

Towards Alleviating Threat Factors in Small Scale Palm Oil Enterprises in the Tropics: Evidence from Nigeria

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ABSTRACT

Smallholder palm oil enterprises dominate the vegetable oil industry in Nigeria but their operational continuity and growth have been under serious threat. This study analysed the threat factors in small scale palm oil firms with data collected from 84 palm oil processors. The finding indicates that the enterprise is profitable (₦486,745) but could be wipe out by external environmental factors. Further result indicates that the most significant threat factor to traditional palm oil extraction firms is climate hazards, particularly bush burning, product competitiveness with substitutes, theft of palm bunches, non-participation of youths, aging farmers and aged farmers' quit tendencies. It was recommended among others that environmental protection policies and regulations by relevant agencies should be intensified against bush burning and reduce the external threats to small scale palm oil extraction firms in Nigeria. Advocacies for climate change mitigation measures should be intensified so as to reduce the external threats to small scale palm oil extraction firms in Delta State, Nigeria.

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INTRODUCTION

Oil Palm (*Elaeis guineensis*, Jacq) has been described by Nwauwa, (2011) as one of the most important economic oil crops in Nigeria. It remains the dominant source of vegetable oil consumed in Nigeria. Crude palm oil (CPO) extracted from the mesocarp of palm oil fruit, accounts for 35.1% of the global vegetable oil output, (Anonymous, 2016). Its economic importance and versatility has contributed greatly to the GDP of major world producers and exporters of the products such as Malaysia and Indonesia.

The increase in the demand for crude palm oil in local and international markets has been the major attraction of small and medium scale palm oil extraction firms. The existing structure of palm oil extraction firms could be a militating factor to the attainment of the goal of increasing the output of palm oil so as to meet local and international market demand. It is therefore important to identify the relevant features of small scale palm oil extraction firms and how these features can be improved through policy initiatives for the development of the palm oil industry in the future.

The levels of free fatty acid (of less than 5%), followed by dirt, iodine value, and other contaminant are used to define and grade palm oil in order for it to be internationally traded (Anonymous, 2011). Employing

Semi-modern processing techniques is needed to meet these standards. Over 80% of Nigeria palm oil extraction firms operators employ traditional processing techniques characterized with intensive labour and low processing capacity, (Orewa, *et. al.*, 2009; Ugwu, 2009, cited in Gunn,2014). The palm oil produced is usually high in free fatty acid. Failure in adopting modern mechanized techniques by small scale operators in producing standard palm oil could be dependent on the cost of operation involved and the required skills.

A study conducted by Gunn (2014), revealed that 64% of traditional palm oil processors are living below (or on) the poverty line. This could be attributed to the use of traditional techniques and the resultant low returns.

The palm oil extraction industry is among the most important sectors in Nigeria today. Besides contributing to the Gross Domestic Product (GDP) and increasing employment opportunities, it is a great weapon in breaking the shackles of generational poverty trap and sustainable livelihoods, particularly in rural areas. It is important to investigate the sources of strength and opportunities of this industry and how they affect the potential of the industry in alleviating poverty and contribution to GDP of Nigeria. Certain threats such as; financial constraint in

acquiring modern technologies, lack of credit facilities, unavailability of the market for the product, foreign exchange instability, product competitiveness could affect the potentials of small scale palm oil extraction firms in alleviating poverty in the country.

Different works have been done on oil palm industry, such as the problems and prospects of small scale palm oil processing; the feasibility study of small scale palm oil production; the importance of palm oil production as a poverty alleviation strategy among small scale farmers; the resource use efficiency assessment of methods of palm oil processing (Adeniyi, *et. al*, 2014; Gunn, 2014; Ohimain, *et. al*, 2014; Adebo, *et. al*, 2015).

Although these studies were able to identify some of these threat factors independently, none of them conducted a threat factor analysis on the industry. This study would therefore, make an immense contribution to existing knowledge by conducting threat factor analysis and analysing the effect of these identified factors on the profitability of small scale palm oil extraction firms.

There is a lack of empirical evidence on threat factor analysis of Palm oil Extraction firms. Conducting threat factor analysis could assess its internal and external threats and how these threats can be alleviated. Furthermore, there is a need to identify the threat elements in the environment that envelops the palm oil industry. It is important to investigate how the threat environment affects its performance (profitability). When the threats are addressed the palm oil industry could be sustained. These are the research gaps that this study was designed to fill. It is believed that the result of this study will help relevant stakeholders to formulate policies and programs to improve traditional palm oil extraction firms.

The broad objective of the study was to analyse the threat factor of small scale palm oil extraction firms in Nigeria.

