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Research Paper

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Economic Analysis of Oil Palm Processing in Ilesa East Local Government Area of Osun State, Nigeria

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Abstract:

Palm oil production in Nigeria has suffered a setback due to a very low development of the sub-sector of agriculture making the country losing her leading position in palm oil production in the world. Therefore this study investigated the economic analysis of oil palm processing in Ilesa East Local Government Area of the State of Osun. The objectives of the study were to determine the factors affecting palm oil production and estimate the costs and returns of oil palm processing in the study area. Primary data were collected from 120 oil palm farmers using multiple stage random sampling procedure in the Local Government Area. Data were analysed using descriptive statistics, budgetary analysis and Cobb Douglas multiple regression analysis.

The descriptive statistics revealed that most of the farmers lack formal education. The mean age was 53 years and the industry was dominated by men. The budgetary analysis showed that oil palm processing was a profitable enterprise. The average Gross Margin was ₦77,613.30 and Net Profit of ₦39,146.64 in a production period of 4-6 months. The Benefit-Cost Ratio and Rate of Returns on Investment are 1.26 and 25.8% respectively which showed that the enterprise was profitable in the study area and worth venturing into to boost production of palm oil.

The regression results revealed that the quantity of fresh fruit bunches, the variety of oil palm fruits, the method adopted in processing, processing period, and the level of education impacted significantly on the quantity and quality of red oil produced. This directly affected the income of the sampled farmers. The majority of various activities involved in oil palm extraction are still traditional. Policy recommendations include sensitization and enlightenment programme to encourage people to venture into oil palm industry, provision of improved variety of oil palm seedlings, modern equipment and processing machines at subsidized rate.

Keywords:

cobbdouglas regression, cost and returns, oil palm processing, Osun state

Introduction:

Oil palm (Elaeisguineensis) is one of the most important economic crops in Nigeria. According to World Rain-forest Movement (2001), oil palm is indigenous to the Nigerian coastal plain which has migrated in-land as a staple crop. The crops' cultivation serves as a means of livelihood for many rural families, indeed it is in the farming culture of millions of people in the country. The often referral of oil palm as a crop of multiple value underscores its economic importance. All its essential components namely; the fronds, the trunk and the roots are used for several purposes ranging from palm oil; palm kernel oil, palm wine, broom, and palm kernel cake (Daramola et. al., 2002).

Laying credence to the economic value of oil palm, the International Potash Institute (1957) identified the principal products of oil palm to be the palm fruit, which is processed to obtain three commercial products: namely palm oil, palm kernel oil, and palm kernel cake. Iwena (2002) posited that palm oil and palm kernel are important products of oil palm produced for commercial purposes.

Adelekanet.al. (2002), described palm oil as the principal source of much of the edible oil consumed in Nigeria and the rest of the West African region. Kolawole (1997) explained that extracted oil can be used in the manufacture of soaps, margarine and candles. Other uses of palm oil include its use in the manufacture of baking fats, tin plate and sheet steel materials (Adeniji et. al. 1997).

Oil palm locally called *Nkwu* (Igbo), *Itacenkuara* (Hausa) and *Ope* (Yoruba) in Nigeria is native to West African humid tropics, the Congo basin and central Africa, growing wild in secondary forest (Ugochukwu et.al 1999, Akinyosoye, 1976). Researchers have established that oil palm trees do better on plantation farms when planted on a deep, slightly acidic loamy soil with pH 5 – 6; under a climatic humid tropical with 250cm rainfall well distributed during the year; and long hours of light. It is mainly propagated by seed through pre-nursery and field nursery practices (Ugochukwu et.al 1999). It is the most important source of vegetable oil of all oil-bearing plants. It has overtaken coconuts in the export field.

In recent decades, the domestic consumption of palm oil in West Africa has increased more rapidly than its production. After centuries as the leading producing and exporting region, West Africa has now become a net importer of palm oil. Between 1961 and 1965 world oil palm production was 1.5 million tons, with Nigeria accounting for 43%. However, since then, oil palm production in Nigeria has virtually been stagnated.

