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Economic Feasibility of Natural Rubber Cultivation – A Farmer Level Approach

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ABSTRACT

Considering the importance of rubber cultivation, the study was undertaken with the objective to analyse the economic feasibility of rubber plantations. For the study of financial feasibility of rubber plantations, two districts each from Karnataka and Kerala were selected based on the average area under rubber plantations during a period of five years. Capital budgeting techniques were used for analysing the economic feasibility of natural rubber cultivation in both the states. The results revealed that NPV would be of the order of around Rs.9,19,000 for Kerala, it would be around Rs.10,17,000 for Karnataka. It was also found that the BC ratios would be 2.55 and 3.02 for Kerala and Karnataka respectively. This implied that a rupee of investment would fetch Rs.2.55 and Rs.3.03 in these states in corresponding order. The IRR would be higher (17.32 %) in Karnataka compared to Kerala (16.45 %). In spite of BCR, NPV and IRR being larger for Karnataka, the payback period would be higher for this state. This finding appears plausible because the girth development of the rubber tree in a non-traditional state like Karnataka is slower compared to Kerala, the conventional producer. The results of sensitivity analysis indicated, in each adverse scenario considered, the investment in rubber plantations would still be financially viable. In the light of the study, the extension agencies could motivate the farmers to take up rubber cultivation as a profitable venture.

Keywords Natural rubber, Economic feasibility, payback period, Internal rate of return, Net present value.

INTRODUCTION

Kerala is the highest producer of natural rubber in India, followed by Tripura and Karnataka (Roy 2004). Presently, 1.2 million farmers are involved in rubber cultivation in the country. The turnover of the rubber sector is Rs 76,000 crores. In the year 2014-15, as many as 30 lakh individuals were employed in various sectors of rubber economy. As such, rubber crop has a significant role to play in Indian plantation sector. Owing to the growing demand for natural rubber by various sectors in India, rubber cultivation assumes a great importance. This crop which can be grown on waste lands as in Karnataka also helps rehabilitation/ resettlement of tribal families. In Kerala, this crop has

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been drawing area from many of its competing crops. During 1960-61, the area under rubber cultivation was 5.23 % of the total cropped area in Kerala, which increased to 19.65 % during 2009-10 (Karunakaran 2013). Considering the importance of rubber cultivation, the study was undertaken with the objective to analyze the economic feasibility of rubber plantations.

Methodology

For the study of financial feasibility of rubber plantations, two districts each from Karnataka and Kerala were selected based on the average area under rubber plantations during a period of five years (2009-10 to 2013-14). This resulted in the selection of Dakshina Kannada and Udupi from Karnataka and Kottayam and Ernakulam from Kerala. Thus, 15 rubber farmers were selected randomly from each selected taluk of Dakshina Kannada, Udupi, Kottayam and Ernakulam districts. This resulted in the selection of 120 farmers.

The following capital budgeting techniques used for the financial analysis were:

Pay back period

Payback period represents the length of time required for the stream of cash proceeds produced by the investment to be equal to the original cash outlay i.e. the time required for the project to pay for itself. In the present study, payback period was calculated by successively deducting the initial investment from the net returns until the initial investment is fully recovered.

$$\text{Payback period} = \frac{\text{Initial investment}}{\text{Average annual net cash inflow}}$$

According to the payback criterion, the shorter the payback period, the more desirable is the project.

Net present value

The present value represents the discounted value of the net cash inflows to the project. In the present study, a discount factor of 12 % was used to discount the net cash inflows representing the opportunity cost of capital. It can be represented by

$$NPV = \sum_{i=1}^{n} Y_n (1 + r)^{-n} - I$$

Where,

Y_n = Refers to the net cash inflows in the year 'n'

r = Refers to the discount factor

I = Initial investment

The decision rule associated with the net present value is, the project will be accepted if its value is positive and reject if its value is negative.

