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An Economic Analysis of Production and Marketing of Natural Rubber in the Midland Plain Regions of Kerala

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Abstract

This paper presents a comprehensive analysis of natural rubber production and marketing efficiency in Kerala, India with a focus on understanding the factors influencing rubber tapping and assessing the economic viability of rubber cultivation. The analysis of historical trends in rubber cultivation reveals a consistent increase in the cultivated area over the years. However, despite the expansion in cultivation, natural rubber production in Kerala has experienced instability, with a decline observed after 2012-13. The study identifies climate conditions and farmers' responses to falling rubber prices as key contributors to the decline in production. The economic analyses of natural rubber cultivation highlights rubber tapping charges were increased and it contributes around 55 per cent to total cost. The significant costs involved with annual maintenance expenses representing the largest expenditure for farmers. This study demonstrates that the rubber cultivation in Kerala is financial feasible only with the final timber value of the rubber plantation. From the analysis of determinants of the rubber tapping it was found that the age of the rubber plantation and the availability of the family labour for the rubber cultivation are positively affecting the rubber tapping, pessimistic perception of rubber prices and emigration in the family has negatively affected the rubber tapping. The marketing efficiency was found to be higher in the marketing channel with fewer market intermediaries. In conclusion, natural rubber cultivation in Kerala is becoming more difficult due to the non remunerative rubber prices and higher labour cost. Farmers are not benefitted without accounting the timber value of rubber tree. In this situation government need to step up in order to fix a floor price for processed rubber, that can make rubber farmers to stay in the business and also government institutions can training to tapping farmers in order to produce superior quality rubber so that these produce can compete in the international market.

Keywords : Natural rubber production, Economics of rubber production, determinants of rubber tapping

Natural rubber, a versatile polymer is extracted from various plant species, primarily the para-rubber tree. Besides its application in rubber production, the para-rubber tree also provides valuable resources like timber, honey, seed and oil cake. Global rubber production in 2020 reached around 13 million metric tons with the Asia Pacific Region responsible for 91 per cent of the output. Thailand and Malaysia are the top producers, contributing 34 per cent and 24 per cent, respectively (Anonymous, 2021).

In India, the majority (81%) of natural rubber production originates from the traditional rubber cultivation regions of Kerala (70%) and Tamil Nadu (11%) (Anonymous, 2022). Additionally, several non-conventional rubber-growing states, such as Tripura, Meghalaya, Assam, Odisha, Karnataka, Maharashtra, and West Bengal contribute to the overall production. Tripura stands out as the leading non-traditional state, accounting for 7.6 per cent of total rubber production in India.

Natural rubber is a critical commercial crop in Kerala, with a significant impact on the state's social and economic life. In the 2020-21, the area under rubber cultivation in Kerala was 5.54 lakh hectares with a production of 7.18 lakh tonnes (Anonymous, 2022). Despite a sharp decline in rubber prices since 2012, the area under rubber cultivation in Kerala is increasing and rubber growers are only partially tapping their plantations. This situation raises interesting questions about the factors that determine the tapping potential of rubber growers. Furthermore, the influx of cheap imported rubber and advances in synthetic rubber technology have given a pressure on domestic rubber growers to improve efficiency and quality. In this context, the study with the following specific objectives was carried out in midland plain regions of Kerala.

Objectives of the Study

i. To analyse the trend in area, production and productivity of rubber in Kerala

ii. To study the economics of natural rubber production in Kerala

iii. To analyse the determinants of the tapping of the natural rubber in Kerala and

iv. To map the value chain of natural rubber and to analyse the marketing efficiency and marketing margins

METHODOLOGY

Sampling Framework

The proposed study was specifically carried out in the Kottayam and Ernakulam districts of Kerala. Since, these districts collectively contribute for about 33 per cent of total rubber area of the state (Anonymous, 2020). Random sampling method was used to select 60 rubber growers and fifteen stakeholders of the rubber value chain comprising of five each, village level, town level and district level traders. In Kottayam district, 10 each rubber growers were selected from Vaikom, Meenachil and Changanacherry taluk and the remaining 30 rubber growers were equally selected from Kothamangalam, Kunnathunad and Muvattupuzha talukas of Ernakulam district. Out of the fifteen intermediaries, nine were selected from Kottayam district (3 retailers, 3 wholesalers and 3 terminal level traders) since the Kottayam district has more number of market intermediaries as compared to Ernakulam and remaining, six intermediaries are selected from Ernakulam district. The required data on the socio-economic parameters, land holding, cropping patter, untapped area, total cost and returns were collected from the rubber growers. The data regarding costs incurred on the transportation, storage, packing etc. and procurement and selling price were collected from market intermediaries was collected for the year 2020-21.

