Growth of Output of Principal Crops in Kerala:
A Decomposition Analysis

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Abstract: 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 recently it is towards rubber. The real growth of agricultural crop output has declined continuously since 1960-61 compared to monetary growth. Among twelve crops studied during different periods, rubber is the only crop exhibited positive values in all the components in the decomposition analysis. For all crops during the overall period, the share of monetary components is more than 90% for the overall growth of output of these crops compared to real components.

Key words: Decomposition · Principal crops · Real growth · Monetary growth · Agricultural crop output

INTRODUCTION

Agriculture 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 66.63% during 1960-61 to 12.05% of the Total Cropped Area (TCA) during 2009-10. But the situation is just the reverse in the case of non-food crops, which went up from 33.37% of the TCA in 1960-61 to 87.95% of the TCA in 2009-10.

Time series analysis of acreage, production and productivity data of twelve principal crops in Kerala during the period 1960-61 to 2009-10 revealed the performance of major crops in terms of growth of area, production and productivity.

The area under rice decreased from 33.16% in 1960-61 to 8.77% in 2009-10, cashewnut area decreased from 2.31% to 1.84%, tapioca cropped area decreased from 10.31% to 2.80%, proportion of tea area decreased to 1.38% and ginger from 0.51% to 0.20% of the total cropped area. The area under rubber cultivation on the other hand increased

to 19.69% in 2009-10 from 5.23% in 1960-61, coconut to 29.18% from 21.32%, arecanut to 3.72% from 2.31%, pepper to 6.43% from 4.25%, coffee to 3.18% from 0.72%, cardamom to 1.56% from 1.22% and banana to 3.71% from 1.89% respectively.

Of late, it is being debated that productivity of crops in India, as well as in states, has been stagnant during the past few years [1]. The argument is that during the late sixties and early mid-seventies, the production of food grains in the country has shown a rising trend but after this trend has not been maintained. It is argued that this has happened because the productivity is almost stagnant [2].

An analysis of the performance of major crops in terms of growth of area, production and productivity in Kerala during the period 1960-61 to 2009-10 revealed that the production of major food crops, rice and tapioca reached at a negative growth rates due to the declining trend of their area; but the production rate of banana and other plantains increased due to the increase in area [3]. Both area and productivity growth rates influenced the production rates of non-food crops. Pepper production

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growth and growth rate of coconut production was determined more by increase in area. Increase in yield growth rate was responsible for increase in production growth rate of arecanut. Productivity growth rate was responsible for good production growth rate for ginger. Decline in area and yield growth rate was responsible for the negative growth rate in production for cashewnut. For cardamom and tea only yield growth rate is helpful for production growth [4]. In the case of coffee both area and yield growth rates helped the increase in production growth rate. The outstanding performance of rubber in the production growth rate is as a result of the combined growth of area and productivity [5].

There are many factors which affect the growth of crop output and productivity. The sources of output growth like area effect, yield effect and cropping pattern effect have relevance in deciding the programmes of agricultural development and priorities of investment in it [6]. The growth rates as such offer no explanation for desperate performance of agriculture [7]. Thus it becomes important to find why these growth rates differ from one another so that the bottlenecks could be removed to achieve the speedy development of agricultural sector [8]. Changes in the gross cropped area, productivity and level of prices are the important components influencing the growth of aggregate agricultural output [9].

This study is an attempt to decompose the growth of agricultural production in Kerala in terms of its determinants, viz, area, productivity and prices. The main aim, here, is to decompose the increase in crop output into its components (real and monetary) and thereby to analyse, to the extent possible, the factors responsible for the increase.

MATERIALS AND METHODS

Decomposition of output growth is not a new concept in the field of agricultural growth analysis. Still it has its usual importance to the researchers and policy makers for identifying the root causes of high and low growth of agricultural crop output.

Although some attempts were made to explain agricultural growth in terms of the area and yield components, the first systematic study was pioneered by Minhas and Vaidyananthan (1965) [10]. The growth of crop output was decomposed into a set of physical factors, such as, area, yield and rate of cropping pattern as well as interaction between the latter two. Later, Minhas developed a seven-component version of his additive scheme which was subsequently used by Mishra. V.N (1971) [11] for his study.

