International Journal of Research in Agriculture and Forestry
Volume 5, Issue 1, 2018, PP 27-33
ISSN 2394-5907 (Print) & ISSN 2394-5915 (Online)

Determination of Costs and Returns of Oil Palm Production in Kogi State, Nigeria

Ukwuteno, S. O[1]., E. C. Eboh[2] and J. O. Ocheja[3]

[1]Department of Agricultural Economics and Extension Faculty of Agriculture, Kogi State University, Anyigba
[2]Agricultural Economics, University of Nigeria, Nsukka
[3]Animal Production, Kogi State University, Anyigba

***Corresponding Author:** Ukwuteno, Department of Agricultural Economics and Extension Faculty of Agriculture, Kogi State University, Anyigba.*

ABSTRACT

The study examined costs and returns in oil palm production on Kogi State, Nigeria. The objectives of the study were to: analyse costs and returns on oil palm production and determine profitability or otherwise of oil palm production in the study area. Data for the study were collected from Nigeria Institute for Oil Palm Research, NIFOR, Acharu substation in Kogi State, Nigeria and Oil Palm Producers in the State. A total of one hundred and twenty (120) respondents (oil palm producers) were randomly selected from the four agricultural zones for the structured questionnaire was administered on one hundred and twenty (120) respondents (oil palm producers) to obtain relevant information. Data collected were analysed using costs and returns and gross margin analysis. Results from the study showed that oil palm plantation which starts production in the 4th year will reach its peak production in the 14th year with peak yield of 13.50 tonnes/hectare per year. Also the study found that an oil palm production which starts fruiting in the 4th year will break-even in the 11th (eleventh) year. This means that an oil palm producer will have to be in pain of having to service debt for about eleven (11) years at which time he could be stressed. Gross margin analysis showed that oil palm production is profitable. The gross margin analysis shows a ratio of 1:1.56, indicating that one naira invested in oil palm production will yield N1.56. The main problems have been that of inadequate financial support; lack of good policy direction and other incentives to boost palm produce economy. It is recommended that oil palm be cut down and replaced at the age of 35 years; this will ensure that the production enjoys a flow of output. The need to commission agency(ies) to undertake the establishment of oil palm farms by government and after tending it to a certain age shall hand over to private individuals on charge is imperative.

Keywords: *Oil Palm, Production, Costs and Returns.*

INTRODUCTION

Oil palm (Elaeis guineensis Jacq) is a monocotyledonous tree crop which belongs to the family palmae and subfamily cocoideae. The normal (deploid) chromosome number is 2n=32. The adult plant possesses an impressive crown of 30 to 45 green leaves, each 5-9m long at the top of a trunk bearing old leaf bases arranged spirally, (Kochhar, 1976; Opeke, 1992; CTA, 2000 and Ukwuteno, 2011). The stem may be 30 to 38cm in diameter with progressive thickening towards the base. On older palms, the stem is punctuated with conspicuous and regularly arranged leaf scars and the stem terminate in a handsome growth of leaves (fronds). The leaf is paripinnate with a prominent petiole 0.9 to 1.5m long. The petiole often broadens at the base to form a clasper round the stem. Each palm frond bears 20 to over 150 pairs of leaflets arranged in more or less two rows along each side of the flattened rachis with the longest pinnate varying up to 120cm. The pinnae are parallel veined.

The plant is monoecious with separate male and female flowers (inflorescences) on the same plant. Cross-fertilization is achieved through successive cycles of male and female flower production. It produces bunches of fleshy fruits, the pulp (mesocarp) of which yields a solid, edible, orange-red oil called palm oil. The endosperm or kernel yields clear yellowish oil that is also edible

and solid and is called palm kernel oil. These two products are important in world trade. The oil palm no doubt is believed to have originated in the tropical rain-forest region of West Africa, (Zeven, 1965; Agboola, 1979; Hartley, 1988; CTA. 1998). Oil palm adapts well to most textures from medium loams to clays. Extremely coarse or fine textures may not always be suitable, especially if they affect water supply to the roots.