Analytical Tools and Techniques

Time series analysis : The exponential Compound Annual Growth Rate (CAGR) is estimated by using log linear functions on the time series data of area, production and productivity.

The growth rate is estimated using the form: $ln\ Y_t = ln\ Y_0 + t \ln (1+r)$

Where,

$ln\ Y_t$ is Natural log of area or production or productivity of natural rubber; t is time variable in the year; r is Compound Growth Rate; $ln\ Y_0$ is area or production or productivity of natural rubber in the base year in our study 2004-05.

Now, let $lnY_o = a$ and $ln\ (1+r) = b$, then the above expression will become, $lnY_t = a + bt$, a and b can be calculated using regression.

By solving for 'r' annual compound growth rate was worked out using: $r = exp\ (b) - 1$

Cost and Returns Analysis : Cost and returns analysis include cost of cultivation gross returns and net income.

Cost of Cultivation : Annual Cost of cultivation (Rs /acre) is the sum of amortized establishment cost, fixed and variable costs.

$$CoC = AEC + TFC + TVC$$

Where,

CoC is Cost of cultivation (Rs./acre/year); AEC is Amortized establishment cost (Rs./acre/year); TFC is Total fixed cost per acre (Rs./acre/year); TVC is Total variable cost (Rs./acre/year)

Amortized Establishment Cost (AEC)

$$AEC = [\text{Total establishment cost}] * \frac{(1+i)^{AL}*i}{(1+i)^{AL}-1}$$

Here, AL is Average life of the rubber plantation in this study 30 years was considered; 'i' is interest rate, we have considered 5 per cent in this study to represent the average rate of inflation.

Total Fixed Cost: It includes interest on fixed capital, depreciation and land rent.

Total Variable Cost: labour cost, material cost, interest on working capital and marketing cost.

Gross Returns (Rs./acre/year) = Qr*Pr + Qc*Pc

Where, Qr is total quantity of sheet rubber sold per year (kg); Pr is price of sheet rubber (Rs./kg); Qc is total quantity of field coagulum sold per year (kg); Pc is price of field coagulum in (Rs./kg).

Net Income (Rs./acre/year) = GR-TC

Where, GR is gross returns (Rs./acre/year); TC is total cost (Rs./acre/year)

Capital Budgeting tools were used to study the financial feasibility of investment in rubber cultivation. Specifically in this study, the Net Present value (NPV), Internal Rate of returns (IRR), Benefit – Cost Ratio (BCR) and Discounted Benefit - Cost Ratio (BCR) were used. The discount rate of 12 per cent was considered for this study.

$$NPV = \sum_{n=0}^{N} \frac{C_n}{(1+r)^t} - \text{Total establishment cost}$$

C_n is series of net cash flow; r is discount rate; t is number of years

$$IRR = r_a + \frac{NPV_a}{NPV_a - NPV_b}(r_b - r_a)$$

Where, r_a is lower discount rate chosen; r_b is higher discount rate chosen; NPV_a is NPV at r_a; NPV_b is NPV at r_b

$$BCR = \frac{GR}{CoC}$$

GR is gross returns (Rs./acre/year); CoC is cost of cultivation (Rs./acre/year).

$$DBCR = \frac{DR}{DC}$$

DR is discounted returns; DC is discounted Costs

Ordered Probit

Ordered probit model was used to estimate relationships between an ordinal dependent variable having more than two outcomes and a set of independent variables. Whereas, logit models is famously used in the adaption suties if the out come is binary Lokesh and Mahin (2021) used logit model to analysised the determinants of processing coconut into natural bal copra in Tumukuru districts. In this study it was used to find out the factors that determines the tapping of natural rubber. To find out the determinants of rubber tapping, the following empirical model was used.

$$TP_i = \beta_0+\beta_1 FA_i+\beta_2 PC_i+\beta_3 AP_i+\beta_4 TC_t+\beta_5 NFM_t+ \beta_6 EM_t+\beta_7 TLH_i+\beta_8 LS_t+\beta_9 EF_t+\beta NFL_t+e_t$$

Where,

TP_i is depended variable represents 'tapping percentage', it is coded as 1 for 0 to 30 per cent, 2 for 31 to 60 per cent, 3 for 61 to 75 per cent, 4 for 76 to 90 per cent and 5 for >90 per cent.