The specific objectives of the study were to:

- i. describe the features of small scale palm oil extraction firms;
- ii. identify the threat factors in traditional palm oil extraction firms;
- iii. assess the profitability in traditional palm oil extraction firms; and
- iv. determine the effect of threat factors on the profitability of small scale traditional palm oil extraction firms in the study area.

Hypothesis

H₀₁: The identified threat factors have no significant joint and separate effects on the profitability of small-scale palm oil enterprises.

MATERIALS and METHODS

Description of the study area, sampling and data collection

The study was carried out in Delta State, Nigeria. This area was chosen for the study because of its evergreen forest with many oil palm trees which provides industry for which there are technological preserves. There are twenty-five (25) Local Government Areas in Delta State (Anonymous, 2006). This study was approved by the ethics committee of Faculty of Agriculture Faculty, Delta State University (Approval Date: 19.03.2020).

The Climate is equatorial marked with two distinct seasons; the dry season (Nov - Dec) and Rainy season (April -Oct). It has an average monthly temperature of 28°C. The study area has rain forests, swamps, and a long network of streams and creeks (Anonymous, 2012). The common dishes cheered by the people include: "Banga soup" (palm fruit soup), "Oghwo soup" (palm oil soup), "Starch" (from cassava and prepared with palm oil) and "Ukhodo" (palm oil, unripe plantain and yam peppery soup). The Population of the Study comprised of all the Small Scale Palm oil Extraction Firms Operators in Delta State, Nigeria.

The study made use of two-stage sampling techniques to compose the sample for the research.

Out of the 7 communities, 3 communities were purposively selected based on their level of involvement in palm oil processing which were identified during a reconnaissance survey. The communities selected are Ughelli, Agbarha-otor and Orogun. The reason for the selection is based on the fact that there are more processors in these communities compared with others which mainly focus their agricultural activities on cassava production and fish farming.

From the 3 communities, 35 respondents were randomly selected from Agbarha-otor, 35 was randomly selected from Orogun, while 14 were randomly selected from Ughelli, giving a total of 84 palm oil processors. The reason for this selection was because of the low population of palm oil extraction firms in the communities. Out of the 84 palm oil processors, 79 were small scale semi-modern palm oil extraction firms while 5 were small scale traditional palm oil extraction firms. The reason for this is because the majority of the processors have adopted the use of semi-modern technologies.

Primary data were collected in 2018 for the purpose of this study from related respondents in the study area using structured questionnaire and interview scheduled. These techniques were complemented by the observation (participant) method. The use of the interview method was employed to allow for proper interaction with respondents so as to get detailed information which could not be presented in

questionnaire. This was achieved by paying visits to small scale palm oil extraction firms and observable features were also noted. The questionnaire contained questions relating to specific objective of the study such as the features of the small scale palm oil extraction firms; age of operational existence, type of ownership, sources of funds, method of processing technique, no of employees, type of labour, no of fresh fruit bunches processed per day, age of operators, educational level. Information was also collected on cost of operation, net profit return and constraints faced by the industry.

Methods of Data Analysis

The data on features of the small scale palm oil extraction firms were analysed using descriptive statistical tools, such as mean, mode, frequency distribution table and percentage.

Cost analysis of traditional of palm oil extraction firms.

The information used was collected in form of enterprise expenditure directly from the palm oil extraction firms. In measuring the cost differential, Cost Differential formula was used:

$$TC_T - TC_M \quad \text{eqn (1)}$$

$$TC_T = VC_T + FC_T \quad \text{eqn (2)}$$

$$TC_M = VC_M + FC_M \quad \text{eqn (3)}$$

Where;

TC_T = Total Cost of small scale traditional palm oil extraction firms

VC_T = Variable Cost of small scale traditional palm oil extraction firms

FC_T = Fixed cost of small scale traditional palm oil extraction firms

Analysis of the Net Return on Investment in traditional

The information used was collected in form of enterprise budget directly from the palm oil extraction firms. In measuring the return on investment, the study made use of ROI formula:

$$ROI_T = \frac{TR_T - TC_T}{TC_T} \times 100 \quad \text{eqn (4)}$$

Where;

ROI_T = return on investment in small scale traditional palm oil extraction firms

TR_T = Total Revenue of small scale traditional palm oil extraction firms

TC_T = Total Cost of small scale traditional palm oil extraction firms

The data collected were analysed using descriptive statistics such as percentage and frequency.

The effect of threat factors on the profitability of small scale traditional palm oil extraction firms

A multiple regression model was used to determine the effect of the identified factors on the profitability of small scale traditional and semi-modern palm oil extraction firms.

