

RESEARCH PAPER

# Economics feasibility of coconut cultivation in Karnataka

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## ABSTRACT

The present study was undertaken in Tumkur and Hassan districts of Karnataka during the year 2015-16, with the objective of studying the economics and feasibility of coconut cultivation. Multistage sampling method was used for the study. The sample size was 80 farmers. Tabular analysis and financial feasibility tools like NPV, IRR, B:C ratio and PBP were used for analysis. The results revealed that initial investment on coconut plantation worked out to of Rs. 63,708 per hectare. The total maintenance cost during gestation period was found to be Rs. 4,68,750 and the total cost of establishing one hectare of coconut plantation was Rs. 5,37,266. The total cost of cultivation of coconut during bearing period was Rs. 1,61,827 per hectare. The total cost of cultivation of copra was Rs. 1, 67,580 per hectare. It was observed that the per quintal cost of cultivation of copra worked out to of Rs. 8,480. The net return from copra was the highest at Rs. 22,856 per hectare, followed by the second highest net returns from tender nuts (21,591 per hectare) and lastly returns from mature nuts (905 per hectare). The net present value at the end of the economic life of the project *viz.*, 50 years was found to be Rs. 3,76,861 per hectare at 10 per cent discount factor. The project on coconut cultivation had an internal rate of return of 13.3 per cent over its economic life. It was observed that the payback period of coconut cultivation was 21.8 years. The benefit cost ratio of coconut plantations was found to be 1.18.

**KEY WORDS :** Coconut, Maintenance cost, Cost of cultivation, Feasibility, Copra, Net present value, B:C ratio, Internal rate of return, Pay back period

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**C**oconut is one of the most important plantation crops in India and more so in south India. It is nicknamed Kalpatharu meaning tree of life.

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Popular saying goes 'Nourish a coconut tree for seven years and it will nourish you for the rest of its life'. However, in recent times, the coconut community has been facing several problems like shortage of rainfall, insufficient irrigation facilities and fluctuating prices among others. There have also been discussions and debates regarding the profitability of coconut cultivation among the coconut community and stakeholders. There have also been many studies with respect to economics of coconut cultivation and marketing. Majority of these studies have been conducted in Kerala and Tamil Nadu. However, the inflationary rates and costs vary from state

to state to a large extent. Hence, there is a need for a detailed study of the various economic aspects of coconut cultivation and marketing like the investment and maintenance charges, cultivation charges, marketing costs etc. with respect to Karnataka state. This information can be used by policy makers while formulating support prices for coconut and copra. The present study was conducted with the objective of analyzing the costs and returns, establishment costs, annual cost of cultivation and financial feasibility of coconut cultivation in Karnataka.

## METHODOLOGY

Multistage sampling method was used for selection of districts, taluks and markets. Tumakuru and Hassan districts were purposively selected based on highest area and production in the state *viz.*, 45 to 50 per cent of area and production of coconut. Two taluks in each district *viz.*, Arsikere and Channarayapatna from Hassan district and Tiptur and Turuvekere from Tumakuru district were selected, respectively. 80 farmers were interviewed by simple random sampling method using well structured and pre-tested schedules. The primary data relating to initial investment, maintenance cost during gestation period, annual cost of production, returns was obtained from the respondents for the year 2015-16. Tabular analysis tools like percentages, averages and financial feasibility tools like NPV, B:C ratio, PBP and IRR were used for analysis.

### Amortization cost :

The amortization cost for establishment of coconut plantation is considered to represent the annual fixed cost component of plantation maintenance. The capital investment made in first 7 years for establishment was divided into equal annual instalments starting from seventh year till the economic life of coconut plantation

$$A = (c \times r) \times (1+r)^t / (1+r)^t - 1$$

where,

A = Annual amortization cost in rupee

C = Initial capital investment in rupee

r = Discount rate (10 %)

t = Expected life of the orchard (50 years).

