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## Financial analysis of tender coconut plantation in Coimbatore district of Tamil Nadu

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### Abstract

India ranks first in coconut production and productivity and ranks third in cultivation area globally. Twelve million people in India depends on coconut for their livelihood either directly or indirectly. But the prevailing practice of determining the price of coconut by the price of coconut oil which is highly fluctuating in nature has resulted in non-remunerative price for the coconut farmers. To promote the sustainability in the coconut sector, it is imperative to delink the sector from dependency of coconut oil and enhancing the production of diversified coconut products. The present study was conducted with the objective of studying viability of tender coconut cultivation among small, medium and large farmers as a measure of product diversification. The investment decision model was used to analyse the viability of investing in tender coconut cultivation. Research results showed that the NPV was Rs.5.71 lakhs, Rs. 4.87 lakhs and Rs. 5.37 lakhs and the BCR was 2.99, 3.6, 3.2 for small, medium and large-scale tender coconut farmers. The IRR was 18.9 percent, 17.2 percent and 18.3 percent for small, medium and large tender coconut farmers respectively indicating that tender coconut cultivation is financially feasible. The data used for the potential 25 years of economic life of plantation, tender coconut plantation is profitable in the study area.

**Keywords:** Tender coconut, product diversification, financial feasibility, net present value, benefit cost ratio, internal rate of return, profitability

### 1. Introduction

Coconut is highly valued commercial crop gaining momentum among other plantations due to its multifaceted uses. Coconut production in the world is estimated at 66,674 million nuts from an area of 12.257 million hectares. The world productivity of coconut stands to be 5,440 nuts per hectare<sup>[3]</sup>. India ranks first in production with 20,736 million nuts (31.1 percent) against world production of 66,674 million nuts from 2.19 million hectare (17.8 percent share in world's coconut area). India had the highest productivity of 9430 nuts per hectare. The estimated value of output from coconut sector is Rs. 26,327 crores in 2020-21 and earnings of 3,237 crores from export of coconut products in 2021-22. During the past two decades, the area under coconut cultivation has increased from 1.93 million hectare to 2.17 million hectare at an annual growth rate of about 0.7 percent. The production of coconut at India level has increased at an annual rate of growth of about three percent (12 billion nuts to 19 billion nuts) during 2001-2021. The productivity has increased from 6709 nuts per hectare to 9430 nuts per hectare at a growth rate of 2.4 percent. The four southern states Kerala, Tamil Nadu, Karnataka and Andhra Pradesh holds 89 percent of total area under coconut and accounted for 90 per cent of country's coconut production.

Coconut being one among the important commercial plantation crop, most suited for cultivation in varied regions has not been realized its full potential for attaining better profitability. Being holding top position in production and productivity, India's coconut sector is not gaining momentum in processing and value addition lagging behind other small coconut producing countries, which reminds underutilization<sup>[1]</sup>. To achieve sustainability in long run, attention towards research and development efforts, especially in post-harvest handling is critical<sup>[6]</sup>. To enhance competitiveness of coconut industry globally, there exists a vast potential for value added coconut products. The value addition of tender coconut water becoming popular as natural and healthy product<sup>[4]</sup>.

To enhance farm income, there is a need to promote small scale coconut-based enterprises marketing of tender coconut-based food products are some of the viable enterprises. The primary reason behind less profitability would be the utilization of narrow conventional product line of the coconut sector, that only limited to coconut oil, coir and some extent of activated carbon. Hence the present study was undertaken to estimate the feasibility of investing in tender coconut plantation.

**2. Materials and Methods**

A multi-stage random sampling technique was employed to select the sample respondents for the study. In the first stage, among various districts in Tamil Nadu, Coimbatore district was purposively selected for the study based on its major share in area and production of coconut. Coimbatore district contributed to 19.6 percent of the area and 22.7 per cent of coconut production in the state. In the second stage, based on the area under tender coconut cultivation three blocks were selected. In the third stage, data was collected from four villages from each of the selected blocks. The tender coconut farmers were reached individually for collection of information on initial investment, maintenance cost, annual cost of production, marketing, post- production activities, with the help of a standardized and well- structured interview schedule.

To analyse tender coconut cultivation, the study applied three financial tools, Net Present Value, Internal Rate of Return and Benefit Cost Ratio. To determine the financial viability among different categories of farmers, sample respondents were categorized into small, medium and large farmers based on their land holding size.

