Asian Journal of Agricultural Extension, Economics & Sociology
3(3): 206-216, 2014; Article no. AJAEES.2014.003

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Employment and Socioeconomic Effects of Semi-Mechanized Palm Oil Mill in Bayelsa State, Nigeria

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Authors' contributions

This paper was carried out with the collaboration of all the authors. Authors EIO and SCI participated in the field data gathering exercise. Author EIO did the literature search. Author SCI wrote the initial draft, while authors EIO and CIE edited the manuscript. All authors read and approved the final manuscript.

Original Research Article

Received 27th January 2014
Accepted 3rd March 2014
Published 29th March 2014

ABSTRACT

Aims: The unemployment rate in Nigeria has risen in recent years. Activities related to the oil palm industry could employ millions of people. This study evaluated the employment and socioeconomic influence of semi-mechanized oil palm processing in Elebele, Bayelsa State, Nigeria.
Methodology: Direct observations and interviews of the employees of the processing units of the mill were used to obtain the data.
Results: The mill employed eleven workers for each shift and each person had the capacity of producing 9.1 liters of palm oil per day. The labor force was comprised of able-bodied men and women (72.7 and 27.3% respectively). During processing, women sieved the oil while men received the palm bunches at the plant. Men also loaded bunch on stripper, stripped, sieved, sterilized/boiled, digested/pressed, clarified and dried the oil. The processors ranged from 21 to 51 years old. The educational background showed that they were graduates of universities (degree), polytechnics (diploma), secondary (high)

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school, standard six certificates, or no standard six certificate (13, 35, 30, 22 and 0%, respectively). The employees had worked in the industry for <10 to> 30 year.
Conclusion: The study shows that the semi-mechanized oil palm industry can be an important source of employment creation in Nigeria

Keywords: Employment; oil palm processing; semi-mechanized; socioeconomics.

1. INTRODUCTION

Nigeria is a country with about 167 million people. The country is the 8th and 6th major world producer and exporters of petroleum products [1]. In addition, the nation has other mineral resources such as natural gas, tin, iron ore, coal, lead, zinc limestone, niobium and arable land for agricultural purposes. Despite these resources, Nigeria is a poor country with high rate of unemployment [2,3]. The federal government has developed some programmes to reduce poverty, but these efforts have not yielded positive result thus far [1]. The United Nations (UN) Human Poverty Index in 2006 rated Nigeria among the 25 poorest nations of the world. According to National Bureau of Statistics, the unemployment rate for Nigeria has declined from 31.1 to 19.7% from 2000 to 2011 (Fig. 1). Before 2009, Nigeria was Africa second largest economy with a gross domestic product (GDP) of about US$40 billion, yet over 33% of the country's population live below the poverty line of US$1/ day [4]. Despite the upsurge in population, the country has continued to experience poor economic growth and development. The principal cause of poverty in Nigeria is joblessness especially among the active labor force of youth (15 to 45 years old).

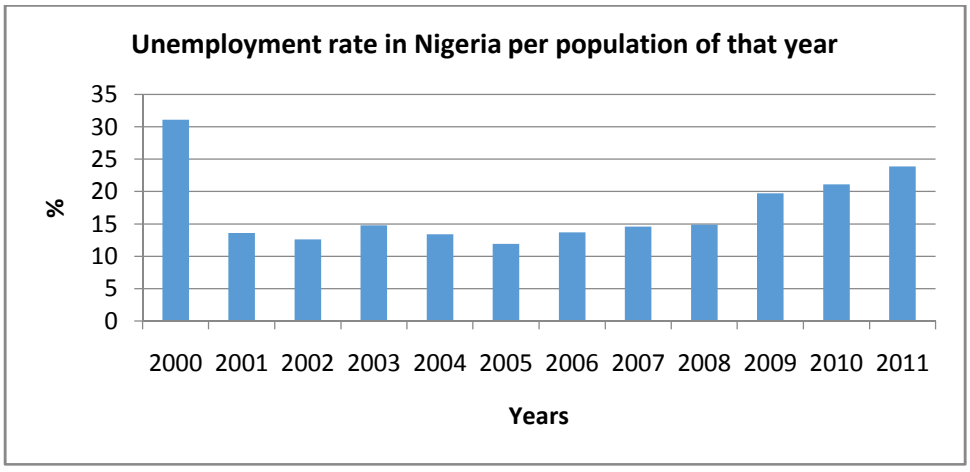

Fig. 1. Unemployment rate in Nigeria as a percentage of the entire population [2,3]