### Discounted payback period (PBP) :

Pay-back period refers to the length of time period required for an investment to generate the net cash income to be equal to the original investment.

$$\sum_{t=0}^n C_t = \sum_{t=0}^n R_t$$

where

$R_t$  = Return in period t

$C_t$  = Cost in period t

### Net present value (NPV) :

It represents the discounted value of the net cash flows of the project.

$$NPV = \sum_{t=1}^n \frac{(B_t - C_t)}{(1+d)^t}$$

where

$B_t$  = Benefits in each year

$C_t$  = Costs in each year

d = Discount rate (10 %)

n = Economic life of the plantation

### Benefit-cost ratio :

The benefit cost ratio was worked out by dividing discounting benefits by discounted cost during the life period of the coconut plantation. It was calculated using the formula:

$$BCR = \frac{\sum_{t=1}^n \frac{B_t}{(1+d)^t}}{\sum_{t=1}^n \frac{C_t}{(1+d)^t}}$$

where

$B_t$  = Benefits in each year

$C_t$  = Costs in each year

d = Discount rate (10 %)

n = Economic life of the plantation

### Internal rate of return (IRR) :

It is that discount rate which makes the net present worth of cash flow equal to zero. It represents the average earning power of money used in the project over the project life. The formula used is

$$\left[ \text{Internal rate of return} \right] = \left[ \text{Lower discount rate} \right] + \left[ \text{Difference between two discount rates} \right] \left( \frac{\text{Present worth of the cash flow at the lower discount rate}}{\text{Absolute difference between present worth's of cash flow at two discount rates}} \right)$$

The interest rate closer to opportunity cost of 10 per cent was chosen as discount rate in case of coconut cultivation.

## ANALYSIS AND DISCUSSION

The initial investment is the amount required to start a project and establish it until the returns start coming from the project. The initial investment on coconut plantation worked out to of Rs. 63,708 per hectare. It contributed only 11.96 per cent to the total establishment cost. Activities like digging, filling and planting (15,895), fencing (8,892) and land preparation (4,218) were the major contributors towards labour costs as shown in Table 1. Similar results were found in case of Goswami and Challa (2007) in their study on Rubber plantations. The maintenance cost is the major part of the establishment cost contributing 88.03 per cent. It was observed that almost 56.08 per cent of maintenance cost was borne towards the variable cost and the remaining 43.92 per cent was towards fixed costs like land rent, depreciation and interest on fixed capital (Table 2). The total maintenance cost during the gestation period was Rs. 4,68,750 per hectare. Among the maintenance costs, majority went towards rental value of land (27,170), followed by intercultivation (8,954), irrigation (6,171), manure application (4,810), weeding (3,468) and others (Chinniah and Suresh, 2013). The labour costs formed a major part in the total variable costs. The interest on working capital has been taken as seven per cent per annum, while interest on fixed capital has been taken to be 10.00 per cent per annum.

The annual cost of cultivation and marketing of coconut is the cost involved in production and marketing of coconut after the bearing starts *viz.*, 7<sup>th</sup> year. The

variable costs have been worked out separately for mature coconut and copra. In the cultivation and marketing of mature coconut, the total cost of cultivation was found to be Rs. 1,61,827 per hectare. Out of this cost, fixed costs (93,361) constituted about 57.69 per cent and variable costs (68,466) constituted 42.3 per cent. This high share of fixed cost was because of two major costs *viz.*, the amortization cost and rental value which are hypothetical costs. They are assumed based on opportunity cost concept. Among the variable costs, the expenses on labour (44,074) and material inputs (9,724) constituted 27.23 per cent and 6 per cent, respectively. Labour intensive activities like intercultivation (7,797), irrigation (9,062), dehusking (4,940), harvesting (2,649) and collection and handling (2,688) contributed to a large extent to the total variable cost. It can be suggested that these activities have to be brought under mechanization to the maximum extent possible. The major material costs were expenses on manures (4,668), fertilizers (1,733) and organic protectants (2,140). Marketing costs of mature coconut constituted 6.26 per cent of total cost. With respect to cost of cultivation and marketing of copra, it was observed that the material costs and labour costs are the same as mature nuts, upto the stage of harvesting of nuts. After the harvesting stage, additional cost has to borne towards conversion of nuts to copra. The total cost of cultivation and marketing of copra worked out to of Rs.1,67,580 per hectare. Out of variable cost, major portion was borne towards copra making (16,863) followed by irrigation (9,062), intercultivation (7,797) and