The climatic and soil requirements constitute the physical factors that are responsible for the growth of oil palm. Oil palm requires a rainfall of 1,600mm to 5,000mm per year evenly distributed will enhance the growth of oil palm (Keu, 2001; Khera, 1976). The oil palm has a wide adaptability range of soil to low pH but sensitive to high pH (above 7.5) and stagnant waters. Neutral pH soils are most favoured.

The temperature requirement varies between 18^0C and 34^0C. Opeke (1992) observed that oil palm would tolerate even higher temperature provided there is adequate moisture. It requires plenty of sunshine; productivity is reduced in areas with excessive sky overcast. It thrives under conditions of high relative humidity; yields are adversely influenced when the crop is exposed to dry harmattan winds (CTA, 2000).

Oil palm is affected by pests and diseases attack. The pests and diseases attack both seedlings in the nursery and mature plants on the field. Some notable pests of oil palm are snails, crickets and mammals especially rodents (rats and mice). Others include leaf-minners, weevils, caterpillars, birds and squirrels. The oil palm diseases include Antracnose, freckle, Blast, Ganoderma trunk rot, vascular wilt disease, Basal rot and crown diseases. These pests and diseases pose serious problems to the production of oil palm. They attack the plants at various stages of growth and development (Uguru, 1996; CTA, 1998).

Cost in whatever form, is incurred with the hope of getting returns (benefits) from the action taken. The returns may be in kind or monetary. A rational decision maker is assumed to choose an enterprise combination with lower cost (in terms of cost), and choose one with greater benefit (in terms of benefit) all things being equal (Olukosi and Erhabor, 1988).

In determining how many units of a given commodity to consume, the individual must focus on the additional cost of each addition unit. The additional unit is expected to yield additional returns. For a profit maximizing farm firm, the Marginal Cost (MC) must be equal to Marginal Revenue (MR).

$$\text{Marginal Cost (MC)} = \frac{\text{Change in Total Cost } (\Delta TC)}{\text{Change in Output } (\Delta Y)}$$

$$\text{Marginal Revenue} = \frac{\text{Change in Total Revenue } (\Delta TR)}{\text{Change in Output } (\Delta Y)}$$

Considering the cost of inputs and their net returns, it could be part of economic variables that have limited the production of oil palm by small scale farmers. Labour being a critical factor in the production process, in recent years; it has become too expensive (CTA, 2000).

The importance of oil palm in Nigerian economy cannot be over-emphasized. Oil palm is a tree crop which has both social and economic values (Usoro, 1974; Uguru, 1996; Wakker, 2004). Palm tree sap otherwise called palm wine has many uses. It is obtained by tapping either the male inflorescences on the standing trees or the growing points (terminal meristem) on felled trees. The yield of sap depends on the extraction method used and the age of the tree. Slightly fermented, the sap becomes palm wine, a popular drink throughout West Africa. Palm wine is taken in social gatherings such as traditional wedding and festival occasions.

In South-East Asia, Wakker (2004) reported that oil palm has fed millions, employed over a million and generated billions in dollar income to private sector including producers, trading companies, financial institutions and retailers. In the process of creating this value, the production of palm oil, he observed, brought about serious environmental and social impacts. There is rampant deforestation, dozens of people have been killed on land tenure and labour related conflicts and hundreds of deaths could be attributed to the environmental impacts of oil palm expansion. The expansion destroys ecosystems and wildlife in the world's most bio-diverse region. It is the most polluting rural industry in South-East Asia. This is not the case in our situation here as there are no such processing companies in our rural areas.

Palm oil is rich in carotene which is a precursor of vitamin A and is used to remedy night blindness. Palm oil is used in homes as cooking oil. In

industries, it is used for the manufacture of margarine, soap, lubricating oils and candles. Palm kernel oil is used as skin lotion or as laxative. When mixed with kerosene, it is used as wood polish. After extracting the oil, the residue, palm kernel cake forms a good portion of animal feed (livestock and poultry). Palm wine obtained by tapping the tree is used as a very good alcoholic drink in many social gathering in Nigeria.

Objectives of this Study

The objectives of the study are to:

- Analyze costs and returns on oil palm production
- Determine profitability or otherwise of oil palm production in the study area.

