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ECONOMIC ANALYSIS OF PALM OIL PROCESSING IN ODOGBOLU LOCAL GOVERNMENT AREA, OGUN STATE, NIGERIA

***[1]Sanusi M.M., [2]Idowu S.D., [1]Akerele D. and [1]Olabode T.S.**

[1]Department of Agricultural Economics & Farm Management,
Federal University of Agriculture, Abeokuta, Ogun State, Nigeria
[2]Department of Agricultural Extension & Management,
Federal College of Animal Health & Production Technology, Moor-Plantation, Ibadan, Nigeria

*Corresponding author's email: sanusimm@funaab.edu.ng

ABSTRACT

The study analyzed economic implication of palm oil processing in Odogbolu Local Government Area, Ogun State, Nigeria. A purposive sampling procedure was employed to select 90 respondents for the study with the aid of a questionnaire. Data generated were analyzed using descriptive statistics, budgetary technique and regression analyses. The majority (81.10%) of the palm oil processors were female, 51.10% had no formal education and most (78.90%) of the processors used the traditional method of processing. The costs and returns analysis indicates that palm oil processing is a profitable venture with an average gross margin of ₦158, 404.00 and net return of ₦125, 301.00 per processing cycle. The profitability index (0.32) revealed that for every one Naira invested in the enterprise, a profit of 32 kobo was obtained. Furthermore, the regression analysis showed that the factors affecting net returns obtained from palm oil processing were processing method ($p < 0.10$), processing experience ($p < 0.01$), marital status ($p < 0.01$), education ($p < 0.01$) and household size ($p < 0.05$). It was concluded that palm oil processing is a profitable enterprise in the study area. Thus, the study recommends that processors should be educated on improved/modern methods of processing.

Key words: Palm oil, processors, enterprise, socioeconomic factors, Ogun State

INTRODUCTION

Oil palm (*Elaeis guineensis* Jacq) is a multipurpose tree crop of economic importance in Nigeria, a monocotyledonous plant belonging to the palm family *Arecaceae* with 225 genera and over 2, 600 species. It is a monoecious species known to produce unisexual male and female inflorescences in an alternating cycle, and the seed thrives better in humid tropics (Anyawu *et al.,* 1982; Akinniran *et al.,* 2013; Barcelos *et al.,* 2015; Okolo *et al.,* 2019). The breed of oil palm groves of the Central and West Africa consists mainly of a thick-shelled variety with a thin mesocarp, called dura. Breeding work predominantly crosses between dura and the shell-less variety (pisifera*)* have led to the development of a hybrid variety with a much thicker mesocarp and a thinner shell named tenera*,* which have much higher content of palm oil than the native dura. Palm oil, a product from oil palm is the most widely traded tropical vegetable oil globally, a source of biodiesel and a raw material for local industry. When measured in terms of both production and its importance to trade, its demand is projected to increase substantially in the future. It is an agricultural commodity that is used in a host of food and non-food products (Corley, 2009; IFC, 2011; Potts *et al.,* 2014; Vijay *et al.,* 2016). The economic benefits of oil palm to Nigerian economy includes food production for human consumption, provision of employment to citizens, source of foreign exchange earnings to government, supply of raw materials to industries and source of income to the farmers and palm oil processors. Thus, the overall economic importance of the crop to the economy of the country cannot be over emphasized (Onoh and Peter-Onoh, 2012). In 1948 through 1963, Nigeria was the leading producer of palm oil in the world (Onoh and Peter-Onoh, 2012). However, the advent of crude oil exploration and the civil war drastically reduced the production of palm oil in the country (Okolo, 2004).

