Possible Challenges of Potential Drivers of Oil Palm Processing Sector in Nigeria

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Abstract: In Nigeria, efforts are being made to boost the agricultural sectors that the country once neglected. Oil palm is one notable area that Nigeria can produce and provide millions of job. Nigeria oil palm industry is dominated by smallholders and to lesser extent semi-mechanized and mechanized processors. Smallholders and semi-mechanized palm oil processors account for about 95% of the total domestic production. For effective production, the role of the drivers is essential. These include farmers, processors, marketers/consumers and equipment fabricators. For Nigeria to be able to increase her share of domestic production reduces importation and produce palm oil with improved quality, the challenges of the drivers need to be addressed. The study concludes by suggesting techniques through which the challenges of the drivers can be overcomed.

Keywords: Agriculture; Nigeria; Oil palm drivers; Scale of processing.

1. Introduction

Following the discovery of crude oil in Nigeria, the agricultural sector was neglected. Nigeria used to be a major export of cash crop such as cocoa, rubber and oil palm. Nigeria used to be a major global oil palm producing nation before oil boom. But presently, the country has long lost her place in major oil palm producing nation. According to Ohimain and Izah [1] and Ohimain, *et al.* [2], Nigeria loss her place as a dominant oil palm producing country due to poor agricultural policies, multiple agencies targeted at the same functions, civil war, preference of crude oil to agriculture, poor financing, lack of basic amenities and infrastructure, land tenure challenge, use of obsolete/rudimentary equipment for processing and over dependence on smallholder processors.

Presently, oil palm producing nations are in the order; Indonesia> Malaysia> Thailand> Columbia> Nigeria (Figure 1). These countries accounts for about 93% of global palm oil. Till date, palm oil is the largest source of oil and fat, accounting for about 57.7% of total global production and export market [3]. Of these, Indonesia and Malaysia account for about 86% of global output. While the rest countries produces approximately 14% of palm oil.

Figure-1. Global palm oil production output per nations (000 metric tonnes); Modified from [4]
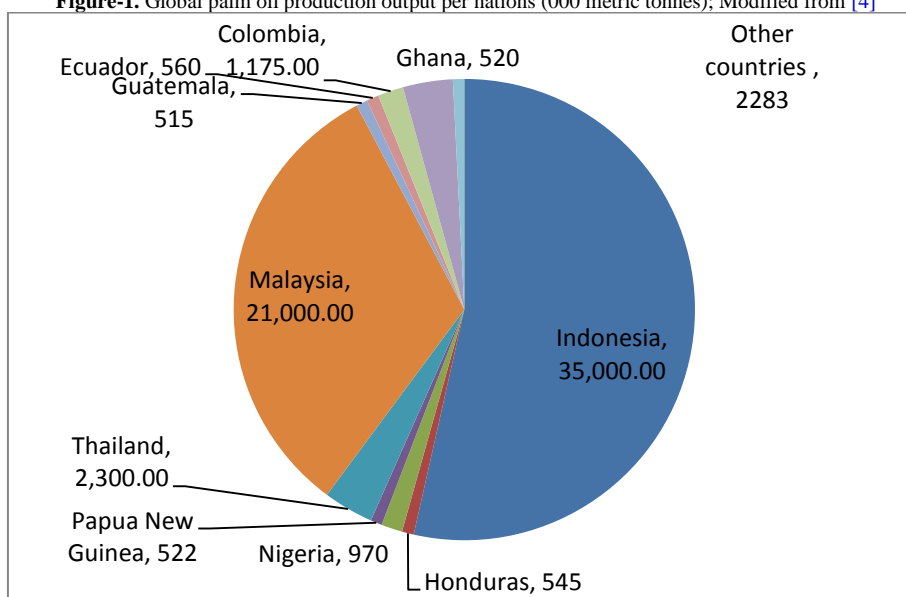
Like Indonesia and Malaysia which witnessed a massive growth in the 1970 to 2010, Thailand and Columbia have also significantly increased their domestic output [5]. Nigeria has not witnessed any significant growth in the global oil palm trend, compared to the four largest oil palm producing nations. Till date, Nigeria account for 970,000 metric tonnes of crude palm oil which have been stagnated between 2012 – 2016 [6]. Hence growth rate of 0.00% was witnessed alongside with Guinea, Philippines, Senegal, India, Cote D'ivoire, Liberia, Mexico, Benin, Dominican Republic, Sierra Leone, Togo, Venezuela, Angola, Brazil, Congo, The Democratic Republic, Cameroon while Papua New Guinea observed negative growth rate [7]. Whereas other countries are increasing their growth rate including Malaysia (12%), Honduras (11.22%), Ecuador (9.80%), Guatemala (9.57%), Thailand (9.52%), Peru (8.51%), Costa Rica (8.00%), Indonesia (6.06%), Ghana (4.00%), Columbia (0.09%) [7].

