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## REVIEW ARTICLE

# The opportunities and weakness of Nigerian oil palm industry

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## ABSTRACT

Oil palm is one of the most oil bearing plant in the world and it has diverse uses. Oil palm is grown in tropical and subtropical regions with suitable environmental conditions. Nigeria presently is the fifth largest producers of oil palm accounting for about 1.5% of global output behind Indonesia, Malaysia, Thailand and Colombia. The continued population growth industrialization and expansion has resulted to increased demand for palm oil (i.e the major product from oil palm). Nigeria domestic supply can only meet about 55% of the total demand. Hence, the deficits are met through importation. This study aimed at evaluating the opportunities and weakness/threat of the Nigeria oil palm sector and ways of overcoming the pitfalls were suggested.

**KEY WORDS:** Nigeria, Oil palm Industry, opportunities, strength/weakness

## Introduction

Oil palm (*Elaeis guineensis* Jacq.) abounds in Nigeria especially in the southern region. Oil palm is found in both wild and plantations (Nwaugo *et al.*, 2008; Ohimain *et al.*, 2013a). Basically, oil palm thrives in tropical and subtropical regions including Indonesia, Malaysia, Thailand, Colombia, Peru, Guatemala, Ecuador, Honduras, Guinea, Ghana, Togo, Venezuela, Angola, Congo, Cameroon, Liberia, Sierra Leone etc. Palm oil is one of the major products produced from the processing of oil palm. Palm oil has found application in both food and industries. Izah and Ohimain (2013a), Pleanjai *et al.* (2007) reported that palm oil is a suitable feedstock for biodiesel production. Embrandiri *et al.* (2012), Aghalino (2000), Izah and Ohimain (2013b), Ibitoye (2014), Basiron and Weng (2004) stated that palm oil is used for soap, margarine, soap candle, base for lipstick, waxes and polish bases, confectionaries, tin plating, lubricant and pharmaceutical products. However, nearly 90%

of global palm oil produced is used for food and feed production including baking and soup making etc (Mahlia *et al.*, 2001; Ohimain and Izah, 2014a; Akinola *et al.*, 2010; Izah and Ohimain, 2013b).

Oil palm is a monocotyledons belonging to the palmae family (Ohimain *et al.*, 2012a) and produces separate male and female inflorescences (Ibitoye and Onje, 2013). Oil palm is propagated by seed. During cultivation, oil palm spend 9 – 12 months in the nursery section before being transplanting. The useful economic plant start bearing fruit after 3 – 6 years of planting, which could reach optimum yield in about 10 years for Tenera and Dura varieties respectively (Ibitoye, 2014; Ohimain *et al.*, 2013a). Oil palm attains a height of 10 – 18 meters tall depending on the variety (Ibitoye and Onje, 2014). Oil palm has economic life and life span of 25 – 35 and about 200 years respectively. In the plantation, oil palm has a planting density of about 150 stands per hectare. Each

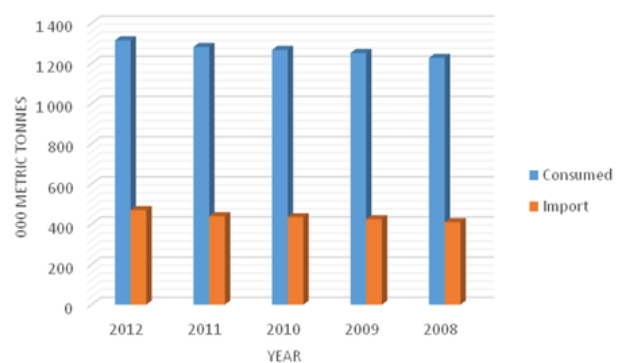
tree produces compact bunches of fruitlets, weighing about 10 to 25kg with 100 to 3000 fruit lets per bunch (Ibitoye and Onje, 2014). The palm branch which bear the fruit develops into fruit bunches, each bearing up to 200 fruits is a drupe, with an oval, spherical or elongated in shape and sizes and color depending on the variety (Ibitoye, 2014). Generally, palm fruits is dark in colour but turn red, yellow, orange and blackish-red when ripe (Ibitoye, 2014; Ibitoye and Onje, 2014). Oil palm have been severally reported as the most oil bearing plants in the world (Izah and Ohimain, 2013b; Akangbe *et al.*, 2011; Okechalu *et al.*, 2011; Ngando *et al.*, 2011; Dimelu and Anyaiwe, 2011; Singh *et al.*, 2010; Tagoe *et al.*, 2012; Ugbah and Nwawe, 2008).

