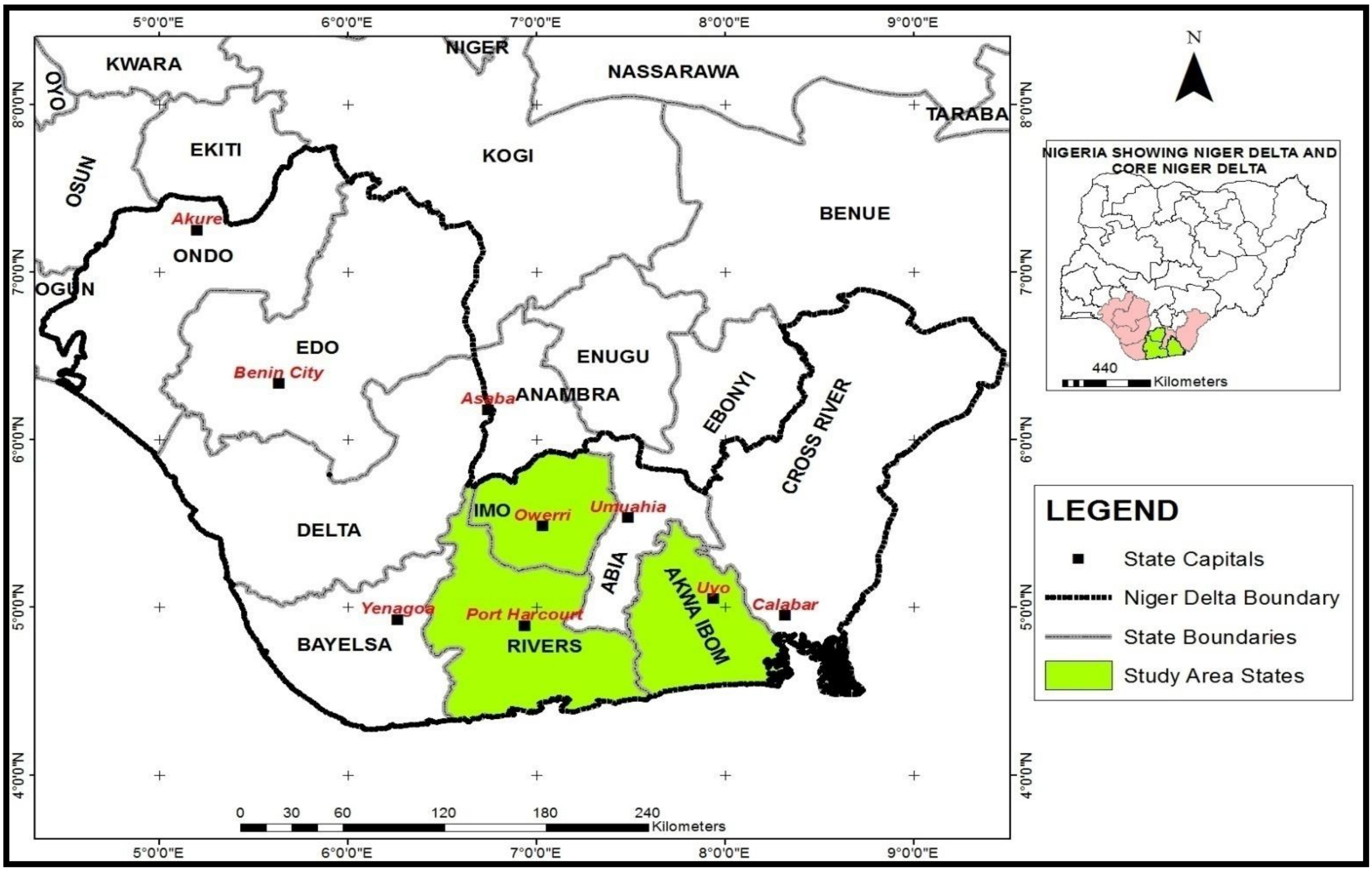

Figure 1: Study Area States

The geology is basically sedimentary and is dominated by the geology of arcuate Niger delta; composed of an overall classic sequence which reaches a maximum thickness of 9-12 kilometers (lbe, 1988). The vegetation of the area is characterized by mangrove forests, brackish swamp forests and rain forests. The study adopted the cross sectional research design (Schmidt and Kohlmann, 2008). The study involved using primary data acquired from the field surveys using structured questionnaire which was administered on the sampled oil palm producers and business men and women in the study areas. The population of study involved all oil palm processors in three LGAs under each three States (that is; Akwa Ibom (Esit Eket, Nsit Ubium and Ibesikpo), Imo (Ezinihitte Mbaise, Obowo and Aboh Mbaise) and Rivers States (Ikwerre, Etche and Emohua)). The study area was divided into wards and a total of 114 wards were obtained for the study whereby, 34 wards were recorded for the 3 LGAs in Akwa Ibom, another 34 wards were obtained from 3 LGAs in Imo State; while the remaining 46 wards were obtained from the 3 LGAs in Rivers State. The total number of wards of 114 was considered high for the study. Thus, a sample size of 50% was determined from the total number of each ward in each LGA. In other words, half of the size of each total number of wards (50%) was used as criteria for selecting oil palm farmers and processors as participants for the study. In each selected ward, ten (10) oil palm farmers and processors were selected to give a total of 560 respondents for the study. Thus, based on the number of wards, the sample size for the study was 560 respondents. The sampling procedure employed multi-stage sampling, purposive sampling and random sampling techniques. Oil palm agricultural zones namely; Akwa Ibom, Imo and Rivers States were purposively selected among Niger Delta member states because of the intensity of oil palm processing activities in these areas and also that oil palm processing is largely a rural based enterprise (Onoh and Peter-Onoh, 2012; Eze et al., 2014; Uche et al., 2017). Thus, rural communities as grouped by wards in each LGA under each state were used as the study areas where questionnaire administrations were carried out for the study in line with the study objectives. Descriptive statistics in form of frequency and percentages were used for the data analyses.

III. RESULTS AND DISCUSSIONS

Socio-economic Characteristics of Sampled Respondents

