



ECONOMIC ANALYSIS OF PALM OIL PROCESSING IN AYEDAADE LOCAL GOVERNMENT AREA, OSUN STATE, NIGERIA

OGUNNAIKE, M.G.*, OSINOWO, O.H., IDOWU, A.O.
AND OLASUPO, A.I.

Department of Agricultural Economics and Farm Management,
Olabisi Onabanjo University, Ago Iwoye, Nigeria

ABSTRACT

Palm oil appears as one of the most promising productive alternatives for the Nigerian agricultural sector and long-term industrialization. This research study examined the economic analysis of palm oil production in Osun State. A multi-stage sampling technique was used to select 240 processors which were sampled using structured questionnaires. Data were analyzed using descriptive statistics, budgetary technique as well as regression analysis. Results from the study revealed that majority of the processors were females (67.5%) and married (57.5%) with an average age of 52 years and household size of 5 persons. 89.9% of the respondents had at least a primary education with an average of 11 years processing experiences. The descriptive results further revealed that majority of the respondent make use of digestion (95.8%) during production process as well as oil extraction (89.2%), and Threshing (86.7%). The budgetary analysis results showed a Gross Margin of ₦194,287.35. The Net Return (NR) of the palm oil processors was ₦109,804.60. In addition, Age, farm size and amount of credit used were significant variables that influence the quantity of palm oil produced. The study concluded that palm oil processing is profitable and therefore recommends among others that Agricultural extension institutions in collaboration with community leaders should aid in the provision of services to intensify and impact technical knowledge on palm oil processing, especially to the youths and young adults.

Keywords: Economic Analysis, Palm oil, Processing, Profitability

***Correspondence:** oluwagbemisolami@gmail.com, 08137554616

INTRODUCTION

Palm oil plays an important role in the national economy because palm oil plantation creates job opportunities, especially in rural areas, provides raw materials for the industrial sector, and contributes the foreign exchange earnings [1]. The oil palm ranks among the most important oil producing crops in sub-Saharan Africa, and is one of the most important sources of edible oil. It produces one of the major oils and fats traded on the continent and the world today [2].

Palm oil is processed from the fresh fruits using various methods, and these techniques differ in the level of mechanization and interconnecting material transfer mechanisms. The scale of operations also differs at the level of processing and this affects the quality of the final product. The operations can be grouped into four, namely traditional methods, small-scale mechanical units, medium-scale and large industrial mills. The small-scale mills generally process up to two tonnes fresh fruit bunch (FFB) per hour while the large-scale mills process from 10 to 60 tonnes FFB per hour [3].

The principal product of the oil palm crop (*Elaeis guineensis*) is the palm fruit which is processed into three main commercial products which are palm oil, palm kernel oil (PKO) and palm kernel cake (PKC). However, the oil palm tree is highly versatile in its uses, ranging from domestic cooking to industrial manufacturing. For instance, the leaves are used for

making brooms and roofing materials, while the thicker leaf stalks are used for walls of village huts. The bark of the palm frond, on the other hand, is peeled and woven into baskets, while the main tree trunk can be split like sawn timbers and used as supporting frames in buildings [4]. Palm oil is obtained from FFBs while the residue from the processed fruit is used as fuel and fertilizer. Palm kernel oil is extracted from the nut inside the palm fruit, leaving the palm kernel cake as residue. Palm kernel oil is used as vegetable oil for cooking as well as in soap making. PKC, on the other hand, is used for livestock feed. Palm kernel shells are also a useful energy source as well as industrial raw materials in making mosquito coils [5].