The yield of oil is 10 – 30 tonnes/hectare/annum (Singh *et al.*, 2010, 2011; Sridhar and AdeOluwa, 2009; Chavalparit *et al.*, 2006; Mahlia *et al.*, 2001; Ohimain *et al.*, 2013b). During processing about 9 – 30% of the palm fruit forms palm oil while 70 – 90% end up as wastes and by-products such as empty fruit bunch, chaff, palm press fiber, palm nut, palm kernel, palm kernel shell (Ohimain *et al.*, 2013b). Other wastes generated including gaseous emissions such as nitrogen dioxide (NO<sub>2</sub>), carbon monoxide (CO), sulphur dioxide (SO<sub>2</sub>), hydrogen sulphide (H<sub>2</sub>S), ammonia (NH<sub>3</sub>), volatile organic compounds and suspended particulate matters etc (Ohimain *et al.*, 2013c; Ohimain and Izah, 2013a) and liquid wastes such as palm oil mill effluents (POME). Basically during palm oil processing large volume of water are used and a significant amount end up as POME. It has been variously reported that about 5.0 – 7.5 tonnes of water are used during the processing of 1 tonne of fresh fruit bunch (Ahmad *et al.*, 2003; Wu *et al.*, 2009) and about 50 – 79% end up as POME (Ohimain and Izah, 2013b; Ohimain and Izah, 2014b, c; Singh *et al.*, 2010; Okwute and Isu, 2007; Awotoye *et al.*, 2011; Chavalparit *et al.*, 2006).

In Nigeria, these wastes are discharged into the environment without treatment thereby leading to environmental degradation. The resulting impacts include loss of biodiversity (Sridhar and AdeOluwa, 2009) and odour pollution (Ohimain and Izah, 2014b, c). Recent studies by Ohimain and Izah (2014d) has estimated the possible quantity methane and carbon dioxide emitted by untapped POME from palm oil mills Nigeria under anaerobic

conditions. These gases are the major contributor of greenhouse effects leading to climate change.

Nigeria is a typical agrarian economy before the discovery of crude oil in commercial quantity in the 1950's. As such Nigeria is an exporter of cash crops such as cocoa, rubber, oil palm. Ugbah and Nwawe (2008) reported that Nigeria exported about 75% of palm oil and remained the highest producing nation between 1954 and 1961. Thereafter, Malaysia overtook Nigeria in 1962 – 1969 (Ugbah and Nwawe, 2008) and subsequently by Indonesia. Nigeria loss her place in the global oil palm export market due to crude oil preference, civil war (1967 – 1970), lack of modern farm mechanization, over dependency on smallholder/traditional processors, weak agricultural policies, multiple agencies targeted at the same functions, land tenure problem, inadequate infrastructure/facilities, poor funding, and campaign by environmentalist for environmental protection/sustainability, population increase etc (Ohimain and Izah, 2014c,e; Ohimain *et al.*, 2014a). Presently, Nigeria is a net importer of palm oil from major producing nations like Indonesia, Malaysia etc. The quantity of palm oil consumed and supplied in Nigeria through importation from the period (2008 – 2012) is presented in Figure 1. Nigeria is presently the fifth largest oil palm producing nation account of about 1.5% (930,000 metric tonne) of the global output in 2013 economic year (Ohimain and Izah, 2015a, Izah and Ohimain, 2015a). The domestic production only accounted for about 55% per annum of the total demand.



**Figure 1:** A comparison of palm oil consumed in Nigeria and amount supplied through importation (Adapted from Ohimain and Izah, 2014c)

Nigeria oil palm industry is under activation due to the participation of stakeholders, government and non-

governmental agencies in the sector after several years of neglect. The aim of this paper is to present the opportunities and weakness of the Nigeria oil palm sector.