Palm oil processing involves scheduling operations which include bunch reception, separation of the fruits from fibrous attachment, sterilization followed by the crushing of the fruits. Heating and extracting the oil using an oilseed expeller, clarification in a filter press by sedimentation after which oil is stored mostly in kegs and drums (FAO, 2002; Biodun *et al.,* 2021). The traditional/local techniques of palm oil processing have been shown to be stressful, time consuming and also results in low yield due to the massive percentage of wastes during processing (Basiron 2002; Ugba and Nwawe, 2008; Inyiama

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et al., 2011). The traditional mills with manual screw press are known to have low oil extraction rate (8.00-10.00%), as against the modern small-scale palm oil processing equipment (mills) with extraction rate of 13.00-18.00% (NIFOR, 2019). High cost of palm oil processing plant is a big concern to palm oil producers in Nigeria (Olagunju, 2008; Potter, 2015). Other factors responsible for the decline in palm oil processing in Nigeria include inadequate knowlegde of modern processing machines, over-reliance on smallholder processors, the problem of land, lack of basic amenities, and inadequate financial support (Omoti, 2001). To increase the yields of palm oil during the processing, it is necessary to address issues on palm oil processing that will bring about improve quality and high yield. Hence, the study analyzed the economic implication of palm oil processing in Odogbolu Local Government Area (LGA) of Ogun State, Nigeria. Specifically, it described the socio-economic characteristics of palm oil processors, estimated the costs and returns to palm oil processing, determined the factors influencing palm oil processing, and identified constraints involved in palm oil processing in the study area.

METHODOLOGY

The study was carried out in Odogbolu LGA of Ogun State. The LGA is located on latitude 6°50'N and longitude 3°46'E in the northwestern part of the State. The area occupies a land mass of 541 km² and a population of 127,123 (NPC, 2006). It experiences double maxima of rainfall in Jul. and Sep. The soil is predominantly well-drained loamy. The climate of the area is suitable for palm oil production. Majority of the natives of Odogbolu LGA engage in farming, palm oil processing, hunting and fishing. There are also craftsmen such as carpenters, plumbers and electricians. The major crops cultivated include vegetables, maize, cassava, and oil palm.

Sampling Technique and Method of Data Collection

A purposive sampling procedure was employed to choose the respondents for the study due to the shared set of characteristics of the respondents being palm oil processors and the domination of palm oil processors in the study area. Primary data were collected through a well-structured questionnaire administered to 90 palm oil processors through one-on-one interview. The data collected include socio-economic characteristics of the processors, factors affecting palm oil processing, net returns from palm oil processing and identification of constraints to palm oil processing in the study area.

Analytical Techniques

Descriptive statistics such as frequency counts, percentages and mean values were used to describe the socio-economic characteristics of the palm oil processors and identify constraints to palm oil processing in the study area. The budgetary technique was used to determine the profitability of the enterprise as follows; net profit (π) = TR – TC, profitability index = π / TC, and rate of returns on investment (ROR) = TR / TC.

The gross margin analysis is specified as follows:

$$GM = TR - TVC;$$

where GM is gross margin, TR is total revenue, and TVC is total variable cost. Multiple regression analysis was used to determine the factors affecting the net returns of palm oil processing in the area. Implicitly, the model for the study is specified as:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, U);$$

where Y is net returns from palm oil processing (naira per processing cycle), X_1 is method of palm oil processing (traditional = 0 and modern = 1), X_2 is experience of processor (years), X_3 is marital status of processor (1 if processor is married while 0 if otherwise), X_4 is age of processor (years), X_5 is sex of processor (1 if male and 0 if otherwise), X_6 is level of education of processor (years), and X_7 is household size of the processor (number). Explicitly, $Y = \beta_o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + U$; where β_0 is constant, $\beta_1 \ldots \beta_7$ are parameters estimated, $X_1 \ldots X_7$ are independent variables, and U is error term.

RESULTS AND DISCUSSION

Socioeconomic Characteristics of the Palm Oil Processors

Table 1 shows that the majority (81.10%) of the palm oil processors were females. This implies that females are mostly engaged in palm oil processing than their male counterparts in the study area. This result confirms the findings that food processing is the responsibility of women (Azam-Ali *et al.,* 2003; Yinusa, 2015). The distribution of the respondents based on their age group indicates that majority (76.70%) of the processors were within the age group of 41-60 years with mean being 48 years. This tends to agree with the findings of Solomon (1994), Ekong (2003), Ibitoye *et al.* (2011) and Akinniran *et al.* (2013). This indicates that processors were middle-aged and still active. Also, majority (72.20%) of the processors were married, 23.30% were divorced, while only 4.50% were widowed. Furthermore, majority (67.80%) of processors had a household size of between 4 and 6 persons with mean being five (5) persons. The implication is that large family size translates to ready supply of family labour, i.e., more members of the household could provide a reliable source of labour. This result agrees with the findings of Agwu (2006), who opined that majority of the palm oil processors have a household size ranging from 5 to 9 persons. The result also shows that 51.00% of the processors had no formal education. The low level of educational attendance among processors could have negative effects on their productivity,