But today, world oil palm production amounts to 14.4 million tons, with Nigeria which happens to be one of the largest producers in West Africa, accounting for only 7%.

Kei et. al. (1997) compared the characteristics of the Oil palm sectors in Malaysia and Nigeria and found out that Malaysia's success is built on plantation management together with processing in large modern mills. The plantation mode of production is characterized by large scale monoculture under a unified management.

In Nigeria by contrast, 80% of production comes from dispersed small holders who harvest semi wild plants and use manual processing techniques. Several million small holders are spread over an estimated area of 1.65 million hectares in the southern part of Nigeria. There are other environmental and coordination problems such as inadequate use of modern inputs and low extension service; monopoly of marketing board; low provisions of market information, low standards and quality control (Udom,1986 and Udom, 2002).Since independence in 1960, Nigeria's agricultural sector has experienced slow output growth that has not kept pace with population increases. This has resulted in declining agricultural exports and domestic food supplies and a growing reliance on imported food.

Nigeria has been particularly fortunate in having vast oil reserves but it has also been plagued by economic chaos and political instability over the past three decades. The decline in the agricultural sector can be partly explained by drought, serious pest and diseases infestations (Hyman, 1990). There are other prominent reasons for its decline, including the neglect of the agricultural sector after the crude oil boom, and unfavorable government policies which greatly affected the technology generation capacity and technology environment, farm level production and marketing environment and production and coordination machinations between different stages of the oil palm sector in Nigeria (Hyman, 1990). Therefore there is need to carry out research on economic analysis oil palm processing in order to gain more knowledge on the profitability and factors affecting palm oil production so as to formulate appropriate policies that will favour red oil production, improve farm production and farmers involved and thereby increase food production in the country.
Hence the research objectives are to:

(i) Describe the socio-economic characteristics of the oil palm farmers
(ii) Determine the factors affecting palm oil production and
(iii) Estimate the costs and returns of oil palm processing in the study area

Materials and Methods

Data Source and Collection

For this study, primary data were obtained by means of structured open and close ended questionnaire. The information sought was on the socio-economic characteristics of the farmers viz: age, sex, marital encountered by the farmers.
The total number of questionnaires administered to oil palm farmers scattered all over the local government was 120. These questionnaires were administered to farmers in Iyemogun, Ilerin, Ido-ijesa, Ilo-Olomo, Imelu, Imo, Irojo and Omiru villages due to the concentration of oil palm farmers in these villages.

Sampling procedure

The sampling procedure involved multistage random sampling of which the first stage was purposive selection of Ilesa East local government from 30 local Government Areas of the State of Osun because of high level of palm oil production in the area.
The second stage involved the random selection of 8 villages from the local government and the third stage was the random selection of 15 oil processing farmers proportionate to the size of each selected village making 120 oil processing farmers as a sample size.

Analytical Technique

To analyse the objectives of this study, the following analytical techniques were used.

Descriptive statistics

Frequency tables were used to analyse the socio-economic characteristics of the farmers such as age, sex, educational level, and some other useful information.

Cost and Returns Analysis

In order to determine the Profitability of small scale oil palm fruit processing, three different methods of determining profitability were used.

a. **Gross margin analysis**

GM=TR-TVC
Where Profit = GM-TFC
GM =Gross margin
TR =Total Revenue (N)
TVC = Total Variable Cost**.** The variable cost include: cost of maintenance, transportation, firewood, and labour cost
TFC = Total Fixed Cost. The Fixed Cost items include cost of drums, bucket, basket, jerry can, diesel engine, and mechanical digester.
If the Gross Margin is positive, then it shows that the processing business is profitable but if it has negative value, it implies that the business is not profitable and not worth venturing into.