### **Opportunities of Nigeria oil palm Nigeria Industry**

The oil palm sector has several prospects when adequately managed. This could be due to several indices that could enhance palm oil production and profitability of the enterprise. The strengths and opportunities such as availability of land cultivable hectares of land, labor force/population, improved varieties, suitable atmospheric and soil conditions are discussed in this subsection.

#### **Improved varieties**

Two distinct varieties oil palm exist in the West Africa including Nigeria, these are *Dura* and *Pisifera*. The crossing of the two varieties produced the third variety called *Tenera*. *Tenera* variety is the highest oil yielding variety. Several works have been carried out with regard to oil palm yield by the Nigerian Institute for oil palm research (NIFOR). According to Ugba and Nwawe (2008), Ibitoye (2014), attempt to increase oil palm production led to the establishment of NIFOR in 1939 previously known as Oil palm Research Station. In Nigeria presently, about 80% of oil palm plantation is covered with *Dura* and *Pisifera* and are cultivated by smallholders, while *Tenera* covers approximately 20% (Ohimain *et al.*, 2013b). However, there have been intensive awareness and campaign of high oil bearing *Tenera* variety and most smallholder oil palm farmers have begun to replace the *Dura* and *Pisifera* varieties with *Tenera*. The *Tenera* variety has a thin-shelled fruit and improved partition of dry matter within it (Ohimain *et al.*, 2013b). Corley and Lee (1992) stated that the oil yield is about 30% high at the expense of shell, without a corresponding reduction in the overall dry matter produced. Sridhar and AdeOluwa (2009) have reported that about 40% and 20% of an individual palm fruit and fresh fruit bunch from a typical *Tenera* variety of oil palm can be extracted for palm oil respectively.

#### **Employment creation and Labour force**

Nigeria has a population of about 170 millions. Several small and medium scale business abounds in Nigeria including oil palm enterprise. National Council of Industries has defined Nigeria small scale business as an enterprise whose total costs and/ or expenditure excluding land  $\leq$  100 million naira

and a workforce of 11 to 70 on full time staff strength (Adeleke, 2012). High unemployment is one of the major challenge of the nation. According to Fanim and Okere (2012), unemployment rate in Nigeria is 19.7 % in 2011 and it may rise in few years to come. Unemployment rate has affected both genders (male and female) significantly. The active labour force of Nigeria ranged between 15 to 45 years of age (youths). Oil palm processing enterprise involves series of age grade (Table 1). Studies have shown that  $\geq$  76% of processor fall within the age grade of 21 – 50 years. Of these, male dominates the sector accounting for about  $\geq$  80% of gender. The age bracket involves in oil palm processing are the dominants age grade with high level of unemployment in Nigeria. Alexander *et al.* (2012) have reported the unemployment age grade of 15 - 24 for secondary school graduates, thus contributing about 71% of the urban unemployed youths. Ohimain *et al.* (2014b) reported that National Bureau of Statistics has reported an unemployment rate of 4.6% among individual within the age grade of 15 - 24 in 2009. Of these, 21%, 22.3% and 21.3% has no formal education, primary, and post-secondary school leavers respectively. Oil palm sector could provide direct employment to about 4 million to oil palm growing states in Nigeria and indirect employment to several people that are involved in other value chains such as marketing (Ahmed, 2001). According Olagunju (2008), Ohimain *et al.*, (2014b, 2012b), the cultivation and processing is a source of livelihood to several millions of families especially in the rural areas. Table 2 presents the number of staff that oil palm can employment is smallholder and semi-mechanized palm oil mills according to operational activities. There are several smallholder palm oil mills scattered overall the Nigerian oil palm region. The combination of staff strength of these mills could reach millions.

#### **Profitability**

The profitability determinants model includes Gross Margin (GR), Benefit-Cost Ratio (BCR) and Expense Structure Ratio (ESR). Profitability of palm oil enterprise put other feasibility drivers such as economical (financial and employment), technological and operational techniques into considerations. Of these, economics/finance are the key determinants of oil palm profitability (Ohimain *et al.*, 2014a). Studies have shown that there is profitability in oil palm processing business (Table 2).