Explanatory variables are, FA_i is age of the farmers in years; PC_i represents their perception of rubber price, taking the value '1' if they consider it remunerative and '0' otherwise; AP_i is Current age of the plantation in year; NFM_i is Non-Farm Income (rupees per annum); EM_i is emigration in the family (1 if any member has emigrated, 0 otherwise); TLH_i is total land holding in acres; LH_i is perception of the farmers on farm labour availability in the study area (1 for scarcity, 0 otherwise); EF_i is Formal education of the farmer (years). NFL_i is Number of family labour available and e_i is random error.

Marketing Margin (MM_i) : The Marketing margin at any stages of the marketing has been calculated as follows:

$$MM_i = SP - (PP_i + MC_i)$$

MM_i is marketing margin of the i^{th} middleman; SP_i is selling price of the middleman; PP_i is purchasing price of the i^{th} middleman; MC_i is marketing cost incurred by the i^{th} middleman

Producers share in consumer's rupee was calculated by using the following expression :

$$\text{Producers share in consumer's rupee} = \frac{\text{Producer's price}}{\text{consumer's price}} \times 100$$

Here the producer is the farmer and the consumer is rubber products manufacturing industries.

Marketing Efficiency

In this study, Acharya's Modified Marketing Efficiency (MME) approach is used to find out marketing efficiency of various channels.

$$MME = \frac{FP}{MC + MM}$$

Where,

MME is meditied marketing efficiency; FP is price received by the farmer; MC is total marketing cost; *MM* is net marketing margin

Results and Discussion

Trend in Area, Production and Productivity of Natural Rubber in Kerala

The trends in the area, production and productivity of natural rubber in Kerala were estimated using Compound Annual Growth Rate (CAGR). The findings of the study show that, while the area under cultivation of natural rubber in Kerala has steadily increased, the state's rubber production has been unstable due to changes in productivity. The area under cultivation increased until 2015-16, but has since stabilized. However, production began to decline after 2012-13, despite the increase in the cultivated area. Productivity has also been fluctuating, ranging from 1553 kg/ha to 1482 kg/ha and currently, the productivity in Kerala is lower than the national average productivity.

The analysis of the trend in the area under natural rubber cultivation in Kerala reveals a steady increase