Rajender Sondhi, *et al.*, (1975) [12], Vidhya Sagar (1977) [13], Dharm Narain (1977) [14], Dashora. S.K, et.al (2000) [15] and Kurosaki Takashi (2002) [16] used the same as well as a modified version of the Minhas-Vaidyananthan model.

Besides these methodology used for decomposition, Ashok Parikh (1966) [17], Dayal (1966) [18] and Bhalla, et.al (1979) [19] adopted multiplicative schemes, instead of the additive schemes, in their decomposition exercise.

Kurien, C.T. and Joseph James (1979) [20] and Kaushik, K.K (1993) [9] used a procedure which was a modification of the Minhas-Vaidyananthan method to study the relative contribution of different elements to the growth of crop output in Tamilnadu and Himachal Pradesh.

To measure the relative contribution of different elements (real and monetary) to the growth of output for the total crops during different periods in Kerala, the model used by Kurian. C.T. and Joseph James (1979) [20] and Kaushik. K.K (1993) [9] is applied in this study. Rather than the crop output which forms the basis of analysis in the Minhas-Vaidyananthan model, this model basically work with the value of aggregate output. Observing the value of output in period zero (V_0) and in period t (V_t), the difference between the two is decomposed into eight component elements, viz, (i) change in area, (ii) change in yield per hectare, (iii) change in cropping pattern, (iv) the interaction between yield and cropping pattern, (v) the price change effect, (vi) the interaction between price and yield, (vii) interaction between price and cropping pattern effect and (viii) interaction between price, cropping pattern and yield.

If V_0 and V_t will represent the value of output in the two periods and A_0 and A_t will denote gross cropped area in years 0 and t respectively, then by definition,

$$V_0 = A_0 \, \Sigma_i wi_0 \, ci_0 \, yi_0$$
$$V_t = A_t \, \Sigma_i wi_t \, ci_t \, yi_t$$

Terminal period output valued at base year prices can be said to represent the 'real output' of the terminal year to be denoted by P_t. That is,

$$P_t = A_t \, \Sigma_i wi_0 ci_t yi_t$$

The difference in the value of aggregate output (V_t-V_0) can be disaggregated into its 'real' and 'monetary' components with the help of the concept:

$$V_t\text{-}V_0 = (V_t\text{-}P_t) + (P_t\text{-}V_0)$$

The first term on the right hand side

$$V_t - P_t = A_t \sum_i wi_t \, ci_t \, yi_t - \sum_i wi_0 ci_t yi_t$$

is the difference between the terminal year aggregate output valued in terms of terminal year prices (wi_t) and base year prices (wi_0) and hence can be thought of as a measure of the monetary component in increase in output. The second term

$$P_t - V_0 = A_t \sum_i wi_0 ci_t yi_t - A_0 \sum_i wi_0 ci_0 yi_0$$

is the difference between 'real output' in the terminal year and 'real output' in the base year and hence can be said to be a measure of the real component in increase in output.

$(P_t - V_0)$ can be decomposed as shown below. That is,

$$(P_t - V_0) = (A_t - A_0) \sum_i wi_0 \, ci_0 \, yi_0$$

$$+ A_t \sum_i wi_0 \, ci_0 \, (yi_t - yi_0)$$

$$+ A_t \sum_i wi_0 \, yi_0 \, (ci_t - ci_0)$$

$$+ A_t \sum_i wi_0 \, (yi_t - yi_0)(ci_t - ci_0) \qquad (1)$$

In the decomposition scheme (1) above, the first term on the right hand side is the area effect, the second the yield effect, the third the cropping pattern effect and the fourth interaction effect, representing the interaction between yield and changes in cropping pattern. The term 'area effect' reflects the impact of growth of average area on the increase in the level of production, keeping all other influences inoperative during the period. 'Yield effect' reflects the impact of the growth of average yield and the 'cropping pattern effect' reflects the impact of cropping pattern changes during the current period as compared to the base period. The 'interaction effect' between yield and cropping pattern signifies the influence of these factors over the others in bringing about the changes in production. The above decomposition scheme (1) shows the disaggregation of the real component.