The poverty and employment currently experienced in Nigeria is linked to corruption and mismanagement [5], low productivity, poor and unfavorable government policies for business, frequent change of power, and under performance of the manufacturing sector. In Nigeria, there is no alliance between the supply skill and labor market needs. The business environment is characterized by lack of transparency, unreliable power supply, weak quality of regulation and enforcement, conflicting rules, offices, fees and agencies cutting across the three tiers of government. In addition, access to finance is another major constraint of

business development [6]. But, one means of breaking the cycle of poverty and unemployment is through small scale business. According to Adeleke [1], the National Council of Industries in 2008 defined small scale enterprises in Nigeria as business enterprises whose total costs and/ or expenditure excluding land was not more than one hundred million Naira ($1=₦ 160) and a workforce of 11–70 on full time staff strength. The government has several promising small scale enterprises that could serve as source of livelihood to many families especially in the rural setting but they have failed to recognize the potential of these enterprises.

World Bank [6] stated that in Nigeria, over 10 million adult are illiterate and 7 million children have dropped out from school representing 16.7% and 11.7% respectively, due to poor quality of education in the country. In Nigeria, the unemployed literate often adapt better than the illiterate, depending on age. Again, the unemployment rate among graduates is lower than uneducated individuals within the same age grade. Therefore it appears that socioeconomic status influences the unemployment rate in Nigeria. According to Awogbenle and Iwuamadi [7], the statistics from the Federal Bureau of Statistics show that Nigeria has 80 million people, representing 60% of the total population who are young people [7]. Out of these, about 64 million were unemployed and about 1.6 million are underemployed [2]. The rate of unemployment rate among youth of secondary school graduates is about 31–40%, About 71% of the urban unemployed are from 15-24 years old [2]. Alexander et al. [2] reported that unemployment has wreaked havoc irrespective of the age bracket, educational group and sex. According to them, the National Bureau of Statistics presented 4.6% of unemployed youth were between the ages of 15 and 24 in March 2009. Of these, 21.3% were unemployed with post-secondary education, 22.3 and 21.0% had either primary school education or no formal education, respectively.

Nigeria has over 100 universities, several polytechnics, monotechnics and colleges of education producing graduates for the country in different fields [1]. Fanimo and Okere [3] reported that of the 1.37 and 1.98 million students enrolled into higher education between 2006 and 2007,3.2 million graduates had no job by 2011. Shadare [8] reported that unemployment and under- employment lead to rural urban drifting resulting to overcrowding and unsettled labor force. Other negative penalties of unemployment include poverty, frustration, depression, hostility, food insecurity, criminal acts (robbery, prostitution, illegal bunkering of petroleum, bombing activities, kidnapping and hostage taking) and general insecurity of life and property [9–11].

The petroleum industry generates three quarters of government revenues and more than 90% of foreign exchange earnings. At the same time, agriculture continues to play an important role in the economy, contributing 26% of total GDP in 2005, with crop production accounting for an estimated 85% of this total. Livestock accounts for 10% and forestry and fisheries generate the remaining 5% of the total earnings [4]. Prior to the oil boom of the 1970s, Nigeria was a major exporter of agricultural commodities such as cocoa, groundnuts, cotton, rubber, and palm oil, but presently Nigeria exports non-oil products such as cocoa, beans and butter, rubber, leather, and hide and skins [4]. Currently there has been an intensive effort to diversify economic resources through strengthening of the agricultural sector [12]. Generally, agriculture generates nearly 90% of Nigeria export and employment for about 65% of the total labor force. In particular, the cultivation and production of oil palm is a major source of livelihood for millions of Nigeria, especially those residing in rural areas [13–15].

Oil palm is one of the most economic plants found in Nigeria [13,16]. Oil palm have been variously referred to as the most productive oil bearing crop in the world [13,17–24] with one hectare of farm field producing 10–30 tonnes/hectare/annum [22,25-28]. Nigeria oil palm market is dominated by smallholders who typically dominate about 80% of the national palm oil production [11,14,15,29]. These smallholders use rudimentary equipment for palm oil processing [30]. The oil yield by smallholder processors is low and in the range of 9.4–12.8% and 26.0–28.2% for Dura and Tenera varieties of palm oil plants, respectively [30]. There are many indicators of strong economic growth in palm oil global demand [31]. Palm oil has emerged as the main global source of vegetable oil due to its wide availability, versatility in usage and lower cost, as compared to other vegetable oils [32]. Palm oil forms nearly 33% of the world vegetable oil production mix. Hence, it could be used to diversify the current rate of unemployment in Nigeria. Ohimain et al. [11] and Olagunju [14] reported that it could create employment for several millions of people. However, oil palm industry has been recognized for its contribution towards economic growth and rapid development through biofuel [11]. Nigeria has entered into the biofuel industry and it has the potential of creating enormous employment opportunities. For example, the employment effects of the twelve currently operating Global Biofuel Limited bioethanol factories could employ 696,000 employees [5]. The two biodiesel refineries proposed in Cross Rivers State could generate several thousands of jobs both on farms and in factories. The oil palm sector is capable of providing about 4 million direct employment opportunities in more than 20 oil palm producing states in Nigeria, as well as to other employment opportunities in processing and marketing [33].

