

Economic Aspects of Oil Palm Production in Nellore District of Andhra Pradesh

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ABSTRACT

The commercial cost of cultivation incurred to raise one hectare of oil palm during its life span of 25 years stood at Rs.6, 33,627.2 and Rs. 6, 17,377.2 without and with subsidy respectively. The gross income realized by the oil palm orchardists, during its life span amounted to Rs. 9,63,135.09 per hectare which include the net income from inter crops during pre bearing period and from sale of oil palm fresh fruit bunches from third year onwards. The respective net income received by the farmers without and with subsidy stood at Rs.3, 29,507.89 and Rs. 3, 45,757.89. The net present value was as high as Rs. 65,201.48 at 12 percent and Rs. 15,103.41 at 24 percent discount rates. The benefit- cost ratio was 1.166 even at higher discount rate of 24 percent. The IRR was calculated at 39.19 percent. All the measures indicated that oil palm cultivation is a profitable proposition.

Keywords: Oil Palm- Capital Productivity- Economic Viability

1. INTRODUCTION

India is the third largest edible oil economy in the World after U.S and China. India is the largest importer of edible oils 50% of it being palm oil. Oil palm is a potential source of edible oil expected to contribute significantly towards meeting the growing edible oil demand. Of all the known oil yielding crops, oil palm ranks first with the production of about 6 tonnes of oil/ha/year.

Among states, Andhra Pradesh and Karnataka were found to possess the maximum potential for oil palm cultivation with identified areas of 4.5 Lakh.ha and 2.5 Lakh.ha respectively. The year-wise achievement for the period 2005-06 and 2006-07 in respect of area coverage under oil palm through implementation of the Oil- palm Development Programme is 12665 ha and 13818 ha. In Andhra Pradesh Nellore is one of the important districts in oil palm cultivation. Even though oil palm is being cultivated in Nellore district since 1991, so far no research work has been done. So it is felt necessary to probe into the economic aspects of oil palm.

2. MATERIALS AND METHODS

Nellore district was purposively chosen for the study as it has considerable area (2,766 ha) under oil palm and ranks fourth in the cultivation of oil palm in Andhra Pradesh. All the mandals in Nellore district growing oil palm orchards were listed out and arranged in descending order of their area under oil palm cultivation and the top 3 mandals were selected purposively. All the oil palm growers in the selected villages were listed out and divided into two groups namely pre bearing orchards up to age of 4 years and bearing orchards with the age above 4 years. From the list of oil palm growers 30 oil palm growers from each group were randomly selected and thus making the total sample size to 60 orchardists. Survey method was employed to collect the data from the oil palm growers. The primary data pertaining to the production aspects of oil palm were collected directly from the farmers with the help of a specially designed schedule by personal interview. The data Collected were subjected to conventional tabular analysis to workout costs and returns of oil palm production.

Discounted cash flow techniques were used to analyze the capital productivity of oil palm orchards. The following discounted measures were used in the analysis viz., Net Present Worth, Benefit Cost Ratio and Internal rate of Return.

2.1 Net Present worth (NPW):

It is sometimes referred to as net present value. It is the present worth of the incremental net benefits or incremental cash flow stream. The selection criterion of the project depends on the positive value of the net present worth discounted at the opportunity cost of the capital.

$$\text{Net Present Worth} = \sum_{j=1}^N \frac{B_j - C_j}{(1+i)^j}$$

When B_j = Benefits in Rupees in J^{th} year
 C_j = Costs incurred in J^{th} year
 I = Discount Rate
 N = No of Years

2.2 Benefit Cost ratio (BCR)

This ratio compares the present worth of costs with present worth of benefits. The common procedure of selecting the project is to choose the project having the B.C.Ratio of more than one, discounted at opportunity cost of capital. This ratio was arrived by using the following formula.

$$\text{B.C.Ratio} = \frac{\sum_{j=1}^N \frac{B_j}{(1+i)^j}}{\sum_{j=1}^N \frac{C_j}{(1+i)^j}}$$

Where B_j = Benefits in rupees in j^{th} year
 C_j = Costs in rupees in j^{th} year
 I = Discount rate
 N = Number of years