Model Specifications

The model was expressed implicitly as;

$$\pi = f(CM, LPD, QCP, TGT, TFT, NPY) + \mu \quad \text{eqn (5)}$$

Where;

π = Profitability (Return on Investment)

CH = Climate hazards

WFB = wild fire/bush burning

QCP = Quality competition

TGT = Temporary glut

TFT = Theft

NPY = Non participation of Youths

μ = Disturbance term

The model is explicitly specified as:

$$\pi = \beta_0 + \beta_1CH + \beta_2LPD + \beta_3QCP + \beta_4TGT + \beta_5TFT + \beta_6NPY + \beta_7AGF + \beta_8FQT + \mu$$

RESULTS AND DISCUSSION

Features of Small Scale Palm Oil Enterprises

The features of the small scale palm oil extraction firms considered in the study includes: Age of Operational Existence, Processing technology employed, Mode of Operation, Ownership Structure of Palm Oil Extraction firms, Sources of Finance, Number of Employees, and Type of Labour Utilize.

The results are presented in Table 1

Age of Operational Existence

Age of Operational Existence is the number of years the firm has been operating or extracting palm oil since its establishment. The results in Table 2 revealed that 88.1% of the firms have been operating from the year ranging from 1 – 15 years while the remaining 11.9% have been operating from 16 years and above. This implies that majority of the palm oil extraction firms in the study area are operated by people with enough experience and they therefore, have knowledge of the strengths, weaknesses, opportunities and threats of the industry. This result supported the findings of Gunn (2014) who found that 77% of the respondents in the study area have palm oil processing experience ranging from 1 – 18 years.

Mode of Operation

The result in Table 2 revealed that 96.4% of the respondents interviewed during the field survey are operating full time while 3.6% are operating part time. This implies that palm oil extraction serves as a major source of livelihood for majority of people in the study area.

Processing Technology Employed

The result in Table 2, shows that all the surveyed palm oil processors made use of traditional processing technologies. They could not afford to adopt new

technologies because it is capital-intensive. This result supports the earlier finding of Gunn, (2014) that most of the local processors adopted traditional technologies due to the high cost involved in the adoption of modern processing equipment.

Table 1. Description of variables in the model

Symbols	Description	Measurement	Apriori Expectation
π	Profitability	Naira (₦)	Positive
CH	Climate hazards	5 point likert scale of Very Strong= 5, Strong = 4, Moderately Agree= 3, Slightly Strong= 2, Not Strong = 1	Negative
WFB	wild fire/bush burning	5 point likert scale of Very Strong= 5, Strong = 4, Moderately Agree= 3, Slightly Strong= 2, Not Strong = 1	Negative
QCP	Quality Competitiveness with substitutes	5 point likert scale of Very Strong= 5, Strong = 4, Moderately Agree= 3, Slightly Strong= 2, Not Strong = 1	Negative
TGT	Temporary Glut	5 point likert scale of Very Strong= 5, Strong = 4, Moderately Agree= 3, Slightly Strong= 2, Not Strong = 1	Negative
TFT	Theft	5 point likert scale of Very Strong= 5, Strong = 4, Moderately Agree= 3, Slightly Strong= 2, Not Strong = 1	Negative
NPY	Non participation of Youths	5 point likert scale of Very Strong= 5, Strong = 4, Moderately Agree= 3, Slightly Strong= 2, Not Strong = 1	Negative
AGF	Aging farmers	5 point likert scale of Very Strong= 5, Strong = 4, Moderately Agree= 3, Slightly Strong= 2, Not Strong = 1	Negative
FQT	Aged farmers quit tendency	5 point likert scale of Very Strong= 5, Strong = 4, Moderately Agree= 3, Slightly Strong= 2, Not Strong = 1	Negative
β_0	Constant		
$\beta_1 - \beta_8$	Co-efficient of parameter estimates		
μ	Disturbance error term		

Table 2. Features of Palm Oil Extraction Firms

Variables	Frequency(n = 84)	Percentage	Mean/Mode
Age of Operational Existence			
1-5 years	20	23.8%	8
6-10 years	45	53.6%	
11-15 years	9	10.7%	
16 and above	10	11.9%	
Mode of operations			
Full-time	81	96.4%	Full-time
Part-time	3	3.6%	
Form of Ownership			
Sole proprietorship	63	75%	Sole proprietorship
Partnership	21	25%	
Cooperative	0	0	
Government	0	0	
Sources of Finance			
Personal saving	75	89.3%	Personal Savings
Relatives/friends	2	2.4%	
Cooperative/thrift	7	8.3%	
Government agencies/Bank Loans	0	0	
Number of Employee			
0 – 9 Employed	61	72.6%%	4.5%
10 – 19 Employed	18	21.4%	
20- 29 Employed	5	6%	
Type of Labour			
Family labour	10	11.9%	Hired/Contract
Hired labour	16	19%	
Contract labour	2	2.4%	
Hired/contract	56	66.7%	