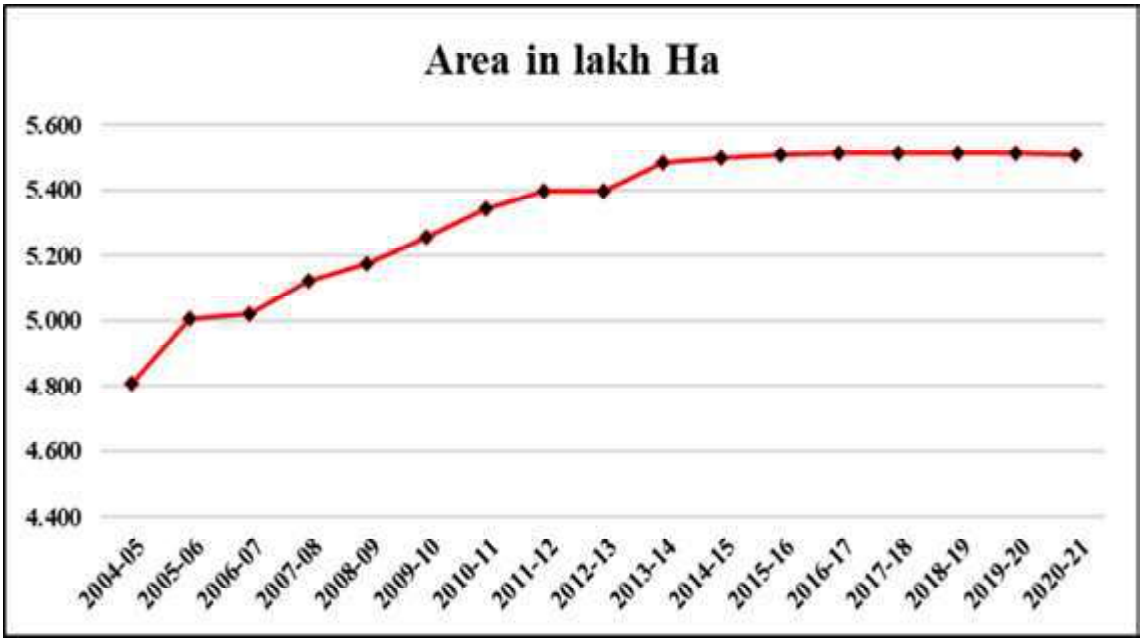

Fig. 1: Trend in area of natural rubber in Kerala

over the years, with a remarkable Compound Annual Growth Rate (CAGR) of 0.85 per cent, as illustrated in (Fig. 1). This growth can be attributed to the expected rise in rubber prices, which motivated farmers to expand their cultivation area. As reported by Karunakaran (2013), there was a shift from cashew to more profitable crops such as rubber in Kerala. Farmers perceived rubber as a lucrative option, being a perennial crop with a gestation period of 6 to 7 years, providing them with an opportunity to capture the price increase and expand the cultivation area.

In 2012-2013, Kerala recorded its highest production of natural rubber with a record to eight lakh tonnes produced, as shown in (Fig. 2). This was a result of a higher price of Rs.237 per kg. However, following

