

# Investments and Expected Returns from Oil Palm Cultivation in India

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*This paper gives information on the potentiality and profitability of growing oil palm in India based on initial studies carried out at the Central Plantation Crops Research Institute (CPCRI) Research Centre, Palode. A detailed account of the cost involved from raising of oil palm nursery to the tenth year of its planting in the main field (when the crop attains yield stability) is furnished.*

*Cost of raising about 150 seedlings in the nursery to meet the requirement for planting 1 hectare is around Rs. 920. This amount includes the combined expenditure for both primary and secondary nursery. Once the crop attains stabilised bearing, the cost of maintenance of 1 hectare of oil palm plantation is around Rs. 3 600 under rainfed conditions with a labour requirement of 150 mandays. Annual net profit will be around Rs. 31 500 per hectare. Under irrigated conditions the annual net profit will be Rs. 48 700 the cost of cultivation being Rs. 4 200 per hectare. The labour requirement pattern for various agricultural operations shows that the crop provides employment opportunity to the rural poor throughout the year. During the productive stage, major share of labour is utilised for three operations viz., harvesting, weeding and fertiliser application.*

*It is illustrated that if a processing unit with a capacity of 3 tonnes of fresh fruit bunches (FFB) per hour is installed (as available at present in the country) production from an area of 150-200 hectares, is required to keep the unit fully operational. Hence the possibilities and need to establish smaller capacity oil extraction units for a 30 hectare plantation to run its own FFB processing plant as a viable unit is also discussed.*

India is the largest importer of edible oils, 50 per cent of which is palm oil. Palm oil can be produced in India by promoting cultivation of oil palm. The oil palm plantations raised in Kerala State has given encouraging results. There is tremendous potential for raising this perennial oil crop in Andamans, Karnataka, Andhra Pradesh and parts of Tamil Nadu. The possibility of growing this crop in Maharashtra, Goa, Gujarat and North Eastern regions is being evaluated and the initial results are positive and encouraging. The major oil yielding crop in India viz., groundnut,

castor, rapeseed, sunflower and coconut give an average yield of around 1 tonne oil per hectare, whereas the oil palm under rainfed conditions is giving a yield of 2.5 to 3 tonnes oil per hectare, which can go above 5 tonnes per hectare with good management practices including irrigation.

The crop requires a well distributed rainfall of 2000-3000mm. The hot humid equatorial climate with no dry period is most suitable for oil palm. The minimum temperature should not fall below 15°C., and the maximum

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should not exceed 35°C. Where the temperatures are higher, ameliorative measures such as irrigation, raising of cover crops, border planting of trees, heavy mulching *etc.*, will have to be adopted. The crop requires good sunlight. Oil palm performs well in a deep well-drained medium loam soil, rich in humus with a pH of 4 to 5. Flat or gently undulating land is ideal, however, hillylands can also be used in which case cost for terracing should be anticipated. Triangular system of planting with 9m x 9m x 9m spacing is recommended for the crop to accommodate 138 palms per hectare.

## MATERIALS AND METHODS

The information on labour requirements for various agricultural operations were collected from CPCRI farm, Palode, Kerala, India. The plantations are of different age groups with the earliest planting done during 1976 constituting an area of around 15 hectares. Harvesting is carried out using a chisel attached to a wooden pole. Weeding is done using manual labour. Labour charges were estimated at Rs. 12 per day which is prevailing in most of the South Indian states.

## RESULTS AND DISCUSSIONS

### *Raising nursery*

At present India is in a position to produce 3 lakh seed materials of *Tenera* hybrids (*Dura* x *Pistifera*) in the country itself. CPCRI, Research Centre, Palode is the only centre from where oil palm seeds are supplied as preheated seeds or as sprouts from which the nursery has to be raised. The sprouts are planted initially in small

polybags filled with top soil (primary nursery). After three months, these seedlings are transferred to bigger polybags where it will remain for another nine months (secondary nursery) before planting. The cost involved in raising a nursery required for 1 hectare (150 seedlings) plantation will be around Rs. 920 as furnished in *Table 1*. Single stage nursery is not considered since polybags are found to tear away within one year.