METHODOLOGY

Kogi State of Nigeria is chosen as the study area. The area is chosen because it has oil palm production as one of its major industries and has participated in oil palm product trade in the 1960s and up to now, oil palm production is still being carried out (Agboola, 1979; Idachaba, 2005). The area is located in the heart of Nigeria and it has two great rivers, the rivers Niger and Benue forming a confluence in the state. Geographically, it is located between latitudes 6.5^0N and 8.8^0N ($6^0 30^1$N and $8^0 48^1$N) and Longitudes 5.38^0E and 7.8^0E ($5^0 23^1$ E and $7^0 48^1$E). It has a population of 3,278, 487 inhabitants (National Population Commission, NPC, 2007). It covers a land area of 30,354.74 square kilometers (km^2).

Data for the study were collected from Nigerian Institute for Oil Palm Research, NIFOR, Acharu substation in Kogi State, Nigeria and oil palm producers in the state. A total of one hundred and twenty (120) oil palm producers (respondents) were randomly selected for the study using ADP data as sample frame. A set of structured questionnaire was administered on one hundred and twenty (120) respondents (oil palm producers) to obtain relevant information. Data collected were analyzed using Costs and returns analysis and Gross Margin analysis.

Data Analysis

The tools of analysis used are: Costs and Returns and Gross Margin Analysis

Model Specification for Costs and Returns in Oil Palm Production

The net revenue (NR) in any year is specified as

$$NR_n = Y_n - a_n\text{-}1\text{-}bn\text{-}Cn \quad (1)$$

Where

Y_n = Gross revenue (₦)

a_{n-1} = interest on the unpaid balance of the establishment cost at the beginning of the year or end of the previous year (₦)

b_n = Annual maintenance cost (₦)

c_n = planting cost (₦)

$$\text{PV of } NR_n = \frac{1}{(1+r)}(NR_n) \quad (2)$$

Where

r = discount rate

n = n^{th} year

The amortized present value of the net revenue was obtained by accumulating value of the net revenue. This is represented thus:

$$\text{Accumulated Present Value (APV) of } NR_n = \Sigma \frac{NR_n}{(1+r)^n} \quad (3)$$

Is therefore, the expression on the right side of equation (3) multiplied by the amortized factor

$$\frac{1-V}{1-V^t} \quad (4)$$

Where $V = \frac{1}{(1+r)}$ and t = number of years.

We now obtain $ANR_n = \left[\sum_{t=0}^{n} \frac{NR_n}{(1+r)^n}\right]\left[\frac{1-V}{1+V^t}\right]$

Decision to replace therefore is $ANR_n \geq NR_n + 1$

Gross Margin Analysis

The model is specified as:

$GM_i = GR_i - TVC_i$

Where

GM_i = Gross Margin of enterprise $_i$

GR_i = Gross returns (benefits) from $_i$

TVC_i = Total variable costs from $_i$

For single enterprises, the gross margin model is given by:

$$GM = PyY - \sum_{i=1}^{k} P_{xi} X_i$$

Where

Y = Quantity of the product (kg)

Py = Price of the product (₦)

P_x = Price of the input (₦)

K = number of inputs

RESULTS AND DISCUSSION

Cost and Returns in Oil Palm Production

Cost constitutes the expense incurred while trying to produce oil palm products. This could be the cost of land acquisition, land preparation, seedlings, fertilizers, taxes, cutlassing, running/ maintenance, etc. that are incurred in order to produce oil palm products. The cost of land preparation and planting at a wage rate of N300.00/manday was N69, 452.70 while the material component cost for land preparation and planting was N57, 600.00 per hectare per year.

Seedlings per hectare were ₦42, 900.00 Cutlassing 1st to 4th year was ₦76, 800.00, and the 5th year onward was ₦43, 200.00 per hectare per year. Pruning (death fronds, epiphytes, etc) up to 10th year was ₦4, 800.00 per hectare per year and pruning after the 10th year onward was ₦3, 600= per hectare per year. Fertilizer application was ₦4, 800.00/ha per annum. The oil palm plantation maintenance/running cost with cost of materials required for five years and above was found to be ₦303, 152.70 annually.