The information displayed on Table 1 describes the socio-economic characteristics of sampled respondents. In Akwa Ibom State, it was revealed that 26.0% oil palm farmer were males while 74.0% were females; in Imo State, 27.3% respondents were males while 72.7% were females; however, least number of males (24.4%) were sampled from Rivers State with highest number of females of 75.6%. The distribution revealed that more female oil palm farmers/traders/retailers were sampled for the study. The information for the age distribution of sampled respondents revealed that 12.4% of sampled respondents were between the age bracket of 26 and 35 years; 44.5% of sampled respondents were between the age bracket of 36 and 45 years; 33.8% of sampled respondents falls within the age bracket of between 46 and 55 years; while the remaining 9.4% of sampled respondents are 56 years and above. Thus, more respondents within the age bracket of 26 and 55 years were sampled for the study with majority (49.1%) being contributed from sampled oil palm farmers from Imo State.

The information for the level of education revealed that 5.5% sampled respondents had primary level education; 59.2% of sampled respondents had secondary level education; 23.9% of respondents have tertiary level of education; while the remaining 11.5% of sampled respondents have other forms of education that teaches them to read and write. The occupational status of respondents for the study indicated that 30.9% are farmers; 60.3% of the respondents are oil palm traders; while the remaining 8.8% of respondents are oil palm businessmen/women or retailers. The average monthly income of sampled respondents showed that 0.4% earn on the average #30,000; 4.4% of respondents earn between #31,000 and #45,000; 18.3% of sampled respondents earn on the average between #46,000 and #60,000; 47.7% of sampled respondents earn between #61,000 and #80,000; while the remaining 29.2% of sampled respondents earn at least #81,000 and above.

Table 1: Socio-economic Characteristics of Sampled Respondents

Socio-economic Status		State			Total
		Akwa Ibom	Imo	Rivers	
Gender	Male	39	44	52	135
		26.0%	27.3%	24.4%	25.8%
	Female	111	117	161	389
		74.0%	72.7%	75.6%	74.2%
Age	26-35 years	15	20	30	65
		10.0%	12.4%	14.1%	12.4%
	36-45 years	69	79	85	233
		46.0%	49.1%	39.9%	44.5%
	46-55 years	51	49	77	177
		34.0%	30.4%	36.2%	33.8%
	56 years and above	15	13	21	49
		10.0%	8.1%	9.9%	9.4%
Level of Education	Primary	15	3	11	29
		10.0%	1.9%	5.2%	5.5%
	Secondary	87	100	123	310
		58.0%	62.1%	57.7%	59.2%
	Tertiary	32	41	52	125
		21.3%	25.5%	24.4%	23.9%
	Others	16	17	27	60
		10.7%	10.6%	12.7%	11.5%
Occupation	Farmer	49	47	66	162
		32.7%	29.2%	31.0%	30.9%
	Oil Palm Trader	91	98	127	316
		60.7%	60.9%	59.6%	60.3%
	Business/Retailer	10	16	20	46
		6.7%	9.9%	9.4%	8.8%
Average monthly income	#31,000 - #60,000	0	2	0	2
		0.0%	1.2%	0.0%	0.4%
	#61,000 - #90,000	2	19	2	23
		1.3%	11.8%	0.9%	4.4%
	#91,000 - #120,000	27	41	28	96