b. **Rate of Return on Investment**

$$RRR = \frac{NR \times 100}{ATC}$$

Where
RRI = Rate of Return on Investment
NR = Net Return or Net income
ATC = Average Total Cost
The rate of return on investment reveals the profit made by the oil palm processing farmer on every unit of Naira invested in the processing business.

c. **Benefit Cost Ratio**

$$B/C = \frac{\text{Total Revenue}}{\text{Total Cost}}$$

Where Benefit Cost Ratio (BCR) is used in determining the viability and profitability of the venture, if the BCR is less than 1, the business is not worth venturing into, but if the BCR is equal to or greater than 1, the business is profitable and is also worth venturing into.

Multiple Regression Analysis

Regression analysis was used to determine the degree to which the dependent variable (quantity of palm oil produced) was explained by the independent variables, the implicit form of the regression model is:
$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, u)$
Where
Y = the quantity of palm oil produced per production period per season
X_1 = Quantity of Fresh Fruit Bunches
X_2 = Variety/Type of palm fruits (Local = 0, improved = 1)
X_3 = Method of processing used (traditional =0, improved method = 1)
X_4 = Processing Period in days
X_5 = Farm Size in hectares
X_6 = Household size in number

X_7 = Level of education in years.
U = Error term
Cost of palm fruits and amount of capital were not part of the variables because majority of the farmers in the study area did not buy palm fruits and could not access loan but used fund from other arable crops. These variables would constitute constants in the regression model.
The following functional forms were fitted: Linear, Semi-log and Cobb Douglas.
The functional forms are written as:

a .**Linear**
$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + X_7 + e$

b. **Semi log**
$Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + b_7 \ln X_7 + e$

c. **Cobb Douglas**
$\ln Y = b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_6 + b_7 \ln X_7 + e$

Choice of Lead equation
The lead equation is the functional form of the regression that fits the data best and it is chosen based on some criteria:

1. The coefficients of the functional forms are checked for correct signs and significance of the magnitude of the coefficients
2. Examination of the magnitude and pattern of the redidual errors through the best standard errors obtained. The functional form with minimum standard error is chosen.
3. Examination of the coefficient of multiple determination R^2 for the proportion of the variatiation in Y jointly explained by variations in the explanatory variables

(X_1, X_2,.....X_7), the t-statistics and F-statistics for significance of the parameter and the predictability of the dependent variable through the independent variables.

