# Economic Analysis of Small Scale Palm Kernel Oil Producers In Ogbomosho Area of Oyo State, Nigeria

**O.I.Adesiyan**

Department of Agricultural Economics, Ladoke Akintola University of Technology, Ogbomoso, Oyo state, Nigeria.

DOI: 10.29322/IJSRP.9.09.2019.p9365
http://dx.doi.org/10.29322/IJSRP.9.09.2019.p9365

***Abstract-*** The study was conducted in Ogbomoso zone with five local government areas to analyze the profitability of small-scale palm kernel oil producers. A survey was carried out with the use of purposive sampling technique to collect data from 60 respondents with the use of interview schedule. The collected data were analysed with the use of tables, frequencies, percentages and other tools that include benefit cost ratio and Cobb-Douglas production model were also used.

The result of the study showed that the production of palm kernel oil is profitable. Most of them depend on electricity as their source of energy. It was discovered that palm kernel producers in the study area are underdeveloped. Furthermore, the results revealed that the by-product (palm kernel cake) also contribute to the overall revenue. The adjusted coefficient of multiple determinations ($r^2$) is 0.71.The Cost Benefit Ratio (BCR) is 1.42, which signifies that palm kernel oil production is profitable in the study area.

The study recommended development of new oil palm plantation and introduction of better varieties oil palm seedlings, all of which will serve as catalyst to minimize the problems encountered in buying the palm kernel and to enhance the production of palm kernel oil industry at large.

***Index Terms***- Profitability, Palm kernel oil Purposive, Benefit-Cost Ratio

## I. INTRODUCTION

Palm oil is produced mainly in the southern part of Nigeria because of natural vegetation that is favorites to the growth of palm trees. Over 90 percent of the palm oil in Nigeria is from the wild palms, which are found in groves in most parts of the country Industrial use of palm oil has become very significant in Nigeria though, Palm oil export from Nigeria declined drastically as soon as crude oil was discovered in commercial quantity in Nigeria (CTA, 2007).

Palm kernel oil output in Nigeria had a very bad growth record in the past decade. The sharp decline in export stems from a rapidly expanding domestic demand for oil, which was not matched by output expansion. Similarly, palm kernel, which is a product of the palm tree, did not also boost foreign earning of the country. Palm kernel production remained virtually stagnant between 1960 and 1972 except for the sharp decline that occurred between 1967 and 1969 to the civil war.

Nigeria's share of total world palm kernel output decline from about 41 percent in 1965 to 32 percent in 1972. Export declined rather sharply from 418 thousand Metric tons in 1960 to about 181 thousand metric tons in 1974. The decline is largely accounted for by a rapidly domestic demand particularly for industrial processing (FAO 2013). This is why is the proportion of palm kernel output exported decline from 97 percent in 1960 to 91 percent in 1965 and 50 percent in 1972. Throughout the period of oil boom, income from palm kernel was marked sharp annual fluctuations. This was more so for export income than product income as producer prices fluctuated less than export prices.

Oil Palm tree is one of the greatest economic assets a state or nation has, provided its importance is realized and potentials fully harnessed. The Oil Palm products include Palm Oil, Palm Kernel Oil and Palm Kernel Cake. These can further be processes into RBD OLEIN (Cooking oil), Vegetable Ghee, Shortenings, Margarine, and CBS. CBE, Ice Cream, Dough, Creaming, Coating, and other specially fats. Some other by-products of the Oil Palm include Palm wine, fatty alcohols as well as intermediates. Nature so made it that all aspects of the Oil palm tree are useful and economically viable.

In an attempt to restore the oil palm to its prime position as well as agriculture as the mainstay of the economy that the federal and state governments started revamping and establishing oil palm agencies. For example, states like Anambra, Abia, Cross river, and Rivers States established oil palm agencies while the federal government increased its funding to the Nigerian Institute of Oil research (NIFOR) Benin .Anambra State Oil Palm Development Agency, State, was charged to execute the small holder oil palm development scheme of the state government as well as Oil Palm plantations, nurseries and Oil Mills amongst. Like many government's policies that are beautiful on paper but leave much to be desired in the implementation, the agency has wound up and the assets/liabilities were inherited by the State Ministry of Agriculture shortly after the creation of Anambra state in 1992.