A decomposition of the monetary component is shown in scheme (2) below:

$$V_t - P_t = A_t \sum_i ci_0 yi_0 \, (wi_t - wi_0)$$

$$+ A_t \sum_i ci_0 \, (wi_t - wi_0)(yi_t - yi_0)$$

$$+ A_t \sum_i yi_0 \, (wi_t - wi_0)(ci_t - ci_0)$$

$$+ A_t \sum_i (wi_t - wi_0)(ci_t - ci_0)(yi_t - yi_0) \qquad (2)$$

The first component in the scheme (2) is the 'pure price effect', that is, in the absence of any change in the total output ($ci_0 yi_0$ is total output of the ith crop) an increase of this magnitude in the value of output is solely due to rise in prices. The second and third terms are respectively the first order interactions between price and yield rate and price and cropping pattern effect, under constant cropping pattern and constant yields. These effects signify the influence of any of the two factors over the other in bringing about changes in production. The last term is the second order interaction term between the three variables considered, viz, changes in prices, cropping pattern and yields and may be called the 'total interaction effect'.

The variables and notations used in the model are:

A_0 = Gross cropped area in base year zero (0),
A_t = Gross cropped area in terminal year (t),
V_0 = Value of output in period zero (0),
V_t = Value of output in period t,
P_t = Real output of the terminal year (t),
ci_0 = Proportion of the area of the ith crop in Gross cropped area in the base year,
yi_0 = Yield of the ith crop in the base year,
wi_0 = Farm harvest price of the ith crop in the base year,
ci_t = Proportion of the area of the ith crop in the terminal year (t),
yi_t = Yield of the ith crop in the terminal year (t),
wi_t = Farm harvest price of the ith crop in the terminal year (t).

The subscript '0' and 't' refer respectively to the base year and terminal year. Subscript 'i' is used for the ith crop (i = 1, 2, 3,........., 12).

The study used secondary data and was collected from various publications of the Government of Kerala like Economic Review, Statistics for Planning and Agricultural Statistics. The decomposition of different elements to the growth of principal crop output in Kerala was done from 1960-61 to 2009-10 considering five sub-periods (I, II, III, IV and V) for 12 principal crops (Rice, Coconut, Arecanut, Rubber, Pepper, Cashewnut, Tapioca, Coffee, Tea, Cardamom, Ginger, Banana and other plantains). Since the period can be broken up in different ways and the result will vary accordingly, decade wise classification of the entire period into five sub-periods was undertaken. In choosing the crops for analysis, the primary consideration has been to ensure maximum coverage of cropped area.

RESULTS AND DISCUSSION

The value of the variables share of area, yield, prices and total cropped area during 1960-61 to 2009-10 for 12 principal crops in Kerala are shown in Table 1.

Table 2 gives the decomposition of the increase in the value of output of 12 principal crops in Kerala for periods I to V and overall period. Taking period I first, it is noted in serial number 1 of Table 2 that the percentage increase in value of output for each crop ranges from

Table 1: Decomposition of output growth of Principal crops in Kerala

		Period I					
Sl. No.	Crops	c_0	y_0	w_0	c_t	y_t	w_t
1	Rice	33.16	1371	40.51	29.97	1403	100.31
2	Coconut	21.32	920	21.51	24.27	720	49.84
3	Arecanut	2.31	1020	2.73	2.87	1080	4.02
4	Rubber	5.23	187	347.96	6.01	439	518.94
5	Pepper	4.25	271	404.59	4.05	207	559.54
6	Cashewnut	2.31	1558	77.32	3.39	1122	146.42
7	Tapioca	10.31	6949	7.74	10.14	13785	18.48
8	Coffee	0.72	442	575	0.99	432	898
9	Tea	1.60	1073	562.50	1.31	1050	702
10	Cardamom	1.22	45	2230	1.61	23	5653
11	Ginger	0.51	938	117.50	0.40	1041	866.13
12	Banana and other plantains	1.89	7381	6.73	1.83	7570	17.18

A_0 = 2349 ('000 ha) A_t = 2916 ('000 ha)