Data Limitations

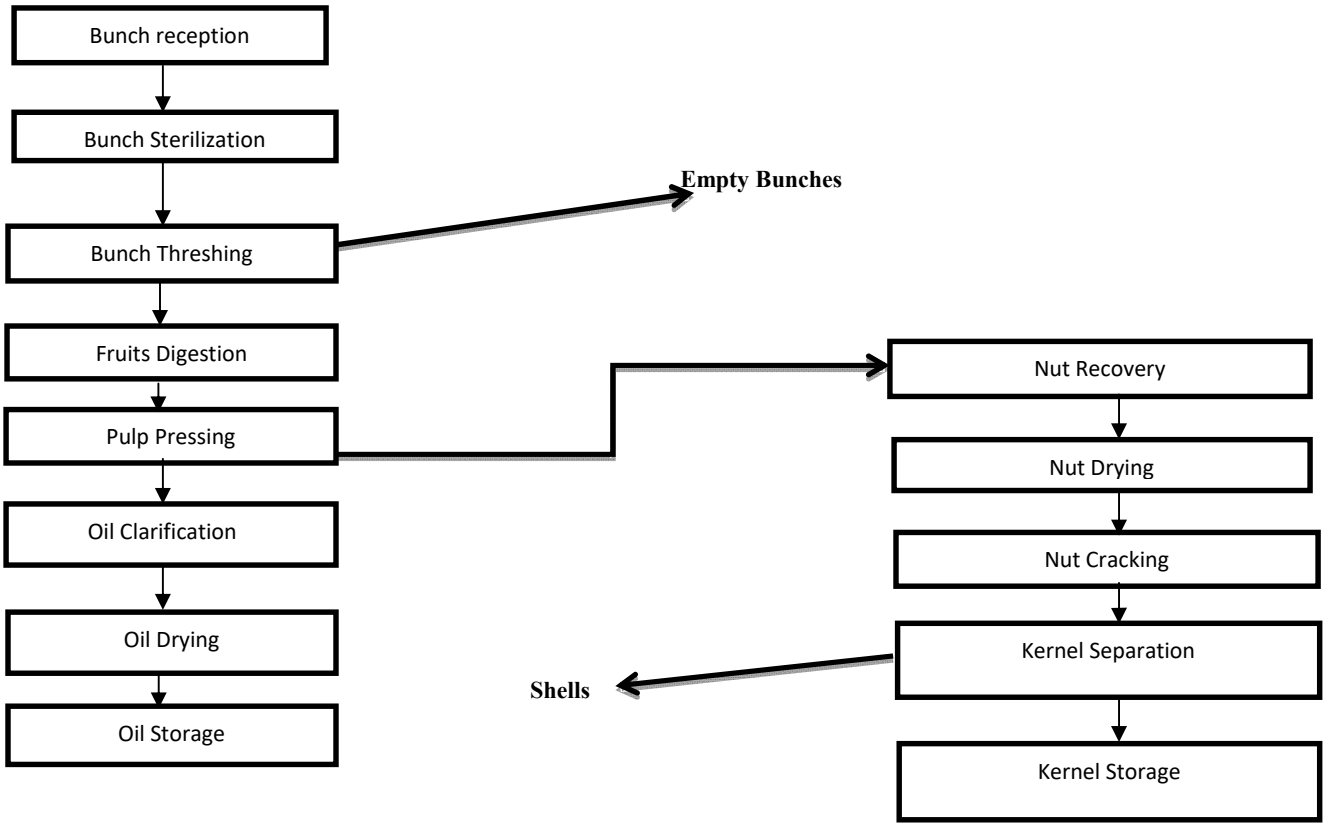
Most of the farmers were not formally educated and therefore do not keep records, so they basically depend on memory recall for the supply of answers. Besides, the questions had to be translated to Yoruba Language in order to collect the data. In some cases, personal observations and interview were carried out including calculations to arrive at the cost of production. Notwithstanding, the above limitations, the findings of this study are useful for accessing the profitability of small scale oil palm processing in the study area.

Conceptual framework and Literature review:

The primary unit of production of the palm oil industry is the farm where the oil palm tree is cultivated to produce palm fruits. There are also wild groves of oil palm. The farm units are of different sizes and may be classified as small, medium, and large-scale estates.
The wild groves, as the name implies, grow untended in the forest. They are found in clusters and are mainly the result of natural seed dispersal. Dura, the main variety found in the groves, for decades has been the source of palm oil - well before modern methods of oil palm cultivation were introduced to Africa in the second quarter of the 20th century.(Atie, 2009)
The other varieties are Pisifera and Tenera, which is a hybrid variety obtained by crossing Dura and Pisifera. The Dura has a large nut with a thick shell and thin mesocarp. The Pisifera is a small fruit with no shell. By crossing the Dura with Pisifera a fruit is obtained with a thick mesocarp containing much more oil and fat (chemically saturated oil) than either of its parents. The Tenera nut is small and is easily shelled to release the palm kernel. The Tenera palm kernel is smaller than the Dura kernel although the Tenera bunch is much larger than Dura. In all, the Tenera is a much better variety for industrial and economic purposes.((Atie, 2009)

Figure 1

The palm oil extraction process flow diagram



Adapted and modified from FAO 2002

Result and Discussions

Distribution of the farmers by source of tree or variety

There are three varieties of oil palm: dura, pisifera and tenera. The hybrid of dura and pisifera is tenera. Table 1 revealed that most farmers own their farm (17.5%), 5.8% rented the farm land, and 11.7% of them received the farms as a gift to cultivatetenera variety (improved variety). It takes tenera 3 to 4 years to reach maturity. The old varieties (Dura) which were inherited oil palm plantations were more than 65%.