Oil palm is a resourceful raw material with several important economic values. Oil palm grows mainly in tropical and sub-tropical countries [8]. Oil palm typically produces two types of oil i.e. crude palm oil and palm kernel oil and several by-product with downstream applications. Some of these wastes include liquid (i.e. palm oil mill effluents) [2, 9-14], solid wastes (empty fruit bunch, palm kernel shell, palm press fiber and chaff [15-23]. During palm oil processing about 75% of total fresh fruit bunch end up as wastes while 22% are palm oil under Malaysia setting [3], 71.8 – 90.6% as wastes and 9.0 – 28.0% palm oil under smallholder palm oil processing in Nigeria [15] depending on the variety of the oil palm.

Oil palm processing typically has environmental perspective. In a recent review study, Izah, *et al.* [23] reported that particulates matter released during combustion in palm oil mill often exceed the permissible limits depending on wind speed, palm oil mill effluents discharged into the soil could cause alteration in soil physicochemical parameters, as well as physical appearance of the soil, and on water bodies could changes the water quality. For Instance, Awotoye, *et al.* [24] and Edward, *et al.* [25] in a separate studies, reported that palm oil mill effluents could alter water quality parameters such as temperature, pH, total alkalinity, total solid, total dissolved solid, total suspended solid, potassium, nitrate, phosphate etc. Eze, *et al.* [26], Okwute and Isu [27]; Awotoye, *et al.* [24] also reported that palm oil mill effluents alters pH (towards acidic), organic carbon, total nitrogen, phosphate, sulphate, phosphorus, sodium, potassium, calcium, magnesium, aluminum, hydrogen etc of soil they are discharged into. Okwute and Isu [27]; Awotoye, *et al.* [24] also reported that palm oil mill effluents affects the vegetation growth, odour, soil colour, moisture and constituents in soil they are discharged into.

Of the two type of oil produced from oil palm, palm oil appears to have higher economic value is the most utilized. Palm oil have found application in several sectors including food and industries such as soap, margarine, soap candle production, confectionaries, tin plating, lubricant and pharmaceutical products, base for lipstick, waxes and polish making [1, 28-36], fuel such as biodiesel [37-40]. Despite attempt made to use palm oil as fuel due to its environmental benefits, over 90% of palm oil produced globally is used for food and feed production including [8, 19, 30, 41-43]. Palm oil also have health benefits including vitamin A, Vitamin E, anti-oxidant potentials, cholesterol lowering effects, anti-cancer and protection against arterosclerosis [43, 44]. For fuel application, attempts made thus far have not materialized into full scale production after 10 years, Nigeria joined the league of nation searching for cleaner energy and about 9 years after the release of Nigeria biofuel policy and about 5 years after the commencement of installation of 2 biodiesel factory in Cross Rivers state and to be powered using palm oil feedstock.

Nigeria palm oil domestic production is grossly inadequate for her teeming population. As such, the deficit is met via importation from major producing nation [36]. Ohimain and Izah [31], Izah and Ohimain [8] reported that Nigeria palm oil production account for about 55% domestic consumption and that the rest 45% deficit are met through importation. The aim of this study is to assess the overview of palm oil processing in Nigeria with emphasis on smallholder and semi-mechanized processors, and the role of potential drivers of Nigeria oil palm industry.

2. Scale of Processors of Nigeria Oil Palm Industry

Nigeria oil palm processors are classified into three scales (i.e. mechanized, semi-mechanized and smallholder) based on the level of processing. The sector is dominated by smallholder processors. Authors have variously reported that over 80% of Nigeria oil palm industry is occupied by smallholders, using rudimentary equipment for processing [12, 19, 34, 35, 45]. Smallholder typically uses manual energy for processing stages apart from boiling, digestion and oil extraction. Similarly the semi-mechanized palm oil processors account for about 16% of the country processing tonnage while the rest 4% are processed by mechanized processors [18, 22, 45, 46]. Generally, smallholder palm oil mills are found in several communities in Niger Delta region of Nigeria. However, at least of semi-mechanized palm oil mill are also found in the region. While mechanized mill are scantly located with some of the states not having any.