Benefit cost ratio

The Benefit Cost Ratio (BCR) was worked out by using following formula

$$BCR = \frac{\text{Discounted cash inflow}}{\text{Discounted cash outflow}}$$

It measures the present value of returns per rupee invested and it is a relative measure. The decision rule is that, accept the project, when BCR is greater than one, reject it when BCR is less than one.

Internal rate of return

The rate at which the net present value of project is equal to zero is the Internal Rate of Return (IRR) to the project. The net cash inflows were discounted to determine the present worth following the interpolation technique. The method of interpolation followed is as under:

$$IRR = \begin{matrix}\text{Lower} \\ \text{[discount]} \\ \text{rate}\end{matrix} + \begin{matrix}\text{Difference} \\ \text{[between two]} \\ \text{discount rates}\end{matrix} \times \left[\frac{\begin{matrix}\text{Present worth of cash flow at lower} \\ \text{discount rate}\end{matrix}}{\begin{matrix}\text{Absolute difference between the present worth} \\ \text{of cash flows at the two discount rates}\end{matrix}}\right]$$

Internal rate of return is a relative measure. To accept the project, the calculated IRR should be greater than the present opportunity cost of capital.

The following assumptions were made while performing the financial feasibility analysis of rubber

plantations:

(a) A vast majority of the farmers' process latex themselves and sell rubber sheets. Hence, the study focused on financial feasibility of plantations with primary processing units (sheet preparation).
(b) The economic life of the plant was assumed to be 30 years based on the opinions of the farmers and field officers of Rubber Board.
(c) The number of tapping days was assumed to be 120 days in a year.
(d) The establishment cost in the study means establishment cost of the rubber plantations plus establishment cost of primary sheet processing unit.
(e) A discount rate of 12 % was considered to be the opportunity cost of capital investment in the rubber plantations. Since it is the rate at which bankers advance long term loan for rubber plantations.
(f) The existing charges for tapping latex from one tree and converting it into sheet are Rs 2 and Rs 1.5 respectively in Kerala and Karnataka. Based on the experts' opinion, tapping charges were assumed to be increasing every third year at the rate of Rs 50 paisa and calculations were made on this ground.
(g) The cost of labor used for all operations except tapping and sheet making was assumed to be rising by 2.9 % as per the report of Federation of Indian Chambers of Commerce and Industry (FICCI) (Anonymous 2015). The existing cost of Rs 600 and Rs 400 respectively in Kerala and Karnataka was assumed to be growing at the above rate.
(h) The material cost was assumed to be increasing at the rate of 5 % per annum in line with the increase in Wholesale Price Index (WPI) of fertilizers and chemicals during the period 2004-05 to 2015-16.
(i) For the calculation of salvage value at the end of the project, it was assumed that rubber wood price would be increasing at the rate of 6.27 % in line with the growth of 6.27 % in the WPI of wood and wood products.
(j) The rubber price was assumed to grow at the rate of 6.26 % per annum during the life of the project in accordance with 6.26 % growth in WPI of rubber.
(k) The study also assumed that during the last three years of plantation, slaughter tapping is adopted, where maximum yield is tapped from the tree based upon the tapping technique adopted.

RESULTS AND DISCUSSION

Table 1 presents the investment pattern of rubber plantations in Kerala and Karnataka respectively (Maibangsa and Subramanian 2000). In both the cases, the cost of materials such as seedlings, manures, smoke houses, storage structure, accounted for a large proportion of initial investment (around 70 % in Kerala and around 78 % in Karnataka). As such the cost of labor engaged for the initial establishment of rubber plantations was around 30 % in Kerala and 22 % in Karnataka. The total initial investment outlay was almost the same for both the cases (Rs 3,61,000 per ha in Kerala and Rs 3,35,550 per ha in Karnataka).