### *Raising plantation*

*Rainfed conditions.* Details of various agricultural operations and the cost of establishing 1 hectare of oil palm plantation is furnished in *Table 2*. This excludes the cost of land as we expect government owned land, leased land or already owned property will be used for the cultivation of oil palm. Although flowering starts within two years, these inflorescences are removed (ablation) and not allowed to bear bunches till 3½ years. From the fourth year, the yield of bunches increases up to the tenth year and a stabilised bearing is attained thereafter. During the first year, the expenses will be as high as around Rs. 7 310, a large part of which is spent towards land preparations, cost of seedlings and platform cutting on slopes. The annual recurring expenditure will be increasing gradually because of the increasing doses of fertilisers and also due to the harvesting costs from the fourth year onwards. From the fifth year, the cost of cultivation of maintaining the plantation will be around Rs. 3 600.

The annual returns are expected to exceed the annual expenses from the sixth year (please *vide Table 4* for details on returns). However, the total returns

**TABLE 1.**  
**COST OF RAISING NURSERY FOR PLANTING 1 HECTARE**  
**(150 SEEDLINGS)**

	<i>Labour (mandays)</i>	<i>Material- cost Rs.</i>	<i>Total cost Rs.</i>
<i>Primary nursery</i>			
Cost of 150 sprouts @ Rs. 1/-	—	150	150
Cost of polybags 0.5 x 150	—	75	75
Cost of farm manure	—	15	15
Filling polybags and planting germinated sprouts	1.5	16	34
Providing shade and upkeep	1.5	15	33
Watering	0.5	—	6
Cost of fertiliser and its application charges	0.5	11	17
Total	4	282	330
<i>Secondary nursery</i>			
Collection of top soil	2	—	24
Cost of farm manure and Rock phosphate	—	30	30
Cost of 150 polybags @ Rs. 2/-	—	300	300
Transplanting to secondary nursery	2	—	24
Watering secondary nursery	5	—	60
Fertiliser and its application charges	3	50	86
Weeding, maintenance and other charges	5	—	60
	17	380	584
Total (Primary + Secondary nursery)	21	662	914

since its planting, exceeds the total cumulative expenditure only during the eighth year. The gross cost of establishing 1 hectare of oil palm plantation up to the end of eighth year under rainfed condition is around Rs. 37 000 and the cumulative returns for the corresponding period will be about Rs. 51 000 giving a profit of Rs. 14 000 up to that year. During the ninth year an annual yield of 12 tonnes FFB is obtained giving an annual net profit of Rs. 24 000 per hectare. From the tenth year onwards an annual yield of 15 tonnes FFB per

hectare, can be expected, giving a gross return of Rs. 39 000. The corresponding annual expenditure including the cost of maintenance and cost of oil extraction will be Rs. 7 500. Thus the net profit works out to be Rs. 31 500 per hectare per year during the stabilised bearing stage.

*Irrigated conditions.* Majority of the area identified for oil palm cultivation in the states of Karnataka, Andhra Pradesh, Maharashtra and Tamil Nadu are under assured water supply. The