**Table 1 : Initial investment and maintenance cost of coconut plantation during gestation period (Rs./hectare/year)**

Sr. No.	Particulars	Unit	Quantity	Rate/unit	Value (Rs./acre)	Per cent to total
	Initial investment					
1.	Planting materials	Number	132.47	130	17,220.59	3.23
2.	Fencing	-	-	-	-	-
A	Poles	Number	88.92	120	10,670.40	2.00
B	Barbwire	Quintal	1.06	5000	5,310.50	0.99
3.	Small implements	-	-	-	1,500.00	0.28
I	Total material cost	-	-	-	34,701.49	6.51
4.	Land preparation	Machine hours	5.21	700	3,648.19	0.68
		BL	0.82	700	570.57	0.10
5.	Digging, planting and filling	(Rs./pit)	132.47	120	15,895.93	2.98
6.	Fencing (Digging, planting, filling)	(Rs./pit)	88.92	100	8,892.00	1.66
II	Total labour cost	-	-	-	29,006.69	5.44
A	Total initial investment (I + II)				63,708.19	11.96
B	Total maintenance cost				4,68,750.00	88.03
	Total establishment cost (A + B)				5,32,458.19	100.00

others as shown in Table 3.

The analysis of cost and return structure in coconut cultivation is observed in Table 4. The returns have been discussed separately for of mature nuts, tender nuts and copra. The total nut yield per hectare has been considered as 14,326 nuts per hectare. After deducting the household and other requirements, the nuts are available for selling was worked out to 14,026 nuts. The returns from selling mature nuts at 11 per nut were calculated as of Rs. 1,54,286 per hectare. The returns from by-products like husk and dry leaves were worked out to of Rs. 8,447 and the total returns from main and by-products was Rs. 1,62,733 per hectare. After deducting the total cost of cultivation (1,61,827 per hectare), the net returns from mature nuts was found to be Rs. 905 per hectare. The return from selling of tender nuts was also calculated. The nuts available for selling as tender nuts were assessed as 13,800 nuts. The returns from sale of tender nuts at 13 per nut were worked out to of Rs. 1,83,105 per hectare. The returns from by-products *viz.*, dry leaves were worked out to of Rs. 3705 and the total returns

from tender nuts were found to be Rs.1,83,105 per hectare. The total cost of tender nut cultivation and marketing was calculated as Rs. 1,61,513 per hectare, thereby giving the farmers a net profit of Rs. 21,591 per hectare.

The returns from copra were also worked out on a per hectare basis. It was estimated that from 14,026 mature nuts or from one hectare land, approximately 19.7 quintals of copra can be obtained. An average price of Rs. 9,000 per quintal were used for calculation of returns, taking into consideration, the average annual price of the previous and present years. Accordingly, the returns from copra were calculated to be Rs. 1,77,840 per hectare. The returns from by-products *viz.*, dry leaves, husk and shell was Rs.12,596. The total returns was found to be Rs. 1,90,437 and thereafter deducting the total cost of copra production and marketing (1,67,580 per hectare), the net profit realized by farmer was found to be Rs. 22,856 per hectare. It was also observed that the per quintal cost of cultivation of copra worked out to be Rs. 8,480.