Table 2 is intended to present a broad overview of the maintenance cost of rubber plantation in terms of material cost, labor cost and fixed cost per ha annually during a gestation period of six years in Kerala and Karnataka. It may be noted that the numbers presented in the table are the averages over six years of the gestation period computed without using the concept of time value of money. In other words, these figures just serve to give an idea of which item accounts for what proportion in the total maintenance cost. As revealed by the table, in Kerala the total material cost per ha per year accounted for around 29 % of the total cost, while the total labur cost accounted for around 42 %. In the case of Karnataka, the share of material cost and labur cost was almost the same at around 35 %. of the total cost. The remaining part of the total cost in both the states was accounted for by interest on working capital and fixed cost. The total maintenance cost per ha every year was on an average around Rs.1,37,000 in Kerala and around Rs 1,11,000

Table 1. Investment pattern of rubber plantation in Kerala and Karnataka. (Per ha).

Sl. No.	Particulars	Total cost(Rs)	%
A	Kerala		
I	Total material cost	2,51,500	69.67
II	Total labor cost	1,09,500	30.33
III	Total investment cost (I+II)	3,61,000	100.00
B	Karnataka		
I	Total material cost	2,60,350	77.59
II	Total labor cost	75,200	22.41
III	Total investment cost (I+II)	3,35,550	100.00

Table 2. Maintenance cost of rubber plantation during gestation period (six years) in Kerala and Karnataka. (Rs/ ha/year).

Sl. No.	Particulars	Kerala		Karnataka	
		Average cost	%	Average cost	%
I	Variable cost				
A	Total material cost	39,473	28.83	39,468	35.45
B	Total labor cost	57,877	42.27	39,443	35.42
C	Total working capital excluding interest	97,351	71.10	78,910	70.87
D	Interest on working capital @ 7%	6,815	4.98	5,524	4.96
E	Total variable cost	1,04,165	76.07	84,434	75.83
II	Fixed cost				
F	Total fixed cost	32,761	23.93	26,914	24.17
III	Total cost	1,36,926	100.00	1,11,348	100.00

Note: In the above table, the numbers in the column of average cost were calculated for each item as the average over 6 years of gestation period, without accounting for time value of money. This was done to have a quick idea of the share of individual components in the total cost. However, for the conduct of financial feasibility analysis, the total cost of each year was discounted appropriately with suitable discount rate as mentioned in methodology section.

in Karnataka. It may be noted that the observed difference in the total cost per ha of rubber plantation between Kerala and Karnataka was mainly on account of difference in labor cost arising from higher wages in Kerala compared to Karnataka.

Table 3 presents the similar picture like Table 2, but with respect to the economic period of 24 years for both the states. It can be seen from the table that, annually, on an average, the material costs would account for around 40% of the total maintenance cost in Kerala, while accounting for around 43% in Karnataka. The costs on account of labor would be around 41% of the total cost in Kerala and 38% of the total cost in Karnataka per ha annually. Since the proportion of material cost in the total cost would be around 3% more in Karnataka compared to Kerala and the proportion of labor cost would be around 3% more in Kerala compared to Karnataka, the share of the total variable cost in the total cost would be around 88% in each state.

With a view to assessing the financial feasibility of rubber plantations in both the states, both discounting measures (BCR, NPV and IRR) as well as non-discounting measures (payback period) were computed (Table 4). It was found that the BC ratios would be 2.55 and 3.02 for Kerala and Karnataka respectively. This implied that a rupee of investment would fetch Rs 2.55 and Rs 3.03 in these states in

Table 3. Average maintenance cost of rubber plantation during economic period (24 years) in Kerala and Karnataka. (Rs/ ha /year).

Sl. No.	Particulars	Kerala		Karnataka	
		Average cost	%	Average cost	%
I	Variable cost				
A	Total material cost	1,66,061	39.99	1,50,450	43.16
B	Total labor cost	1,71,957	41.41	1,33,978	38.44
C	Marketing cost	2,559	0.62	2,142	0.61
D	Total variable cost excluding interest	3,40,577	82.01	2,86,570	82.22
E	Interest on working capital @ 7%	23,661	5.70	19,910	5.71
	Total variable cost (I)	3,64,238	87.71	3,06,480	87.93
II	Fixed cost	51,028	12.29	42,076	12.07
III	Total cost (I+II)	4,15,266	100.00	3,48,556	100.00

Note: In the above table, the numbers in the column of average cost were calculated for each item as the average over 24 years of economic life, without accounting for time value of money. This was done to have a quick idea of the share of individual components in the total cost. However, for the conduct of financial feasibility analysis, the total cost of each year was discounted appropriately with suitable discount rate as mentioned in methodology section.