Technology used

Table1 shows that 74% of the farmers use improved method of oil palm processing using diesel engine and locally made digester as mechanical method of oil processing to improve the quantity of oil they get. 26% of them were still using old or so-called traditional ways of processing dueto lack of fund to buy diesel engine and a digester made by a welder. The traditional method involved using of mortar and pestle to pound the boiled palm fruits instead of the digesters.

Palm Oil Extraction Practices

The various activities involved in palm oil extraction vis-a-vis their corresponding practices as carried out by respondents are shown in Table 2. The results revealed that majority of the oil palm extraction processes were predominantly carried out using traditional practices, except in the case of digestion activities where mechanical digester were used with the help of the powered diesel engine (Lister). It requires the operator once in a while based on the need. 75.8% of the respondents use digesters while 24.2% of them still used traditional way (unhygienic) instead of powered digester.79.2% of the farmers store their red oil in rubber containers or called kegs majorly of 25 litres capacity while 20.8% of them use drums. About two-third (66.7%) of the respondents indicated that they produced oil for commercial purpose only while the remaining 33.3% produced oil for consumption.

Therefore, modern equipment for oil palm processing should be employed for farmers to improve the quality and quantity of red oil produced in the country to meet up with the local consumption and export.

Cost and Returns Analysis:

The production cost analysis comprised the total cost which is made up of fixed cost and variable cost items. The revenue generated is made up of the value of palm oil, palm kernel and palm oil residue (sludge) production for 6months of the year. The production period is 4-6months for most processors. At this period, palm fruit is available in commercial quantities according to the processors. The quantity of these inputs used by each farmer on weekly basis was collected through the questionnaire administered. Through this, it was possible to calculate the quantities and amount expended on the inputs and other variable cost per production period (effectively 5months) on a spread sheet Microsoft excel. It is from these figures that the average amount expended on each input by the farmers' was computed and provided in table 2. The fixed cost, variable cost and revenue items are presented.

Since Benefit/Cost ratio is greater than 1, it shows that the oil palm fruit processing is profitable and worth venturing into in the study area. Table 5 reveals that Benefit/Cost is high (1.26). This shows an increase in returns. It indicates that the oil palm processing enterprise is profitable (Adesiyan et al, 2007: Olagunju, 2008). There is the possibility that if farmers are supported with improved technology, this ratio may increase.

The gross ratio (Total Cost/Total Revenue) is 0.79. This implies that from every ₦1.00 return to the oil palm industry, 79k is being spent by the farmer.

Expense Structure Ratio (Fixed Cost/Total Cost) is 0.25 which implies that about 25.4% of the total cost of production is made up of fixed cost components. This makes the business worthwhile to invest. Rate of Return was 25.8% which indicates that on every ₦1.00 invested on oil palm fruits processing, ₦0.25 will be realized as the profit.

The variable cost item with the highest cost is the cost of maintenance (labour cost for weeding and pruning of palm trees) which has the average cost of ₦ 56,758 per production period and this accounts for 66.55% of the total variable cost. This is presented in table 3. The least variable cost item was found to be other expenses which include the cost of firewood, transportation and fetching of water which is ₦10,388 accounted for 9.21% of the total variable cost.

Table 5 shows the farmers generated revenue from three items; palm oil, palm kernel and sludge. The major revenue item was palm oil and it has the highest share of 96.6% of the total revenue generated, palm kernel generates 1.8% while the sludge generates 1.6% of the total revenue.

Regression Analysis

The effect of the explanatory variables which are quantity of fresh fruit bunches (ffb), variety of palm fruits, technology adopted in processing the palm fruits, processing period in days, farm size,(ha), Household size, and the level of education on the dependent variable (quantity of palm oil in litres) was determined through the use of multiple regression analysis. The three functional forms fitted were Linear, Semi log, and Double log functions.