**Table 2 : Maintenance cost of coconut plantation during gestation period in the study area (Rs./hectare)**

Sr. No.	Particulars/Years	1 <sup>st</sup> year	2 <sup>nd</sup> year	3 <sup>rd</sup> year	4 <sup>th</sup> year	5 <sup>th</sup> year	6 <sup>th</sup> year	Total cost	Per cent to total
1.	Planting materials	-	2,283	-	-	-	-	2,283	0.49
2.	Manure	3,251	3,413	3,576	4,772	4,980	5,187	25,178	5.37
3.	Fertilizers	1,130	1,246	1,367	1,495	1,627	1,766	8,631	1.84
4.	Plant protection chemicals	-	-	-	-	346	354	701	0.15
5.	Silt	-	210	216	222	228	234	1,111	0.24
6.	Miscellaneous	1,235	1,297	1,359	1,420	1,482	1,544	8,336	1.78
A	Total material costs	5,616	8,449	6,517	7,909	8,663	9,085	46,239	9.86
7.	Gap filling	-	2,107	-	-	-	-	2,107	0.45
8.	Fertilizers/solutions application	1,061	1,104	1,146	1,188	1,231	1,273	7,003	1.49
9.	Manure application	4,810	4,995	5,181	6,523	6,750	6,977	35,236	7.52
10.	Silt application	-	3,062	3,185	3,307	3,430	3,552	16,536	3.53
11.	Irrigation	6,171	9,235	9,789	10,152	10,514	10,877	56,738	12.10
12.	Weeding	3,468	3,607	3,745	3,884	4,023	4,161	22,888	4.88
13.	Intercultivation	8,954	9,300	9,646	9,993	10,340	10,688	58,922	12.57
B	Total labour cost (A)	24,464	33,410	32,692	35,047	36,288	37,529	1,99,431	42.55
14.	Interest on working capital @ 7 %	2,106	2,930	2,745	3,007	3,147	3,263	17,197	3.67
I	Total variable cost (A + B + 14)	32,185	44,789	41,955	45,963	48,098	49,878	2,62,867	56.08
15.	Rental value	27,170	27,442	27,713	27,985	28,257	28,529	1,67,096	35.65
16.	Land revenue	200	200	200	200	200	200	1,200	0.26
17.	Depreciation	3,145	3,145	3,145	3,145	3,145	3,145	18,870	4.03
18.	Interest on fixed capital @ 10 %	3,052	3,079	3,106	3,133	3,160	3,187	18,717	3.99
II	Total fixed cost (15+16+17+18)	33,567	33,865	34,164	34,463	34,762	35,061	2,05,882	43.92
III	Total cost (I + II)	65,751	78,655	76,119	80,426	82,860	84,938	4,68,750	100.00

The net present value of coconut was calculated at 10 per cent discount factor taking into consideration the existing bank base rate for agriculture with respect to public sector banks, private sector banks and also co-

operative banks. The net present value of the economic life of the project *viz.*, 50 years was found to be Rs. 3,76,861 per hectare as shown in Table 5. It was positive and therefore satisfying the norms of feasibility with