		18.0%	25.5%	13.1%	18.3%
	#121,000 - #150,000	74	67	109	250
		49.3%	41.6%	51.2%	47.7%
	#151,000 and above	47	32	74	153
		31.3%	19.9%	34.7%	29.2%

Methods of Extraction and Processing of Oil Palm Products in the Study Area

Land Area (hectares) Utilized for Oil Palm Production

The land area (hectares) utilized for oil palm production among sampled States is presented on Table 2. It was revealed that more of Rivers oil palm producers (42.9%) (43.5%) and (37.7%) utilizes less than 1 hectare, 1 hectare and between 1 and 2 hectares of land for oil palm production in the study area. However, more oil palm producers were sampled in the LGAs in Rivers State due to higher number of wards. For land area space between 3 and 4 hectares and above 4 hectares showed slightly lower land utilization for LGAs in Rivers State (32.6%) and (28.6%) against Akwa Ibom (32.6% and 37.1%) and Imo States (34.8% and 34.3%) which may be due to the cost of land in Rivers state which is usually higher in Rivers State than the other states.

In the same analysis, land utilization for oil palm production was compared across LGAs and this was presented on Table 3. The results revealed that among LGAs in Akwa Ibom State, Ibesikpo (11.6%) utilizes more of less than 1 hectare of land for oil palm business; Aboh Mbaise (11.1%) also showed that more oil palm farmers utilizes less than 1 hectare of land; 18.5% was indicated for oil palm farmers in Etche LGA with less than 1 hectare of land. However, in general, the study sampled more oil palm farmers in Ibesikpo and Ezinihitte LGAs with land area utilization of more than 4 hectares in the study area. The information on Table 4 further shows the analysis for land utilization among sampled oil palm producers in the study area. The column analysis revealed that in the study area 36.1% of oil palm producers utilizes less than 1 hectare of land; 36.8% of oil palm farmers utilizes at least an hectare of land; 11.6% of oil palm farmers occupied a land space of between 1 and 2 hectares; while the remaining 8.8% and 6.7% of sampled oil palm producers have between 3 and 4 hectares and above 4 hectares of land for oil palm cultivation in the study area.

Table 2: Land Area (Hectares) Utilized for Oil palm Production

Hectares of Land Used		State			Total
		Akwa Ibom	Imo	Rivers	
Less than 1 hectare		53	55	81	189
		28.0%	29.1%	42.9%	100.0%
I hectare		51	58	84	193
		26.4%	30.1%	43.5%	100.0%
Between 1 and 2 hectares		18	20	23	61
		29.5%	32.8%	37.7%	100.0%
Between 3 and 4 hectares		15	16	15	46
		32.6%	34.8%	32.6%	100.0%
Above 4 hectares		13	12	10	35
		37.1%	34.3%	28.6%	100.0%
Total		150	161	213	524
		28.6%	30.7%	40.6%	100.0%

Table 3: Hectares of Land Utilized for Oil palm Production (Row)

Land Area (Hectares)	LGAs									Total
	Akwa Ibom			Imo			Rivers			
	Esit Eket	Nsit Ubium	Ibesikpo	Ezinihitte	Obowo	Aboh Mbaise	Ikwerre	Etche	Emohua	
Less than 1 hectare	15	16	22	18	16	21	24	35	22	189
	7.9%	8.5%	11.6%	9.5%	8.5%	11.1%	12.7%	18.5%	11.6%	100.0%
I hectare	17	18	16	22	16	20	27	32	25	193
	8.8%	9.3%	8.3%	11.4%	8.3%	10.4%	14.0%	16.6%	13.0%	100.0%
Between 1 and 2 hectares	7	6	5	6	6	8	6	8	9	61
	11.5%	9.8%	8.2%	9.8%	9.8%	13.1%	9.8%	13.1%	14.8%	100.0%

