TREND AND OVERALL GROWTH ANALYSIS OF RUBBER CULTIVATION IN KERALA [†]

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ABSTRACT

In the present century also, agriculture is the main source of livelihood for majority of the people of Kerala. But agricultural sector is under the big threat of economic reforms like liberalization and modernization of economy. The agrarian economy of Kerala could not exclude from the drastic hitting of the liberalization, privatization and globalization reforms; farmers of the state began to think that there is no other way to sustain their life. The statistical profile of Kerala agriculture in the last five decades experienced agricultural transformation. In this change, plantation crops increased considerably. Changing cropping pattern in terms of acreage allocation among different crops is the integral feature of Kerala agrarian economy. The diversification of crops in terms of variation in acreage allocation has taken place due to price and non-price factors like agro-climatic conditions, labour availability, irrigation facilities, soil fertility, cost of cultivation, price levels, profitability, mechanisation, etc. The change has taken place largely in favour of non-food crops and

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recently it is towards rubber. The real growth of agricultural crop output has declined continuously since 1960-61 compared to monetary growth. In the case of rubber, the crop exhibited positive values in all the components in the decomposition analysis.

Key words: Kerala; rubber; Growth trend; overall growth; real growth; monetary growth; area response; yield response.

INTRODUCTION

In Kerala the agricultural scenario continues to be the most important and single largest sector of the state's economy in terms of income and employment. Due to a variety of reasons, different types of food and non-food crops are grown throughout the state which include, rice, coconut, rubber, tapioca, pepper, cashewnut, arecanut, banana, coffee, tea, ginger, cardamom, etc. Agricultural development experience of the state since the last seventies has been characterised by sharp decline in the area under food crops and the substantial expansion in the area under non-food crops. Area under food crops decreased from 67 percent of the total cropped area during the early 1960's to 12 percent of the total cropped area at present. But the situation is just the reverse in the case of non-food crops where it went up from 33 percent of the total cropped area to 88 percent. This agricultural transformation of the state indicates a heavy concentration of non-food crops. The emergence of cash crops, particularly rubber, as a dominant sector over the last four decades is the most notable feature of this transformation.

This change in cropping pattern mainly towards rubber is due to farmers decisions. Based up on price expectations, labour availability, impact of government strategies, agro-climatic conditions, irrigation facilities, expected yield, cost of cultivation, soil fertility and so on, farmers decide whether to allocate their land for agricultural purposes, viz, which of the crops to cultivate, how much area to allocate, etc, or for non-agricultural purposes (Mythili G, 2006). The agricultural statistics of Kerala since 1960-61, clearly depicted that the cropping pattern in the state has made a significant shift towards rubber. Naturally there must be certain determinants that motivated the farmers to make such a change in the cropping pattern. In this context, an overview of rubber cultivation in Kerala in terms of trends, determinants and overall growth analysis is worked out.

MATERIALS AND METHODOLOGY

The study used secondary data from various publications of the Government of Kerala and India. Two models were used to analyse farmer's decisions in terms of area response and yield response.

(i)   Area Response Model for Rubber:
$$At = a0+a1Pte+a2Ptce+a3Yte+a4TAt+a5PRte+a6RFt+vt$$

(ii)   Yield Response Model for Rubber:
$$Yt = b0+b1Yt-1+b2Pte+b3Ptce+b4PRte+b5RFt+ut$$

(Where, At = Area under the crop in the current year, Yt = Yield per hectare of the crop in the current year, Pte = Expected price of the crop (The expected price of the crop in period t was calculated as the average prices prevailing in the preceding three years), PRte = Expected price risk in the current year (The price risk in period t was represented by the standard deviation of price in the past three years from period t), RFt = Average annual rainfall in mm, Ptce = Expected price of the competing crop (that is, coconut), Yte = Expected yield of the crop (The expected yield of the crop in period t was calculated as the average yield prevailing in the preceding three years), TAt = Tappable area in the current year, Yt-1 = Yield of the crop in period t-1). The regression coefficients were estimated by the method of OLS. The regression coefficients were tested for their significance using t test. Durbin-Watson statistic was also computed for testing the incidence of auto-correlation.