which may in turn have impacts on their standard of living since the output of an uneducated processor may be lowered compared to their educated counterparts. The level of experience indicates that 54.40% of the processors had between 11 and 20 years of experience in palm oil processing with mean being 9.78 years. This indicates that they possess experience that could improve processing and hence the greater tendency to be technically efficient as indicated by Karki (2004) alongside Onyenweaku and Nwosu (2005), that positive correlation subsists between experience and efficiency in business.

According to occupation of the processor, the result indicates that 50.00% of the processors were full-time palm oil processors while the remaining 50.00% were engaged in other activities such as trading (18.90%), adire making (tie and dye) (1.10%), hair dressing (8.90%), tailoring (12.20%), basket making (7.80%) and security officers (1.10%).

Table 1: Distribution of respondents by socioeconomic characteristics

Variables	Frequency	Percentage (%)
Sex		
Male	17	18.90
Female	73	81.10
Total	90	100.00
Age (years)		
31-40	18	20.00
41-50	33	36.70
51-60	36	40.00
61-70	3	3.30
Mean = 48.06 years		
Total	90	100.00
Marital status		
Married	65	72.20
Divorced	21	23.30
Widowed	4	4.50
Total	90	100.00
Household size		
1-3	5	5.60
4-6	61	67.80
> 6	24	26.60
Mean = 5 persons		
Total	90	100.00
Level of education		
No formal education	46	51.10
Primary	9	10.00
Secondary	18	20.00
Tertiary	17	18.90
Total	90	100.00
Processing experience (years)		
1-10	24	26.70
11-20	49	54.40
21-30	14	15.60
31-40	3	3.30
Mean = 9.78 years		
Total	90	100.00
Occupation		
Palm oil processing	45	50.00
Trading	17	18.90
Adire making	1	1.10
Hair dressing	8	8.90
Tailoring	11	12.20
Basket making	7	7.80
Security service	1	1.10
Total	90	100.00

Description of Processors by Palm Oil Processing Characteristics

Table 2 shows that 54.50% of the processors had gifts as the source of capital for the palm oil processing enterprise, 24.40% indicates the use of only personal savings as capital, 18.90% used loans while only 2.20% had grants from the government. This implies that the processors are able to continue palm oil processing in the study area despite little support from government. Also, majority (67.80%) of the palm oil processors used hired labour while 32.20% used both hired and family labour. Majority (81.10%) of the palm oil processors sourced palm fruits from own-farm, while 18.90% sourced palm fruits from own-farm and also purchased palm fruits from other farms. Most processors obtained fruits for processing from their own farms because this could reduce the cost of processing.

Furthermore, Table 2 shows that 78.90% of the processors used the traditional method of processing while 21.10% used modern method. This may be due to availability of locally made machines and/or adequate knowledge on how to handle such machines. About 68.90% of the processors used traditional method due to lack of credit and high cost of modern machines and this could have effect on their profitability. About 63.30, 22.20 and 14.50% of the palm oil processors used dura, pisifera and tenera varieties of palm fruits respectively in processing.