Source: Field Survey, 2018

Ownership Structure of Palm Oil Extraction Firms

The structure of ownership of a firm affects the decision making process of that firm. From the result revealed in Table 2, 75% of the palm oil extraction firms are operating under sole proprietorship. 25% are operated through partnership while none are operated or owned by cooperative societies or the government. This is closely in line with the findings of Nwalieji and Ojike (2018) majority (93%) of the respondents did their palm oil processing on individual bases.

Sources of Finances

According to Table 2, about 89.3% of the respondents get their finance from personal savings. 8.3% get theirs from cooperative and thrift societies, while 2.4% get theirs from relatives and friends. None of them are financed by the government, banks and agricultural agencies. These three agencies are the major source of large loans which are needed to expand into large scale production. Similar trend was also observed by Ogunleye, et. al. (2010), that initial capital used was mostly from the personal savings of the producers. In order for the operators to seize the opportunities available for the firm, there is need for credit support from different loan agencies.

Number of Employees

The number of employees in a firm is a major determinant of the output derived by the firm. From Table 2, 72.6% of the respondents had number of employees ranging from 0 – 9, while the average number of employees is approximately 5%. 25% employ worker ranging from 0 – 4, while 21.4% had number of employees ranging from 10 – 19 and finally 6% had a number of employees ranging from 20 -29. This is in line with the findings of Orewa, et. al (2009) and Adeniyi, et. al (2014) who reported that palm oil processing is characterized by over-utilization of resources such as cost of labour.

Type of Labour Utilized

From the result shown in Table 2, 66.7% of the respondent makes use of both (or either) hired and (or) contract labor while 11.9% make use of family labour.

The result is similar to that of Nnenna, (2011) where 64 % of the respondents used hired labour and family labour (30 %), while communal labour accounted for only 6%. They concluded that in an agrarian community, people go for hired labour as a source of income to supplement that of the household.

Net Returns in Traditional Palm oil extraction firms

The result of the net returns in traditional palm oil extraction firms is represented in Table 3. The net returns from the investment in smallholder palm oil extraction firms is presented in Table 3. From Table 3, the mean annual net returns of traditional palm oil extraction firms is ₦486,745, This implies that smallholder palm oil extraction firms earned relatively low net returns. This is due to the effect of the weaknesses inherent in traditional palm oil extraction firms such as slow extraction rate, high loss of palm oil during extraction and the use of manual processing technologies. The result gotten from the study of Nze, et. al, (2017) revealed that total variable cost was estimated as ₦3,084,000 while the total revenue was estimated as ₦7,449,550 with a net return of ₦4,365,650. Ohimain, et.al, (2014) in their study, were able to analyse the returns on investment using the profitability analytical tool as 32%.

Table 3. Distribution of the Mean Annual Net Returns in Traditional Palm Oil Extraction Firms

Type of Firm	No.	Net Returns (₦)	S.D
Traditional	84	486745	529.436.932

Source: Field Survey, 2018

Threat factors analysis of traditional palm oil extraction firms

Table 4 shows the distribution of threat factors in traditional palm oil extraction firms in the study area. The very serious threat factor identified was extreme climate change events in the forms of extreme temperature, sunshine, drought, storms and wild fire. The identified serious threat factors include wild fire/bush burning, quality competitiveness with substitutes, temporary glut of palm oil, theft of palm bunches, non-participation of youths, aging farmers and aged farmers' quit tendency (Table 4).

Table 4. Distribution of threat factors in traditional palm oil extraction firms

Threat factors	weighted score (n = 84)	mean score (3.00)	remarks
Extreme climate change events	5 (84) = 420	5.00 > 3.00	very serious threat
Wild fire/bush burning	3 (84) = 252	3.00 = 3.00	serious threat
Quality Competitiveness with substitutes	4 (84) = 336	4.00 > 3.00	serious threat
Temporary Glut	3 (84) = 252	3.00 = 3.00	serious threat
Theft	4 (84) = 336	4.00 > 3.00	serious threat
Non participation of Youths	3 (84) = 252	3.00 = 3.00	serious threat
Ageing farmers	3 (83) = 252	3.00= 3.00	serious threat
Aged farmers quit tendency	4 (84) = 336	4.00 > 3.00	serious threat

Note: mean score \geq 3.00 is a serious threat

Source: Field Survey, 2018.

