

TREND, DETERMINANTS AND PRICE-VOLATILITY OF RUBBER-CROP IN KERALA

N. Karunakaran*

In the present period also, agriculture is the main source of livelihood for majority of the people of Kerala; but the sector witnessed big threat under economic reforms of liberalization, privatization, globalization and modernization. Agriculture in the state experienced transformation where plantation crops increased considerably. Various price and non-price factors like agro-climatic conditions, labour availability, irrigation facilities, soil fertility, cost of cultivation, price levels, profitability, mechanisation, etc has contributed to it. Cropping pattern in the state is dominated by non-food crops and recently rubber. Farmer's decisions in terms of area response and yield response determinants like lagged area, expected price of the crop, expected price of the competing crop, lagged yield, expected yield risk and price risk, average annual rainfall, tappable area, etc are crucial and the analysis about rubber revealed that price is the most dominant governing determinant. Recent years witnessed unprecedented volatility in rubber price. Declining trend in the prices of rubber has pushed natural rubber production the lowest in the country. The study revealed that prices were so low so that the rubber cultivators cannot even pay workers wages and the recent unprecedented volatility in prices declined rubber production leads to the falling standard of living of the rubber farmers in Kerala.

Keywords: Growth trend; Rubber Cultivation; Determinants; Area response; Yield response

INTRODUCTION

In Kerala agriculture continues to be the most important and single largest sector in terms of income and employment. Agricultural development experienced decline of area under food crops and substantial expansion of non-food crops. This implies transformation and heavy concentration of non-food crops. The emergence of rubber as a dominant sector is the most notable feature. Major rubber producing states in India are Kerala, Tamilnadu and Karnataka; other includes Tripura, Assam, Meghalaya, Nagaland, Manipur, Goa, Andaman and Nicobar Islands. Kerala is in the forefront and is one of the most plantation crop cultivated. Of the total rubber produced in the country 92 percent, and in area 84 percent is the contribution of Kerala (Karunakaran, 2017). Based on price expectation, labour availability, government strategies, agro-climatic condition, irrigation facilities, expected yield, cost of cultivation, soil fertility and so on, farmers decide whether to allocate their land for agricultural purpose, which crops cultivated, how much area to allocate or for non-agricultural purpose (Mythili, 2006).

Rubber cultivators in Kerala are mainly small growers and any financial constraints, fluctuations in price or backwardness in technology will affect the growers considerably. In the state, 10 lakh farmers directly and indirectly depends and the capital employment opportunity ratio the rubber providing is 40 percent employment for one crore rupees and is a main source of tax to state government. The manufacturing units using rubber were facing problems because of the volatility in the price of natural rubber (Karunakaran, 2017). About 11 lakh small rubber growers are facing crisis due to fall in price (Hameed, 2014). Price of natural rubber is determined by international market. In Kerala, the price of one kilogram of natural rubber had decreased from Rs. 245 in 2011 to Rs. 102 in 2016 (Karunakaran, 2017). However, the cost of cultivation in this sector is increasing.

**Head of the Post Graduate Department of Economics, EKNM Government College, Elerithattu – 671314, Nilishwar, Kasaragod, Kerala, India, E mail: narankarun@gmail.com*

Therefore, an investigation into the micro aspects associated with rubber production and marketing is important. More specifically the main objectives of the study to analyse rubber cultivation in Kerala in terms of trends and determinants and to identify the trend in price volatility of rubber in Kerala.

METHODS AND MATERIALS

The study used both primary and secondary data. The primary data were collected through sample survey from Kerala with the help of a well structured questionnaire. The secondary data were collected from official website of Rubber Board, Rubber Board office and publications of Govt. of Kerala and India.

Compound Growth Rates (CGR) of area, production and productivity of rubber for the period were estimated with the following exponential model.

$$Y = ab^t$$

The growth rate (GR) has been computed using the formula:

$$GR = (\text{Antilog } b - 1)100$$

The F test has been applied to test the significance of b.