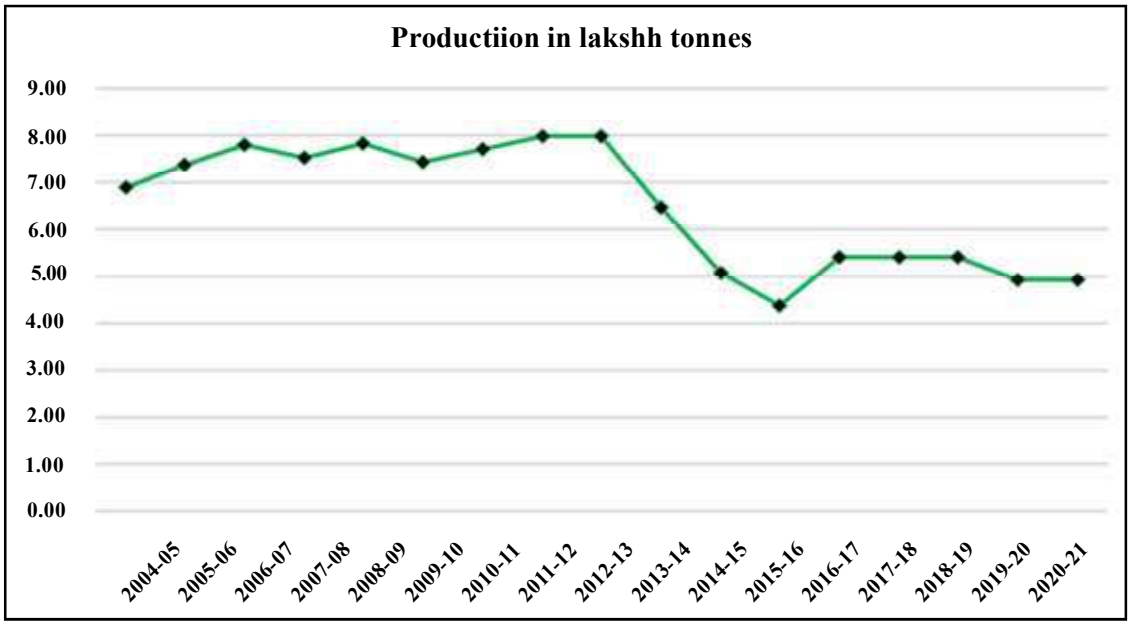

Fig. 2: Trend in production of natural rubber in Kerala

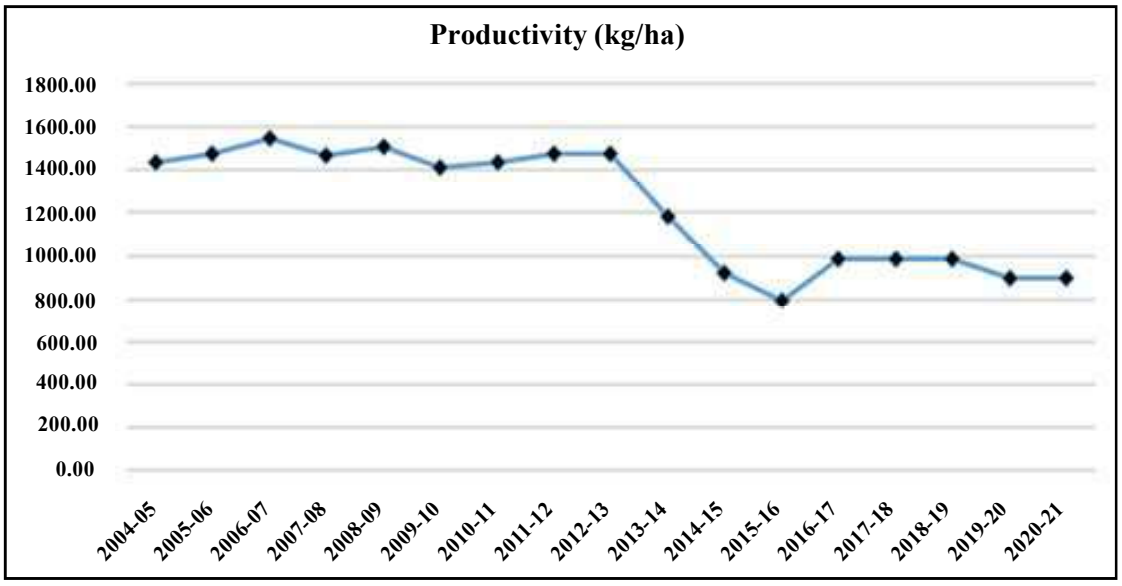

Fig. 3: Trend in productivity of natural rubber in Kerala

this peak, production drastically declined until 2015-2016, reaching its lowest point of 4.39 lakh tonnes, corresponding to the lowest price of Rs.93 per kg for the farmers. Despite this decline, the production of natural rubber in Kerala during the study period remained at 4.9 lakh tonnes.

Although the cultivated area showed positive-growth, the production growth rate revealed a significant decrease of 3.27 per cent per annum. This decline can be attributed to the negative growth rate of productivity, which stood at -4.09 per cent per annum (Fig. 3), resulting from the combined effects of adverse climatic conditions and farmer's responses to the falling rubber prices. This correlation between production and price highlights the fact that the production of natural rubber is positively impacted by the price with a decrease in production observed during the year when the price was at its lowest.

Economic Analysis of Natural Rubber Cultivation in Kerala

The cost of growing natural rubber was determined using survey data from the study area. This cost is divided into three parts: Amortized establishment cost, maintenance cost and fixed costs. Amortized establishment cost is amortization of the sum of the expenses incurred during planting and maintaining the plantation till first six years (*i.e.,* gestation period of the plantation). Maintenance cost, on the other hand, covers the daily activities on the field, such as tapping, extracting latex, processing and various other cultural operations. The fixed costs include depreciation, land rent and taxes, interest on the fixed capital etc.

TABLE 1
Cost of cultivation of natural rubber

Particulars	Unit	Quantity	Rate	(Rs. per acre)
Tapping charges (@Rs.3/tree/day)			Rs.3 per tree per day	96000 (52.48)
Other intercultural operations	Man days	4	Rs.800	3200 (1.75)
Rain guard	Per tree	200	Rs.60 per tree	12000 (6.5)
FYM	Tractor load	1	20000	20000 (10.93)
Fertilizer				
i. Urea	kg	5	18 per kg	90 (0.05)
ii. SSP	kg	5	18 per kg	90 (0.05)
iii. DAP	kg	3	25 per kg	75 (0.016)
Plant protection chemicals				680 (0.37)
Formic acid	Litre	10	55 per litre	550 (0.22)
Copper sulfate application	Kg	1	260 per kg	260 (0.14)
Maintenance of equipment				600 (0.32)
Interest on working capital (7%)				9555 (5.22)
Total variable cost				**Rs.143100 (78.2)**
Total amortized establishment cost				**Rs.12668 (6.93)**
Rental value of land				Rs.11000 (6.01)
Depreciation				Rs.1013 (0.55)
Interest on Fixed capital (7%)				Rs.1692 (0.93)
Total fixed cost				**Rs.26373 (14.42)**
Total Marketing Cost				**Rs.13500 (7.38)**
Total cost of cultivation				**Rs.182974 (100.00)**