The result of the regression is shown below. The choice of Lead equation was based on the earlier criteria mentioned earlier. Cobb Douglas equation was selected as the lead equation

$$\ln Y = 3.869 + 0.48\ln X_1 + 0.96\ln X_2 + 0.165\ln X_3 - 0.19\ln X_4 - 0.006\ln X_5 - 0.12\ln X_{6+} \quad 0.004\ln X_7 + 0.2618$$

(87.550) (3.885) (1.187) (1.689) (-1.702) (-0.445) (-1.390) (0.668)

The Cobb Douglas function form was chosen because it has a very low standard error of 0.2618; a considerable adjusted R^2 which is O.910, R^2 is 0.916 which means that about 92 % variability in the dependent variable (Quantity of palm oil in litres) was explained by the independent variables (Quantity of FFB, Variety of FFB, Technology used, Processing period, Farm size, Household size and level of education).

Aside the above stated reasons it has the highest number of significant coefficients with the correct signs t-statics. The F- test is 173.838 and significant at 1%. The F-test shows that the model fits the problem because it is significant.

The quantity of fresh fruit bunches (ffb) has a positive coefficient and hence a positive relationship with the palm oil output produce and it is significant at 1%.

The implication is that bunches of fresh fruit of oil palm contribute to the quantity of palm oil produced in the study area. Quantity of fresh fruit bunches is an important factor in oil palm processing. A unit increase of this variable will bring about increase in the output of palm oil produced.

The variable, variety of palm fruit has a positive coefficient and a positive relationship with the dependent variable. The type of palm fruit used in processing is an important variable that determine the quantity and quality of palm oil produced in the study area. It is also significant at 10%. The improved variety produced more oil than local variety (mostly inherited)
The coefficient of the improved method (technology used) is positive and significant at 5% level. Efforts to raise agricultural production and farmer's standard of living require the introduction of improved farm equipment and technologies as well as increased availability and utilization of energy and power. This therefore implies a positive relationship with the palm oil output from oil palm processing. An advantage of the use of mechanical digestion is the shorter period expanded, which means that the mash has higher temperature than when it is pounded manually.

High temperature means that oil extraction is more efficient unlike with manual processing which is slower and less output of palm oil. Processing period is significant at 5%. It has a negative coefficient and hence a negative relationship with quantity of palm oil produced. Delay in the time interval between harvest and final output may render the quantity of red oil produced low and hence reduces the net returns from final output and it is significant at 5%. A unit increase in the number of days for processing will lead to 1.9% decrease in the quantity of palm oil produced in the study area.

Farm size has negative coefficient and hence negative relationship with quantity of palm oil produced and it is not significant at 1% , 5% 10 %. Therefore farm size does not contribute to any change in quantity of red oil produced in the study area. Farm size was determined by the number of trees planted in the farmland. A farmer can have a large number of trees and harvest low quantity of fresh fruit bunches if all the trees are not alive and productive. The farm size can be big and the trees are not productive or have low bunches of palm fruit whereas there were some farmers with small farm size and the few number of trees produced more bunches of palm fruits and hence higher quantity of red oil produced than farmer with large farm size and less productive palm trees with low bunches of palm fruits. This might be due to maintenance culture adopted by each farmer.
The result of the regression also shows a negative relationship of household size with dependent variable and it is not significant at any level of 1%, 5%, nor 10%. Though most farmers use family labour to reduce the cost of labour for processing yet they consume more red oil as household consumption and as a gift to people before they finally assume the remaining oil as their final output. With this, the quantity of red oil produced will become lower than expected. It was difficult for the farmers to measure what they consume in litres as compared to what they produced (Ibekwe, 2008).