Palm oil processing begins as soon as the oil palm fruits begin to ripen after harvest since delay in processing at this stage can lead to rotting of the fruit, resulting in low output of palm oil. Necessary care is taken in handling the fruit to avoid excessive bruising which can result in poor quality palm oil output. Therefore, damage done to fruits in the processes of harvesting, transportation and handling of bunches are usually minimized to an extent by processing the fruits as early as possible after harvest, often within 48 hours. The traditional method involves employing manual/human effort in the striping, sterilization, milling (digestion), separation and clarification processes. This method is labourious and yields a low percentage of palm oil relative to the other methods, thereby adversely affecting the income of processors. The traditional method is still used in many parts of Nigeria, and it is estimated that about 25,000 tonnes of palm oil is lost annually due to the inefficiency of

this method which is employed by majority of the small-scale processors in the country who account for 70% of the palm oil produced [3]. Switching from the traditional method to the use of simple processing equipment will reduce labour drudgery, increase marketable surplus and profit [6]. In this view, the study therefore described the socioeconomic characteristics of palm oil processors, assessed their profitability as well as factors influencing the quantity of palm oil processed in the study area.

MATERIALS AND METHODS

Study area

The study was carried out in Ayedaade Local Government Area of Osun State, Nigeria. Its headquarters are in the town of Gbongan in the north of the area at 7°28'00"N 4°21'00"E. It has an area of 1,113 km² and a population of 150,392 [7]. Ayedaade local government falls under the Irewole federal constituency. There are two distinct climatic seasons which are the rainy season which exists from March to October and the dry season from November to early March. Annual rainfall average is 1570 mm while temperature ranges from 25 to 27.5°C. Osun state is agrarian state with large production of palm oil which is associated with soil area that is deep and well drained sandy loam. Agriculture is the traditional occupation of the people of Osun State [8].

Sampling technique and sample size

The study population consists of the palm oil processors in Ayedaade Local Government Area of Osun State. A multistage sampling procedure was used to for the study. The first stage involved random selection of ten (10) villages Ogbagba, Wakajaiye, Benbe, Orile Owu, Abinu, Adam, Afonle, Alagbede, Alakan, and Anjorin, from Ayedaade Local government where palm oil processing activities have been established. In the second stage twelve (24) processors were randomly selected in each village making two hundred and forty (240) palm oil processors from whom relevant information were obtained.

Methods of data analysis

Both descriptive and inferential statistics were used to analysis the data. Descriptive statistics such as frequency tables was used to describe the socio-economic characteristics of the processors and the different production techniques employed by palm oil farmers in the study area. The Budgetary analysis examined the cost and return structure of palm oil processing and the estimated profit among the selected processors for the study. The total revenue (TR) from the sales of palm oil, palm kernels, palm oil mill effluents (POME) and other minor products of processing and all costs incurred in production were itemized in an enterprise budget and the gross margin and net income determined. Gross margin (GM) was determined by subtracting the total cost of goods sold

(total variable cost, TVC) from the total revenue earned following [9]. Net income (NI) was obtained by subtracting the total cost of fixed inputs (total fixed cost, TFC) from the GM.

$$GM = TR - TVC \quad \dots \dots \dots (1)$$

Where GM =Gross margin

TR =Total Revenue.

TVC = Total Variable Cost. The variable cost included the cost of FFBs, firewood, labour wages (per man-day), fuel (in liters) and transportation

TFC = Total Fixed Cost. The fixed cost included the costs of machines, drums, shovels, cutlasses, and head pans

If Gross Margin is positive, this shows that the production of palm oil business is profitable in the study area.

Rate of Return on Investment (RRI)

$$RRI = \frac{NR}{TC} \times \frac{100}{1} \quad \dots \dots \dots (2)$$

Where: NR = Net Return and TC = Total Cost

Profitability Index (PI)

$$PI = \frac{NR}{TR} \quad \dots \dots \dots (3)$$

Where: NR = Net Return and TR = Total Revenue

Operating Expense Ratio (OER)

$$OER = \frac{TVC}{TR} \quad \dots \dots \dots (4)$$

Where: TVC - Total Variable Cost and TC = Total Revenue

Multiple regression analysis was used to determine the factors affecting the quantity of palm oil processed. The implicit form of the regression model is

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, u)$$

Where

Y = the quantity of palm oil processed (Litres)

X₁ = quantity of fresh fruit bunches (Kg)

X₂ = variety or type of fruits (0= Local, 1= Improved)

X₃ = Method of processing used (0= traditional, 1= Improved)