**Table 1:** Age and gender characteristics of oil palm processors in Nigeria

Socio-economics	Ohimain <i>et al.</i> , 2014b	Ekine and Onu, 2008	Ajayi and Solomon, 2010	Soyebo <i>et al.</i> , 2005	Ohimain <i>et al.</i> , 2012b; 2014a
States	Bayelsa	Rivers	Delta	Osun	Rivers
Processing mills	Semi-mechanized	Traditional	-	-	Traditional
Age, %					
21 – 30	11	6.7 – 14.6	33.0	1.9	14.0
31 – 40	35	6.7 – 31.3	20.0	24.5	31.0
41 – 50	27	29.9 - 53.3	23.0	23.5	25.0
>51	27	31.3 – 33.3	24.0	50.0	30.0
Gender, %					
Male	72.7	62.5 – 68.9	74.0	79.4	73.0
Female	27.3	31.1 - 37.5	26.0	20.6	27.0

Oladipo (2008) stated that palm oil enterprise is a critical commodity traded globally and helps for the sustenance of the economy. Generally the profitability margin from oil palm processing is relies on the processing toll (Simeh, 2002; Oladipo, 2008; Orewa *et al.*, 2009), variety and physical condition of the fresh fruit bunch prior to processing. According to Ekine and Onu (2008), the profit margin from oil palm processing business could depend on cost of palm fruits, cost of hiring/purchase of equipment, transportation of the palm bunches, availability of labor, price of palm oil. Putting all these conditions together, the profit margin from oil palm processing enterprise is still high (Table 3).

**Availability of land resources**

Nigeria has a total land mass of nearly 1 million square kilometers. Of these, agricultural land occupies 71.9 million hectares ranking Nigeria as one of the top bio-fuel potential countries in the world (Agboola *et al.*, 2011; Ohimain, 2010). Of the arable land, oil palm is suitable for cultivation in 24 million ha (Business Day, 2013). Ugbah and Nwawe (2008) stated that the Nigeria oil palm groves is 2.1 million hectare and about 250,000 hectares is under cultivation by smallholder, semi-mechanized and mechanized oil palm farmers. Presently 3.0 million hectares are under cultivation by oil palm stretching from Lagos in the West to Calabar in the east and to the Northern region. Of these, about 1.4 – 1.8 million hectares are found in the Niger Delta, Nigeria (Ohimain and Izah, 2014c; Business Day, 2013).

**Table 2:** Itemization of activities according to number of staff and gender

Activities/mills	Ohimain <i>et al.</i> , 2012b	Ohimain <i>et al.</i> , 2014b	Gender
	Smallholders	Personnel (No.)	
Bunch reception	3-Jan	2	Male
Bunch loading on stripper	*	2	Male
Stripping	*	1	Male
Slicing	2-Jan	*	Male
Sieving	2	3	Female
Sterilization/Boiling	1	1	Male
Digesting/pressing	3-Jan	2	Male
Clarification	-	1	Male
Fiber separation	2-Jan	1	Female/male
Repressing	3-Jan	*	Male
Oil drying	*	1	Male
Total work force	12-May	11	-

Generally, the climatic conditions in the Northern part of Nigeria do not produce optimal yield of oil palm as compared to the yield from the southern region. Basically, several smallholder farmers covers an estimated land area of 1.65 million hectares in the southern part of Nigeria (Ibitoye, 2014).

**Suitable environmental condition**

Oil palm thrives in Nigeria due to the suitable soil and climatic conditions of the region. Oil palm requires annual rainfall of 1800 – 5000mm per year (Embrandiri *et al.*, 2012), temperature and relative humidity of 17 – 28°C and >70% respectively (Poku, 2002), annual rainfall of 150cm (Ibitoye, 2014), low pH, which is sensitive at 7.5 and stagnant water (Hartley, 1988). The soil condition of Nigeria is characterized by sandy, loamy and clay. Other soil characteristics that enhance the growth of oil palm include soil redox potentials, soil porosity, organic contents etc. The distribution of the various fractions makes it suitable for oil palm growth especially in the Southern Nigeria. Temperature to a large extent influences the yield of oil palm because it influences all other climatic conditions such as relative humidity and rainfall. A high temperature is likely to lead to low relative humidity and subsequently the amount of rainfall.