**Net Present Value**

The net present value can be used as an important tool in making a decision by a farmer to invest in tender coconut production. With regard to tender coconut production by farms, benefits and costs are linked to the age of the trees. At the early stages, there are heavy costs which are then followed by annual benefits that continue over the full life of the trees once they have reached maturity. By following Nkang *et al.* (2009), will define INC as the net income (benefit or return) from i-year-old trees as expected in the year t, then the net present value of the expected net income from one hectare of tender coconut in the year t for one cycle of I years duration amounts to:

$$NPV_{I,t} = \sum_{i=0}^I \frac{INC_{i,t}}{(1+r)^t}$$

The expected net income per hectare in the year t is given as:

$$INC_t = \sum_{i=0}^I (REV_{i,t} - TC_{i,t})$$

Where,

$REV_{i,t}$  = the expected revenue per hectare from i-year-old trees in the year t;  
 $TC_{i,t}$  = the total cost per hectare from i- year old trees in year t;  
 r = discount rate or the opportunity cost of capital  
 t = time period

An investment is financially feasible if the net present value is positive. When the NPV is negative the investment is not feasible.

**Benefit-Cost Ratio**

The Benefit- Cost Ratio is another indicator of the worthiness of an investment decision. It is given as ratio of the sum of discounted benefits to the sum of discounted costs. Thus, for the cycle of I years duration, the benefit cost ratio can be represented by the formula:

$$BCR_{I,t} = \sum_{i=0}^I \frac{DERV_{i,t}}{DTC_{i,t}}$$

Where,

$DERV_{i,t}$  = Discounted revenue per hectare from i- year- old trees in year t;  
 $DTC_{i,t}$  = Discounted total cost per hectare from i- year- old trees in year t;

**Internal Rate of Return**

The internal rate of return is the rate arrived, at which NPV is zero. It represents the average earning power of money used in the tender cultivation over its economic life. When the IRR is greater than the rate of interest then the investment is feasible. It is calculated by using the following formula.

IRR =	The present worth of incremental net benefit stream (cash flow) at a lower discount rate
	LDR + Difference between the two X discount rates
	= A sum of the absolute values of the present worth of cash flows at two discount rates

Where

IRR = Internal Rate of Return  
 LDR = Lower Discount Rate  
 HDR = Higher Discount Rate

**3. Results and Discussion**

**A. Investment Cost**

The investment cost needed to establish tender coconut cultivation includes cost of planting materials, fencing materials, small implements and labour cost involved in the field operations. All these investment costs must be spent at year 0 prior to launching the business. Firdayani *et al.* (2023) made similar concept in rubber plantation. The investment cost incurred by the small, medium and large farmers in tender coconut cultivation was presented in table 1.

**Table 1:** Investment costs of tender coconut plantation

S. No	Particulars	Small Farmers		Medium Farmers		Large Farmers	
		Cost (Rs/ Hectare)		Cost (Rs/ Hectare)		Cost (Rs/Hectare)	
		Rs.	%	Rs.	%	Rs.	%
1.	Planting Materials	89816.18	59.7	98448.46	60.2	96875	62
2.	Fencing Materials	17874.33	11.8	22049.44	13.4	17500	11.2
3.	Small implements	13405.75	8.9	13474.60	8.2	13125	8.3
4.	Labour Cost	29273.3	19.4	29387.59	17.9	28625	18.3
	Total Cost	150369.56	100	163360.06	100	156125	100

From the table it is observed that the total investment cost during initial year of plantation for small, medium and large farmers was Rs.150369.56, Rs.163360.06 and Rs. 156125. The major cost component was incurred on planting materials (60.6 percent) followed by labour cost (18.5 percent) and other expenses. The cost of plantations was significantly influenced by the variety preferred by the sampled farmers. The seedlings of hybrid variety incurred higher cost compared to dwarf followed by tall variety.

### B. Maintenance cost of tender coconut plantation during gestation period

The maintenance cost of tender coconut cultivation varies according to the earliness of the varieties planted. The earliness of the hybrid varieties starts from 3-5 year onwards, dwarf variety 4-5 years and tall variety 6-7 years. The maintenance costs consist of variable and fixed costs incurred during the gestation period which differs based on the varieties planted. The total maintenance cost of tender coconut plantation per hectare during gestation period was presented in table 2.