TABLE 2.  
COST OF PRODUCTION PER HECTARE UNDER RAINFED CONDITIONS

Sl. No.	Details of work	First year			Second year			Third year			Fourth year			Fifth year		
		L	M	T	L	M	T	L	M	T	L	M	T	L	M	T
1.	Cleaning, levelling and bunding	120	-	1 440	12	-	144	-	-	-	-	-	-	-	-	-
2.	Peg marking and alignment	4	25	73	-	-	-	-	-	-	-	-	-	-	-	-
3.	Taking pits of size 60cm x 60cm x 60cm	38	-	456	-	-	-	-	-	-	-	-	-	-	-	-
4.	Filling of pits with top soil	5	-	60	-	-	-	-	-	-	-	-	-	-	-	-
5.	a) Cost of 140 seedlings @ Rs. 7/- b) Seedling (60) for gap filling	-	980	980	-	-	-	-	-	-	-	-	-	-	-	-
6.	Transporting seedlings to pits	5	-	60	-	-	-	-	-	-	-	-	-	-	-	-
7.	Planting cost	8	-	96	-	-	-	-	-	-	-	-	-	-	-	-
8.	Raising cover crops (2.5 kg @ Rs. 20/-)	4	50	98	-	-	-	-	-	-	-	-	-	-	-	-
9.	Manuring cover crops	3	64	100	-	-	-	-	-	-	-	-	-	-	-	-
10.	Fertilisers (N:P:K g/palm) First year (400 : 200 : 400) Second year (800 : 400 : 800) Third year (1200 : 600 : 1200)	-	488	488	-	-	-	-	-	-	-	-	-	-	-	-
11.	Fertiliser application (2 rounds)	12	-	144	12	-	144	24	-	288	24	-	288	24	-	288
12.	Gap filling	2	-	24	1	-	12	-	-	-	-	-	-	-	-	-
13.	Weeding thrice a year	75	-	900	60	-	720	45	-	540	45	-	540	36	-	432
14.	Plant protection a) Insect disease control b) Bird control	3	40	76	3	40	76	3	40	76	3	40	76	3	40	76
15.	Upkeep of foot paths and roads	2	-	24	2	-	24	2	-	24	2	-	24	2	-	24
16.	Platform cutting/forming basins	138	-	1 656	-	-	-	-	-	-	-	-	-	-	-	-
17.	Palm cleaning	1	-	12	2	-	24	3	-	36	4	-	48	5	-	60
18.	Ablation or castration	-	-	-	-	-	-	4	-	48	-	-	-	-	-	-
19.	Palm numbering using paint	-	-	-	-	-	-	2	60	84	-	-	-	-	-	-
20.	Leaf pruning	-	-	-	-	-	-	1	-	12	2	-	24	3	-	36
21.	Harvesting	-	-	-	-	-	-	-	-	-	-	-	288	48	-	576
22.	Transporting charges	-	-	-	-	-	-	-	-	-	-	-	144	24	-	288
23.	Miscellaneous expenses	-	200	200	-	200	200	-	200	200	-	200	200	-	200	200
		420	2 267	7 307	92	1,215	2 319	84	1 760	2 768	121	1 740	3 192	150	1 740	3 540

Cost of labour @ Rs. 12/- day, L = Labour (Mandays), M = Material cost (Rupees), T = Total amount (Rupees).

additional investments in establishing plantations under irrigation through installation of drip irrigation system and the anticipated returns under such situation is presented in *Tables 3 and 4*.

The investments during the first year will be almost three times than that under rainfed conditions mainly on account of the initial expenditure required to install the drip irrigation system. The annual recurring expenditure also increases due to irrigation. With irrigation, the annual returns will exceed the expenses from the fourth year of its planting *ie.*, from the first harvest itself. The total expenditure up to the end of fourth year is Rs. 31 000. The cost of maintaining the plantation from the fifth year will be around Rs. 4,200. By the end of seventh year of its planting, the total returns amount to Rs. 68 000 giving a profit of Rs. 18 000 after meeting all the expenses of Rs. 50 000 up to that year. The annual net profit obtained during the eighth and ninth year with an annual yield of 16 and 20 tonnes FFB per hectare, amounts to Rs. 33 500 and 44 000 respectively. A stabilised yield of 22 tonnes FFB per hectare, can be expected from the tenth year of its planting giving an annual net profit of Rs. 48 700 which means a monthly net income of around Rs. 4 000 per hectare. Under irrigated conditions, additional profit can be obtained through mixed cropping systems with compatible crop combinations such as Cacao and Coffee.

#### *Labour requirement*

The labour requirement for maintaining an adult plantation is 150 mandays under rainfed conditions and 200 mandays under irrigated conditions,