Table 4. Financial feasibility of rubber plantation in Kerala and Karnataka.

Particulars	Unit	Kerala	Karnataka
Benefit cost ratio	Ratio	2.55	3.03
Net present value	Rs/ ha	9,18,943	10,17,215
Internal rate of return	%	16.45	17.32
Pay back period	Years	9.20	10.17

corresponding order. While NPV would be of the order of around Rs 9,19,000 for Kerala, it would be around Rs 10,17,000 for Karnataka. The higher BCR and higher NPV for the states of Karnataka compared to Kerala could be explained in the light of rubber yields that are declining in Kerala and increasing in Karnataka on the one hand and lower wage rates in Karnataka on the other hand. Naturally, the IRR would be higher (17.32 %) in Karnataka compared to Kerala (16.45 %). In spite of BCR, NPV and IRR being larger for Karnataka, the payback period would be higher for this state. This finding appears plausible because the girth development of the rubber tree in a non-traditional state like Karnataka is slower compared to Kerala, the conventional producer. Slow girth development would result in low quantity of latex collected in the initial years(Kusuma 2014, Sharma *et al*. 2014, Viju 1986).

Since the future is uncertain, it is quite possible that the assumptions made regarding certain parameters such as labor wages, rubber price that have a bearing on the financial feasibility may not turn out to be true in future. As such financial feasibility analysis based on a given set of assumptions may not be able to address the effects of fluctuations in the values of the important parameters. In this context, the present study sought to conduct sensitivity analysis to ascertain what would happen to BCR, NPV, IRR and payback period, when some unfavorable changes would happen in the values of important parameters namely wage rate, fertilizer price and rubber price. In particular, for sensitivity analysis, it was assumed that labor wages would increase by additional 2% and 5% compared to the base scenario; fertilizer prices would increase by additional 2% or 5% and rubber prices would fall by 2% or 5% compared to base scenario. As the results of sensitivity analysis indicated (Table 5), in each adverse scenario considered, the investment in rubber plantations would still be financially viable. For none of the adverse situations considered, NPV was negative or BCR was less than one or IRR was less than the opportunity cost of capital (12%). Similarly, the payback period did not show any considerable increase.

CONCLUSION

The Rubber Board has estimated that an area of around 2 lakh ha can be potentially put under rubber crop in Karnataka. As indicated by the results, rubber plantations are found to be financially feasible. Further, some studies have shown that the demand for natural rubber in the country is projected to rise in the future. In the light of the above, the extension agencies could motivate the farmers to take up rubber cultivation as a profitable venture.

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Table 5. Sensitivity analysis.

Sl. No.	Scenario	Kerala				Karnataka			
		BCR (ratio)	NPV (Rs/ ha)	IRR (%)	PBP (years)	BCR (ratio)	NPV (Rs/ ha)	IRR (%)	PBP (years)
1.	Base scenario	2.55	9,18,943	16.45	9.20	3.03	10,17,215	17.32	10.17
2.	Two per cent annual rise labor cost	2.51	9,04,391	16.37	9.21	2.99	10,05,228	17.25	10.18
3.	Five per cent annual rise in labor cost	2.44	8,81,834	16.25	9.81	2.94	9,87,248	17.15	10.90
4.	Two percent annual rise in fertilizer price	2.53	9,14,564	16.42	9.23	3.02	10,13,119	17.30	10.19
5.	Five percent annual rise in fertilizer price	2.52	9,07,995	16.39	9.91	3.00	10,06,976	17.27	10.63
6.	Two per cent annual fall in rubber price	2.37	8,54,582	16.18	9.29	2.86	9,58,244	17.07	10.19
7.	Five per cent annual fall in rubber prices	2.09	7,58,041	15.77	10.01	2.59	8,69,787	16.68	11.23

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