Palm oil is a big business, traded in both local and international markets. So far, palm oil contributed immeasurably to the survival of many nations [34] by providing income for many farmers and their dependents. A strong palm oil sector in Nigeria will enable the poor to be part of the solution to poverty by providing employment and a means of livelihood [29]. Beyond the plantation, employment is also generated in other stages of oil palm production including processing, marketing and other non-farm enterprise such as the sale of farm and agricultural processing implements, and agro-chemicals [11]. Beside the positive effects of the industry on employment, the socio economic value of the oil palm industry is also important. The benefits of small scale oil palm production are covered in the literature. These include the economics on small scale palm oil processing in Rivers State [35], southwestern Nigeria [14], Osun State [16], Delta State [36] and in Rivers State [11].No studies are available on the employment and socioeconomics influence of semi industrialized oil palm processing in Bayelsa state, Nigeria, which is the subject of this paper.

2. METHODOLOGY

A semi-mechanized palm oil mill at Elebele, Bayelsa State, Nigeria was visited in June 2013 (N 04° 52′ 12.8"; E 006° 18′ 51.2"). The process of oil palm extraction was obtained through observations and interviews of oil palm processors (Fig. 2). Also, the workers working in the various processing activities were counted. Beside physical observation, information were elicited from oil palm processors using interviews, on the employment effects of oil palm processing, characteristics of the workers including gender, age, years of experience, size of house hold) and the duration/time of the various activities in the processing mill [11]. The data were analyzed using descriptive statistics.

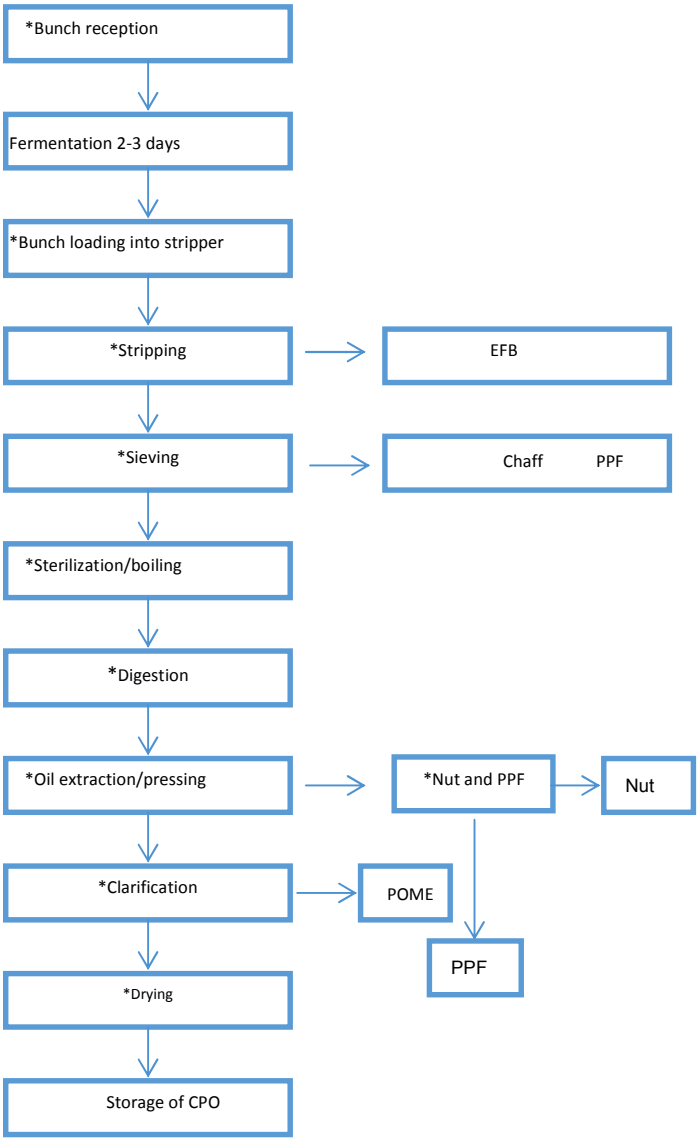

Fig. 2. Flow-chat of a semi-mechanized oil palm processing in Bayelsa Palm
*(EFB = empty fruit bunch; PPF= palm press fiber; CPO = crude palm oil; POME = palm oil mill effluents; *processing phase in oil palm processing that requires employment)*