This result agrees with the earlier report of Achoja (2011) which revealed that unfriendly climatic environment is a threat to the growth and survival of small scale agricultural businesses. Table 4 summarized the levels of seriousness of the threat factors.

Several weaknesses and threat factors militate against the potential of small scale palm oil extraction firms. Low palm oil extraction rate and palm oil with high FFA content were identified as major weakness factors of small scale palm oil extraction firms in Nigeria.

Ojemade (2016) concluded that the annual revenue per hectare was sensitive to marginal change in climate variables (temperature and rainfall). Annual farm revenue was affected negatively by increase in temperature and positively by increase in rainfall. This follows that the profitability of palm oil processors could also be dependent on the change in climatic variables. They were estimated to have led to 42% annual losses of the total palm oil produced in Nigeria, (Orewa, et. al, 2009; Adjei-Nsiah, et al. 2012).

Small scale processors experience a loss of 38% for every income during the peak period of production due to temporary glut which was recognized as a threat to

the industry,

Orewa, et. al,(2009) and Adjei-Nsiah, et al. (2012),who concluded that in the peak season fruit production period of April-May, processors make very little profit in their operations as a result of poor processing technologies and lack of storage facilities

Effect of identified threat factors on profitability of small scale palm oil extraction firms.

H₀: The identified threat factor (extreme climate events) has no significant effect on the profitability of small scale palm oil extraction firms.

Table 5. shows the chow test of the effect of the of the most significant threat factors on the profitability (ROI) of the traditional small-scale palm oil firms. The regression analysis was carried out and the most significant threat factor was selected to carry out the chow test. The threat factors were taken into consideration but the less significant factors were removed from the analysis so as to avoid the case of multi-co linearity i. e exact relationship among variables. Following the decision rule; “If a qualitative variable has m categories, introduce only (m – 1) variables (Gujarati, 2004).

Table 5. Chow Test of Threat Factor on Profitability of smallholder Palm Oil Extraction Firms

Variables	Linear +	Double log	Semi-log	Exponential
Constant	-1.979 (-105.70**)	-8.052 (-20.33**)	-4.148 (-9.36**)	-4.731 (-57.76**)
CH (Extreme climate change events)	-0.084 (-71.05**)	-0.378 (-9.42**)	-0.271 (-6.03 **)	-0.116 (-22.47**)
R ²	1.00	0.99	0.99	0.99
Adjusted R ²	0.99	0.99	0.97	0.99
F statistics (3, 1)	7151.25	186.89	52.57	1055.73

Source: Field Survey, 2018.

Note: **= significant at 1% levels of significance, respectively.

Figures in parenthesis are the t-values

+ = lead equation.

The linear equation is given as;

$$ROI = -1.979 - 0.084CH + \mu$$

(-105.70**) (-63.95**)

The linear model was chosen as the lead equation because it has the highest R²(adj.) value of 0.99 (99%). This means that 99% variability in the profitability of traditional small scale palm oil extraction firms is explained by threat factor of extreme climate change events. The F statistics (83, 1) of 7151.25 is significant (p<0.05)thus indicating a goodness of fit of the regression model. This implies that the model is reliable. T- statistics showed that (p < 0.01) for this reason the null hypothesis is rejected and the alternate hypothesis which stays that The identified threat factor (extreme climate events)has a significant effect on the profitability of small scale palm oil extraction firms, is accepted.

Extreme climate change events (CH)

The result shows that extreme climate change events such high temperature, sunshine and drought have negative and significant effects on the profitability (ROI) of traditional small scale palm oil extraction firms in the study area. This implies that the extreme climate change events are potential threat to the small scale palm oil extraction firms in the future.

CONCLUSION

In the light of the result of the study, the following conclusions were drawn:

Traditional palm oil extraction firms earn a mean net returns of ₦48,6745 (\$1,352.07). Extreme climate change events (such wild fire, high temperature, sun shine and drought) were the threat related factors that have negative and significant effects on the

profitability of the traditional palm oil extraction firms. Increase the resilience of the firm to external threats. Operators should form palm oil association in the study area where they can make plans to mitigate the climate change threats in the study area.

On the basis of the findings the following proposals were made:

Research institutes should breed heat resistant varieties of oil palm suitable for tropical environment such as Nigeria. Policies by the Federal Government should be enacted to stop wild fire. Advocacies by relevant stakeholders should be intensified on climate change mitigation measures. The Federal Government should place ban on the importation of crude palm oil from other countries.

Statement of Conflict of Interest

Author has declared no conflict of interest.

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