Variations exist between the various types of processor. However, the detail differences between semi-mechanized and smallholder palm oil mills in Nigeria have been documented by Izah and Ohimain [39]. The authors further reported that both type of processors share about 50% similarity. The major difference is the condition of the fresh fruit bunch before, threshing, and recovery of palm press fiber oil (PPFO) from the PPF. Also, the time for processing 1 tonne of FFB differs according to type of processing. For instance, smallholder processors takes between 6 – 10 days and semi-mechanized methods 2 – 4 days to process a batch of FFB [39], while mechanized processors takes few hours to process a tonne of FFB.

Large volume of oil is loss during smallholder palm oil processing, probably due to the nature of the processing equipment and techniques applied. For instance, Orewa [46], Orewa, *et al.* [47], Ekine and Onu [48] have reported

that 25 to 75% palm oil reduction occurs in smallholder/traditional oil palm processing. But the mechanized processors use mechanized equipment for processing thus producing higher quantity of palm oil [43].

Oil palm industry is one of the largest agro business in Nigeria. The industry is a source of livelihood to millions of Nigeria especially in the rural areas. The employment opportunities in oil palm processing ranging from nursery of the oil palm seedling, plantation farming, palm oil mills, marketing of the final product i.e. palm oil. Ohimain, *et al.* [35] reported that smallholder palm oil processing employs 3 – 12 workers (mean = 8) personnel depending on the quantity of fresh fruit bunch available for processing. Similarly, Ohimain, *et al.* [12] also reported that semi-mechanized processors have employment capacity of about 11 persons. For both types of processor, the labour force is predominately men. The labour force for oil palm processing in Nigeria have been severally report in the range of 62.5 – 79.4 (male) and 20.6 – 37.5% (female) [2, 12, 35, 48, 49].

3. Overview Palm Oil Yield in Nigeria

Oil palm processing typically requires a number of processing from the fresh fruit bunch to the generation of palm oil itself and can be further processed to obtain second grade palm oil basically called palm press fiber oil. The processing stages for both smallholders and semi-mechanized palm oil mill have been variously documented by Ohimain and Izah [14], [18-20], Ohimain, *et al.* [9], [10, 11, 15-17, 34, 35]. The PPFO production is only predominant to smallholder processors and the quality of oil producing is usually poor with regard to general physicochemical properties [37]. During oil palm processing stages, several by-products are generated. The proportion of palm oil and several by-products generated from palm oil mills are presented in Figure 1.

In Nigeria, the quantity of palm oil generated is low in volume. This probably due to mixed variety being processed or low quantity of *Tenera* variety processed. Ohimain and Izah [20] reported that semi-mechanized oil palm processors in Bayelsa state processed mixture of *Tenera* and *Dura* variety. In a study conducted by Ohimain, *et al.* [15] about 20% of the palm oil mill assessed processed *Tenera* variety at the time of study in April 2012. *Tenera* variety is the most preferred oil palm variety due to its ability to produce high oil.