3. RESULTS AND DISCUSSION

The efficiency of palm oil processed per personnel and staff strength is presented in Table 1. The total labor force was comprised of 11 employees. The employees processed 74 FFB/ day. However, the average weight of FFB was 13.5 kg. The volume of FFB processed was 100 litres. The productivity of CPO per personnel was 9.1 liters/day. Smallholder's processors typically have 3–12 staff involved in oil palm processing [11]. Ohimain et al. [30] reported that the average weight of FFB processed by smallholders in Nigeria ranged from 12.7–15.7kg depending on the variety of plant. Ohimain et al. [11] reported that smallholder

processors produced 8.9–74 liters of CPO depending on the quantity of FFB available. The authors reported that one of the mills could process up to 700 FFB into 680 liters of CPO. Authors have previously reported that the use of manual/rudimentary equipment in oil palm processing led to loss of CPO in the range of 25–75% of FFB [35,37]. Ohimain and Izah [38] reported that semi-mechanized palm oil mill shared about 50% of the characteristics of smallholder processors. In this study, production processes was usually accomplished the same day unlike smallholder processor, which take between 4 – 10 days to complete CPO generation from FFB [39,40]. In traditional processing, fermentation of FFB and PPF took 2–4 days each of the 4–10 days, respectively [11,15,17,30,41–43]. Also, Olagunju [14] reported that the low number of personnel involved in processing could have been attributed to the availability of FFB. In all, the small number of employees engaged in the processing plant may have been associated with the number of FFB available for processing because the study was carried out at the end of the peak period (period of high oil palm production).

Table 1. The efficiency of palm oil processed per personnel and staff strength

Number/quantity of inputs and outputs	Activity breakdown	Volume and quality of output
Quantity FFB Processed	No. of FFB/day	74
	Average weight (kg)	13.5
Number of Workers (employment effects)	No. of staff/day	11
Volume of oil produced (liters)	CPO volume/day	100
Volume of oil produced /personnel (liters)	CPO volume/personnel	9.1

The various activities requiring handling by workers during oil palm processing included bunch reception, stripper loading, stripping, sieving, sterilization, digestion, oil extraction, clarification, drying and fiber and nut separation (Table 2).The number of workers involved in the various processing activities at this processing plant included two (bunch reception), two (bunch loading into stripper), one (stripping), three (sieving), one (sterilization), two (digestion), two (oil extraction), one (clarification), one (oil drying) and one (fiber separation). These activities are all done by hand. In contrast, semi-mechanized method of palm oil processing is devoid of second fermentation and a second pressing of PPF. Akangbe et al. [13] reported that certain activities require efficiency training including stripping, mixing, sterilization, digestion, skimming and clarification.

The gender of palm oil processors per activity is presented in Table 2. Females sieve the stripped fruit but the other processing activities are carried out by males. Some workers performed more than one activity per shift. This result is similar to the findings of Ohimain et al. [11] that reported that bunch reception, slicing, boiling, digesting/pressing are carried out by males, while sieving and fiber separation are carried out by females, while threshing is carried out by either male or female in smallholder palm oil mills. The level of involvement of females in the various processes varies by region. Akangbe et al. [13] reported contrary views stating that, women were involved in all the processing activities in Oyo state, Nigeria. FAO [44] also reported that men cultivate oil palm while women undertake milling activities and marketing of products.

Table 2. Itemization of activities according to number of personnel, gender and energy utilization

Activities	Time (mins)	Personnel (No.)	Gender	Energy source
Bunch reception	33	2	Male	Manual
Bunch loading on stripper	35	2	Male	Manual
Stripping	32	1	Male	Mechanized
Sieving	25	3	Female	Manual
Sterilization/Boiling	45	1	Male	Manual/mechanized
Digesting	15	2	Male	Mechanized
Pressing	5	2	Male	Mechanized
Clarification	12	1	Male	Mechanized
Oil drying	30	1	Male	Manual
Fiber separation	56	1	Male	Mechanized

Note: Some staff did undertake more than one processing activity

Socio economics of oil palm involves the age, gender, educational background and years of experience. These factors are the determinants of profit efficiency in oil palm venture [45].