**Table 3 : Annual cost of cultivation and marketing of coconut/copra during bearing period (Rs./hectare)**

Sr. No.	Particulars	Unit	Qty	Value
1.	Manure	Tonnes	6.66	4,668.30
2.	Fertilizers	Kg	97.93	1,733.47
3.	Plant protection chemicals	Litres	0.41	314.93
4.	Silt	Tractor loads	6.76	203.03
5.	Organic protectants	Kg	5.26	2,104.44
6.	Miscellaneous	-	-	700.00
A	Total material costs	-	-	9,724.17
7.	Manuring	Man days	6.05	1,452.36
		Machine hours	6.96	4,875.78
		Bullock days	0.59	414.96
8.	Application of fertilizers/organic protectants	Man days	8.47	2,033.30
9.	Irrigation	Man days	37.76	9,062.43
10.	Top dressing with silt	Tractor loads	6.76	2,368.73
		Man days	4.86	1,167.82
11.	Weeding	Man days	14.44	3,467.88
		Man days	4.81	1,155.96
12.	Intercultivation	Machine hours	10.12	7,088.90
		Bullock days	1.01	708.89
13.	Harvesting	Rs./tree	20.00	2,649.32
14.	Collection and handling	Man days	11.20	2,688.00
15.	Dehusking	Man days	18.77	4,940.00
B	Total labour cost	Rs.	-	44,074.33
C	Marketing cost	Rs.	-	10,188.75
16.	Interest on working capital @ 7 %	Rs.	-	4,479.11
I	Total variable cost of coconut (A + B + C + 16) Sold as Copra	Rs.	-	68,466.36
D	Copra making charges	Rs.	-	16,863.00
E	Marketing charges	Rs.	-	3,642.00
17.	Interest on working capital @ 7 %	Rs.	-	4,855.45
II	Total variable cost of copra (A + B + D + E + 17)	Rs.	-	74,218.95
18.	Amortised establishment cost	Rs.	-	54,188.21
19.	Rental value	Rs.	-	27,170.00
20.	Land revenue	Rs.	-	370.50
21.	Depreciation	Rs.	-	3,145.00
22.	Interest on fixed capital @ 10 %	Rs.	-	8,487.37
III	Total fixed cost (18+19+20+21+22)	Rs.	-	93,361.08
IV	Total cost of cultivation of coconut (I + III)	Rs.	-	1,61,827.44
V	Total cost of cultivation of copra (II + III)	Rs.	-	1,67,580.03
VI	Cost of producing 1000 mature coconuts	Rs.	-	11,537.68
VII	Cost of producing 1000 tender coconuts	Rs.	-	11,703.91
VIII	Cost of producing one quintal of copra	Rs.	-	8,480.77

respect to NPV. It has to be noted here that the net present value would be much higher if only actual costs are taken into consideration. The findings are similar to findings of Khunt *et al.* (2003). The benefit cost ratio of coconut plantations was found to be 1.18, which is satisfactory as it is more than unity. It goes on to show

that investment in coconut plantations is both economically feasible and financially sound. It was noted that in some of the previous studies on financial feasibility, a different formula of calculating the B: C ratio was used *viz.*, taking the ratio of net discounted cash flow to the initial investment. This method would give a higher B: C ratio.

**Table 4 : Annual cost and returns from coconut cultivation in the study area**

Sr. No.	Particulars	Unit	Per hectare
1.	Total yield	No.	14,326.00
2.	Domestic consumption	No.	300.00
3.	Nuts available for selling or copra making	No.	14,026.00
I	Yield of mature nuts	No.	14,026.00
4.	Average price per nut	Rs.	11.00
5.	Returns realized	Rs.	154,286.00
	Returns from by products		
6.	Husk	Rs.	4,742.40
7.	Dry leaves	Rs.	3,705.00
8.	Total returns	Rs.	162,733.40
9.	Total cost	Rs.	161,827.44
10.	Net returns from mature coconut	Rs.	905.96
II	Yield of tender nuts	No.	13,800.00
11.	Average price per nut	Rs.	13.00
12.	Returns realized	Rs.	179,400.00
	Returns from by products		
13.	Dry leaves	Rs.	3,705.00
14.	Total returns	Rs.	183,105.00
15.	Total cost	Rs.	161,513.91
16.	Net returns from tender nuts	Rs.	21,591.09
III	Yield of copra	Quintals	19.76
17.	Average price per quintal	Rs.	9,000.00
18.	Returns realized	Rs.	177,840.00
	Returns from by products		
19.	Dry leaves	Rs.	3,705.00
20.	Husk	Rs.	4,742.40
21.	Shell	Rs.	4,149.60
22.	Total returns	Rs.	190,437.00
23.	Total cost (including copra making and marketing costs)	Rs.	167,580.03
24.	Net returns from copra	Rs.	22,856.97

**Table 5 : Financial feasibility of coconut cultivation in the study area (Per hectare)**

Sr. No.	Particulars	Unit	Value
1.	Net present value @ 10 %	Rs.	3,76,861.57
2.	B:C ratio	-	1.18
3.	Payback period	Years	21.80
4.	Internal rate of return	%	13.30

\* The returns from copra have been considered for calculation of cash flows.