Two kinds of oil are obtained from this oil palm; Palm Oil and Palm Kernel Oil. Palm oil is extracted from the fleshy mesocarp of the fruit, which contains 45-55% oil, which varies from light yellow to orange-red in colour, and melts from $25^0$ to $50^0$C. For edible fat manufacture, the oil is bleached. Palm oil contains saturated palmtic acid, oleic acid and linoleic acid, giving it a higher unsaturated acid content than palm kernel or coconut oils. Palm oil is used for manufacture of soaps and candles, and more recently, in manufacture of margarine and cooking fats. Palm oil used extensively in tin plate industry, protecting cleaned iron surfaces before the tin is applied. Palm oil is also used as lubricant, in textile and rubber industries. Palm kernel oil is

extracted from the kernel of endosperm, and contains about 50% oil. Similar to coconut oil, with high content of saturated acids, mainly lauric, it is soild at normal temperatures in temperate areas, and is nearly colorless, varying from white to slightly yellow. This non-drying oil is used in edible fats, in making ice cream and mayonnaise, in baked goods and confectioneries, and in the manufacture of soaps and detergents. Press cake, after extraction of oil from the kernels, used as livestock feed, containing 5-8% oil.

**1.1 Statement of the problem**

Oil palm producing industries entails the production of palm oil, palm kernel oil/cake. Palm kernel oil is considered to be technically easy venture after palm oil and of all available sources of vegetable oil such as soybeans oil, sunflower oil, coconut oil and palm kernel oil. Palm kernel oil production could be established with low capital outlay (Hartley,1975).

Despite the encouraging nature of palm kernel oil production, not many people are involved in its production. The probable reasons could be that the local extractor machine used in extracting the oil is not is not economically efficient because when compared with the industrial machines it is lower in output and industrial machines has dryer it makes it possible to grind the palm kernel without sun dryer and also there is no market control in the oil industry, this has delayed the expansion of the palm kernel oil production. The increases in income and standard of living had increased local industries of palm kernel oil in Nigeria and have increased the demand for palm kernel.

The increase in cost of production due to high cost of input like electricity and inadequate working capital made it impossible for most of the investor in palm kernel oil to produce optimally. Based on the above this study uncovered the following mind bothering objectives: to determine how profitable palm kernel oil production is and factors that determines its profitability of the production in the study area.

## II. Research Methodology

**2.1 Area of study**

The study area for this project is Ogbomoso. It comprises of five local government areas namely: Ogbomoso north, ogbomoso south, Surulere. Orire, and Ogo oluwa local government area. The climate condition favours sun drying of the palm kernel. The rainfall distribution annually is between 1000mm and 1400mm FAO (2013).

**2.2 Sources and Types of Data Collected**

The data used in this study were essentially from primary source. Structured questionnaires were used in collecting information on the scoio-economic characteristics of respondents such as age, marital status, sex family size, educational level, year of experience. Input-output data such as output of oil, output of palm kernel cake, cost of input, labour input were also collected.

**2.4 Method of Data Collection**

The method employed was interview via the use of structured questionnaire purposive sampling technique was employed in selecting the palm kernel oil producers. Sixty respondents were interviewed in order to get needed information. Fifteen respondents from each local government were contacted.

**2.5 Analytical Techniques**

characteristics of the palm kernel oil producers. Cost and returns on production were analyzed via the benefit cost ratio (BCR).

**2.6 Input Oriented Measures**

Farrell (1957) illustrated his idea using a simple example involving firms, which use two input (X1 andX2) to produce a simple output (Y).In this study however a total of 60 respondents were sample for the study with a total of six inputs.

Y is the palm kernel oil output in naira

The inputs are:

$X^1$ = Total palm kernel cost (#)

$X^2$ = Cost of electricity (#)

$X^3$ = Cost o machine (depreciation calculate)(#)

$X^4$ = rent paid on building and site (#)

$X^5$ = Transportation cost (#)

$X^6$ = Wage paid to labourers (#)

**(a) Profitability measurement of Palm kernel oil**

(i) Costs Concept

Total cost = Total fixed cost + variable costs

i.e TC = TFC +TVC

where,

TC = Total costs

TCV = Total variable costs

TFC = Total fixed costs

(ii) Revenue Concept

Revenue Generated from Palm kernel oil Production

Therefore,

Revenue = Total quantities of palm kernel oil sold x Unit price of palmkernel oil sold = $Q_T x P_x$

Where Qr = Total quantities of goods

Px = Unit price of output X.