**Table 2:** Maintenance cost of tender coconut plantation during gestation period

S. No	Particulars	Small Farmers		Medium Farmers		Large Farmers	
		Cost(Rs/Hectare)		Cost (Rs/ Hectare)		Cost (Rs/Hectare)	
		Rs.	%	Rs.	%	Rs.	%
1.	Material Cost	63829.85	26	63523.29	25.7	59834.73	23.5
2.	Labour Cost	101139.7	43	101315.8	41	96592.5	37.9
3.	Intercultivation	19264.71	8	18684.21	7.5	9196.42	3.6
I.	Total Variable Cost	176881.3	77	183523.3	74.2	165623.65	65
5.	Machinery	15607.94	6	31124.81	12.6	25971.43	10.2
6.	Rental value of land	38235.29	16	27974.68	11.3	58571.43	23
7.	Interest on fixed capital	3769.026	1	4136.96	1.6	4418	1.73
II.	Total Fixed Cost	57612.26	23	63236.45	25.5	88960.8	34.7
III.	Total Maintenance Cost	234493.5	100	246759.7	100	254584.51	100
IV.	Total Establishment Cost	384863.06	-	410119.76	-	410709.5	-

The data presented in table revealed that the total maintenance cost per hectare were worked out to Rs. 2.3 lakhs Rs. 2.4 lakhs and Rs. 2.5 lakhs for small, medium and large farmers respectively. The maintenance cost was found highest in large size of tender coconut holding followed by medium size and small size tender coconut holdings. The proportion of variable cost was higher (72 percent) than the fixed cost (27.7 percent) for all the three categories of farmers. Considering the contribution of different cost components in total variable cost the average cost incurred in labour was high (40.6 percent) for all three categories of farmers followed by the material cost like manure and fertilizer (25 percent). However, the total establishment cost which encompasses both initial investment and maintenance cost was found to be Rs. 3.8 lakhs, Rs. 4.1 lakhs and Rs. 4.1 lakhs respectively for small, medium and

large farmers. The variations in establishment costs occurred based on farm size, with large scale farmers incurring the high establishment costs followed by medium scale farmers and small-scale farmers.

### C. Annual costs of tender coconut cultivation

The annual cost of tender coconut is the cost involved in production and marketing of tender coconut after the bearing starts viz. fifth year. The annual operational costs consist of variable and fixed costs. Variable costs include expenses for fertilizer, plant protection chemicals, intercultivation, labour, irrigation weeding and harvesting. Fixed costs include share of net establishment cost, depreciation, rental value of land and interest on fixed capital.

**Table 3:** Annual costs of tender coconut cultivation

S. No	Cost Components	Small Farmers		Medium Farmers		Large Farmers	
		Cost(Rs/Hectare)		Cost (Rs/ Hectare)		Cost (Rs/ Hectare)	
		Rs.	%	Rs.	%	Rs.	%
1.	Manure	12256.68	5.8	12319.69	5.83	12000	5.5
2.	Fertilizer	16115.63	7.6	16492.98	7.8	16065	7.4
3.	Plant protection chemicals	3064.17	1.4	3079.92	1.45	3000	1.3
4.	Intercultivation	5106.95	2.41	5133.20	2.43	2500	1.1
5.	Labour cost on manure and fertilizer application	35748.6	16.9	35932.42	17.0	35000	16.3
6.	Irrigation	13350.79	6.32	13333.33	6.31	15000	6.9
7.	Weeding	10724.6	5.08	10779.73	5.10	10500	4.8
9.	Harvesting	37358.29	17.7	37001.3	17.5	45690.3	21.2
I.	Total Variable Cost	1,33,725.7	63.35	1,34,072.57	63.52	1,39,755.3	65.14
10.	Share of net establishment cost	48251.4	22.8	51417.99	21.5	51491.9	24.0
5.	Depreciation	6902.8	3.2	3359.64	1.4	1749.62	0.8
6.	Rental value of land	20427.8	9.6	20532.81	8.6	20000	9.3
7.	Interest on fixed capital	1913.14	0.9	1672.47	0.7	1522.47	0.7
II.	Total Fixed Cost	77495.14	36.6	76982.91	36.47	74763.99	34.8
III.	Total Cost	2,11,057.5	100	2,11,055.48	100	2,14,519.29	100
IV.	Total Yield	18286.97	-	18573.42	-	18557.84	-
V.	Total Return	356644.4	-	392921.1	-	390187.5	-
VI.	Gross Return	1,45,586.9	-	1,81,865.62	-	1,75,668.21	-