Table1. *Costs and Returns in Oil Palm Production*

Age	Yield Kg	Total Cost TC	Total Revenue TR	Net Revenue NR_t	Discount Factor DF
0	0	69452.70	0	-69452.70	1.0000
1	0	57600.00	0	-57600.00	0.9091
2	0	43200.00	0	-43200.00	0.8264
3	0	32400.00	0	-32400.00	0.7513
4	3500	32400.00	35000.00	2600.00	0.6830
5	5000	18900.00	50000.00	31100.00	0.6209
6	5000	17728.13	50000.00	32271.87	0.5645
7	5500	15787.50	55000.00	39212.50	0.5132
8	8000	18613.88	80000.00	61386.12	0.4665
9	11000	19297.13	110000.00	90702.87	0.4241
10	11250	19572.38	112500.00	92927.62	0.3855
11	11250	20700.00	112500.00	91800.00	0.3505
12	11250	19200.00	112500.00	93300.00	0.3186
13	11250	27300.00	112500.00	85200.00	0.2897
14	13500	28200.00	135000.00	106800.00	0.2633
15	13500	28200.00	135000.00	106800.00	0.2394
16	12000	31800.00	120000.00	88200.00	0.2176
17	12000	19200.00	120000.00	100800.00	0.1978
18	12000	37200.00	120000.00	82500.00	0.1799
19	12000	20400.00	120000.00	99600.00	0.1635
20	12000	31800.00	120000.00	88200.00	0.1486
21	12000	37200.00	120000.00	82800.00	0.1351
22	12000	31500.00	120000.00	88500.00	0.1228
23	12000	25500.00	120000.00	94500.00	0.1117
24	12000	25800.00	120000.00	94200.00	0.1015
25	12000	29400.00	120000.00	90600.00	0.0923
26	10000	41700.00	100000.00	58300.00	0.0839
27	10000	51300.00	100000.00	48700.00	0.0763
28	10000	49500.00	100000.00	50500.00	0.0693
29	10000	55500.00	100000.00	44500.00	0.0630
30	10000	43800.00	100000.00	56200.00	0.0573
31	8000	37500.00	8000.00	42500.00	0.0521
32	8000	30300.00	80000.00	49700.00	0.0474
33	8000	22200.00	80000.00	57800.00	0.0431
34	6000	25200.00	60000.00	32800.00	0.0391
35	5500	19800.00	55000.00	35200.00	0.0356
36	4600	20277.00	46000.00	25723.00	0.0324
37	4500	20271.00	45000.00	24729.00	0.0294
38	4500	27783.00	45000.00	17217.00	0.0267
39	3500	29478.00	35000.00	5522.00	0.0243
40	3500	29295.00	35000.00	5705.00	0.0221

Present Value of Net Revenue PVNR	Accumulated Present Value of Net Revenue ACC.NR	Amortized Factor A.F. $\left(\frac{1-v}{1-v^t}\right)$	Amortized Present Value of Net Revenue APV.NR	NR_{t+1}
-69452.70	-69452.70	1.0000	-69452.70	-57600.00
-52364.16	-121816.86	1.1000	-133998.55	-43200.00
-35700.48	-157517.34	0.5238	-82507.58	-32400.00
-24342.12	181859.46	0.3655	-66469.63	2600.00
1775.80	-18083.66	0.2868	-51647.99	31100.00
19304.99	-160773.67	0.2398	-38553.53	32271.87
18217.47	-142556.20	0.2087	-29751.48	39212.50
20123.86	-122432.34	0.1867	-22858.12	61386.12
28636.62	-93795.72	0.1704	-15982.79	90702.87
38467.09	-55328.63	0.1578	-8730.86	92927.62
35823.60	-19505.03	0.1479	-2884.79	91800.00
32175.90	12670.87	0.1400	1773.92	93300.00
29725.38	42396.25	0.1334	5655.66	85200.00
24682.44	67078.69	0.1280	8586.07	106800.00
28120.44	95199.13	0.1234	11747.57	106800.00
25567.92	120767.05	0.1195	14431.66	88200.00
19192.32	139959.37	0.1162	16263.28	100800.00
19938.24	159897.61	0.1133	18116.40	82500.00
14841.75	174739.36	0.1108	19361.12	99600.00
16284.60	191023.96	0.1087	20764.30	88200.00
13106.52	204130.48	0.1068	21801.14	82800.00
11186.28	215316.76	0.1051	22629.79	88500.00
10867.80	226184.56	0.1036	23432.72	94500.00
10555.65	236740.21	0.1023	24218.52	94200.00
9561.30	246301.51	0.1012	24925.71	90600.00
8362.38	254663.89	0.1001	25491.86	58300.00
4891.37	259555.26	0.0992	25747.88	48700.00
3715.81	263271.07	0.0984	25905.87	50500.00
3499.65	266770.72	0.0977	26063.50	44500.00
2803.50	269574.22	0.0970	26148.70	56200.00
3220.26	272794.48	0.0964	26297.39	42500.00
2214.25	275008.73	0.0959	26373.34	49700.00
2355.78	277364.51	0.0954	26460.57	57800.00
2491.18	279855.69	0.0950	26586.29	32800.00
1282.48	281138.17	0.0946	26595.67	35200.00
1253.12	282391.29	0.0943	26629.50	25723.00
833.43	283224.72	0.0939	26594.80	24729.00
727.03	283951.75	0.0937	26606.28	17217.00
459.69	284411.44	0.0934	26564.04	5522.00
134.18	284545.62	0.0932	26519.65	5705.00
126.08	284671.70	0.0930	26474.47	