Between 3 and 4 hectares	5	4	6	6	6	4	6	5	4	46
	10.9%	8.7%	13.0%	13.0%	13.0%	8.7%	13.0%	10.9%	8.7%	100.0%
Above 4 hectares	4	3	6	6	5	1	3	3	4	35
	11.4%	8.6%	17.1%	17.1%	14.3%	2.9%	8.6%	8.6%	11.4%	100.0%
Total	48	47	55	58	49	54	66	83	64	524
	9.2%	9.0%	10.5%	11.1%	9.4%	10.3%	12.6%	15.8%	12.2%	100.0%

Table 4: Hectares of Land Utilized for Oil palm Production (Column)

State	LGAs	Land Area (Hectares) Less than 1 hectare	I hectare	Between 1 and 2 hectares	Between 3 and 4 hectares	Above 4 hectares	Total
Akwa Ibom	Esit Eket	15	17	7	5	4	48
		31.3%	35.4%	14.6%	10.4%	8.3%	100.0%
	Nsit Ubium	16	18	6	4	3	47
		34.0%	38.3%	12.8%	8.5%	6.4%	100.0%
	Ibesikpo	22	16	5	6	6	55
		40.0%	29.1%	9.1%	10.9%	10.9%	100.0%
Imo	Ezinihitte	18	22	6	6	6	58
		31.0%	37.9%	10.3%	10.3%	10.3%	100.0%
	Obowo	16	16	6	6	5	49
		32.7%	32.7%	12.2%	12.2%	10.2%	100.0%
	Aboh Mbaise	21	20	8	4	1	54
		38.9%	37.0%	14.8%	7.4%	1.9%	100.0%
Rivers	Ikwerre	24	27	6	6	3	66
		36.4%	40.9%	9.1%	9.1%	4.5%	100.0%
	Etche	35	32	8	5	3	83
		42.2%	38.6%	9.6%	6.0%	3.6%	100.0%
	Emohua	22	25	9	4	4	64
		34.4%	39.1%	14.1%	6.3%	6.3%	100.0%
Total		189	193	61	46	35	524
		36.1%	36.8%	11.6%	8.8%	6.7%	100.0%

Oil Palm Production Process

The oil palm production processing normally follows the steps displayed on Table 5. The first process is the softening of the palm fruits which is being pounded/skimmed into paste like product after which the oil extraction process starts; and the final stage is the clarification stage which is basically for removing of impurities and the separation of particles from the extracted oil palm. Plate 1 and Plate 2 gives a clear picture of the local method of boiling palm fruits. Plate 3 describes the modern method of heating up the palm fruits before being processed and transferred to the Clarification Tank (the whole process is automated but only need a controller that monitors the process). Plate 4 showed a local clarification tank that separates the oil from the fibre and nuts. Plate 5 and Plate 6 describes the modern and local method of oil clarification process that separates palm oil from the fibre and nuts.

Table 5: Processing Steps of Palm oil products

Process	Methods: Local (Native)	Methods: Modern (Automated)
Softening of the palm fruits by heating	Boiling of palm fruits in a big pot using firewood	Palm fruits are heated up in a container using pressured heaters
Maceration	Pounding	Skimming
Oil Extraction	A Colander pounds the oil palm paste which is mixed water and heated to release oil	Palm oil extracting Machine called Pioneer Mill (Revolver Press)
Clarification (Removal of impurities)	A manually wheeled clarification tank	An automated giant sized clarification tank

Plate 1: Local heating method: Boiling of palm fruits with firewood

Plate 2: Local method of boiling palm fruits

Plate 3: Palm fruits Heater and Processor Machine that is connected to the Clarification Tank


Plate 4: Local Oil extractor which pound the paste to release the oil

Plate 5: A modern Clarification tank (Large scale business)


Plate 6: A local Clarification Tank (Small scale business)

Extraction Methods

The information on Figure 2 reveals the typical process of palm oil extraction. The actual palm oil extraction process starts from the bunch threshing (which is the separation of the bunch from the nuts); to fruit digestion (process of releasing the palm oil in the fruit through rupture of breaking down of oil bearing cells); to pulp pressing (pressing stage that involves extracting the oil out of the digested palm pulp); to oil clarification (removing impurities from the palm oil); and packing the oil that comes out of the clarification process.