Table 2: Distribution of respondents by palm oil processing characteristics

Variables	Frequency	Percentage (%)
Source of capital		
Personal savings	22	24.40
Loan	17	18.90
Government grant	2	2.20
Gift	49	54.50
Total	90	100.00
Type of labour		
Hired labour	61	67.80
Hired and family labour	29	32.20
Total	90	100.00
Source of palm fruits used		
Own farm	73	81.10
Purchase and own farm	17	18.90
Total	90	100.00
Processing method adopted		
Traditional	71	78.90
Modern	19	21.10
Total	90	100.00
Reasons for using traditional method		
Lack of credit	16	17.80
High cost of modern machines	12	13.30
Lack of credit and high cost of modern machines	62	68.90
Total	90	100.00
Varieties of palm fruits processed		
Dura	57	63.30
Pisifera	20	22.20
Tenera	13	14.50
Total	90	100.00

Estimation of Profitability of Palm Oil Processing among Processors in the Study Area

Table 3 shows the breakdown of the total costs and returns to palm oil processors considered in this study. The palm oil processors incurred a total cost of ₦397,309.38 and earned a total revenue of ₦522,611.10. Consequently, the processors realized a net profit and gross margin of ₦125,301.72 and ₦158,404.88 per processing cycle respectively. The total fixed cost obtained was ₦33,103.16 while the total variable cost incurred in palm oil processing was ₦364,206.22.

The expenditure on palm fruits contributed the most to variable cost with a percentage of 65.50%, a reflection that the processors desire to increase the quantity of palm oil produced. This also confirms the findings of Ogbonna and Ezedinma (2005), who opined that the cost of palm fruits was the highest cost factor in palm oil processing. The profitability index gave a value of 0.32. This means that every ₦1.00 invested in the enterprise, 32 kobo (₦0.32) is realized as profit. The rate of return to investment (RORI) gave a value of 1.32 and this implies that every ₦1.00 invested in palm oil processing enterprise in the area returns a net profit of one naira thirty-two kobo (₦1.32) to the processor.

Factors Influencing Net Returns of Palm Oil Processors in the Study Area

Table 4 shows the result of the regression analysis for factors influencing net returns of palm oil processors in the study area. Out of the three functional forms fitted in the regression analysis, the linear function was selected as the lead equation due to the large number of significant variables, value of R^2, value of adjusted R^2, and F-value. The result indicated the R-square value of 0.94, which implies that 94.00% of the total variations in net profit were influenced by the explanatory variables included in the model. Three variables {processing method ($p < 0.10$), education status ($p < 0.01$) and household size ($p < 0.05$)} had significant positive influence on the net returns of palm oil processors while experience and marital status negatively affected the net returns of palm oil processors in the study area at $p < 0.01$ respectively.

The coefficient of processing method used was positive at 10.00% level of significance, this means that an increased use of modern processing method by the processors will lead to a corresponding increase in the net returns from palm oil processing by ₦80,804.94. The findings from this study are not far from *a priori* and logical expectations. Efforts to raise processors' standard of living and processing of palm oil require the introduction of improved/modern farm equipment and technologies as well as increased availability and utilization of such technologies. Modern processing method means that oil extraction will be more efficient unlike with manual/traditional processing method which is slower and with lesser output. The coefficient of level of education was positive at 1.00% level of significance, and this means that an increase in level of education of the processors will lead to a corresponding increase in the net returns from palm oil processing by ₦72,660.92. A literate person is expected to inculcate education in the ways of doing things. The coefficient of household size was positive at 5.00% level of significance, and this means that a larger household size has a positive relationship with profit in relation to a smaller household, i.e., a larger household size has a corresponding increase in the net returns from palm oil processing by ₦11,510.30. This indicates that members of the household could be a source of cheap labour in the palm oil processing activities.

Table 3: Cost and return analysis of palm oil processing in Odogbolu Local Government Area (LGA)

Variables	Amount per month (₦)	Total cost (%)
Total revenue	522, 611.10	
Variable cost items		
Labour	55, 098.00	13.90
Transportation	49, 028.22	12.30
Value of palm fruit processed	260, 080.00	65.50
Total variable cost (TVC)	364, 206.22	91.70
Fixed cost items (depreciated)		
Storage drum	5, 429.44	1.40
Steam cooker	10, 568.89	2.60
Hand press	7, 875.00	2.00
Sieving material	3, 467.83	0.90
Clarifier	5, 762.00	1.40
Total fixed cost (TFC)	33, 103.16	8.30
Total cost (TC)	397, 309.38	100.00
Gross margin (TR – TVC)	158, 404.88	
Net profit (π = TR – TC)	125, 301.72	
Profitability index (π / TC)	0.32	
ROR (TR / TC)	1.32	