Source: *Constructed from Field Survey Data, 2011.*

Producer Price, ₦10.00/Kg fresh fruit bunch (ffb)

Wage rate, ₦300.00/Manday

Discount rate, 10%.

The oil palm comes into fruiting at the age of 4 years after planting. The initial yield was 3.5 tons per hectare per year. The yield increases and reaching a peak in the 14th year with a peak yield of 13.50 tons/ha per year after which it declines. This shows that the yield of oil palm is affected by the law of diminishing returns. Whereas in Nigeria, the highest yield attained was 13.50 tons/ ha/year, in Malaysia, a yield of 30,000 tons/ha/year has been achieved (Adegeye and

Adegeye, 2000). The summary is presented in Table 1 below.

Gross Margin Analysis

Gross Margin Analysis is one budgeting technique which can be used to analyse profitability or otherwise of an enterprise. It is used to analyse cost and returns in oil palm production. For this study, only fresh fruit bunch (ffb) was considered as product for the four agricultural zones. The summary is presented in Table 2 below.

The gross margin analysis shows that oil palm production is profitable. For an oil palm farmer in the study area who cultivates one hectare of oil palm, will enjoy or earn as much as N51,171.00 over and above cost for a period of forty years.

Benefit Cost Ratio (Analysis)

$$\text{Benefit-cost, B.C.} = \frac{\text{Discounted Benefit}}{\text{Discounted cost}} = \frac{2,046,844.00}{1,314,156.00} = 1.56$$

In terms of benefit cost ratio, an investment in oil palm is seen to be profitable. Benefit-cost ratio shows the ratio of the discounted benefit to the discounted cost. It is expressed thus:

This shows that for every one naira invested in oil palm production, it will earn one naira fifty six kobo (₦1.56) in return. Where there is adequate and proper management of the field, the gross margin could be higher.

Table2. *Gross Margin Analysis*

Items	Quantity	Unit	Unit Price (₦)	Amount (₦)
Fresh fruit bunch (ffb)	336,100.00	Kg	10.00	3, 361, 000.00
Labour input	4207.52	Mandays	300.00	1,262,256.00
Seedlings	150	Stands	150.00	22500.00
Fertilizer	525	Kg	56	29400.00
Total cost				**1314156.00**

Source: *Field Survey, 2011*

$$Gross\ \ Margin\ \ GM = Y_i P_y - \sum_{i=1}^{K} X_i P_{Xi} \ (3361000 - 1314156) = 2046844.00$$

Conclusion and Recommendations

Palm oil and palm kernel were important commodities in the international trade in 1950s and 1960s. A technical assessment of the needed impetus for a re-introduction of these commodities, in export, into international trade is imperative. Oil palm production is a profitable venture which must be encouraged and at the same time it is capital intensive. The current laissez faire attitude by the three tiers of government towards oil palm production cannot lead to the desired transformation in the oil palm industry. Government must be seen to be actively involved in the procurement and distribution of essential resources such as seedlings, fertilizers and assist the farmers financially to cut down cost. Proper packaging and storage of extracted oil to slow down deterioration (rancidity) becomes relevant because improper storage has led to sales of palm oil with foul odour in the market thereby lowering the price.