2.3 Internal Rate of Return (IRR)

It represents the average earning capacity of an investment over the economic life period of the project. It is that discount rate which just makes the net present worth of cash flow equal to zero. Mathematically it can be represented as

$$\text{Net Present Worth} = \sum_{j=1}^N \frac{B_j - C_j}{(1+i)^j}$$

When B_j = Benefits in rupees in j^{th} year
 C_j = Costs in rupees in j^{th} year
 I = Discount rate
 N = Number of years

Internal Rate of Return =

Lower discount rate + difference between two discount rates

$$\left\{ \text{NPW at lower discount rate} \right\} \frac{\text{Absolute difference between present worth of two discount rates}}{\text{NPW at lower discount rate}}$$

3. RESULTS & DISCUSSION

Oil palm is a perennial oil seed crop and once established the crop can economically cultivated for about 25 years. The gestation period of oil palm orchard is about 3 years. The economic yields commence from 5th year onwards. Therefore the cost incurred in establishing the orchard during the pre-bearing period was considered as establishment cost. The establishment cost include the expenditure on land preparation , digging of pits, plant material and planting, fencing and other subsequent nurturing operations to the plantation together with orchards. The maintenance costs included the expenditure on manuring, fertilization, plant protection, irrigation, weeding, watch and ward and harvesting along with overheads from commercial bearing.

3.1 Costs of oil palm orchard

The costs incurred in establishing oil palm orchards during pre-bearing period (1-4 years) are presented in Table 1. The total costs expended per hectare of oil palm during its prebearing period (1-4 years) stood at Rs. 77899.64 of which Rs. 49415.45 (63.43 percent) was variable costs and Rs. 28484.19 (36.57 percent) was fixed costs.

It can be seen that among total costs the rental value of owned land formed the major item with Rs. 16045.17 (20.60 percent) followed by fertilizers (15.18 percent), human labour (12.75 percent), plant material costs (10.92 percent), interest on fixed capital (10.36 percent), interest on working capital (9.26 percent), manures (7.70 percent), electricity charges (5.69 percent), annual share of establishment cost (3.55 percent), depreciation (1.66 percent), machine labour (1.54 percent), land revenue (0.40 percent), pesticides (0.23 percent) and bullock labour (0.16 percent).

The total costs incurred to establish one hectare of oil palm during first year , amounted to Rs.27536.34 out of which Rs. 20124.21 (73.08 percent) was spent on variable resources and the remaining Rs. 7412.13 (26.92 percent) pertaining to fixed costs. Among the variable costs plant material cost took a lion's share with Rs.8510.20 which accounted for 30.90 percent of total costs incurred during 1st year of establishing of oil palm. Next to plant material, human labour was the second major item of variable costs amounted to Rs.4145.73 followed by interest on working capital (Rs.2902.63), fertilizers (Rs.1326.66), and manures (Rs. 1150.00), electricity charges (Rs.1133.30), machine labour (Rs.864.96), pesticides

(Rs.50.73) and bullock labour (Rs.40.00). The operations such as land preparation, digging of pits, planting etc. required more human labour and hence the expenditure incurred on human labour was higher in the first year of establishment of oil palm orchard. Among the fixed costs the rental value of owned land occupied the first place with Rs.4994.37 (18.14 percent) followed by interest on fixed capital with Rs.2018.28 (7.33 percent) depreciation charges with Rs. 324.15 (1.18 percent) and land revenue Rs.75.33.

The cost incurred to maintain one hectare of oil palm orchard during the remaining years of prebearing period (2 to 4 years) stood at Rs.15946.26, Rs. 17874.19 and Rs.16542.85 respectively during 2nd, 3rd and 4th years. The respective total variable costs on an average during the above said years were Rs.8479.03, Rs.10126.03 and Rs. 10686.18 whose percentages ranged from 53 to 65 percent of the total costs. In 2nd, 3rd and 4th years fertilizer cost turned out to be the major item of variable cost which worked out to Rs.2644.32 (16.58 percent), Rs.3944.09(22.07 percent) and Rs. 3909.07 (23.63 percent) respectively. The reasons for high fertilizer application in oil palm orchards is that oil palm is a gross feeder which demands a balanced and adequate supply of fertilizers during the initial stages of its life i.e pre-bearing period.