distribution of which is also furnished in *Tables 2 and 3*. *Table 5* summarises the labour utilisation pattern for the major cultural operations during different years (expressed as percentage of total labour during that year). It is seen that during the first year of planting in the main field, more labour is utilised for cleaning and levelling of land (29%), taking pits (9%), weeding (18%) and for platform cutting and forming basins on slopes (32%). The labour requirement during the first year for unirrigated plantation is 420 mandays and for irrigated ones it is 490 mandays per hectare. During the second and third year this gets reduced to 92 and 84 mandays respectively. The major share of labour during these years is utilised for weeding and fertiliser applications. Again from the fourth year onwards more labour is needed mainly for harvesting and transporting of oil palm bunches. Under irrigated conditions an additional 20 per cent more labour is needed for the maintenance and operation of the drip irrigation system. Labour charges is considered at Rs. 12 per day which is applicable to the states of Karnataka and Andhra Pradesh. Under Kerala conditions the labour charge may be as high as Rs. 25 per day. At this rate the margin of profit per hectare per year gets further reduced by Rs. 1 950 under rainfed conditions and Rs. 2 600 under irrigated conditions. Thus establishment of oil palm plantation also provides adequate employment opportunities for the rural population all through the year.

#### *Requirement for a processing unit*

The harvested FFB has to be processed within a few hours for oil extraction. The method of processing involves various stages *viz.*, sterilisation, stripping,

TABLE 3.  
COST OF PRODUCTION PER HECTARE UNDER IRRIGATED CONDITIONS

Sl. No.	Details of work	First year			Second year			Third year			Fourth year			Fifth year		
		L	M	T	L	M	T	L	M	T	L	M	T	L	M	T
Additional requirement for installing drip irrigation for 1 ha. unit.																
1.	Cost of pump set	-	3 000	3 000	-	-	-	-	-	-	-	-	-	-	-	-
2.	Cost of main tank	-	3 500	3 500	-	-	-	-	-	-	-	-	-	-	-	-
3.	Cost of pressure regulating tank	-	500	500	-	-	-	-	-	-	-	-	-	-	-	-
4.	Other fittings	-	500	500	-	-	-	-	-	-	-	-	-	-	-	-
5.	Main pipe, lateral and other fittings	-	5 000	5 000	-	-	-	-	-	-	-	-	-	-	-	-
6.	Installation and laying drip - irrigation system	40	-	480	-	-	-	-	-	-	-	-	-	-	-	-
7.	Operation charges	30	-	360	30	-	360	40	-	480	50	-	600	50	-	600
Total additional cost for irrigation		70	12 500	13 340	30	-	360	40	-	480	50	-	600	50	-	600
Total cost of production under irrigated conditions		490	14 767	20 647	122	1 215	2 679	124	1 760	3 248	171	1 740	3 792	200	1 740	4 140

TABLE 4.  
RETURNS FROM ONE HECTARE OF OIL PALM PLANTATION

Details of receipts	Years since planting									
	1	2	3	4	5	6	7	8	9	10
<b>RAINFED CONDITION</b>										
FFB yield (tonnes)	-	-	-	0.5	1	3	6	9	12	15
Palm oil @ 18% (t)	-	-	-	0.09	0.18	0.54	1.08	1.62	2.16	2.7
Palm kernel oil (Kg.)	-	-	-	9	18	54	108	162	216	270
Income from palm oil @ Rs. 12 000/t.	-	-	-	1 080	2 160	6 480	12 960	19 440	25 920	32 400
Income from palm kernel oil @ Rs. 25/Kg.	-	-	-	225	450	1 350	2 700	4 050	5 400	6 750
Total income	-	-	-	1 305	2 610	7 830	15 660	23 490	31 320	39 150
Cost of production	7 307	2 319	2 768	3 192	3 540	3 540	3 540	3 540	3 540	3 540
Cost of oil extraction	-	-	-	500	500	1 000	2 000	3 000	3 500	4 000
Net returns	(-7 307)	(-2 319)	(-2 768)	(-2 387)	(-1 430)	3 290	10 120	16 950	24 280	31 610
<b>IRRIGATED CONDITION</b>										
FFB yield (tonnes)	-	-	-	2	4	8	12	16	20	22
Palm oil @ 18% (t)	-	-	-	0.36	0.72	1.44	2.16	2.88	3.6	3.96
Palm kernel oil (Kg.)	-	-	-	36	72	144	216	288	360	396
Income from palm oil @ Rs. 12 000/t.	-	-	-	4 320	8 640	17 280	25 920	34 560	43 200	47 520
Income from palm kernel oil @ Rs. 25/Kg.	-	-	-	900	1 800	3 600	5 400	7 200	9 000	9 000
Total income	-	-	-	5 220	10 440	20 880	31 320	41 760	52 200	57 420
Cost of production	20 647	2 679	3 248	3 792	4 140	4 140	4 140	4 140	4 140	4 140
Cost of oil extraction	-	-	-	1 000	1 000	2 000	3 500	4 000	4 000	4 500
Net returns	(-20 647)	(-2 679)	(-3 248)	428	5 300	14 740	23 680	33 620	44 060	48 780

\* Note: Interest on capital investments such as land, factory etc., has not been taken into account in calculating the expenditure.