Sl. No.	Crops	1960-61	1970-71	1980-81	1990-91	2000-01	2013-14
Table 1. Transformation of agriculture in Kerala towards Rubber
(Rank of each crop in the Total Cropped Area)
1	Rice	1	1	1	2	3	3
2	Coconut	2	2	2	1	1	1
3	Arecanut	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 and other plantains	7	8	10	9	6	6

Source: Computed from: Karunakaran N (2014), Paddy cultivation in Kerala: trends, determinants and effects on food security, *Artha Journal of Social Science*, 13(4): 21-35.

RESULTS AND DISCUSSION

Transformation of agriculture in Kerala towards Rubber: During 1960-61 the order of the first five crops was rice, coconut, tapioca, rubber and pepper in the descending order of shares to the total cropped area. Table 1 reveals that in 2013-14, the first five crops were coconut, rubber, rice, pepper and arecanut. Rubber occupied fourth position in area during 1960-61 went to second position in 2013-14. The main crops losing area between 1960-61 and 2013-14 were rice and tapioca. This transformation clearly established a shift from the traditional subsistence cropping to the recent commercial cropping like rubber and coconut. From Table 1 it is very clear that, among the four plantation crops, rubber emerged as the most significant crop with largest area in the state next only to coconut.

Table 2. Transformation in the cultivation of rubber, coconut and rice in Kerala (in %) (2013-14 over 1960-61)				
Sl. No.	Districts	Rubber	Coconut	Rice
1	Thiruvananthapuram	698	31	-92
2	Kollam	75	-9	-92
3	Pathanamthitta	14	-35	-81
4	Kottayam	159	-40	-73
5	Alappuzha	114	-42	-57
6	Ernakulam	265	12	-83
7	Idukki	125	19	-77
8	Trissur	136	127	-73
9	Palakkad	577	227	-49
10	Malappuram	8	75	-86
11	Kozhikkode	31	24	-96
12	Wayanad	89	173	-37
13	Kannur	300	69	-92
14	Kasaragod	54	29	-65
15	State	328	56	-69

Source: Computed from: Karunakaran N (2014), Paddy cultivation in Kerala: trends, determinants and effects on food security, *Artha Journal of Social Science*, 13(4): 21-35.

The percentage increase in the area under rubber was 328 in 2013-14 over the year 1960-61 (Table.2). Among the districts, Thiruvananthapuram district recorded highest percentage increase in area under rubber cultivation (698 percent). Tables 1 and 2 clearly supported the transformation from food crops, mainly rice and tapioca, in favour of tree crops such as rubber and coconut in Kerala.

Table 3. Compound Growth Rates of Area, Production and Productivity of Rubber in Kerala.							
Sl. No.	Item	1960's	1970's	1980's	1990's	2000's	Five decades
1	Area	3.647	1.989	6.485	1.407	1.196	3.292
2	Production	* 11.311	6.107	7.640	7.345	4.514	7.065
3	Productivity	10.729	3.819	1.087	5.853	3.281	3.903
* - Significant at probability level 0.01							
Source: - Karunakaran N (2015) *Crop Diversification for Sustainable Agriculture*, Pointer publishers, Jaipur, India: 90-100.							

Figure 1. Growth in area, production and productivity of rubber crop in Kerala (1960-61 to 2013-14)
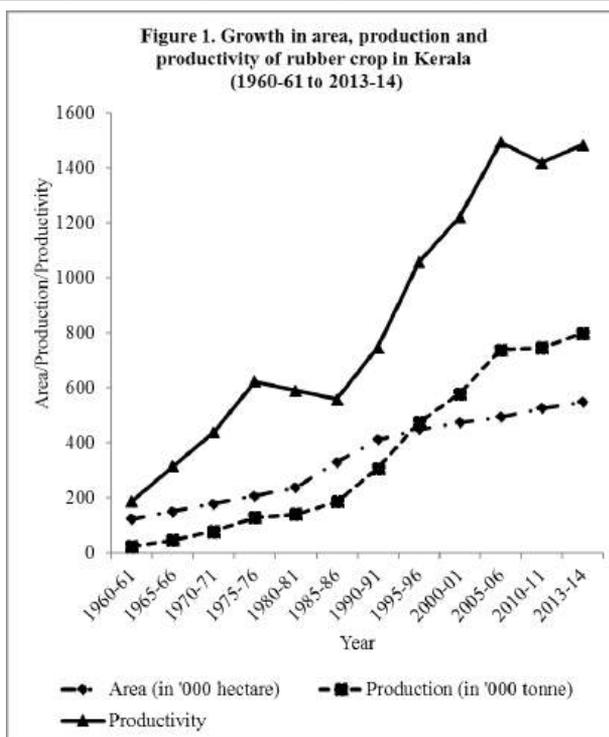
The growth of crop-output in Kerala can be decomposed into real and monetary terms (Karunakaran N, 2013) and the results summarised in Table 4 with respect to rubber during the past five decades shows that the real growth has tended to decline from 60 percent during 1960's to 13 percent in 2000's and monetary growth has correspondingly risen from 40 percent to 87 percent. Comparison of the real and monetary growth during different decades revealed the dominance of monetary growth over real growth. More specifically, the overall growth is actually monetary growth rather than real growth in the case of rubber.