The level of education of farmers is significant at 5% level which also has positive coefficient and hence a positive relationship with the quantity of red oil produced. This may be due to the fact that educated farmers possess ability to embrace innovation that will boost their production. Education enlightens and so the level of education could also contribute to effective oil palm fruits processing to produce more quantity of palm oil for sale and hence increase farmers' income.

Conclusion

With the findings of this study it was discovered that small scale oil palm processing enterprise is profitable in the study area. The quantity of fresh fruits bunches, the variety of palm fruits, and the type of method of processing involved are the major factors determining the quantity of red oil produced in the study area. The results of descriptive statistics revealed that most of the farmers lack formal education. The mean age was 53 years and the industry was dominated by men. The budgetary analysis showed that oil palm processing was a profitable enterprise. The average Gross Margin was ₦77,613.30 and Net Profit of ₦39,146.64 in a production period of 4-6 months. The Benefit-Cost Ratio and Rate of Returns on Investment are 1.26 and 25.8% respectively which showed that the enterprise was profitable in the study area and worth venturing into to boost production of palm oil.

The regression results revealed that the quantity of fresh fruit bunches, the variety of oil palm fruits, the method adopted in processing, processing period, and the level of education impacted significantly on the quantity and quality of red oil produced. This directly affected the income of the sampled farmers. The majority of various activities involved in oil palm extraction are still traditional. Based on the findings of this study, the following recommendations are made.
Since the enterprise is profitable, more people should be sensitized and encouraged to venture into the agribusiness of oil palm industry. This can be done by extension agents of Ministry of Agriculture through the media, Farmers' Association meetings, Youth Forum and so on.

In view of the fact that the more palm fruits bunches processed, the more the quantity of red oil produced, government should provide improved varieties of oil palm seedlings at subsidized rate and accessible to farmers to guarantee high quantity of palm oil in the market for sale and thereby increasing the income of the farmers.

Since the improved method of processing using mechanical digester and a diesel engine improves the quality and quantity of palm oil produced, government should make such equipment and machines available at subsidized rate.

Social amenities such as such as electricity, pipe borne water, and good road network should be regularly provided in areas where oil is processed to facilitate palm oil production and marketing efficiency for farmers.

Oil palm farmers should adopt good management strategies to ensure efficient utilization of assets. In addition, the Nigerian Institute of Oil palm Research (NIFOR) should be revitalized to be more productive, efficient and financially sustainable.

APPENDIX I

Table 1: **SOCIO ECONOMIC CHARACTERISTICS OF OIL PALM FARMERS**

AGE GROUP (YEARS)	FREQUENCY	PERCENTAGE (%)	MEAN
45-50	59	49.1	
51-55	17	14.2	
56-60	36	30.0	
61-65	08	6.70	53 years
Total	120	100%	
SEX			
Male	68	56.7	
Female	52	43.3	
Total	120	100%	
HOUSEHOLD SIZE			
5	27	22.5	
6	26	21.7	
8	67	55.8	7
Total	120	100%	
EDUCATION			
No Formal Education	77	64.2	
Primary	27	22.5	
Secondary	15	12.5	
Post-Secondary	1	0.80	
Total	120	100%	
FARMING EXPERIENCE (years)			
10-20	37	30.8	
21-30	49	40.8	
31-40	34	28.3	24.5
Total	120	100%	
FARM SIZE (ha)			
2.0-4.0	92	76.6	
4.1-6.0	28	23.4	3.12
Total	120	100%	
LABOUR TYPE			
Family	77	64.2	
Hired	43	35.8	
Total	120	100%	
SOURCE OF TREES			**VARIETY**
Rented	7	5.8	TENERA
Gift	14	11.7	TENERA
Own farm(Tenure)	21	17.5	TENERA
Inherited	78	65.0	DURA
Total	120	100%	

Field Survey 2012

Table 2: Distribution Of Respondents Based On The Methods Used For Palm Oil Of Extraction Activities