**Availability of potential consumers of oil palm products**

On global perspective, palm oil is one of the most widely utilized oil. In Nigeria nearly all individual consumes palm oil or its products as food or feed supplements. This is due to its diver's applications. Ekine and Onu (2008) reported that every Nigerian house-hold of about five, consumes nearly 2 liters of palm oil on weekly bases for cooking. Ugbah and Nwawe (2008) stated that there over 30 vegetable oil and soap manufacturing companies that uses palm oil as their feedstocks. With increased applications of palm oil such as biodiesel production, the potential consumers of the palm oil may increase. Nigeria biofuel industry have approved 20% biodiesel blend (B20) for use in Nigeria. The sector also approved the use of palm oil for the production of biodiesel. Hence the consumption of biodiesel is readily available due to the number of cars that utilizes diesel as transportation fuel.

**Availability of market**

Palm oil which is the major product from oil palm sold in nearly all markets involved in the marketing of perishable and edible products across the country. After Nigeria as

emerged as a major importer of palm oil, the country now seek a goal of meeting the domestic demand and then if possible seek to become competitive in export markets (Ibitoye, 2014). Nigeria palm oil production is potentially competitive in the local market if oil palm industry would enhance the overall economic development through the income and employment effects in the rural and urban economies (Ibitoye, 2014).

**Development of rural areas**

Most palm oil mills are situated in the rural areas. According to Oladipo (2008) about 75% of the country's population resides in the rural areas. As such, palm oil business has contributed significantly of the rural areas especially the host communities. Oladipo (2008) has stated that rural development can occur and endure through enhancement of rural production, and reduction in poverty and unemployment. This is so because agricultural practice including oil palm cultivation and processing employ several families in rural areas especially in the southern region.

**Table 3:** Profitability of Palm Oil Processing

Benefit Cost Ratio	Gross Ratio	Rate of returns	Expenses Structure Ratio	References
1.47	0.68	0.32	0.087	Ohimain <i>et al.</i> , 2014a
4.16	-	-	-	Ibitoye and Onje, 2013
1.29	0.77	0.29	0.423	Olagunju, 2008
-	1.1	-	-	Chukwu <i>et al.</i> , 2011

**Weakness and threats of Nigeria oil palm Nigeria Industry**

The Nigeria oil palm sector are faced with several challenges. These include domination of the industry by smallholder who basically uses manual equipment for processing, political/regime changes, poor attitude towards work and inadequate government policies, inadequate access to credit facility and poor infrastructures. Except that these challenges are adequately addressed, the quality of palm oil produced cannot be competition in international

markets and productivity may continue to be low. Also, the import quota will also continue to increase.

#### **Dominance by smallholder processing using rudimentary facilities**

Nigeria oil palm industry (including cultivation and processing) are categorized into three scale of processors. The smallholder has a plantation size of about 1 - 5 hectares, and they accounting for about 80% of the sector (Olagunju, 2008; Ohimain *et al.*, 2012b; PIND, 2011; IPPA, 2010). On the other hand, semi-mechanized and mechanized processors has a plantation size of 5 – 20 hectares and >20 hectares accounting for 16% and 4% of the oil palm sector respectively. The mechanized processor basically used mechanized equipment for processing. The semi-mechanized share about 50% of the characteristics of both mechanized and smallholder processing (Izah and Ohimain, 2015b). The smallholder processor uses rudimentary/manual equipment for oil palm processing. Ibitoye and Onje (2013) stated that the use of crude equipment for palm oil processing has led to decline in the nation's domestic supply. The processes employed by smallholder processors is tedious and time consuming because it's carried out in batches unlike the mechanized mill that utilizes a continuous process. For instance, it has been severally reported that the processing of oil palm by smallholder and semi-mechanized is carried out between 6 – 10 and 4 - 8 days respectively (Izah and Ohimain, 2015b). The breakdown of activities to number of days includes sliced fruit fermentation (2- 3days), boiling/sterilization, digestion and pressing (1 – 2 days), fiber separation (1 day), palm press fiber fermentation (2 – 4 days) (Ohimain *et al.*, 2012a, - c; Ohimain *et al.*, 2013b, c). Orewa *et al.* (2009) has reported a longer duration of fresh fruit bunch fermentation in the range of 7 – 9 days. Smallholders processing method leads to reduction in palm oil yield by 42% (Orewa *et al.*, 2009; Orewa, 1998). Ohimain *et al.* (2013b) reported that the yield of palm oil from *Dura* variety in smallholder mills ranged of 9.4 – 12.8% of fresh fruit bunch. A lower yield of palm oil from *Dura* variety has been estimated to be in the range of 8 to 9% (Orewa *et al.*, 2009).