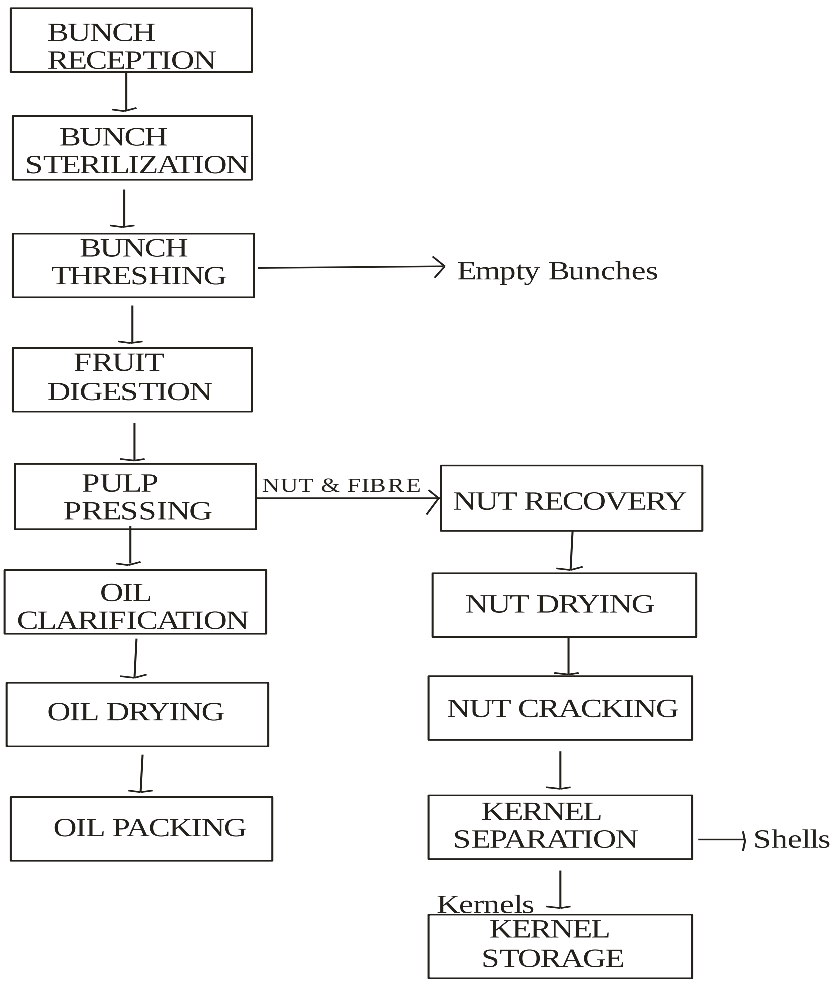

Figure 2: Chart of Palm Oil Extraction (also include the extraction of palm kernel oil)

Extraction Methods across Sampled LGAs

The extraction methods across LGAs are displayed on Table 6. The distribution revealed that native extraction methods were by 69.5% sampled oil palm producers; 29.6% of sampled oil palm producers utilize the squeeze press methods; while the remaining 1.0% of sampled oil palm producers utilizes the pioneer mill method. Thus, only 2 (3.6%) from the total sampled oil palm producers in the three (3) LGAs under Akwa Ibom use the pioneer mill in Ibesikpo LGA; 1 which represents 1.7% of the total population of sampled oil palm producers in the three (3) LGAs under Imo State utilize the pioneer mill in Ezinihitte LGA; while 3.0% from the total sampled oil palm farmers under Rivers State utilizes the pioneer mill in Ikwerre LGA. The squeeze press method was being practiced by 29.6% in the study area of which the utilization showed slight variations in frequency of usage across LGAs. The cross tabulation between hectares of land utilized by oil palm producers and extraction methods is displayed on Table 7. It was observed that the pioneer methods were practiced among oil palm farmers/producers/business men and women who have between 3, 4 and above 4 hectares of land devoted for oil palm production. However, oil palm farmers with less than 1 hectare of land devoted for oil palm business utilizes the native and squeeze method of oil extraction (native methods (47.5%) and squeeze press (10.3%)). These observations are similar for oil palm producers who devoted between 1 and 2 hectares for oil palm production (native methods (42.6%) and squeeze press (24.5%)).

Furthermore, the scales of individual oil palm producer with their extraction methods are displayed on Table 8. The study indicated majority of sampled oil palm producers (98.6%) which totaled 68.9% from the overall total who employed the native method of extracting oil run a small scale oil palm production business. The population of 55.5% of oil palm producers who practiced the squeeze press method operates their oil palm production on a medium

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scale basis. Lastly, 0.5% of oil palm producers who utilizes the native method, and 43.2% who utilize the squeeze method and 100.0% who utilizes the pioneer mill which total 14.1% from the overall total are on a large scale oil palm production in the study area.