Fig-2. A flow chart of oil palm processing in Nigeria mainly from smallholder and semi-mechanized mill in Nigeria [15, 16, 19]
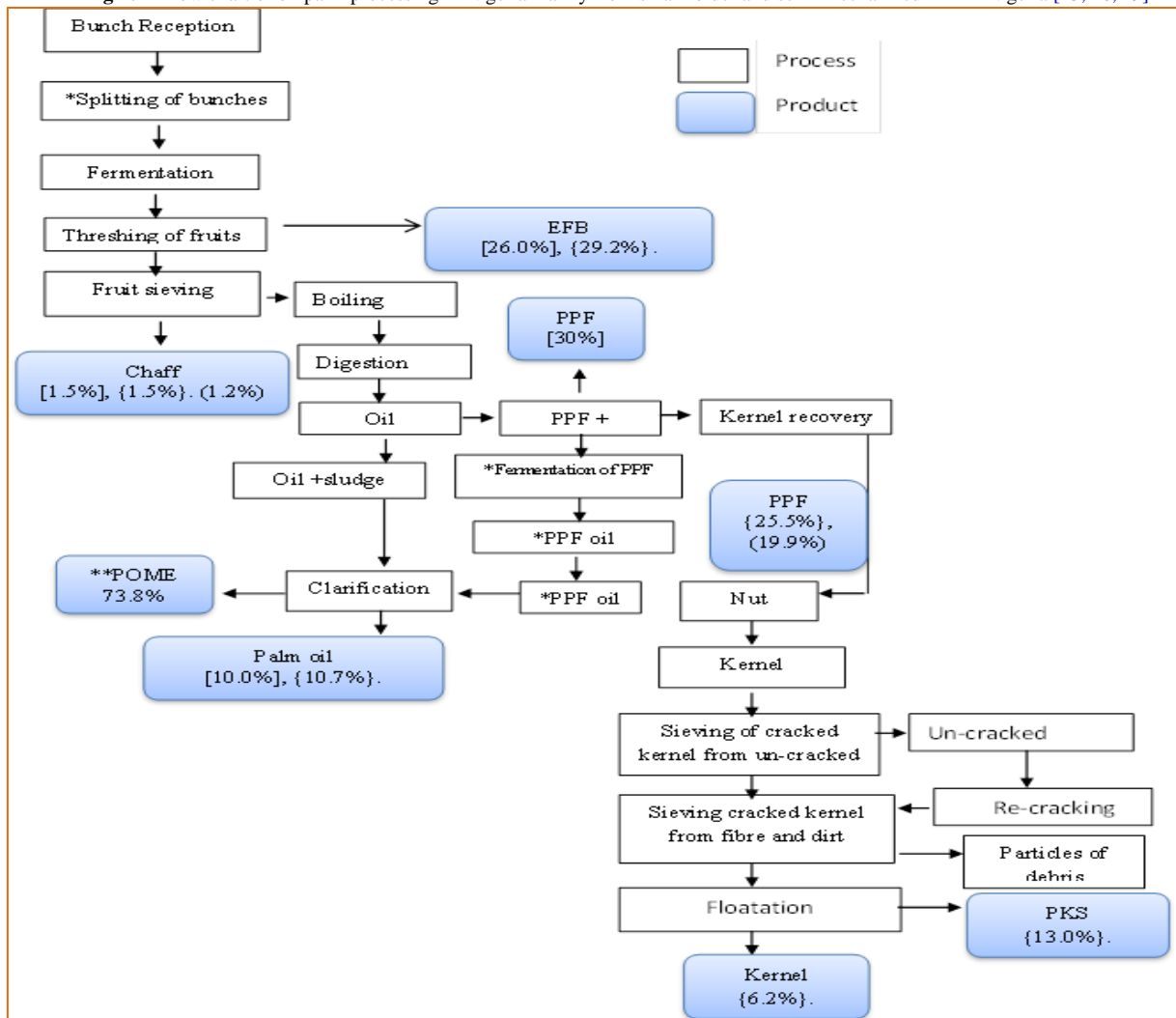
Data in final products are mean of published work of Ohimain, *et al.* [15] for { }i.e. *Dura* variety and ( ) *Tenera* variety; and Ohimain and Izah [20] for semi-mechanized processor [ ] i.e. mixture of *Tenera* and *Dura* variety; ** =POME data are from Ohimain and Izah [14], * =processes are mainly carried out by smallholder processors.

The wastes streams generated during oil palm processing are enormous also. Authors have variously reported that large wastes are generated from palm oil mills. In Nigeria setting the water utilization by smallholder palm oil mill are have been estimated by Ohimain and Izah [14]. Also the quantity of solid wastes (chaff, empty fruit bunch, palm kernel shell and palm press fiber) being generated by smallholder and semi-mechanized palm oil mills have been estimated by Ohimain and Izah [19], [20]. Also potential thermal energy from the solid wastes has been estimated by Izah*, et al.* [23], the potential biogas from the palm oil mill effluents have been estimated by Ohimain and Izah [50], while the biohydrogen potential from palm oil mill effluents have been documented by Ohimain and Izah [13]. While projections on the quantity of all wastes that could be generated by 2029 under three scenarios have been projected by Ohimain and Izah [5], Izah*, et al.* [23].

4. Key Players Involved in Nigeria Oil Palm Processing

Several groups of people are involved in oil palm processing chains. These individuals need each other for palm oil to be produced and get to the final consumers. Hence they are the drivers of oil palm processing. This includes farmers, processors, marketers, consumers, and equipment fabricators/dealers.

Farmers are the estate owners and under take all the activities in the plantation. Hence farmer's jobs starts from planting the seedlings to harvesting of the fresh fruit bunch. Also is the responsibility of the estate owners to replace low oil yielding variety with high yielding variety. Under Nigeria setting, lack of adequate capital is a major challenges for the establishment of oil palm plantation. This has also led to slow growth rate in Nigeria oil palm industry. Land tenure system could also be a challenge. This is because some individuals who intended to expand oil palm estate do not have sufficient land for the expansion.