Sl. No.	Elements	Period					
		1960's	1970's	1980's	1990's	2000's	Five decades
1	Increase in value of output	473.65	367.40	474.04	241.42	502.24	397853.67
2	Area effect	8.99	4.86	22.65	6.17	1.81	0.08
3	Yield effect	40.57	12.84	1.03	29.56	5.19	0.75
4	Cropping pattern effect	4.49	18.48	33.58	7.13	4.77	0.03
5	Interaction effect	6.05	3.03	5.98	4.42	1.14	2.01
6	Real Growth (2+3+4+5)	60.10	39.21	63.24	47.28	12.91	2.87
7	Pure price effect	14.79	34.06	4.72	28.29	57.63	3.28
8	Price Yield effect	19.93	15.13	6.23	17.57	13.77	23.25
9	Price cropping pattern effect	2.21	8.03	20.83	4.23	12.66	8.72
10	Total Interaction effect	2.97	3.57	4.98	2.63	3.03	61.88
11	Monetary Growth (7+8+9+10)	39.90	60.79	36.76	52.72	87.09	97.13
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

Table 4. Overall Growth of rubber Cultivation in Kerala during the last five decades. (in percentages)

Source: - Karunakaran N (2015), *Crop Diversification for Sustainable Agriculture*, Pointer publishers, Jaipur, India: 120-125.

Determinants of Rubber Cultivation in Kerala: Originally rubber was introduced into areas with degraded forests. From there it spread all over. It replaced natural vegetation, tapioca, cashewnut, fruit trees and coconut (Srikumar Chattopadhyay, et.al, 2006). The area, production and productivity of rubber cultivation had tremendously increased during 1960-61 to 2013-14 (Table 3 and Figure 1).

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 importance in determining the area allocation and yield response of rubber in Kerala. The estimated results are given in Table 5 and it 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.

Table 5. 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)	Yt-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		
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			

The area response and yield response of rubber shows that area under rubber was found to be price responsive. Future expectations about prices are one of the major determinants governing the area expansion of rubber in Kerala. The price of coconut and tappable area of rubber are the next two factors working behind the farmer's area expansion decisions on rubber.

CONCLUSION

The analysis on the agricultural transformation of major crops in Kerala clearly established that the cropping pattern in the state made a significant change from food crops to non-food crops and recently towards rubber. The growth of agricultural crop output in Kerala like that of other parts of India is influenced by the gross cropped area, productivity and level of prices. The increase in agricultural crop-output is decomposed into real and monetary components. The real component includes area effect, yield effect, cropping pattern effect and interaction effect. The monetary elements consist of the pure price effect, price yield effect, price cropping pattern effect and total interaction effect. From the analysis of the growth of output of rubber into real and monetary components in the last five decades, the general conclusion derived is the crop exhibited positive values in all the components in the analysis and the share of monetary components is more than 90 percent for the entire decades of output of this crop compared to real components.

This change in cropping pattern towards rubber is mainly due to farmers' decisions. There must be certain determinants that motivated the farmers to make such a shift in the cropping pattern. Area response and yield response models were used to analyse the determinants. The determinants estimated are 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 results of the study revealed that, in the case of rubber, the 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 for rubber. 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.

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