Next to cost of fertilizer, human labour found to be the major item of the cost in 2nd, 3rd and 4th years of pre-bearing period. The cost of human labour increased from Rs.1700.81 (10.67 percent) in 2nd year to Rs.1779.39 (9.96 percent) in 3rd year and Rs.2302.87 (13.92 percent) during 4th year. The operations such as weeding, inter culture, watch and ward and harvesting in 4th year required more labour and hence the

Expenditure on human labour increased with the age of the garden.

Manures were the third important item of variable costs. The cost of manures was almost same during 2nd, 3rd and 4th years which stood around Rs.1600.00. The other important item of variable costs, interest on working capital amounting to Rs.1255.82 (7.88 per cent), Rs.1484.26 (8.30 per cent) and Rs.1574.69 (9.52 per cent) respectively followed by electricity charges for irrigation, machine labour, bullock labour and pesticides.

Rental value of owned land formed major part of fixed costs during 2nd to 4th year. It accounted for 25.88 per cent, 24.66

per cent and 15.21 per cent of total costs respectively during 2nd, 3rd and 4th years.

The cost of cultivation from 5th to 25th year is presented in Table 2. Oil palm is being cultivated in study area since 1991 hence the data was available up to 9th year only. For the remaining years constancy was assumed pertaining to the cultivation aspects.

It is revealed from the table that the total costs increased from Rs.19687.81 in 5th year to Rs.27406.5 in 9th year and remained constant during the remaining period of life. The variable costs increased from Rs.10837.77 (55.05 per cent) during 5th year to Rs.12241.08 (44.66 per cent) during 9th year per hectare. This rise in variable costs was on account of higher expenditure incurred on inputs and input services with each passing year. The fixed costs rose from Rs.8850.04 in 5th year to Rs.15165.42 (55.34 per cent) in 9th year.

The fertilizer accounted for maximum expenditure during the bearing period. It is slightly increased from Rs.3960.33 in 5th year to Rs.4000.75 in 9th year. It is accounted for major expenditure because oil palm is gross feeder and demands a balanced and adequate supply of fertilizer for good growth and yield during bearing period. Human labour was the next major item of operational costs. Costs incurred on human labour increased continuously from Rs.2281.51 in 5th year to Rs.3352.01 per hectare in 9th year. The increase in labour cost was mainly due to increasing human labour requirement for harvesting operation and for weeding. Even though expenditure on manures occupied higher portion in operational cost (Rs.1719.45 in 5th year to Rs.1537.50 in 9th year). Its application has slightly declined during bearing period. As the age of orchards advanced farmers did not take much care towards manuring because they restored to mulching with dried oil palm leaves, empty bunches and with male flowers which improve organic matter content of soil and plant nutrient status. Interest on working capital was the next major item of cost. It increased from Rs.1601.12 in 5th year to Rs. 1806.44 per hectare in 9th year. Similar trends were observed for electricity charges, machine labour, pesticides and bullock labour during bearing period.

Among fixed costs rental value of owned land took lion's share and it increased from Rs.5509.62 (27.98 per cent) in 5th year to Rs.11825.00 (43.15 per cent) in 9th year. This increase is due to increased yield of oil palm during bearing period

with each passing year. Interest on fixed capital accounted for 7.63 percent followed by annual share of establishment cost (3.49 per cent). Depreciation accounted for 1.22 per cent and land revenue 0.28 per cent of total costs.

3.2 Returns from Oil Palm Orchard

The per hectare gross income, total costs and net income from inter crops during 1st to 3rd year and from oil palm during prebearing period are presented in Table 3.