The time for each of the processing activities varies for bunch reception, bunch loading on stripper, stripping, sieving, sterilization/boiling, digesting, pressing, clarification, oil drying and fiber separation (33, 35, 32, 25, 45, 15, 5, 12, 30 and 56 minutes, respectively). The time taken to complete some of the processing activities is dependent on the physical strength of the processor (bunch reception, bunch loading on stripper, sieving and oil drying). Activities such as boiling rely on the quantity and quality of fuel that is fed into the boiler. The clarification depends on the size of the poly vinyl chloride pipe that is used to discharge the POME from the palm oil.

The age of employees, who process oil was 31-40 years, although, some were 20–30 years old (Table 3). The age of these workers was different compared to previous studies [11,13,35,36]. Akangbe et al. [13] indicate that (46.9%) of the palm oil extractors were 60 years and above, while 16.9% fell were 20-40 years. The age range is an indication that oil palm workers are mostly married people who are still in their active working age hence they are matured and responsible [13,35].

The percentage of men and women in labor force was 72.7 and 27.3%, respectively and was comparable to other studies [11,16,35,36]. Gender affects the productivity of the oil palm enterprise. Akangbe et al. [13] reported that women were involved in all the processing activities in their in Oyo State, Nigeria. The result of this finding indicates that women are less commonly working in the industry. Perhaps there are some processing activities that women rarely undertake [11], which may be the reason why oil palm processing enterprise is dominated by males in the Niger Delta, Nigeria.

Educational qualifications such as holders of first degree, diploma, secondary school certificates, standard six certificates and no standard six certificates are 13, 35, 30, 22 and 0%, respectively of the labor force. Like age, educational qualification of the workers differed from previous studies [11,35,36]. Akangbe et al. [13] found that 55.0% of oil palm extractors had no formal education, 21.3% had basic primary school education, and 11.2% had post primary education. Olagunju [14] revealed that 50%, 44%, 1% and 4% had primary, secondary, tertiary, and no education, respectively. Educational level of the workers affected

the overall quantity and quality of palm oil produced. Education played an important role in palm oil processing operations it facilitated the adoption of innovations to improve palm oil processing [14].

Table 3. Socio economics characteristics of oil palm processors in Nigeria

Socio-economics	This study	[35]	[36]	[16]	[11]
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
Educational background, %					
Above first degree	0	8.8 –29.9	-	-	-
First degree	13	8.8 –14.6	-	-	9.0
Diploma	35	0.0 -8.3	14.0 above WASC	-	7.0
WASC	30	39.6 –51.1	25.0	-	34.0
Standard six	22	11.1-14.6	34.0	-	32.0
Below standard six	0	0.0 -20	27.0	-	18.0
Years of experience, %					
<10	45	-	23 <10years	14.7	-
11–20	33	-	77>10 years	28.4	-
21–30	16	-	-	19.6	-
>30	6	-	-	37.3	-
Processors type	Semi-mechanized	Traditional	-	-	Traditial
State	Bayelsa	Rivers	Delta	Osun	Rivers

The years of experience indicates that of the workers were from <10 to>30 years and this finding differed from previous studies [13,16,36]. The experience level of the workers influenced the general output of the product as well as the salary of the workers. The level of experience of processors in this study exceeded 10 years.

4. CONCLUSION

The unemployment that has plagued Nigeria over the years can be accredited to the comparatively low employment opportunities even while population has grown. The petroleum products that the country has relied on for decades are diminishing in supply. Therefore, for the country to break the vicious cycle of unemployment and poverty, agriculture is the surest way forward. The semi-mechanized oil palm processing mills present high opportunities if properly exploited. In this study, the influence of socioeconomics on oil palm processing was investigated and it revealed that male employees comprised >70% of the mill staff. About 78% of the processor educational qualification ≥ West African School Certificate, of these 16.7% have first degree. 70% of the staff was between 30 and 50 years. The processors are capable of producing 9.1 liters of palm oil/personnel/day. Therefore, the sector is capable of impacting youths who currently have a high rate of unemployment in the country. The development of the oil palm industry

could make improvements in operation, leading to higher demand and better prices for oil palm products. We recommend that government of Nigeria focus more on the expansion of the oil palm industry to boost the economy and create employment.

ACKNOWLEDGEMENTS

The authors are grateful to the following undergraduates students of the Niger Delta University who participated in the field survey; Jenakumo Nimi, Fawari Amanda, Fikiye Ilaye and Idoniboye-Obu precious. The authors also wish to thank the management of Bayelsa Palm Limited, Nigeria for allowing us to conduct this research in their oil palm processing mill. The authors also wish to thank Dr Beth Middleton for improving the language of the manuscript.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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Peer-review history:
The peer review history for this paper can be accessed here:
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