X₄ = Processing period (Number of days)

X_5 = Farm Size (ha)

X_6 = Access to extension contact (1=Yes, 0 otherwise)

X_7 = Amount of credit used (₦)

X_8 = Membership of cooperative (Member; 1=yes, 0=otherwise)

X_9 = Age (years)

X_{10} = Level of education (years)

X_{11} = Household size (Number of persons)

X_{12} = Palm oil processing in (years)

U = Error term

RESULTS AND DISCUSSION

Socio-economic characteristics of palm oil processors

Table 1 shows that about half (50.0%) of the respondents were between 51-60 years of age. This implies that palm oil processors were predominantly economically active. Also, palm oil processing in Osun State is a female-dominated activity with nearly

67.5% being female. These results agree with those obtained by Idiaye *et al.* [10]; Ayinde, *et al.* [11] and Aniedu *et al.* [12] who observed that women are the major stakeholders in palm oil processing in Nigeria. Furthermore, most of the processors (71.3%) were married with a major household size of 6 persons. While the relatively small household sizes might bode well for household welfare, they might also imply that there is less availability of family labour for processors in the study area to call upon, thus increasing their reliance on hired labour with the attendant increased cost of production since palm oil processing is highly labour intensive. These findings are like [13, 14] who opined that the larger the household the more availability of labour. However, it can be inferred that the educational attainment is low among processors as 20% of them had no formal education. As indicated by Ogunnaike *et al.* [14] education plays a significant role in skill acquisition and technology transfer. It enhances technology adoption and the ability of farmers to plan and take risks. Farmers with higher levels of education are likely to be more efficient in the use of inputs than their counterparts with little or no education.

Table 1: Socio-economic characteristics of cassava producers

Variable	Frequency	Percentage
Age (Years)		
10-30	8	3.3
30-40	22	9.2
41-50	64	26.7
51-60	120	50.0
61 Above	26	10.8
Mean	51.8	
Gender		
Male	78	32.5
Female	162	67.5
Educational background		
Non-formal	48	20.0
Primary education	62	25.8
Secondary education	74	30.8
B.Sc/HND	56	23.3
Marital status		
Single	24	10.0
Married	138	57.5
Widow/Widower	32	13.4
Divorced/Separated	46	19.1
Years of experience		
1-10	38	15.8
11-20	116	48.3
21-30	32	13.3
31-40	30	12.5
41 and above	24	10.0

Mean	11	
Access to extension agent		
Yes	130	54.2
No	110	45.8
Household (Number of Persons)		
1-4	92	38.3
5-8	144	60.0
9-12	4	1.7
Mean	5	
Members of cooperative		
Yes	132	55.0
No	108	45.0

Source: Field Survey, 2023

Production techniques employed by produce

Results on Table 2 shows the production techniques employed by the palm oil processors in the study area. The results revealed that majority of the respondent make digestion (95.8%) during production process and also use of oil extractor (89.2%), and Threshing (86.7%). The higher percentage of users could be attributed to the fact that the techniques introduced to

the processors are the ones that will help to reduce drudgery and stress in operations since the operations are labour intensive. This finding is similar to Adeniyi *et al.* [6] who reported that due to the labour requirement operations like digesting, pressing and cracking of kernel several processing techniques was introduced to the processors to help in operation.

Table 2: Different production techniques employed by produce

Operations	Adopted		Non-adopted	
	Frequency	%	Frequency	%
Threshing	208	86.7	32	13.3
Sterilization	180	75.0	60	25.0
Digester	230	95.8	10	4.2
Oil extractor	214	89.2	26	10.8
Clarification	196	81.7	44	18.3