The second driver is the processors. After harvesting from the plantation, the fresh fruit bunches are transported to the palm oil mill where they are receipt and processed into palm oil and other by-products are generated. The processors typically ferment the fruits. The approach of fermentation typically depends on the scale of processing. The smallholders typically sliced the fruit with cutlass prior to fermentation (Figure 2) while semi-mechanized processors are devoid of slicing. The overall processing manner typically influences the quality of the oil. Ohimain, *et al.* [34] reported quality of palm oil produced by smallholder in Rivers state, Nigeria to have high chemical properties including Free Fatty Acid (8.44 – 10.30%), moisture (13.70 – 18.21%), and impurities (5.48 – 12.52%) and low peroxide value (1.20 – 1.93 meq/kg). In a review study, Izah and Ohimain [43] reported that most of the palm oil used in Nigeria is within the limit for microbial density specified by National Agency for Food Drugs Administration and Control (NAFDAC), while the microbial diversity is far higher than the limit recommended by the same agency. Similarly, Ohimain, *et al.* [17] reported that semi-mechanized palm oil mill in Bayelsa state has high physicochemical quality including free fatty acid (8.43%), impurity (19.87%), peroxide value (43.9 meq/kg) and low moisture content (0.17%) and Saponification (192.05, mgKOH/g). The high physicochemical properties of palm oil produced from smallholder and semi-mechanized mills which cover over 95% of Nigeria palm oil processing sector in Nigeria suggest that the oil may not be competitive at international market. This quality challenges is due to the use of obsolete and rudimentary equipment for processing. Again lack of capital for mechanized equipment prevents the processors from purchasing the equipment that can processes several tonnes of fresh fruit bunch per hour. Also Lack of electricity from the grid and un-equipped palm oil mill with electricity facilities also contributes to poor quality of palm oil. This is because without electricity the overall period of processing is increased. During the period, microorganisms deteriorate the palm fruit leading to low quality.

Figure-3. Sliced fresh fruit bunch prior to fermentation by Small scale palm oil processors in the Niger Delta

The marketers and consumers of the products play a significant role in the overall acceptance of such product by the final consumers. It is the role of the marketers to transport palm oil produced in oil palm densely produced area i.e. southern Nigeria to area whose production is scares. The marketers informs the consumers about changes in the quality of the products if need be. The markets can also encourage consumers to patronize palm oil produced locally. Though it's very difficult to determine the palm oil imported and the ones produced locally at the market level. The marketers usually buy the palm oil in large quantity is stores them in 20 liters jerry can. During storage, the palm oil could also get degraded by the activities of microorganisms there by leading to changes in its quality assessment. The microbial quality could also be impaired during marketing especially during retailing. Containers, plates, bottles are used for selling palm oil and sometimes the microbial quality of the materials used in selling are not put into consideration by the marketers. This is common phenomenon in busy markets especially during wet season in rural areas in Nigeria.

5. Conclusion and Recommendation

Nigeria used to be a major palm oil producing nation. But have since loss her place to Asia continent mainly Indonesia, Malaysia and Thailand. Also the domestic production by Columbia has exceeded production by Nigeria. Till date, Nigeria is import palm oil to meet her domestic consumption. Nigeria oil palm production is predominately in the hand of smallholders. As such the quality is frequently impaired due to long duration of processing, use of obsolete and rudimentary equipment used for processing. This study identified challenges of potential drivers (i.e. farmers, processors, marketers and consumers) in boosting the Nigeria palm oil sector in addition to government and non-governmental agencies.

Efforts have been previously made to resolve the challenges the drivers has especially the farmers. But the policies regarding the efforts did not materialized to the desired target. The earlier effort was based on the National development plans i.e. first (1962 – 1968), second (1970 – 1974) and third (1975 – 1980). The mandate of each of the developmental plans has previously documented by Ugbah and Nwawe [51] and Izah and Ohimain [8]. Several programmes were listed to boost the Nigeria oil palm production between 1960 to 1993 but none met its desired target. These agencies with their respective years of establishment have been comprehensively listed by Ugbah and Nwawe [51] and Izah and Ohimain [8]. In the new era, some other bodies have emerged including Plantation Owners Forum of Nigeria (POFON), Oil Seed Association of Nigeria and Public/private sector investment has emerged [8]. In addition to these organizations, Nigerian Institute for Oil Palm Research (NIFOR) previously known as West African Institute For Oil Palm Research (WAIFOR) which is the oldest body involved in Research, Development, and Extension Support for the Nigerian palms industry since 1939, Ministry of Agriculture, State Ministry of Agriculture, small and medium enterprises can support farmers for the production of oil palm and its processing. While Standard organization of Nigeria (SON), NAFDAC can help the processors with regard to quality regulation through extension and monitoring. Similarly Bank of Industry, Nigeria Agricultural and Rural Developmental Bank and other microfinance bank can also give financial support in the form of loan. The assistance/support from these agencies toward oil palm processing could aid in overcoming the hurdles faced by drivers of oil palm processing in Nigeria.

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Biography

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