Table 6: Cross Tabulation of Methods Applied for Oil Extraction for Oil Palm with LGAs

LGAs		Extraction Methods			Total
		Native method	Squeeze press	Pioneer Mill (Revolver Press)	
Akwa Ibom	Esit Eket	27	21	0	48
		56.3%	43.8%	0.0%	100.0%
	Nsit Ubium	31	16	0	47
		66.0%	34.0%	0.0%	100.0%
	Ibesikpo	39	14	2	55
		70.9%	25.5%	3.6%	100.0%
Imo	Ezinihitte	35	22	1	58
		60.3%	37.9%	1.7%	100.0%
	Obowo	32	17	0	49
		65.3%	34.7%	0.0%	100.0%
	Aboh Mbaise	44	10	0	54
		81.5%	18.5%	0.0%	100.0%
Rivers	Ikwerre	39	25	2	66
		59.1%	37.9%	3.0%	100.0%
	Etche	70	13	0	83
		84.3%	15.7%	0.0%	100.0%
	Emohua	47	17	0	64
		73.4%	26.6%	0.0%	100.0%
Total		364	155	5	524
		69.5%	29.6%	1.0%	100.0%

Table 7: Cross Tabulation of Extraction Methods and Hectares of Land Utilized for Oil Palm farming and Production

Hectares of Land Utilized		Extraction Methods			Total
		Native method	Squeeze press	Pioneer Mill (Revolver Press)	
Less than 1 hectare		173	16	0	189
		47.5%	10.3%	0.0%	36.1%
I hectare		155	38	0	193
		42.6%	24.5%	0.0%	36.8%
Between 1 and 2 hectares		32	29	0	61
		8.8%	18.7%	0.0%	11.6%
Between 3 and 4 hectares		1	41	4	46
		0.3%	26.5%	80.0%	8.8%
Above 4 hectares		3	31	1	35
		0.8%	20.0%	20.0%	6.7%
Total		364	155	5	524
		100.0%	100.0%	100.0%	100.0%

Table 8: Cross Tabulation of Scale Utilized by Oil palm producers and Methods Applied for Extraction

Scale Utilized		Extraction Methods			Total
		Native method	Squeeze press	Pioneer Mill (Revolver Press)	
Small Scale		359	2	0	361
		98.6%	1.3%	0.0%	68.9%
Medium scale		3	86	0	89
		0.8%	55.5%	0.0%	17.0%
Large scale		2	67	5	74
		0.5%	43.2%	100.0%	14.1%
Total		364	155	5	524
		100.0%	100.0%	100.0%	100.0%

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IV. DISCUSSION OF FINDINGS

Findings revealed that more females were found in the occupation of extracting and processing of oil palm products. This is agreement to the study of Walker (2010) who reported that women play an important role in the production, storage and commercialization of the red palm oil. Majority of the methods for extracting and processing oil palm resources were native methods. This may be attributed to the simple way that this kind of extraction method demands. Although, it is simple but tedious and inefficient (Adeniyi et al., 2014; Bello et al., 2015). Kwasi (2002) reported that pounding (digestion) and oil extraction are the most tedious and essential operations in traditional palm fruit processing; therefore, early efforts concentrated on these tasks. In small-scale processing, digestion, that is, the breaking up of the oil-bearing cells of the palm fruits' mesocarp, is the most labour intensive activity. The general traditional method of oil extraction consists of steeping the pounded fruit mash in hot or cold water; removing fibre and nuts in small baskets and hand squeezing; filtering out residual fibre from the oil/water emulsion in perforated metal colanders or baskets; boiling and skimming palm oil from the oil/water mixture and drying the recovered oil (Poku, 1998).

V. CONCLUSION AND RECOMMENDATIONS

The study concluded that the major method of extracting and processing oil palm in Imo, Rivers and Akwa Ibom States in Nigeria was native methods and majority of land utilized was maximum of one hectare with small scale utilization with respect to oil palm producers and methods applied for extraction. The study therefore recommended that government should support the oil palm farmers/producers with loans and adequate credit facilities that will aid crude oil palm extractions and productions because of its socio-economic benefits to rural livelihoods and food production processes in the study area and the increasing demands of crude oil palm.

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