RESULTS, ANALYSIS AND DISCUSSION

In India cultivation of rubber is on commercial basis dates back to 1902 under the British rule. The history of rubber cultivation during the last 100 years revealed the gradual and steady increase of small growers over large plantation owners. At present, India is the fourth largest producer of natural rubber in the world accounting 844000 tonnes. The productivity of natural rubber was also highest in India.

Table 1: Rank of Agriculture Crops in Kerala (1960-2015)

Sl. No.	Crops	1960-61	1970-71	1980-81	1990-91	2000-01	2014-15
1	Rice	1	1	1	2	3	3
2	Coconut	2	2	2	1	1	1
3	Areca nut	6	7	7	10	8	5
4	Rubber	4	4	4	3	2	2
5	Pepper	5	5	6	4	4	4
6	Cashewnut	6	6	5	6	7	9
7	Tapioca	3	3	3	5	5	7
8	Coffee	10	11	8	7	9	8
9	Tea	8	10	11	11	11	11
10	Cardamom	9	9	9	8	10	10
11	Ginger	11	12	12	12	12	12
12	Banana	7	8	10	9	6	6

Source: Karunakaran N (2016), "Rubber cultivation in Kerala: Determinants and growth", Agricultural Situation in India, 73 (5): 29-34

AREA, PRODUCTION AND PRODUCTIVITY OF RUBBER IN KERALA

Kerala is the largest producer of rubber in India. During 1960's, rubber is in fourth position in the total cropped area; recently it occupied second position compared to other crops. Table 1 and 2 revealed clearly that, among the four plantation crops, rubber emerged as the most significant crop.

Table 2: Area, Production and Productivity of Rubber in Kerala (1960-2015)

Year	1960-61	1970-71	1980-81	1990-91	2000-01	2013- 14	2014- 15
Area (in ' 000 hectare)	123	179	238	412	474	548	550
Production (in ' 000 tonnes)	23	79	140	308	580	648	508
Productivity (in Kg/Hectare)	187	439	590	747	1222	1182	923

Source: Karunakaran N (2017), "Transformation of agriculture towards rubber cultivation in Kerala, its determinants and growth", *Indian Journal of Economics and Development*, 13 (2): 363-368

The percentage increase in area under rubber was 328 in 2014-15 over 1960-61 (Table 2). Among the districts, Thiruvananthapuram recorded highest percentage increase in area under rubber cultivation (Karunakaran, 2016).. Table 2 and 3 show the area, production and productivity of rubber during 1960-2015. Production and productivity has declined during 2013-15 due to sharp fall in prices.

Table 3: Compound Growth Rates of Area, Production and Productivity

Sl. No.	Item	1960's	1970's	1980's	1990's	2000's	Five decades
1	Area	3.65	1.99	6.49	1.41	1.19	3.29
2	Production	* 11.31	6.11	7.64	7.35	4.51	7.07
3	Productivity	10.73	3.82	1.09	5.85	3.28	3.90

* - Significant at probability level 0.01

DETERMINANTS OF RUBBER CULTIVATION IN KERALA

Originally rubber was introduced into areas with degraded forests; from there it spread all over and replaced natural vegetation, tapioca, cashewnut, fruit trees and coconut (Chattopadhyay, 2015). The area, production and productivity of rubber crop had tremendously increased (Table 1 and 2). Factors like expected price and yield of the crop, price of the competing crops (like coconut), average annual rainfall, tappable area, lagged yield of the crop, etc, are conceived to be great important in determining the area and yield response of rubber in Kerala. The estimated results are given in Table 4 which revealed that price variables (expected price of rubber, 0.1383 and expected price of competing crop, 0.2158) turns out to be an important factor in determining the area response in addition to tappable area of rubber (0.4756). The expected yield and expected price risk seems to have negative influence on area. With regard to yield response, the estimated results shows that lagged yield and rainfall were the significant factors influencing the yield of rubber and the price

variable seems to be insignificant. The area response and yield response of rubber is found to be price responsive; future expectations about prices are also the determining factor in addition to the price of coconut and tappable area.

Table 4: Regression Coefficients of the Determinants of Area and Yield of Rubber during the Last Five Decades.