**TABLE 5.**  
**LABOUR UTILISATION PATTERN FOR MAJOR FIELD OPERATIONS**

<i>Field operations</i>	<i>Year of planting in main-field</i>				
	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5th year onwards</i>
	<i>in mandays (% in parenthesis)</i>				
Cleaning and levelling land	120 (29%)	—	—	—	—
Taking planting pits	38 (9%)	—	—	—	—
Platform cutting and taking basins on slopes	138 (32%)	—	—	—	—
Weeding three rounds	75 (18%)	60 (65%)	45 (54%)	36 (30%)	36 (24%)
Fertiliser application	12 (3%)	12 (13%)	24 (29%)	24 (20%)	24 (16%)
Harvesting	—	—	—	24 (20%)	48 (32%)
Transporting bunches	—	—	—	12 (10%)	24 (16%)
All other operations combined	37	30	15	25	18
Total under rainfed conditions	420 (100%)	92 (100%)	84 (100%)	121 (100%)	150 (100%)
Additional for irrigation	70 (14%)	30 (25%)	40 (33%)	50 (29%)	50 (25%)
Total under irrigated conditions	490	122	124	171	200

fruit digestion, pressing and clarification. The presently available mills cannot process less than 3 tonnes FFB per hour. To meet the daily FFB demand of such a unit, we have to have an oil palm plantation of 150–200 hectares, as illustrated below:—

Annual production of FFB under rainfed conditions = 15 tonnes per hectare  
 Production of FFB in peak months (20%) = 3 000 kg per month

Per day production (distributed equally for the 25 working days in a month) =  $3\ 000/25 = 120$  kg  
 Minimum capacity of available processing unit = 3 tonnes per hour  
 Per day capacity for eight hours = 24 000 kg  
 Area required to produce 24 000 kg @ 120 kg. per day =  $24\ 000/120 = 200$  ha.

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It can be seen that if the area is less, the mill has to be idle for a few hours even in peak months thus becoming non-viable. In cases where a single farmer do not own over 200 hectares, few planters within a radius of say 40km., may join on co-operative basis so that a viable processing unit can be installed.

A small scale extraction unit with a capacity of processing 450kg. FFB per hour per day to give approximately 500kg. of palm oil in an eight-hour working day is being established at the Research Centre of C.P.C.R.I. at Palode at a cost of Rs. 12.65 lakhs. If this proves successful it will be possible to raise smaller plantation units of around 30 hectares which will produce about 3 500kg. FFB per day in peak season. In lean season where the factory is not fully operational the labour should be diverted to do the farm work. Efforts are now underway to device still smaller capacity mills so that smallholders can also take up oil palm planting.

### CONCLUSION

In conclusion, the potential rewards as

#### Editor's note:

*The above is a very interesting paper that indicates very clearly official thinking of a major importer of Malaysian Palm Oil. It is also an indicator of Indian Research approaches in the crop. Their preference to irrigation and small scale processing units in what is really a smallholder environment is particularly interesting and if successful could have influence on smallholder development elsewhere in the world.*



given in this article must attract more farmers in India to establish oil palm plantations which is found highly remunerative. Information furnished on cost involved during various years for agricultural operations will provide the basic data required by farmers, scientists and funding agencies interested in oil palm cultivation. Investments and return opportunities on oil palm plantation can be compared with that of an industry. Though investment in the initial years are sizeable, once production starts from the fourth year, there is a sustained income throughout the year for another 40 years. The funding agencies must provide the required incentives to the farmers by way of subsidy and interest free loans especially during the pre-bearing stage for bringing more area under oil palm, which appears to be the best solution to wipe out the present vegetable oil deficit in India.

### REFERENCE

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