It is clear from the table that the gross income obtained from oil palm orchards during its prebearing period amounted to Rs.64875.04 out of which sale of inter crops during first three years contributed Rs.54115.68 and the remaining Rs.10759.36 was received from the sale of fresh fruit bunches of oil palm during 3rd and 4th years. A meager yield of 0.25 tonnes and 3.66 tonnes of FFB was obtained during 3rd and 4th year respectively. It is also evident from the table that the oil palm orchardists incurred Rs. 113900.63 of which Rs. 36000.99 were incurred to raise intercrops and Rs. 77899.64 to establish oil palm orchard. During prebearing period, oil palm orchards could not compensate the costs incurred during the same period resulting in the negative net returns of Rs. 49025.59.

The particulars of Table 4 indicate that the yield per hectare increased from 5th to 9th year. Yield increased from 8.014 tonnes in 5th year to 17.20 tonnes in 9th year. It was assumed constant from 10th to 25th year. During the same period the gross income also increased from Rs.22038.50 in 5th year to 47300 in 9th year. The range of net income was from Rs. 2350.69 in 5th year to Rs. 19893.50 in 9th year. The yield, gross and net income were increased during this bearing period.

3.3 Economic viability of oil palm orchard

The costs and returns are not the perfect measures to assess the profitability from investment made on oil palm orchards. These costs and returns are not comparable with the returns from field crops that are grown in the area. Before making a choice on any enterprise, it becomes necessary to examine the economic feasibility of that enterprise. Several techniques are available for evaluating the economic viability of oil palm orchards. For this project evaluation techniques were employed. Net present worth, Benefit- cost ratio and internal rate of return were employed to examine the economic feasibility of investment on oil palm orchards. In the present study the costs and returns had been discounted at 12, 14, 16, 18, 20, 22 and 24 per cent to estimate net present worth.

It was observed from Table 5 that the net present worth was high and ranged from Rs. 65201.48 at 12 per cent to Rs. 15103.41 at 24 per cent discount rates. The high positive net present worth even at higher discount rates indicated the soundness of the investment made in oil palm orchards.

The benefit-cost ratios were 1.358, 1.321, 1.286, 1.253, 1.223, 1.193 and 1.166 at 12, 14, 16, 18, 20, 22 and 24 per cent it was 1.166 showing that a rupee invested in oil palm orchard would fetch Rs. 1.166 and this proved profitability of oil palm cultivation. So the investment on oil palm cultivation was economically feasible.

The internal rate of return was found to be 39.19 per cent which was much higher than the bank rate of interest on long term loans (14 per cent) and hence the oil palm enterprise is economically feasible. It is evident from the above discussion that the investment on oil palm orchard is a profitable proposition.

Table 1: Cost structure on oil palm orchards during pre-bearing period (1st to 4th year) (Rs/ha)

S.No	Particulars	1 st year	2 nd year	3 rd year	4 th year	Total
A	Variable costs					
1	Human Labour	4145.73 (15.05)	1700.81 (10.67)	1779.39 (9.96)	2302.87 (13.92)	9928.8 (12.75)
	Owned	468.82 (1.70)	258.92 (1.62)	271.87 (1.52)	263.60 (1.59)	1263.21 (1.62)
	Hired	3676.91 (13.35)	1441.89 (9.05)	1507.52 (8.44)	2039.27 (12.33)	8665.59 (11.12)
2	Bullock Labour(owned)	40.00 (0.15)	15.47 (0.10)	25.60 (0.14)	43.20 (0.26)	124.27 (0.16)