Area		Yield	
Variables	Results	Variables	Results
a_0	2.1703	b_0	-0.4139
Pt^e	0.1383 (0.025)	Y_{t-1}	0.9559 (0.048)
Ptc^e	0.2158 (0.036)	Pt^e	0.0047 (0.039)
Yt^e	-0.2183 (0.041)	Ptc^e	0.0079 (0.039)
Tat	0.4756 (0.073)	PRt^e	***** -0.0083 (0.010)
PRt^e	-0.0237 (0.006)	RFt	*** 0.0896 (0.048)
RFt	**** 0.0527 (0.034)	R Square	0.9905
R Square	0.9942	Durbin-Watson statistic	2.181
Durbin-Watson statistic	1.4479		

Source: Computed from: Karunakaran N (2016), "Rubber cultivation in Kerala: Determinants and growth", *Agricultural Situation in India*, 73 (5): 29-34

Figures in bracket shows standard error, *** Significant at 0.05 level of significance, **** Significant at 0.10 level of significance, ***** Significant at 0.50 level of significance

TREND IN PRICE VOLATILITY OF RUBBER IN KERALA

The marketing and export of rubber is commonly adopted through different channels. The leading export markets are China, Malaysia, Indonesia, Turkey, Sri Lanka, Spain and Nepal. More than 90 percent of the rubber produced in India is from Kerala. 80 percent of the area under rubber in Kerala is accounted by small holdings and is generally grown in the midlands and highlands. The small holding under rubber in Kerala is mainly homestead planting and is lying adjacent to each other. The average farm harvest price of rubber in Kerala during 2000-2015 is presented in Table 5 and the highest price was noticed during the year 2011-12; after that fast decline noticed.

The price volatility of rubber in Kerala in terms of average annual growth rate during the period 1961-2015 revealing increasing and decreasing trend. Rubber price showed an increasing trend in 1991 and this continued up to 1995. Since then there is a negative trend in growth rate. After 2001, growth rate again increased; but the present trend is negative (-8.6 percent).

Table 5: Average Farm Harvest Price of Rubber in Kerala (2000-15)

Sl. No	Year	Price (Rs per quintal)	Annual Growth rate (in percent)
1	2000-01	3036	-
2	2001-02	3228	1.92
3	2002-03	3919	6.91
4	2003-04	5040	11.21
5	2004-05	5570	5.30
6	2005-06	6699	11.29
7	2006-07	9204	25.05
8	2007-08	9390	1.86
9	2008-09	10112	7.22
10	2009-10	11498	13.86
11	2010-11	19003	75.05
12	2011-12	20805	18.02
13	2012-13	17682	-31.23
14	2013-14	16602	-10.80
15	2014-15	13257	-33.45

Source: Karunakaran N (2017), "Volatility in the price of Rubber crop in Kerala", Indian Journal of Krishi Vigyan, 5(2): 160-163.

Figure 1: Price volatility of rubber in Kerala during 1961-2015

CONCLUSION

The analysis of growth trends of area in Kerala revealed cropping pattern change from food crops to rubber. This is due to farmers' decisions. There are determinants which motivated farmers and area response and yield response models were used to analyse it in terms of lagged area, lagged yield, expected price of the crop, expected price of the competing crop, expected yield risk and price risk, average annual rainfall, tappable area, etc. The result revealed that price variable (expected price and expected price of competing crop) is the major determining factor in addition to tapped area for area decision. In the yield response decision, past years yield and rainfall were the significant variables. The area response and yield response of rubber shows that area under rubber was price responsive. Future expectations about price are the dominating factor governing the acreage decision of rubber in Kerala.

Rubber is an agro-industry based product in which ten lakh farmers are directly involved. There is a scarcity of 2 lakh tonne natural rubber in the world market today. The farmers in Kerala are facing many problems due to price volatility; so a scheme that guarantee minimum support price of Rs. 150 per kilogram for natural rubber sheets produced should be implemented and government should provide more incentives to protect the small rubber growers and also stop the import of natural rubber; otherwise there is a shift from rubber to other crops.

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