In the cultivation and marketing of tender coconut, the total cost per hectare was found to be Rs.2, 11,057.5 for small farmers, Rs. 2, 11,055.48 for medium farmers, Rs. 2, 14,519.29 for large farmers. The total cost of cultivation was higher for large scale growers compared to medium scale and small-scale tender coconut growers.

The total variable cost stood at Rs. 1.33 lakhs for small farmers, Rs. 1.34 lakhs for medium farmers and Rs. 1.39 lakhs for large-scale farmers. The total variable cost per hectare was highest for large farmers, constituting 65.14 percent of the total cost, followed by medium farmers at 63.52 percent and small farmers at 63.35 percent of the total cost. The major factors contributing to the higher variable costs in large farmers were harvesting and irrigation charges, which is the resultant of larger areas to irrigate would employ hired labours and larger volumes of crops to be harvested.

The contribution of fixed cost to the total cost accounted for Rs. 77,495.14 which is 36.6 percent of total cost for small farmers, followed by Rs. 76,982.91 which is 36.47 percent of total cost for medium farmers and Rs. 74,763.99 which is 34.8 percent of total cost for large scale farmers. Large farmers typically have more land under cultivation, allowing them to benefit from economies of scale. They can spread the fixed costs over a larger area, reducing the per hectare cost. In contrast, small and medium farmers with limited land, may not benefit from the same economies of scale. Their fixed costs, though relatively lower, are spread over smaller land area leading to the higher per hectare cost.

The major factor significantly responsible for higher fixed cost was the share of net establishment cost, which is amortized to represent the annual fixed cost of tender coconut maintenance. Similar results were found in case of Kishore and Murthy (2017) in their study on coconut plantations. The capital investment made during the gestation period for establishment was divided into equal annual instalments starting from first bearing until the economic life of tender coconut plantation.

The return is the amount of production multiplied by the price of tender nuts prevailing at the time of harvest expressed in rupees. Tender coconut plantation income or benefits constitute the difference between the revenue and the total costs incurred, expressed in rupees per year. The gestation period in tender coconut cultivation was the immature phase during which there are no returns for costs spent. Tender nuts can be harvested initially during 3-6 years depending upon the earliness of the variety. The income from tender coconut plantations in its first bearing period is relatively low because the plantations are producing nuts for the very first time, so their productivity would be still low from then the plantation enters mature phase with both expenditure and revenue.

**D. Financial Analysis**

Financial analysis was carried out to find out the investment feasibility of tender coconut plantations. The investment criteria used in measuring tender coconut plantations include NPV, IRR, and BCR. The interest rate or discount factor is used is 12 percent.

**Table 4:** Indicators of financial feasibility of tender coconut plantation

S. No	Investment Criteria	Value			Standard	Remarks
		Small Farmer	Medium Farmer	Large Farmer		
1.	NPV	571314.64	487568.72	537358.02	>0	Feasible
2.	IRR	18.9%	17.2%	18.3%	> 12%	Feasible
3.	BCR	2.99	3.6	3.2	>1	Feasible

The result revealed the financial feasibility of tender coconut plantations for different categories of farmers. At the discounted rate of 12 percent per annum, NPV is positive, IRR exceed the prevailing interest rate, BCR is greater than 1 for the economic life of tender coconut plantations viz. 25 years.

**4. Conclusion**

The result of the study indicated that the investment in tender coconut plantation is financially feasible for small, medium and large-scale farmers. A positive NPV means that the plantation will be profitable as it can generate earnings that exceed the anticipated costs. The IRR exceeding the interest rate of 12 percent indicated that the plantation is a feasible business proposition as it is higher than the minimum acceptability rate for the business to generate returns. The BCR was greater than 1 for all the three categories of farmers. Hence the investment in tender coconut plantation in the study area is financially feasible. The diversification strategy from coconut cultivation to tender coconut cultivation not only has the potential to improve the income of coconut farmers but also contributes the long-term sustainability of coconut industry in the study area.

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