#### **Poor attitude toward work and inadequate government policies**

When the government noticed that Nigeria oil palm industry

is deteriorating with an increasing population, the First National Development Plan (1962 – 1968) which stressed the need to expand oil palm cultivation and subsequently processing was initiated. This failed to large extent due to the civil war. Between 1970 and 1974, the second National Development Plan was established mandating the Nigerian Institute for Oil Palm Research (NIFOR) to replace the wild groove with high oil yielding variety (Ugbah and Nwawe, 2008). This policy worked to some extent because some of the outline made is still ongoing in some areas in Southern Nigeria. Third National Development Plan of 1975 – 1980 stressed the need for smallholder to increase the plantation size. The policy did not yield optimum result due poor attitude toward work. The government attempted to bridge production and demand gap through the launching of programme including planting of 1 million hectares of oil palm for 15 million tonnes of FFB annually (Ugbah and Nwawe, 2008). This program did not yield desired result due to mismanagement rather it made the sector to be festered. Other policies/programme include Federal Government and World Bank Tree Crops Co-operative programme, Federal Government assisted programme (1991), Federal Government National Accelerated Industrial Crops Production Programme (1993), West African Institute for Oil Palm Research (WAIFOR) (1960's), United Nations Development Programme (UNDP) (1970's), Nigerian Institute for Oil Palm Research (NIFOR) (1970's), Directorate of Foods, Roads and Rural Infrastructures (DIFRRI) (1987), agricultural Development Programme, National Land Development Authority (NALDA) (1993) (Ugbah and Nwawe, 2008), Plantation Owners Forum of Nigeria (POFON), Oil Seed Association of Nigeria, Public/private sector investment. Ugbah and Nwawe (2008) reported that if the various program is implemented, the total plantation will increase to about 1.85 million hectares. This will translate to over 950 metric tonnes of palm oil per annum by 2007. Due to poor work execution target yield were not realized.

#### **Poor quality**

The quality of palm oil produced in Nigeria is poor. Basically, the quality of palm oil is a reflection of its uses. For instance, palm oil meant for biodiesel production should be contain water content and free fatty acid (FFA) of < 1% and <2% respectively. Generally the physico-chemical properties of

palm oil produced in Nigeria are presented in Table 4. The major physico-chemical parameters to depict quality impairment include such as free fatty acid, peroxide value, moisture content, saponification value, impurity level and carotene content.

The presence of FFA acid moieties in palm oil is an indication of quality impairment (Agbaire, 2012). FFA content of palm oil is an indication that microbes with lipase activity have invaded the oil which occurs during harvesting, processing and even storage. Basically palm oil with FFA content of 10 – 30% and 5 – 10% is referred to as hard and soft oil respectively and  $\leq$  is the internationally accepted value (Orewa *et al.*, 2009; Orewa, 1998). The relatively high impurity level in palm oil from smallholder palm oil mills is an indication of poor and hygienic conditions that palm oil are processed (Figure 2). Palm oil rich in vitamin A with carotene as the precursor (Nagendran *et al.*, 2000; Okechalu *et al.*, 2011). Akinola *et al.* (2010) have reported that carotene has a high provitamin A activity, and they decreases with storage and high temperature. Basically, proceed palm oil are stores for a very long time in Nigeria. Some marketers often buy palm oil during the palm oil fruiting season at cheap process and later sold it during the off season period at very high price. Basically high moisture content of palm oil indicates that level of spoilage and rancidity and these reflects on the shelf life of the oil (Agbaire, 2012). The moisture content of palm oil depends on the efficiency of the final extraction and clarification processes (Poku, 2002; Orji and Mbata, 2008). Peroxide value is a measure of oxidation during storage and the freshness of the lipid matrix (Ohimain *et al.*, 2013a). Peroxide value is a useful indicator of the early stages of rancidity occurring under mild conditions (Ijeh *et al.*, 2011; Ohimain *et al.*, 2012c; RMRDC, 2004). Due to presence of free radical found in palm oil when the peroxide value is high it could pose a health effects to individuals that consumes such as oil. Saponification value is an indication of the molecular weights of triglycerides of oils (Ohimain *et al.*, 2013a). The saponification value give gives information with regard to the solubility in water and soap formation (Akinola *et al.*, 2010). Saponification value is enhanced with an increased temperature. The palm oil produced in Nigeria is often out of range of the prescribed limit, thereby causing challenges during transesterification processes in biodiesel production (Ohimain and Izah, 2014f). Generally most of the