3	Machine Labour	864.96 (3.14)	101.01 (0.63)	116.40 (0.65)	121.04 (0.73)	1203.41 (1.54)
	Owned	587.03 (2.13)	62.01 (0.39)	78.39 (0.44)	56.48 (0.34)	784.00 (1.01)
	Hired	277.93 (1.01)	38.91 (0.24)	38.01 (0.21)	64.56 (0.39)	419.41 (0.54)
4	Plant Material Cost	8510.20 (30.90)	—	—	—	8510.20 (10.92)
5	Manures	1150.00 (4.18)	1600.00 (10.03)	1620.00 (9.06)	1623.20 (9.81)	5993.2 (7.70)
6	Fertilizers	1326.66 (4.82)	2644.32 (16.58)	3944.09 (22.07)	3909.07 (23.63)	11824.14 (15.18)
7	Pesticides	50.73 (0.18)	40.16 (0.25)	37.26 (0.21)	53.03 (0.32)	181.18 (0.23)
8	Electricity Charges	1133.30 (4.12)	1121.44 (7.03)	1119.03 (6.26)	1059.08 (6.40)	4432.85 (5.69)
9	Interest on working capital	2902.63 (10.54)	1255.82 (7.88)	1484.26 (8.30)	1574.69 (9.52)	7217.40 (9.26)
	Total variable costs	20124.21 (73.08)	8479.03 (53.17)	10126.03 (56.65)	10686.18 (64.59)	49415.45 (63.43)
B	Fixed Costs					
1	Land revenue	75.33 (0.27)	75.33 (0.47)	75.33 (0.42)	75.33 (0.46)	301.32 (0.40)
2	Rental Value of owned land	4994.37 (18.14)	4126.81 (25.88)	4407.74 (24.66)	2516.25 (15.21)	16045.17 (20.60)
3	Depreciation	324.15 (1.18)	324.15 (2.03)	324.15 (1.81)	324.15 (1.96)	1296.6 (1.66)
4	Interest on fixed capital	2018.28 (7.33)	2018.28 (12.66)	2018.28 (11.30)	2018.28 (12.20)	8073.12 (10.36)
5	Annual share of establishment cost	—	922.66 (5.79)	922.66 (5.16)	922.66 (5.58)	2767.98 (3.55)
	Total Fixed costs	7412.13 (26.92)	7467.23 (46.83)	7748.16 (43.35)	5856.67 (35.41)	28484.19 (36.57)
	Total Costs(A+B)	27536.34 (100.00)	15946.26 (100.00)	17874.19 (100.00)	16542.85 (100.00)	77899.64 (100.00)

Note: Figures in parentheses indicate percentages to total

Table 2: Cost structure on oil palm orchards during pre-bearing period (5th to 25th year)

(Rs/ha)

S.No	Particulars	5 th year	6 th year	7 th year	8 th year	9 th year	10-25 th year	Total
A	Variable costs							
1	Human Labour	2281.51 (11.59)	2346.70 (11.11)	2460.23 (10.37)	2979.56 (11.79)	3352.01 (12.23)	3352.01 (12.23)	67052.17 (12.07))
	Owned	238.48 (1.21)	275.07 (1.30)	230.68 (0.97)	252.28 (1.00)	283.82 (1.04)	283.82 (1.04)	5821.45 (1.05)
	Hired	2043.03	2071.63	2229.55	2727.28	3068.19	3068.19	61230.72