Government could encourage transformation of oil palm industry through subsidy and other incentives such as acquisition of land and clearing for plantation production, assist oil palm farmers to use fertilizer for their production. Oil palm farmers should be encouraged to cut down and replace their oil palm trees which are thirty five (35) years old; this will help to increase productivity and output of the producers.

REFERENCES

[1] Adegeye, A.J. and A.O. Adegeye (2000). Technical and Economic Information in Agriculture (The Oil Palm Elaeis guineensis) in *Nigerian Agricultural Development Studies* 1(2): 140-155.

[2] Agboola, S.A. (1979). An Agricultural Atlas of Nigeria. Oxford University Press Pp. 115-134

[3] Centre for Tropical Agriculture (CTA, 1998). The Tropical Agriculturist. Oil palm Macmillan Publishers

[4] Centre for Tropical Agriculture (CTA, 2000). The Tropical Agriculturist. Oil Palm Macmillan Publishers.

[5] Centre for Tropical Agriculture (CTA, 2005). The Tropical Agriculturist. Oil Palm. Macmillan Publishers.

[6] Hartley, C.W.S. (1988). The Origin and Development of the oil palm Industry in the Oil Palm (Elaeis guineensis Jacq) 3rd Edition. PP 1-43

[7] Idachaba, F.S. (2005). Text of Convocation Lecture Delivered at Kogi State University, Anyigba.

[8] Izeke, J.E. (1983). Economic Evaluation of the World Bank Assisted Cocoa Project in Nigeria. A Ph.D Agricultural Economics Thesis submitted to Faculty of Agriculture and Forestry, University of Ibadan, Ibadan, Nigeria. Pp. 57-61, 282-295.

[9] Keu, S.T. (2001). Review of Previous Similar Studies on the Environmental Impacts of oil palm plantation cultivation on people, soil, water and forest ecosystems. www.esir.org.gh/opri.html

[10] Khera, H.S. (1976). Is there a need for National and International Control Schemes for Palm oil? The International Development in Palm Oil. The Proceedings of the Malaysian International Symposium on Palm Oil Processing and marketing held in Kuala Lumpur. Earp D.A. and Newall, W. (Eds) Pp. 491-507

[11] Kochhar, S.L. (1976). Tropical Crops – A textbook of Economic Botany, Macmillan International College Edition, Pp 164-167.

[12] National Population Commission (NPC, 2007). Population Census. Federal Republic of Nigeria Official Gazette 94 (24): 182-183

[13] Olukosi, J.O. and P.O. Erhabor (1988). Introduction to Farm Management Economics: Principles and Application. AGITAB Publishers Ltd, Zaria. Pp 9-37.

[14] Opeke, L.K. (1992). Tropical Tree Crops Spectrum books Ltd Ibadan, Owerri, Kaduna, Lagos. Woye and Sons (Nigeria) Ltd. Ilorin Pp 253-274.

[15] Uguru, M.I. (1996). Crop Production Tools, Techniques and practice. Department of Crop Science, University of Nigeria, Nsukka. Published by Fulladu Publishing Company. Nsukka Pp 118-125

[16] Ukwuteno, S.O. (2011). Economics of Small Scale Oil Palm production in Kogi State, Nigeria. A Ph.D. Thesis submitted to the Department of Agricultural Economics, University of Nigeria, Nsukka, Nigeria.

[17] Usoro, E.J. (1974). The Nigeria Oil Palm Industry/Government Policy and Export production 1906-1965, Ibadan University Press. Pp 130-140.

[18] Wakker, E. (2004). Greasy Palms: The Social and Ecological Impacts of Large-Scale Oil Palm Plantation Development in South-East, Asia. www.foe.co.uk.

[19] Zeven, A.C. (1965). Oil Palm Groves in Southern Nigeria: Part I. Types of Groves in Existence. Journal Nigeria Institute for Oil Palm Research 4: 226-50

Citation: *S. Ukwuteno, E. Eboh and J. Ocheja, "Determination of Costs and Returns of Oil Palm Production in Kogi State, Nigeria", International Journal of Research in Agriculture and Forestry, vol. 5, no. 1, pp. 27-33, 2018.*