physicochemical parameters often exceed the recommend limit specified by vegetable oil governing/ regulating agencies.

Presence of microorganisms also impedes the quality of palm oil. Microorganisms that invade food and non-food products have been known to cause diseases especially in humans (Izah and Ohimain, 2013b). Several microorganisms found in palm oil including *Enterobacter* species, *Bacillus* species, *Pseudomonas* species, *Proteus* species, *Proteus* species, *Staphylococcus aureus*, *Aspergillus niger*, *Aspergillus flavus*, *Aspergillus fumigatus*, *Candida* species, *Mucor* species and *Penicillium* species (Izah and Ohimain, 2013b; Okechalu *et al.*, 2011; Ohimain *et al.*, 2013a). Ohimain *et al.* (2013a) stated that *Proteus* species found in palm oil is capable of causing urinary tract infection especially the urine carriers (urethra, kidney and bladder). Izah and Ohimain (2013b) reported that aspergillosis, endophthalmitis, meningitis, pulmonary osteomyelitis, endocarditis, myocarditis are caused by *Aspergillus* species; *Candida* and *Mucor* species causes candidiasis and mucormycosis respectively. *Enterobacter* species often causes respiratory tract infections, septicemia and meningitis (Okechalu *et al.*, 2011); *Pseudomonas* species especially *Pseudomonas aeruginosa* could also cause skin and soft tissue infections, urinary tract infections, gastrointestinal tract, bone and joint infections, respiratory infections, endocarditis, central nervous infections, necrotic enterocolitis and giving port of entry for septicemia and bacteremia (Ohimain and Izah, 2015b). These microorganisms are opportunistic in nature are capable of affecting individuals that have their immune system suppressed. Most of these microbial species are found in palm oil due poor hygiene maintained by processors (Okechalu *et al.*, 2011; Izah and Ohimain, 2013b).

#### **Inadequate credit facilities and unequal distributions**

Over 70% of oil palm processors reside in the rural areas. Most of the processors process oil palm to palm oil to cater for their immediate needs. Most of them lack long term asset to be used as collateral in the case of obtain loan from the bank. On oil palm perspective, the government has not provided robust credit facilities in the form of loan to the farmers with little or no interest.

**Table 4:** Physico-chemical quality of palm oil used in Nigeria

Oil palm characteristics	Ohimain et al., 2013a	Ohimain et al., 2012a	Enemuor et al., 2012	Akubor and Ogu, 2012	Ohimain and Izah, 2015b	Okechalu et al., 2011	Aletor et al., 1990	Akinola et al., 2010	Onwuka and Akaerue, 2006				
Processing method	Semi-mechanized	Traditional	-	-	-	-	Traditional Industrial	-	-	Traditional Industrial			
Source of palm oil	Mill	Mill	Market	Mill	Market	Market	Mill	Mill	Mill	Mill			
State	Bayelsa	Rivers	Kogi	Kogi	Bayelsa	Plateau	Bendel (Delta)	Osun	Ondo	Imo			
<b>Parameters</b>													
FFA, %	8.43	8.44 - 10.30	6.0	1.98 - 3.63	4.503 - 8.467	2.67 - 4.20	7.04 - 12.24	4.90	0.77 - 1.15	0.27 - 1.31	2.63 - 3.30	0.97	
Moisture, %	0.17	13.70 - 18.21	0.3	0.25 - 2.29	0.550 - 2.425	0.69 - 1.27	0.43 - 1.80	2.96	-	-	-	1.59 - 2.90	0.23
Impurity level, %	19.87	5.48 - 12.52	-	0.08 - 1.59	3.775 - 12.00	-	-	-	-	-	-	0.95 - 1.07	0.09
Peroxide value, meq/kg	43.9 <sup>0</sup>	1.20 - 1.93	-	7.1 - 8.8	2.600 - 9.275	23.2 - 35.5	2.70 - 7.40	5.6	4.94 - 6.00	4.0 - 6.26	8.5 - 8.8	7.0	
Saponification level, mgKOH/g	192.05	-	-	191 - 235	191.50 - 203.05	-	-	-	197 - 204.77	196.35 - 207.22	107 - 251	192	
Carotene, mg/kg	-	-	-	-	-	-	-	-	2715.63 - 33326.13	32918.89 - 33224.32	-	-	