Table 1 provides an analysis of the costs associated with cultivating natural rubber. The cost per acre for cultivating natural rubber was found to be Rs.182974/ year. The largest expense incurred by the farmer was on the annual maintenance cost, which accounted for 78 per cent (Rs.143055) of the total cost of cultivation. This cost includes activities such as tapping of the rubber and performing intercultural operations on the farm, as well as other related tasks. The next significant cost is marketing, which is 7.38 per cent (Rs.13500/year) of the total cost per acre for the sheet rubber produced. In the total cost of cultivation, amortized costs (6.93%) and rental value of land constituted around 7 and 6 per cent, respectively.

A study conducted by Balakrishnan *et al*. (2017) found that cost of cultivation of rubber in Kottayam district was Rs.62,541/acre/year, variable cost contributed about 72 per cent in the total cost of cultivation. Whereas, in our study 78 per cent of total cost is contributed by annual maintenance cost. The rubber tapping chargers was Rs.96000/acre which is 53 per cent of the total cost of cultivation. The ever increasing cost for tapping the rubber was a major concern for the farmers. In 2012-13, Balakrishnan *et al.,* 2017 reported a charge of Rs.1 per tree per day for rubber tapping. Subsequently, in 2016, Nambiar and Balasubramanian observed an increase to Rs.2 per tree per day. In our current investigation, It was discovered that the tapping charges have further risen to Rs.3 per tree per day.

TABLE 2

Cost and returns of rubber cultivation

Particulars	Value
Total cost of cultivation	Rs.182974 / acre
Total output of sheet rubber	1500 kg/acre
Average price realized	Rs.140 /kg
Total returns from sheet rubber	Rs.210000 / acre
Cost of production of sheet rubber	Rs.123 / kg
Total output of scrape rubber	100 kg/acre
Total returns from scrape rubber	Rs.9000 / acre
Gross returns	Rs.219000 / acre
Net returns	Rs.33067/ acre
Returns per rupee of investment	1.19

The Benefit-Cost (BC) ratio of natural rubber cultivation was found to be 1.19. This study reports lower BC ratio when compare the results of a study conducted by Balakrishnan *et al.* (2017), they reported the BC ratio to be 2.68 for farmers who were members of the Rubber Producers' Society (RPS) and 2.08 for non-members. On the other hand, Ashok, 2020 reported a BC ratio of just 1.00 in Pathanamthitta district of Kerala. The drop in the price of rubber combined with rising production costs, particularly tapping charges, have had a significant negative impact on the profitability of rubber farming.

TABLE 3

Financial feasibility of rubber cultivation

Particular	Without the timber value	Predicate	With timber value	Predicate
Discounted Benefit - Cost Ratio	0.97	Not feasible	1.01	Feasible
Internal Rate of Returns	11%	Not Feasible	12%	Feasible
Net Present value	Rs.23739	Not feasible	Rs.12294	Feasible

Financial Feasibility of Rubber Cultivation

Discounted BC ratio, net present value (NPV) and internal rate of return (IRR) tools were used to study the financial feasibility of rubber cultivation and its results are presented in the Table 3.

The analysis of discounted benefit-cost ratio for rubber farming indicates that relying solely on latex extraction from the rubber trees results in a ratio of 0.97, signifying unprofitability. However, including the timber value of the rubber trees in the analysis marginally enhances the profitability of rubber cultivation. Once the rubber trees reach the end of their economic life, they can be utilized for various purposes, thereby elevating the overall value of the rubber plantation and raising the discounted BC ratio to 1.01. This is just above the cut-off value of '1' signifying not great profits/returns.