		Period II					
Sl. No.	Crops	c_0	y_0	w_0	c_t	y_t	w_t
1	Rice	29.83	1484	90.25	27.79	1638	133.24
2	Coconut	24.52	790	56.68	23.22	655	114.28
3	Arecanut	2.93	1060	3.74	2.13	1270	6.15
4	Rubber	6.11	439	457.89	7.55	634	997.74
5	Pepper	4.03	212	616.90	3.71	273	1358.57
6	Cashewnut	3.50	1122	139.80	4.90	591	582.73
7	Tapioca	10.01	15729	20.59	8.54	16774	41.22
8	Coffee	1.08	398	1068	2.03	521	1698
9	Tea	1.28	1105	718.75	1.27	1451	1397.75
10	Cardamom	1.62	26	5302.50	1.89	61	14338
11	Ginger	0.41	1617	553.97	0.50	2536	405.88
12	Banana and other plantains	1.66	7567	16.69	1.74	6253	38.08

A_0 = 2933 ('000 ha) A_t = 2854 ('000 ha)

		Period III					
Sl. No.	Crops	c_0	y_0	w_0	c_t	y_t	w_t
1	Rice	27.79	1587	152.06	19.32	1956	290.47
2	Coconut	22.56	660	138.09	27.57	748	203.81
3	Arecanut	2.12	1245	7.60	2.09	1352	14.27
4	Rubber	8.24	590	1114.24	13.13	695	2043.37
5	Pepper	3.75	264	1208.23	5.53	324	3473.06
6	Cashewnut	4.90	580	731.91	4.10	859	1177.51
7	Tapioca	8.49	16926	37.67	5.30	19075	138.67
8	Coffee	2.01	406	1705	2.49	285	4852
9	Tea	1.25	1402	1314	1.15	1878	2754
10	Cardamom	1.87	60	10915.33	2.14	44	26810.38
11	Ginger	0.44	2523	563.74	0.48	3283	2192.89
12	Banana and other plantains	1.71	6438	38.65	2.01	7404	70.05

A_0 = 2885 ('000 ha) A_t = 3019 ('000 ha)

Table 1: Continued

| Sl. No. | Crops | Period IV | | | | | |
		c_0	y_0	w_0	c_t	y_t	w_t
1	Rice	18.53	1942	289.61	11.59	2203	684.43
2	Coconut	26.72	750	301.23	30.66	877	476.12
3	Arecanut	2.15	1442	26.40	2.72	7265	75.25
4	Rubber	13.63	747	1943.68	15.67	1211	3099
5	Pepper	5.58	278	3234.25	6.58	240	20506.16
6	Cashewnut	3.83	702	1379.90	2.96	733	3638.50
7	Tapioca	4.85	19133	150.69	3.71	22621	368.09
8	Coffee	2.49	278	5551	2.79	719	12671
9	Tea	1.15	1752	3814	1.15	1780	5134
10	Cardamom	2.21	52	22233.70	1.38	159	42636
11	Ginger	0.47	3240	2528.02	0.37	3670	6393.68
12	Banana and other plantains	2.17	7499	75.41	3.06	8762	160.39

A_0 = 3020 ('000 ha) A_t = 3017 ('000 ha)

| Sl. No. | Crops | Period V | | | | | |
		c_0	y_0	w_0	c_t	y_t	w_t
1	Rice	11.50	2162	646.36	8.67	2520	915.87
2	Coconut	30.63	855	281.43	28.88	1055	544.25
3	Arecanut	2.89	6911	41.88	3.58	9200	48.90
4	Rubber	15.70	1222	3036	19.15	1514	11091
5	Pepper	6.69	301	12401.24	6.51	231	11475.64
6	Cashewnut	3.05	718	2368.81	1.96	800	3665.09
7	Tapioca	3.79	22572	397.24	3.23	31061	555.86
8	Coffee	2.80	832	3995	3.13	675	5306
9	Tea	1.22	1876	5133	1.35	1415	11030
10	Cardamom	1.37	184	56999	1.54	206	50644
11	Ginger	0.38	3677	6393.68	0.21	4191	7732
12	Banana and other plantains	3.29	8173	104.35	3.81	7971	156.53