ROR - rate of returns on investment

Table 4: Factors influencing net returns of palm oil processors in the study area

Functional form	Linear	Semi-log	Double-log
β_0	– 1.064 (– 0.121)	– 289, 087.440 (– 1.935)	– 7.913 (– 3.474)
β_1 processing method	80, 804.940* (1.819)	63, 061.312 (1.492)	1.314 (2.038)
β_2 experience	– 6, 200.973*** (– 3.572)	– 65, 910.201*** (– 4.783)	– 0.508** (– 2.418)
β_3 marital status	– 53, 772.397*** (– 4.719)	– 65, 278.827*** (– 6.486)	– 0.815*** (– 5.311)
β_4 age	1, 147.641 (0.976)	130, 492.515*** (2.857)	1.605** (2.304)
β_5 sex	– 13, 325.887 (– 0.439)	– 14, 567.694 (– 0.601)	– 0.303 (– 0.086)
β_6 education	72, 660.918*** (8.878)	70, 263.658*** (8.419)	0.868*** (6.818)
β_7 household size	11, 510.300** (2.445)	52, 160.927 (2.037)	0.457 (1.172)
R^2	0.941	0.940	0.853
Adjusted R^2	0.930	0.930	0.827
F-value	86.830	89.213	32.855
Standard error	37, 368.035	38, 581.457	0.5883

***, **, * respectively represent significant variables at 1, 5, and 10% levels of significance. Figures in parenthesis are t-values.

The coefficient of experience of the processor was negative at 1.00% level of significance and this contradicts the *a priori* expectation that the higher the years of experience of the processors, the higher the chances of having more technical know-how which could be employed in palm oil processing. The decrease in net returns from palm oil processing by ₦6,200.97 may be due to the conservative nature of the processors despite the years of experience in palm oil processing. The negative coefficient of marital status in this study implies that an increase in number of married processors will lead to a decrease in net returns from palm oil processing by ₦53,772.40. This is in support with *a priori* expectations that married person spend more on family needs as well as reduce the time in production process in attending to family issues than otherwise and this could decrease the profit from palm oil processing.

Description of Palm Oil Processors by Constraints Faced in Palm Oil Processing

Table 5 shows various constraints associated with palm oil processing in the study area. Most (80.00%) of the processors had problem of transportation, 42.20% had inadequate finance, 16.70% were faced with high cost of processing inputs while only 5.60% of the processors find it hard to secure land/processing shed for their palm oil processing activities. Inadequate finance by processors to acquire processing inputs (such as procuring or sourcing large quantity of fresh fruits, traditional mills with manual screw press); purchase of modern equipment/machines (which in most cases are very expensive and costly to maintain), may lead to decrease in processing yields. Transportation challenges also pose a significant threat to the palm oil processors due to bad roads. Transporting fruits from farms to processing sheds and palm oil to market is very difficult, thus increasing the cost of processing. With the constraints identified, it implies that palm oil processors in the study area were challenged, and this could lead to reduced profit/income, poor quality and quantity of palm oil produced.

Table 5: Distribution of palm oil processors by constraints faced in palm oil processing

Variables*	Frequency	Percentage (%)
Inadequate finance	38	42.20
Transportation	72	80.00
High cost of processing inputs	15	16.70
Land acquisition/processing sheds	5	5.60

*Multiple responses

CONCLUSION AND RECOMMENDATION

A net return of ₦125,301.72 and a gross margin of ₦158,404.89 per processing cycle were obtained from the enterprise. Processing experience, processing method, marital status, level of education and household size were factors influencing net returns of palm oil processors in the study area. However, processors in the study area were faced with constraints in palm oil processing and these include transportation due to bad roads, inadequate finance, high cost of processing inputs, and land acquisition or processing sheds. The study recommends that processors should be encouraged to change their conservative nature and be educated on improved/modern methods of processing. Government should renovate roads to and from the farm to processing sheds and markets. Adequate and timely provision of funds by government through agricultural loans should be addressed in order to encourage processors which in turn could lead to increase yields from palm oil.

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