NPV result shows that, when only the latex extraction from the rubber trees is considered, the NPV calculation results in a negative value (-Rs.23739),

indicating that the investment is not economically feasible. However, when the value of the timber produced by the rubber trees is taken into account, the NPV calculation shows an increased value of Rs.12294, making the investment in the rubber plantation economically feasible. The contribution of the timber can significantly increase the NPV, as the value of timber can be substantial. Therefore, the viability of a rubber plantation depends on the consideration of both latex extraction and the value of the timber produced by the trees. Without taking the value of the timber into account, the plantation may not be a viable investment. However, including the value of the timber in the NPV calculation can significantly change the outcome and make the investment economically viable.

The Internal Rate of Return (IRR) analysis showed a value of 11 per cent when the timber value of the rubber is not taken in to account while, the IRR is increased to a value or 12 per cent when the timber value of rubber is also considered. This indicates that rubber farming will be viable as long as the interest rate remains below 11 per cent.

These indicators suggest that, the natural rubber cultivation is viable with the timber value taking in to account.

Analysis of Determinants of Rubber Tapping

One major challenge faced by the rubber industry in Kerala is the underutilization of tapping potential. According to a study by Pradeep and James in 2021, only 4.88 lakh hectares out of 6.64 lakh hectares of rubber that could be tapped were actually tapped in the fiscal year 2019-20, leaving around 27 per cent of mature rubber plantations untapped. This study also found that, only 75 per cent of the area was being tapped. Despite facing numerous issues, the majority of farmers in the rubber industry continue to tap their rubber trees. This is largely due to their faith in the industry. On an average, farmers tap their trees for about 150 days per year. The tapping days are highly correlated with the price of rubber. When rubber prices are high, farmers tap rubber for more days and vice versa. Approximately, 70 per cent of farmers tap their trees every two days in favourable weather conditions, while the rest tap once in three days.

A number of factors influence rubber tapping (Table 4), including family emigration, rubber prices, available family labour and the age of the plantation. Rubber tapping is influenced positively by the age of the rubber plantation and the availability of family labour, while it is negatively influenced by decreased rubber prices and family emigration.

TABLE 4

Determinants and marginal effects of determinant of rubber tapping

Determinants	Marginal Effects					
	Co-efficient	Low tapping (≤ 30%)	Moderate taping(31 to 60%)	Average tapping (61to75%)	High tapping (76 to 90%)	Optimal tapping (> 90%)
Age of the farmer (in years)	0.031	0.002	-0.003	-0.001	0.0005	0.005
Perceived level of price is low (Yes/No)	-1.065 *	0.071 **	0.1110 *	0.038 ***	-0.018	-0.20259 *
Non-farm income (Rs./annum)	$-2.22x10^{-6}$	$-1.5x10^{-07}$	$-2.3x10^{-07}$	$7.9x10^{-08}$	$-3.6x10^{-08}$	$-4.2x10^{-07}$
Emigration in the family (Yes/No)	-1.156 ***	0.077 ***	-0.121	0.042	-0.02	-0.22 ***
Labour scarcity (Yes/No)	0.174	-0.011	-0.018	-0.006	0.003	0.033
Number of family labour (in number)	0.244 **	-0.016	-0.025 **	-0.009 ***	0.004	0.046 **
Education of the farmer (Number of years in formal education)	-0.048	0.003	0.005	0.0018	-0.0008	-0.009
Landholding (in acre)	-0.032	0.002	0.003	0.001	-0.001	-0.006
Age of the plantation (in years)	0.139 *	-0.009 *	-0.014 **	-0.005 **	0.002	0.026 *

Note: *Significant at 1% ; **Significant at 5%; ***Significant at 10%

The age of the plantation has a beneficial impact on the tapping percentage of rubber trees because older trees yield more and better quality latex, resulting in higher profits for farmers. However, based on variables such as tree variety, climate and management practices, the yield may vary.

Another important element that influences tapping percentage is the availability of family labour. Rubber tapping has declined due to a shortage of skilled workers and an increase in tapping prices. Farmers' profits have decreased because of this, as well as a decline in rubber prices. In addition, emigration to the Middle East and Europe has decreased the availability of family labour for agricultural work, which may have an adverse effect on rubber tapping cost.