A_0 = 3022 ('000 ha) A_t = 2669 ('000 ha)

| Sl. No. | Crops | Overall Period | | | | | |
		c_0	y_0	w_0	c_t	y_t	w_t
1	Rice	33.16	1371	40.51	8.67	2520	915.87
2	Coconut	21.32	920	21.51	28.88	1055	544.25
3	Arecanut	2.31	1020	2.73	3.58	9200	48.90
4	Rubber	5.23	187	347.96	19.15	1514	11091
5	Pepper	4.25	271	404.59	6.51	231	11475.64
6	Cashewnut	2.31	1558	77.32	1.96	800	3665.09
7	Tapioca	10.31	6949	7.74	3.23	31061	555.86
8	Coffee	0.72	442	575	3.13	675	5306
9	Tea	1.60	1073	562.50	1.35	1415	11030
10	Cardamom	1.22	45	2230	1.54	206	50644
11	Ginger	0.51	938	117.50	0.21	4191	7732
12	Banana and other plantains	1.89	7381	6.73	3.81	7971	156.53

A_0 = 2349 ('000 ha) A_t = 2669 ('000 ha)

c_0, c_t-Share of area (% of TCA); y_0, y_t-Output in Kg^{-1}; w_0, w_t-Price in Rs quintal^{-1}.

Period I (1960-61 to 1969-70), II (1970-71 to 1979-80), III (1980-81 to 1989-90),

IV (1990-91 to 1999-00), V (2000-01 to 2009-10), Overall Period (1960-61 to 2009-10).

Source:-Computed from (i) Statistics for planning (various issues), Department of Economics and Statistics, Govt. of Kerala, Thiruvananthapuram. (ii) Economic Review (various issues), State Planning Board, Govt. of Kerala, Thiruvananthapuram.

Table 2: Decomposition of growth of output of Principal crops in Kerala in different periods. (In %)

1-Rice

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	157.01	37.64	109.11	1.33	-16.05	226.78
2	Area effect	69.29	-24.80	-105.60	56.26	203.00	-30.83
3	Yield effect	14.85	25.00	65.62	12.61	-69.57	11.11
4	Cropping pattern effect	-6.10	-16.47	-86.02	-35.14	103.39	-9.79
5	Interaction effect	-1.43	-1.71	-20.00	-4.72	17.12	-8.21
6	Real Growth (2+3+4+5)	76.61	-17.98	-146.00	29.01	253.94	-37.72
7	Pure price effect	93.96	114.73	256.89	120.50	-175.18	286.57
8	Price Yield effect	21.93	11.91	64.11	1.69	-29.01	240.16
9	Price cropping pattern effect	-90.41	-7.85	-73.21	-45.13	43.11	-211.64
10	Total Interaction effect	-2.11	-0.81	-1.79	-6.07	7.14	-177.37
11	Monetary Growth (7+8+9+10)	23.39	117.98	246.00	70.99	-153.94	137.72
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

2-Coconut

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	191.79	45.87	161.16	143.09	89.68	6025.98
2	Area effect	21.56	-16.15	17.22	9.48	-17.50	0.93
3	Yield effect	-16.04	-32.38	10.57	19.87	21.99	0.38
4	Cropping pattern effect	10.21	-4.35	17.60	10.95	-5.37	0.92
5	Interaction effect	-2.22	1.72	2.35	1.85	-1.26	0.13
6	Real Growth (2+3+4+5)	13.51	-51.16	47.74	42.15	-2.14	2.36
7	Pure price effect	97.08	192.52	37.73	43.11	87.78	62.86
8	Price Yield effect	-21.11	-32.90	5.03	7.30	20.44	9.22
9	Price cropping pattern effect	13.44	-10.21	8.38	6.36	-5.02	22.29
10	Total Interaction effect	-2.92	1.75	1.12	1.08	-1.06	3.27
11	Monetary Growth (7+8+9+10)	86.49	151.16	52.26	57.85	102.14	97.64
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