	Traditional	Improved method	Total	Percentage
Harvesting	120	0	120	100
Chopping	120	0	120	100
Sterilization	120	0	120	100
Boiling of Fruits	120	0	120	100
Digestion	29 (24.2%)	91 (75.8%)	120	100
Mixing	120	0	120	100
Skimming	120	0	120	100
Clarification	120	0	120	100
Storage medium	Tankers	Drums	Rubber containers	
	0	20.8%	79.2%	100
Sales	Commercial	Consumption		
	66.7%	33.3%		100

Field Survey, 2012

Table 3: **FIXED COST ITEMS**

Type of asset	Average No of items used for processing	Cost of item (₦)	Average life span	Depreciation cost (₦)	Percentage of fixed cost (%)
Storage vessels (kegs)	2	1000	2	500	1.29
Boiling drums	2	3000	3	1000	2.59
Baskets	3	300	1	300	0.78
Total A		8900		1800	
LISTER					
Diesel engine	1	70000	3	23333.33	60.65
Digester	1	40000	3	13333.33	34.69
Total B		110000		36666.66	
GRAND TOTAL		**118,900**		**38,466.66**	**100**

Field Survey 2012

Table 4: **TOTAL VARIABLE COST**

Variable Cost Item	Quantity used per production period	Cost per week	Amount per production period (₦)	Percentage of variable cost (%)
Cost of harvesting	40-80 fresh fruit bunches(FFB) at ₦40 each		2,382.70	2.11
Hired labour (processing)	40-80 FFB	1800	24,947	22.13
Firewood			13,388	
Transportation			10,388	9.21
Water			60,758	
Labour (cost of maintenance)			56,758	66.55
TOTAL			**112,728.70**	

Field Survey 2012

Table 5: **REVENUE FROM OIL PALM FRUIT PRODUCTS**

Items	Litre per Bunch	Average Quantity Per bunch (litre)	Price Per litre ₦	Average per week ₦	Average per production ₦	Percentage (%) of revenue	Amount per production ₦
Palm oil	1.25	56.63	170	218.52	1092.6	96.6	185742
Palm kernel	60/kg					1.8	3350
Palm residue						1.6	1250
Total							190342

Field Survey, 2012

Table 6: **SUMMARY OF COST AND RETURNS**

TOTAL REVENUE	₦ 190342
TOTAL VARIABLE COST	₦ 112728.70
TOTAL FIXED COST	₦ 38466.66
GROSS MARGIN	₦ 77613.30
NET PROFIT	₦ 39146.64
BENEFIT COST RATIO	1.26
RATE OF RETURN ON INVESTMENT	25.8

Field survey 2012

Table 7: Regression coefficient and related statistics

Functional Forms	Constant	FFB X_1	VARIETY X_2	TECH USED X_3	PROCESG PERIOD X_4	FARM SIZE X_5	HHSIZ X_6	EDUC X_7	S.E	R_2	ADJ R_2	F Value
Linear form	16.370 (4.567)	0.285 (1.484)***	9.577 (0.7830)*	11.379 (1.805)*	-0.734 (.2.805)*	-0.259 (-0.619)	-0.463 (1.549)	0.466 (0.994)**	4.1080	0.844	0.834	86.450***
Semi log	47.158 (17.903)	2.926 (3.993)***	5.5523 (0.709)*	8.783 (1.933)*	-1.127 (1.689)*	-0.268 (0.363)	-0.719 (1.456)	0.208 (0.633)*	1.5608	0.906	0.900	153.536***
Double log	3.869 (87.550)	0.48 (3.885)***	0.960 (1.187)*	0.165 (1.689)*	-0.190 (1.702)**	-0.006 (-0.445)	-0.12 (1.390)	0.004 (0.668)**	0.2618	0.916	0.910	173.838***

Source: Field Survey, 2012

T values are in parenthesis

*** Significant at 1 %

** Significant at 5 %

* Significant at 10 %

ADJ R^2 0.910, F value =173.838*

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