(iii) Benefit Cost Ratio (BCR)

This is another measure of profitability, and it determines the worthwhile of a business

$$BCR = \frac{\text{Total revenue}}{\text{Total costs.}}$$

Investment criteria require that BCR should be greater than one (i.e BCR>1) before a business can be termed profitable (Adegeye and Dittoh, 1985).

**(b) Model Specification**

A production function was specified and estimated to determine the relationship between the output and the various inputs used. The actual model specified has the general form:

Linear $Y=b_{o+}b_1x_1+b_2X_2+\ldots+bij\ Xij+U_1$

Cobb – Douglas $Y=b_oX_1X_2b_2\ldots Xij^{bij}+U_2\ldots$

Where Y is the dependent variable and Xi through Xii are explanatory variables, bo is a constant and bi through bii are the regression coefficients terms expected to fulfill all Ordinary Least Square assumption (OLS).The cob-Douglas function was converted to the double log form so that it could be solved by ordinary least square method.

The empirical Cobb-Douglas model to be estimated is therefore specified as:

$Ln(Yj)=bo+biLnX_1+b_2LnX_2+…bii\ LnXii+Uj…$

### 2.7 Results and Discussion

Personal characteristics of palm kernel oil producers discussed include Age, family size educational status, Years of experience, Sex.

**(i) Age**

The respondents in the study area are aged between 20-60years. The categorization is as shown in table 1 below. The statistics shows that majority of producers fall between ages 31-40years (52.5%) and 21-30years (30.6%) respectively. The age distribution of producers has implication on productivity, as these people still have enough strength to run around and manage the production effectively.

**(ii) Education**

The educational distribution of producers is as shown in the table below. Although it does not follow the expected outcome trend in the study area (i.e. the more educated they are, the better their expected performance).This can however be linked with the year of experience since productivity is expected to increase with year of experience. Majority of the producers have secondary education, which is 45.0 percent. This however may not be connected to efficiency, as their academic attainment may not necessarily mean that they have adequate knowledge of palm kernel oil production. It is therefore possible that a particular producer who has little education level but is adequately trained in production of palm kernel oil will be efficient than another farmer with tertiary education but have little knowledge of the palm kernel oil production. Revelation of education level of the respondents indicates that 28.0 percent have primary education and 7 percent have adult education and 3.33% are non-educated. There is however no producers that is completely illiterate since basic education is needed to be equipped properly for production of the oil for operations and management.

**(iii) Respondents Years in Production**

The table shows that about 31.66(19 respondents) percent of the producers have spent between less than 5 years, while 15(32 respondents) percent have been in the palm kernel oil production for between 5-10 years of experience and 11-15 years of production experience recorded 68.33(9respondents) percent. These results shows that, the industry is just been joined by new entrants in the last 15 years. These might be as a result of the increasing demand for palm kernel oil both aboard and home as caused by awareness (in recent times) on its low cost of production and it free fatty acid. Profitability is however the major motivating factor causing the observed rush into the industry in recent years.

**(iv) Respondent Marital Status**

Table 1 shows that about 32.2% are single while 67.8% are married; it shows that majority of the palm kernel oil producers are married. This however may not connected to efficiency, as their marital status may not necessary mean that they have adequate knowledge of palm kernel oil production.

**(v) Respondent Source of Finance**

Table 1 reveal that only 2 percent of the palm kernel oil producers in the study area have access to bank loans. The rest 98 percent do not have access to credit facilities. Reasons for this are that most of the producers operate on a relatively small-scale and so could not provide collateral security as demand by the formal lending institution. This restrains creditors from giving loans to them.