\* The economic life of the plantation has been taken as 50 years.

However, this method did not take into account the total costs incurred during the life of the project. The internal rate of returns shows the rate of return that the project could generate out of its returns. It was observed that a rate of 13.3 per cent was being generated from the project's return over its economic life. Considering the average of bank rates of all banks comes to around 12.00 per cent, it can be noted that the rate of return from project is slightly higher and so and the project can be considered as financially feasible. However, if only the actual costs are considered, the rate of return would be much higher. The findings were similar to the findings of Sulochana (2009). The payback period indicates the time required for the investor to get back the establishment cost. It was observed that the payback period of coconut cultivation was 21.8 years. It has to be noted that the payback period was found to be little longer because of the fact that the hypothetical fixed costs contributed to almost 50.00 per cent of the cost of cultivation thereby drastically reducing the net returns. If only actual borne by the farmers is considered the payback period will be lower than the currently estimated payback period of 21.8 years. The findings were similar to that of Ramachandra (2006).

### Conclusion :

The total cost of establishing one hectare of coconut plantation was Rs. 5,37,266. The total cost of cultivation of coconut and copra during bearing period was Rs. 1,61,827 per hectare and 1,67,580 per hectare, respectively. It was also observed that the net return from copra was the highest at Rs. 22,856 per hectare, followed by tender nuts (21,591 per hectare) and mature nuts (905 per hectare). In terms of actual cost and return, the farmers may get higher net returns, but as we take into consideration, hypothetical costs like amortization cost and rental value, the farmer will be realizing very low returns by selling mature nuts. This might explain the fact that majority of farmers were involved in selling of copra in the study area. The findings are similar to the findings of Chengappa *et al.* (1993).

It was observed that the per quintal cost of cultivation of copra worked out to of Rs. 8,480. The minimum support prices fixed by the central government

for the year 2016-17 were Rs.5,950 per quintal of milling copra and Rs. 6,240 per quintal of ball copra were found to be much lower than the actual cost of cultivation in the study area. A detailed analysis of the price policy for copra from 2005 to 2016 revealed that from 2012 onwards, the cost of cultivation in Karnataka has not been taken into consideration while working out the minimum support price. Hence, it can be suggested that CACP consider the cost of cultivation in Karnataka along with other states data, while working out the MSP so that a higher MSP could help the coconut farmers of Karnataka to realize decent returns. It was also observed that farm mechanization could be introduced for coconut cultivation practices like planting, irrigation and harvesting so that the operational costs can be reduced. The financial feasibility analysis revealed that coconut cultivation was a feasible and profitable investment and it justifies the decision of farmer to take up coconut cultivation.

### REFERENCES

- Chengappa, P.G., Ravi, P.C. and Ganapathy, M.S. (1993). Methods of disposal of coconut and economics of coconut at farm level. *Indian Coconut J.*, **11** (3): 202-207.
- Chinniah, M. and Suresh, G. (2013). Coconut cultivation in Tamil Nadu - An economic analysis. *Internat. J. Sci. Res.*, **2** (3): 62-63
- Goswami, S.N. and Challa, O. (2007). Economic analysis of small holder rubber plantations in west Garo Hills district of Meghalaya. *Indian J. Agric. Econ.*, **62** (4): 649-663.
- Khunt, K.A., Gajipara, H.M., Gadhvi, B.K. and Vekariya, S.B. (2003). Economics of production and marketing of coconut in Saurashtra region of Gujarat. *J. Plantation Crops*, **31** (3): 43-47.
- Ramachandra, V.A. (2006). Production and marketing of sapota in north Karnataka – An economic analysis, M. Sc. (Agri.) Thesis, University of Agricultural Sciences, Dharwad, Karnataka (India).
- Sulochana, M. (2009). Production and marketing of coconut with special reference to Kanyakumari district, Ph. D. Thesis, Manonmaniam Sundaranar University, Tamil Nadu.