		(10.38)	(9.81)	(9.40)	(10.79)	(11.19)	(11.19)	(11.02)
2	Bullock Labour(owned)	32.00 (0.16)	64.53 (0.31)	—	—	—	—	96.53 (0.02)
3	Machine Labour	126.86 (0.64)	110.72 (0.52)	238.63 (1.01)	261.36 (1.03)	294.03 (1.07)	294.03 (1.07)	5736.08 (1.03)
	Owned	71.08 (0.36)	33.93 (0.16)	102.27 (0.40)	102.27 (0.40)	115.05 (0.42)	115.05 (0.42)	2265.40 (0.41)
	Hired	55.78 (0.28)	76.79 (0.36)	136.36 (0.57)	159.09 (0.63)	178.98 (0.65)	178.98 (0.65)	3470.68 (0.62)
4	Manures	1719.45 (8.73)	1550.18 (7.34)	1537.50 (6.48)	1537.50 (6.08)	1537.50 (5.61)	1537.50 (5.61)	32482.13 (5.84)
5	Fertilizers	3960.33 (20.12)	3922.18 (18.57)	3956.93 (16.67)	3962.05 (15.67)	4000.75 (14.60)	4000.75 (14.60)	83814.24 (15.08)
6	Pesticides	54.93 (0.28)	50.15 (0.24)	55.68 (0.23)	61.36 (0.24)	100.00 (0.36)	100.00 (0.36)	1922.12 (0.35)
7	Electricity Charges	1061.57 (5.40)	1053.22 (4.99)	1136.36 (4.79)	909.09 (3.60)	1150.35 (4.20)	1150.35 (4.20)	23716.19 (4.27)
8	Interest on working capital	1601.12 (5.40)	1570.34 (7.44)	1629.44 (6.87)	1684.14 (6.66)	1806.44 (6.59)	1806.44 (6.59)	37194.52 (6.69)
	Total variable costs	10837.77 (55.05)	10668.02 (50.52)	11014.77 (46.42)	11395.06 (45.07)	12241.08 (44.66)	12241.08 (44.66)	252013.98 (45.35)
B	Fixed Costs							
1	Land revenue	75.33 (0.38)	75.33 (0.36)	75.33 (0.32)	75.33 (0.30)	75.33 (0.28)	75.33 (0.28)	1581.93 (0.28)
2	Rental Value of owned land	5509.62 (27.98)	7108.26 (33.66)	9375.00 (39.50)	10546.88 (41.72)	11825.00 (43.15)	11825.00 (43.15)	233564.76 (42.03)
3	Depreciation	324.15 (1.65)	324.15 (1.53)	324.15 (1.37)	324.15 (1.28)	324.15 (1.18)	324.15 (1.18)	6807.15 (1.22)
4	Interest on fixed capital	2018.28 (10.25)	2018.28 (9.56)	2018.28 (8.50)	2018.28 (7.98)	2018.28 (7.36)	2018.28 (7.36)	42383.88 (7.63)
5	Annual share of establishment cost	922.66 (4.69)	922.66 (4.37)	922.66 (3.89)	922.66 (3.65)	922.66 (3.37)	922.66 (3.37)	19375.86 (3.49)
	Total Fixed costs	8850.04 (44.95)	10448.68 (49.48)	12715.42 (53.58)	13887.30 (54.93)	15165.42 (55.34)	15165.42 (55.34)	303713.58 (54.65)
	Total Costs	19687.81 (100.00)	21116.70 (100.00)	23730.19 (100.00)	25282.36 (100.00)	27406.5 (100.00)	27406.5 (100.00)	555727.56 (100.00)

Note: Figures in parentheses indicate percentages to total

Table 3 : Returns from oil palm orchards during pre-bearing period (1st to 4th year)

(Rs/ha)

S.No	Particulars	1 st year	2 nd year	3 rd year	4 th year	Total
1	Gross Income					
	Inter crops	19977.48	16507.24	17630.96	--	54115.68
	Oil palm	-	-	694.36	10065	10759.36
	Total	19977.48	16507.24	18325.32	10065	64875.04
2	Total Costs					
	Inter crops	14584.98	10648.32	10767.69	-	36000.99
	Oil palm	27536.34	15946.26	17874.19	16542.85	77899.64
	Total	42121.32	26594.58	28641.88	16542.85	113900.63

3	Net Income					
	Inter crops	5392.5	5858.92	6863.27	--	18114.69
	Oil palm	-27536.34	-15946.26	-17179.83	-6477.85	-67140.28
	Total	-22143.84	-10087.34	-10316.56	-6477.85	-49025.59

Table 4: Returns from oil palm orchards during bearing period (5th to 25th year)

S. No	Particulars	5 th year	6 th year	7 th year	8 th year	9 th year	10-25 th year	Total
1	Yield(tonnes)	8.014	10.34	13.64	15.34	17.20	17.20	339.73
2	Gross income(Rs.)	22038.5	28435.04	37500	42187.5	47300	47300	934261.04
3	Total costs(Rs.)	19687.81	21116.7	23730.19	25282.36	27406.5	27407	555727.56
4	Net income (Rs.)	2350.69	7318.34	13769.81	16905.14	19893.5	19894	378533.48

Table 5: Estimates of economic viability of oil palm orchard

S.No	Particulars	Discount Rates						
		12%	14%	16%	18%	20%	22%	24%
1	Net present worth(Rs.)	65201.48	50698.61	39645.43	31125.43	24540.44	19261.91	15103.41
2	Benefit cost Ratio	1.358	1.321	1.286	1.253	1.223	1.193	1.166
3	IRR	39.19%						

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