**Table 1: Distributions of Socio-economic Characteristics of Palm Kernel Oil Producers.**

| Age | Frequency | Percentage |
|---|---|---|
| 20 | 2.0 | 3.4 |
| 21-30 | 18.0 | 30.6 |
| 31-40 | 32.0 | 52.5 |
| >50 | 8.0 | 13.5 |
| Total | 60 | 100.0 |

| **Educational level** | **Frequency** | **Percentage** |
|---|---|---|
| no formal education | 2 | 3.33 |
| adult education | 4 | 7.00 |
| primary education | 17 | 28.00 |
| secondary education | 27 | 45.0 |
| Tertiary education | 10 | 16.67 |
| Total | 60 | 100.00 |
| **Years of Experience** | **Frequency** | **Percentage** |
| Less than 5 | 19 | 31.66 |
| 5-10 | 32 | 53.34 |
| 11-15 | 9 | 15.00 |
| Total | 60 | 100.0 |
| **Marital Status** | **Frequency** | **Percentage** |
| Signle | 19 | 31.67 |
| Married | 41 | 68.33 |
| Total | 60 | 100.0 |
| **Source of Credit** | **Frequency** | **Percentage** |
| Cooperative Society | 40 | 66.69 |
| Friends | 18 | 30.0 |
| Banks | 2 | 3.33 |
| Total | 60 | 100 |

2.9

**Analysis of Cost and returns**

Total variable cost=10,450,500

Total fixed cost = 9,770.500

Total cost (TC)=TVC +TFC

= N 10,450,500 + N 9,770,500.00

=N20, 221, 000

(i) Total Revenue (TR) = N28, 800,000

Profit =TR – TC

=N 28,800,000 – N 20,221,000

= N8, 579,000

=N7797900

π=Profit

TR=Total Revenue

TC=Total cost

TFC=Total fixed cost

TVC=total variable cost

(ii) Benefit Cost Ratio = Total Revenue / Total cost

BCR = N 28,800,000 / N 20,221,000

= N 1,424,237

The criteria judgment is BCR=>1; hence with BCR of 1.424 palm kernel oil production is profitable in the study area.

(iii) **Profit, (One tone) of Palm Kernel in a Day**

**(i) Input Costs**

1TON = N45,000 input per day

Labour = (a day) = N400 input per day

Electricity = N450.33 input per day

Rent =N400.00 input per day

Total=450.33 + N400+N400+N45000=N46,250.33 input per day

(iv) **Output on One Tonne per day**

540 Liters of palm kernel oil at N155 per liter per day

540 * N 150=N81, 000per day

450kg of palm kernel cake at N10 per kilo

450x N 10 = N 4,500per day

Total = N 81,000+4,500per day

= N85, 500per day

(v) **Profit on the production on a day**

Profit ($\pi$) = TR – TC

= N 85,500-46,250.33

$\pi$ = N39, 250 per one tone per day

Judging from the value of net profit made on a one tone basis it shows that upon every N46250.33 investment N39, 250.

(vi) **Input-Output relationship**

The production function used with the best fitting function was Cobb-Douglas production function; it has the highest coefficient of determination ($R^2$) which measures the relationship between the production inputs (independent or explanatory variables) and the output (dependent variable) O'Farrell *e tal* (2006). It also has the lowest standard error.

The function was fitted as:

$Y = AX_1^{b1}X_2^{b2}X_3^{b3}X_4^{b4}X^5b^5X^6b^6$

The function was linearised by taking the logarithm of both sides hence the term double log

$\text{Log } y = a+b_1\log X_1+b_2\log X_2+b_3\log X_3+b_4\log X_4+b_5\log X_5+b_6\log X_6+\log u$

Where = Y = Palm kernel oil (output in Nigeria)

X1 $X_1$ = Total palm kernel cost in Naira

$X_2$ = Total of electricity consumed

$X_3$ = Cost of machine (depreciation calculated)

$X_4$ = Rent paid on building and site

$X_5$ = Transportation cost

$X_6$ = salary paid to laborers

a = intercept

$b_1$ = coefficient of $X^1$ (i+1to6).

The result shows that the adjusted R square ($R^2$) equal 0.710, this reveals that 71% of the total variation in the palm kernel oil production output is explained by variation in explanatory variables included in the equation. Three explanatory variables are significantly explained palm kernel oil output variation at 5% and 10% respectively. The variables are cost of palm kernel oil(X1), rent(X4) and transport(X5). Their coefficients are of positive direction, indicating, that the relationship between the (significant) independent variables and output (dependent) variable is of direct relationship. The interpretation of the relationship is that for a unit increase in the significant (explanatory) variables will increase the palm kernel oil output.