To assess the effect of rubber prices on tapping percentage, farmers were asked a simple yes or no question. 'Do you think rubber prices are remunerative and sufficient to sustain rubber cultivation?' Farmers' answers were included in the model as a dummy variable with a value of 0 if they said 'No' and 1 if they said 'Yes'. Farmers who responded 'No' to the question had a lower tapping percentage, according to the findings. This suggests that rubber prices have a significant effect on the area and frequency of tapping.

The availability of family labour has a positive impact on rubber tapping percentage. With every increase in a family labour, the chances of being in the low tapping group decrease by 1.6 per cent, moderate tapping group by 2.55 per cent and average tapping group by 0.9 per cent. At the same time, the chances of being in the optimal tapping group increase by 4.6 per cent and the higher tapping group by 0.4 per cent

The incidence of emigration within a farm household negatively affects the rubber tapping percentage. With each additional household reporting emigration, there is a 7.7 per cent increase in likelihood of being in the low tapping category and a 22 per cent decrease in likelihood of being in the optimal tapping category.

Age of the rubber plantation has a positive effect on the rubber tapping percentage. Increase in age of plantation by one year is associated with 0.92 per cent, 1.4 per cent and 0.5 per cent of less likely to be in the group of low tapping, moderate tapping and average tapping, respectively. Whereas, 2.6 per cent of more likely to be in the category of optimal tapping.

The perception of low prices for rubber among farm households has a negative impact on the amount of rubber tapped. When more households report feeling that prices are not adequate, there is a 7 per cent increase in the likelihood of being in the low tapping category, an 11 per cent increase in the likelihood of being in the moderate tapping category and a 3 per cent increase in the likelihood of being in the average-tapping category. However, there is a 20.25 per cent decrease in the likelihood of being in the optimal tapping category.

Marketing Channels of Natural Rubber

This study identified two marketing channels used by farmers. The first marketing channel is a chain of actors, including farmers, a village-level retailer, a town-level wholesaler and district-level traders. The district-level traders then sell the purchased rubber products to various manufacturers of rubber goods, such as tire companies and shoe companies.

Small-scale farmers or marginal farmers prefer this channel for several reasons. Firstly, they usually have a smaller quantity of produce, so it is more practical for them to sell to a nearby trader. Secondly, transportation costs are lower as the quantity of produce is smaller. Many small-scale farmers produce low-quality sheet rubber, which fetch lower prices at higher trader levels. Additionally, these farmers often have limited knowledge of grading and standardization and they produce rubber primarily to sustain their livelihood. All of these factors help explain why many small-scale farmers choose this marketing channel.

The second marketing channel starts with the farmer and ends with rubber product manufacturers. Farmers who have large rubber plantations or a high daily yield typically use this channel. These farmers are able to

take advantage of the high quantity and quality of their produce to negotiate better prices directly with the manufacturers.

On the other hand, small-scale farmers often face difficulties in accessing town-level farmers, who are more likely to be the direct link to manufacturers. As a result, small-scale farmers prefer not to use this channel, even though it may result in higher prices for their produce. Additionally, the higher marketing costs associated with this channel, such as transportation and other expenses; make it less attractive for small-scale farmers.

Both the channels serves their purpose. Market characteristics are better for channel II as compared to channel I. The efficiency of the marketing channel I is more compared to marketing channel II (3.78 for channel I and 4.39 for channel II). However, various reasons make channel II preferable for large famers. The comparison of characteristics of both channels are given below.

Fig. 4: First marketing channel of rubber

Fig. 5: Second marketing channel of rubber

TABLE 5

Characteristics of marketing channels

Particulars	Channel I	Channel II
Marketing efficiency index	3.78	4.39
Marketing margin	Rs.24/kg	Rs.20/kg
Producer's share in consumer rupee	84.84%	87.87%

The study can conclude that, natural rubber cultivation in Kerala is becoming more and more difficult since, the price of processed natural rubber in far below than the farmers expectation and higher labour cost. Farmers are not benefitted without accounting the timber value of rubber tree. In this situation government need to step up in order to fix a floor price for processed rubber, that can make rubber farmers to stay in the business and also government institutions can training to tapping farmers in order to produce superior quality rubber so that these produce can compete in the international market.

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