**Figure 2:** Palm oil processing environment in Nigeria



The little that the government has provided to the farmers is characterized by favoritism. As such most of the people that get the loans often divert it to other areas, neglecting the sole aim of the loan/ credit facilities. Hence, the farmers continue to cultivate and process palm oil on their own capacity, despite have long term vision on the business.

#### **Poor infrastructural facilities**

Agriculture generally is being carried out in the rural areas where majority of the cultivable land are located. The rural areas in Nigeria lack basic infrastructures such as electricity supply, good road, well equipped school and hospital. Hence most oil palm processing mills especially smallholder generates their own energy using palm oil processing solid wastes such as empty fruit bunch, palm kernel shells, chaff and palm press fiber for heating during sterilization. The smallholder processors also depend on the diesel powered engine for digestion activity. Due to lack of basic facilities such as road, electricity supply, the cost of oil palm processing is high though there is a huge profit in the business. But the profitability could increase with the provision of good access road from oil palm plantation to the mills.

#### **Political/regime change**

Over the years, most agricultural government policy changes along with political/regime change. For instance in 2008 Ugbah and Nwawe (2008) reported that due to low domestic supply rate and high demand, the president instituted oil palm initiative to boost oil palm estate to about 1 million hectares before 2010. The authors also reported that about 869,550 hectares of oil palm estates could be developed if NIFOR is adequately founded to increase annual seed of 40 million within 2 – 3 years before 2010 and expected to reach 2.5 million hectares planted by 2020. Five years ahead to 2020, the oil palm estates are about 360,000 hectares. Due to the change in the regime of the president that initiated the programme, the initiative crashed because successive government did not continue with the programme.

#### **Greed and Cost of palm oil**

The palm oil produced in Nigeria is challenged by quality problems. Additionally the price is high as compared to prices of palm oil imported. Ugbah and Nwawe (2008) have

reported that the price of palm oil produced in Nigeria is about twice the price the amount of the same volume of oil in the international market. However Nnorom (2012) reported that some Nigeria nationals involved in palm oil import have pressured the federal government to remove tariff on palm oil, with an intent aimed of flooding the country with cheap palm oil. In attempt to make more money, some marketer adulterate the palm oil sold in the market to increase profit margin (Agbaire, 2012).

#### **Conclusion**

An attempt to reactivate the Nigeria oil palm sector after several years of neglect is advancement for the industry especially the people that oil palm processing serves as means of livelihood. Since 1962, the country loss her place in international oil palm export market, the country have severally released several agricultural – oil palm policies including presidential oil palm initiatives in an attempt to boost the sector to at least meet the countries domestic demand. This study evaluates the opportunities and challenges of Nigeria oil palm industry. The challenges that threaten the sector include; domination of the industry by smallholder who basically uses manual equipment for processing, political/regime changes, poor attitude towards work and inadequate government policies, inadequate access to credit facility and poor infrastructures. Apart from the pitfalls, there several opportunities for the sector including availability of land cultivable hectares of land, labor force/ population, improved varieties, suitable atmospheric and soil conditions. Therefore for the activation to be successful the weakness and threats of oil palm industry have to be adequately addressed, while capitalizing on the strengths and opportunities of the sector.

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