3-Arecanut

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	198.75	1.55	107.46	2197.33	113.22	44543.71
2	Area effect	27.34	-30.17	2.98	1.20	9.48	0.18
3	Yield effect	4.35	95.71	8.23	23.24	32.39	3.06
4	Cropping pattern effect	18.86	-15.73	-1.36	1.53	23.35	0.22
5	Interaction effect	1.11	-3.98	-0.12	6.16	7.74	1.77
6	Real Growth (2+3+4+5)	51.66	45.83	9.73	32.13	72.96	5.23
7	Pure price effect	36.75	47.38	84.33	10.65	16.40	6.78
8	Price Yield effect	2.16	9.39	7.23	43.00	5.43	54.37
9	Price cropping pattern effect	8.91	-0.04	-1.19	2.82	3.91	3.73
10	Total Interaction effect	0.52	-2.56	-0.10	11.40	1.30	29.89
11	Monetary Growth (7+8+9+10)	48.34	54.17	90.27	67.87	27.04	94.77
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

Table 2: Continued

4-Rubber

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
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

5-Pepper

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	63.12	133.98	704.17	659.99	-39.90	8837.25
2	Area effect	-84.61	-7.75	12.96	3.15	32.65	1.19
3	Yield effect	128.99	19.25	8.34	-2.86	50.70	-0.41
4	Cropping pattern effect	25.70	-5.31	17.42	3.76	5.87	1.46
5	Interaction effect	-6.07	-1.53	3.96	-0.51	-1.36	-0.22
6	Real Growth (2+3+4+5)	64.01	4.66	42.68	3.54	87.86	2.02
7	Pure price effect	-20.92	80.42	6.88	111.75	16.26	75.04
8	Price Yield effect	49.39	23.15	16.80	-15.28	-3.78	-11.07
9	Price cropping pattern effect	9.84	-6.39	26.22	2.73	-0.44	39.90
10	Total Interaction effect	-2.32	-1.84	7.42	-2.74	0.10	-5.89
11	Monetary Growth (7+8+9+10)	35.99	95.34	57.32	96.46	12.14	97.98
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

6-Cashewnut

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	117.73	318.89	74.54	64.56	-36.42	1100.35
2	Area effect	31.07	11.38	-21.08	-35.10	124.08	-0.14
3	Yield effect	-19.32	-20.21	71.28	5.29	-19.09	-2.48
4	Cropping pattern effect	32.20	17.09	-24.19	-27.21	59.74	-0.77
5	Interaction effect	-9.01	-8.09	-11.64	-1.20	0.77	0.38
6	Real Growth (2+3+4+5)	34.94	0.17	14.37	-58.22	165.50	-3.01
7	Pure price effect	61.56	135.38	90.22	196.06	-91.46	236.46
8	Price Yield effect	-17.23	-64.07	30.99	8.66	-10.45	-115.04
9	Price cropping pattern effect	28.78	54.15	-28.49	-44.53	32.68	-35.83
10	Total Interaction effect	-8.05	-25.63	-7.09	-1.97	3.73	17.42
11	Monetary Growth (7+8+9+10)	65.06	99.83	85.63	158.22	-65.50	103.01
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

Table 2: Continued

		7-Tapioca					
		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	468.49	51.25	69.24	68.77	24.97	3523.70
2	Area effect	4.70	-33.10	43.64	-34.32	-95.47	-1.82
3	Yield effect	25.68	10.76	-10.46	20.26	114.70	3.56
4	Cropping pattern effect	-0.43	-23.80	30.92	-26.11	-45.05	-0.70
5	Interaction effect	-0.42	-1.58	3.93	-4.76	-16.94	-2.44
6	Real Growth (2+3+4+5)	29.53	-47.72	68.03	-44.93	-42.76	-1.40
7	Pure price effect	36.12	162.36	-22.57	160.25	121.74	72.40
8	Price Yield effect	35.54	10.78	-33.03	29.22	45.78	251.25
9	Price cropping pattern effect	-0.60	-23.84	77.04	-37.67	-17.99	-49.72
10	Total Interaction effect	-0.59	-1.58	10.53	-6.87	-6.77	-172.53
11	Monetary Growth (7+8+9+10)	70.47	147.72	31.97	144.93	142.76	101.40
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