**Table 2: Regression Parameters from Cobb-Douglas Production function.**

| | Coefficient | Standard error | t-statistic | P-value |
|---|---|---|---|---|
| a (Intercept) | 2.986 | 1.184 | -2.523 | 0.105* |
| X1(palmkenelcost) | 0.662 | 0.072 | 9.155 | 0.000** |
| X2(electricitycost) | 0.0991 | 0.151 | 0.657 | 0.514 |
| X3(machinecost) | 0.812 | 0.098 | -0.825 | 0.413 |
| X4(rent) | 0.289 | 0.073 | 3.974 | 0.000** |
| X5(transport) | 1.052 | 0.186 | 5.645 | 0.000** |
| X6(laboursalary) | 0.023 | 0.283 | 0.082 | 0.935 |

Multiple R = 0.811

R square ($R^2$) = 0.730

Adjusted R square ($R^2$) = 0.710

F* = 42.228.

* 10% Probability level of significant

** 5% Probability level of significant

## III. Summary

The study discovered that majority 52.5 percent of the palm kernel oil producers in the study area fall within 31–40 year old. It was also found that 45 percent of the respondents in the had secondary education, 28 percent of primary education, while 16.67 percent and 7 percent are of tertiary and adult education respectively.

More than half 67.8 percent of the respondents are married and just 32.2 percent are single, it was discovered that majority of the respondents 98 percent do not have access to credit facilities.

It was found out that one tone of the palm kernel yields 540 litres of palm kernel oil 450 liters of palm oil 450kg of palm kernel cake and fifteen kilogram of sludge.

Palm kernel industry establishment in the study area involved constructing a machine (local extractor) and connect it to an electric motor of three-phase lack of capital and information about the location to buy the palm kernel and weather forecast were discovered to to be the major hindrance against economic development of palm kernel oil production in the study area.

The input-output analysis using Cobb-Douglas, regress model revealed that there is statistical significant, relationship between palm kernel production inputs(cost of palm kernel,cost of rent and transportation cost) and palm kernel oil yield. probability level. The value of adjusted R Square (0.71) obtained showed that 71% of the total variation in the oil yield was explained by variation in the production inputs. The study shows that BCR of 1.42 was found for the palm kernel oil production in the study area. The estimated coefficient of $X_1$, $X_2$, $X_4$, $X_5$ & $X_6$ carry a positive sign which indicates that 1% increase in each of the variables would increase the (TPPX1) by0.66%, 0.99%, 01.05% and 0.02%.

## IV. Conclusion

The potential prospects for palm kernel oil production of the study area are enormous. The value of the net profit and benefit cost ratio showed that palm kernel oil production in the study area is profitable.

## V. Recommendation

For the palm kernel producers to be able to produce at optimal level, the government should intervene at reducing the tariff paid by producers to produce officers.

These will go a long was in reducing the final price of the oil.

Also government should encourage oil plantation and introduction of new varieties. This will be of immense benefits in improving availability of the raw material (palm kernel).

Furthermore, government a should rigorously embark on producer public enlightenment campaign on the new technology of palm kernel oil production

Establishment of warehouse will play a vital role in minimizing the input cost due to the transportation, stabilizing the market prices and increasing the market demand for the oil. Increase supply of electricity will to a long way to increase the output of the industry because electricity is the key to the effectiveness of the industry. Government should encourage foreign investors to invest and provide employment through establishment of more palm kernel oil industry.

## References

[1] Adegeye,A.J and Ditto,J.S(1985).Essential of Agricultural Economics Impact publishers Nigeria Limited, Ibadan pp.49-67.

[2] CTA. (2007): CTA spore food sovereignty the right to food (128). 4 April. Published by CTA, The Netherlands.

[3] FAO (2013): http://faostat3.fao.org/faostat-gateway/go/to/browse/Q/QC/E. Accessed on 16 October2018.

[4] Access Online via Elsevier.

[5] Harteley,W.S(1988).The oil palm.Cambridge University Press.Great Britain,pp 23-34.

[6] O'Farrell P., Blackie S., and Chacko E. (2006): The New Rural Industries: A Handbook for Farmers and Investors. Rural Industries Res. Devel. Corp. (RIRDC). Australia. http:// www.rirdc.gov.au/pub/handbook/casew.html. June 14.

## Authors

**First Author** – O.I.Adesiyan, Department of Agricultural Economics, Ladoke Akintola University of Technology, Ogbomoso, Oyo state, Nigeria.

**Correspondence Author** – oiadesiyan @lautech.edu.ng; segun.adesiyan@yahoo.com