Source: Field Survey, 2023

Table 3 presents the cost, returns and profitability of processing palm fruits in Ayedaade Local Government area of Osun State. The result showed that the estimated Total Revenue (TR) of the processors was ₦194,287.35 and Gross Margin (GM) of ₦109,804.60. The Net Return (NR) of the palm oil processors was ₦74,320.09. Overall, palm oil processing was found to be profitable The Profitable Index (PI) of the processors from the computation was 0.38 indicating that about 38% of the Total Revenue (TR) generated from palm fruits processing constitutes the net income of the processors. Hence, this indicates that palm fruits processing is a highly

profitable farm enterprise in the study area. This is in line with the result of Yinusa [15]. The Rate of Return on Investment (RRI) of the palm fruits processing was 61.95% which indicates that an average processor in the study area earns 61.95% profit on every one naira (₦1.00) invested in palm fruits processing. The Rate of Return on Variable Cost (RRVC) of the processors was 87.97% which implies that 87% profit was realized from every naira (₦1.00) incurred as variable cost in palm fruits processing. The return per naira invested was calculated to be 1.62 and this shows that for every ₦1 naira invested in palm oil processing in the study area about ₦1.62 was returned.

Table 3: Cost, returns and profitability of palm oil processing

Items	Amount (₦)
Revenue	194,287.35
Total Variable cost	84,482.75
Total Fixed cost	35,484.51
Total cost (TC)	119,967.26
Gross Margin (GM)	109,804.60
Net Return (NR)	74,320.09
Profitability Index (PI)	0.38
Rate of Return on Investment (RRI)	61.95%

Rate of Return on Variable Cost (RRVC)	87%
Operating Expenses Ratio (OER)	0.43
Benefit Cost Ratio (BCR)	1.62

Source: Field Survey, 2023

Determinants of factors affecting the quantity processed of palm oil in the study area

The linear regression result revealed the variable that affect the quantity processing of palm oil fruit in the study area included farm size (1%) and amount of the credit used by the respondent (1%). The coefficient of determination (R square) is 0.644, implying that the included explanatory variables accounted for about 64.4% of the variation in palm oil processing. The overall significance of the model is measured by using F-statistic. It has a value of 16.10 which was significant at one percent level. From the Table, result revealed Age was statistically significant at 10% with a negative relationship with the quantity of palm oil

produced, that is, the older the processor, the lesser the quantity of palm oil processed. Younger processors are more receptive to the adoption of innovation and new practices unlike older ones; also youths engage in more productive hours. This result is in line with the findings of Igbaraoola and Oladunni, [16] who find out age was statistically significant at 5% with a negative relationship with the gross product in Ejigbo Local Government. Conversely, farm size and amount of credit used were found to be positively significant with the quantity of palm oil produced which implied that the larger the farm size and amount of credit used by the processor the larger the quantity of palm oil produced.

Table 4: Distribution of factors affecting the quantity processed of palm oil in the study area

Variable	Coefficient	T-value
Constant	0.584	1.183
Quantity of fresh fruit bunches	0.125	1.141
Variety or type of fruits	0.024	0.368
Method of processing used	-0.048	-0.654
Processing period in days	0.001	0.018
Farm Size	0.796***	6.977
Access to extension contact	-0.041	-0.649
Amount of credit used	0.248***	3.887
Membership of cooperative	-0.071	-1.061
Age	-0.142*	-1.984
Level of education	-0.062	-0.740
Household size	-0.082	-1.257
Palm oil processing	-0.008	-0.120
R	0.802	
R Square	0.644	
Adjusted R Square	0.604	
F-value	16.10***	

***Sig at 1%

Source: Field Survey, 2023

CONCLUSION

This study revealed that palm oil processing is a profitable venture while factors such as farm size, age and amount of credit used were significant variables that influences the quantity of palm oil produced in the study area. Based on the findings from the study the following recommendation were made:

1. Agricultural extension institutions in collaboration with community leaders should aid in the provision of services to intensify, to impact technical and economic knowledge on palm oil processing, especially to the youths and young adults.
2. Efforts should be geared towards increase in amount of credit used as this will help to expand the

palm oil business thereby increasing the quantity of palm oil produced. Agricultural institutions should provide access to loans with little or no interest rate to processors.

3. Training and efforts should be made by extension agents on the rehabilitation and maintenance of oil palm plantations as well as land use act in the state as this will help to increase the quantity of palm oil produced.

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