		8-Coffee					
		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	260.67	618.18	220.76	641.04	20.40	30782.73
2	Area effect	27.57	13.52	11.73	1.88	-0.23	1.31
3	Yield effect	-1.49	9.17	-15.29	27.72	-92.45	0.86
4	Cropping pattern effect	24.73	26.12	12.25	2.11	57.74	5.48
5	Interaction effect	-0.56	8.07	-3.65	3.34	-10.90	2.89
6	Real Growth (2+3+4+5)	50.25	56.88	5.04	35.05	-45.84	10.54
7	Pure price effect	37.01	17.52	94.70	22.41	160.80	13.47
8	Price Yield effect	-0.84	5.41	-15.17	35.56	-30.34	7.10
9	Price cropping pattern effect	13.89	15.41	22.17	2.70	18.96	45.11
10	Total Interaction effect	-0.31	4.78	-6.74	4.28	-3.58	23.78
11	Monetary Growth (7+8+9+10)	49.75	43.12	94.96	64.95	145.84	89.46
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

		9-Tea					
		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	1.77	143.46	147.29	37.51	77.94	2019.22
2	Area effect	100.42	-2.73	-2.70	1.47	-1.01	-0.14
3	Yield effect	-123.05	20.98	20.64	4.28	-31.27	1.53
4	Cropping pattern effect	-1040.46	-0.52	-0.05	0.00	13.56	-0.75
5	Interaction effect	22.30	-0.16	-1.65	0.00	-3.33	-0.24
6	Real Growth (2+3+4+5)	-1040.79	17.57	16.24	5.75	-22.05	0.40
7	Pure price effect	1423.82	63.27	66.62	92.77	146.22	89.51
8	Price Yield effect	-30.52	19.81	23.15	1.48	-35.93	28.53
9	Price cropping pattern effect	-258.04	-0.49	-4.20	0.00	15.58	-13.98
10	Total Interaction effect	5.53	-0.16	-1.81	0.00	-3.82	-4.46
11	Monetary Growth (7+8+9+10)	1140.79	82.43	83.76	94.25	122.05	99.60
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

Table 2: Continued

10-Cardamom

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	330.23	740.35	146.36	127.11	126.30	18972.40
2	Area effect	35.47	1.83	-8.72	5.76	5.75	0.26
3	Yield effect	-44.28	20.66	14.23	-19.35	95.33	3.00
4	Cropping pattern effect	28.95	2.56	-7.71	122.79	98.93	0.22
5	Interaction effect	-14.16	3.44	2.06	7.26	11.83	0.79
6	Real Growth (2+3+4+5)	5.98	28.49	-0.14	116.46	211.84	4.27
7	Pure price effect	139.26	26.08	-77.64	-8.64	-88.86	18.25
8	Price Yield effect	-67.96	35.20	179.65	-17.75	-10.63	65.17
9	Price cropping pattern effect	44.44	4.36	-4.87	3.25	-11.03	-4.78
10	Total Interaction effect	-21.72	5.87	3.00	6.68	-1.32	17.09
11	Monetary Growth (7+8+9+10)	94.02	71.50	97.44	-16.46	-111.84	95.73
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

11-Ginger

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	515.96	62.59	526.09	80.10	-63.46	5519.39
2	Area effect	-0.78	96.82	2.63	-13.37	78.52	-0.53
3	Yield effect	2.05	4.52	6.71	7.04	-10.12	1.99
4	Cropping pattern effect	-4.02	1.75	2.03	11.28	32.39	-0.27
5	Interaction effect	-0.44	0.99	0.61	1.49	4.53	-1.17
6	Real Growth (2+3+4+5)	-3.19	104.08	11.98	6.44	105.32	0.02
7	Pure price effect	118.56	-2.13	64.43	63.26	-15.16	29.53
8	Price Yield effect	13.03	-1.21	18.08	10.76	2.11	128.90
9	Price cropping pattern effect	-25.59	-0.47	3.75	17.25	6.78	17.38
10	Total Interaction effect	-2.81	-0.27	1.76	2.29	0.95	-75.83
11	Monetary Growth (7+8+9+10)	103.19	-4.08	88.02	93.56	-5.32	99.98
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

12-Banana and other plantains

		Period					
Sl. No.	Elements	I	II	III	IV	V	OP
1	Increase in value of output	201.81	100.83	202.16	393.02	75.56	11511.37
2	Area effect	9.60	1.67	10.22	4.46	4.64	1.13
3	Yield effect	1.57	-18.36	8.10	2.60	-3.28	0.16
4	Cropping pattern effect	-3.60	1.47	9.48	63.24	20.97	2.05
5	Interaction effect	-0.05	-0.88	1.42	1.06	-0.52	0.16
6	Real Growth (2+3+4+5)	7.52	-16.10	29.22	71.36	21.81	3.50
7	Pure price effect	93.13	134.03	43.90	17.38	66.33	44.33
8	Price Yield effect	2.39	-23.27	6.39	2.93	1.64	3.54
9	Price cropping pattern effect	-2.96	6.46	9.05	7.13	10.48	45.03
10	Total Interaction effect	-0.08	-1.12	11.44	1.20	-0.26	3.60
11	Monetary Growth (7+8+9+10)	92.48	116.10	70.78	28.64	78.19	96.50
12	Total (6 +11)	100.00	100.00	100.00	100.00	100.00	100.00

Period I (1960-61 to 1969-70), II (1970-71 to 1979-80), III (1980-81 to 1989-90),

IV (1990-91 to 1999-00), V (2000-01 to 2009-10), Overall Period-OP (1960-61 to 2009-10).

Source:-Computed from Table 1

Ginger's high of 515.96 to tea's 1.77. The main divisions into real component and monetary components have been given in serial number 6 and 11 respectively of the 12 crops in Table 2.

It is seen that the real growth is positive for 10 crops; tea and ginger have negative real growth during period I. For coconut, cashewnut, tapioca, tea, cardamom, ginger, banana and other plantains monetary growth is greater than real growth. During period II, III and IV, 10 crops out of the 12 crops studied, shows higher monetary growth in relation to real growth. In period V four crops observed negative monetary growth and six crops observed higher monetary growth over real growth.

It may be further noted in the Table 2 that rubber and coffee observed positive cropping pattern effect in all the periods under consideration. During period I rubber and arecanut had positive values for all the components in the real and monetary growth. In period II, rubber and coffee exhibited positive values in all the components. During period III four crops (coconut, rubber, ginger and banana), in period IV six crops (coconut, arecanut, rubber, coffee, tea and banana) and in period V two crops (arecanut and rubber) exhibited positive values in all the components for real and monetary growth.

Among the 12 crops analysed during the different periods, rubber is the only crop which has positive values in all the components in the decomposition of growth of output in real and monetary terms. A comparison between the different periods clearly shows that pure price effect is the main component dominating the increase in the value of output of majority of the crops studied in Kerala. From the above analysis, it is revealed that the increase in the value of output of all the crops analysed in the overall period from 1960-61 to 2009-10, is monetary growth in nature rather than real growth. (All the crops exhibited more than 90 % monetary growth as compared to real growth) [21].

Price and non-price factors have a definite bearing up on agricultural growth. It is noticed that in different sub-periods and also in the overall period price factors influence the level of output in majority of the crops as compared to the non-price factors [22-24]. At the same time real factors like area effect, yield effect and cropping pattern effect have definite bearing upon crops, particularly non-food crops, during different periods.

CONCLUSIONS

The growth of agricultural output in the state like that of other parts of India is influenced by the gross cropped area, productivity and level of prices. The increase in agricultural 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 decomposition of output growth into real and monetary components of Kerala agriculture among twelve crops studied during different periods in the reference period, the general conclusions derived are:

- There are fluctuations in the overall growth of crop output in Kerala over different periods.
- There is a perceptible increase in the monetary growth and decline in the real growth of crop output in Kerala from period I to period V.
- Price factor is the major element in determining the relative contribution of different elements to the growth of crop output.
- Overall growth of crop output in the Kerala agriculture is monetary growth in nature rather than real growth.
- Among twelve crops, during Period V, price yield effect and price cropping pattern effect are positive and high for rubber. This implies that the cropping pattern has shifted in favour of those crops for which money value and yield are high.
- Among twelve crops studied during different periods, rubber is the only crop exhibited positive values in all the components in the decomposition analysis.
- For all crops, during the overall period, the share of monetary components is more than 90 % for the overall growth of output of these crops compared to real components.

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