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Decomposition Analysis of Growth of the Selected Crops in India

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ABSTRACT

The present study seeks to decompose the growth of selected major crops in India. The study is pertained to the whole of the India and covers the period ranging from 1993-94 to 2022-23. Selected Major crops like sugarcane, tea, coffee, Cotton (Lint), Raw jute and Mesta and Tobacco crops have been selected for the present study. The data have been collected from Handbook of Statistics on Indian Economy published by RBI. The data have been compiled and analysed for the study period from1993-94 to 2022-23 and also, the entire study period has been divided into three decades to extract the results. The present study suggests that area effect played significant role in the incremental production of sugarcane in India. Regarding contribution of different factors to the incremental production of tea, area and yield played their role during different decades. As far as coffee is taken into consideration, area was observed as most instrumental factor in the increasing production of Coffee throughout the study period. In case of the cotton (Lint), it was established that increase in production was led due to breakthrough in yield during entire study period. It is revealed in case of raw jut and mesta production that area effect was powerful during first, second and third sub-study periods of the study while during overall study period, yield effect was most powerful. Maximum contribution was made by area effect during first and second period of the study in case of tobacco while during third and overall study period, maximum contribution was done by yield effect.

Keywords: Area effect, Agriculture, Interaction Effect, decomposition analysis. Yield effect

Introduction

Agricultural sector continues to remain a very important sector of the Indian economy. In addition to being the largest employer and a key contributor to GDP, India's import revenues are largely derived from agriculture. Since the majority of their business

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comes from the transportation of agricultural commodities, the agricultural sector makes extensive use of rail and road transport infrastructure. In addition, the industry creates a need for industrial goods such fertilisers, tractors, tube wells, pump sets and building supplies for warehousing and storage. India's agriculture has provided raw materials for many of the country's key businesses, including food processing, sugar, vegetable oils, cotton and jute textiles, and sugar. Furthermore, a consistent increase in the surplus of foodgrains that is sold is essential for the labour force that works in non-agricultural sector. As such, the expansion of foodgrain production in the agricultural sector is critical to the economy's general development and quick industrial growth. Overall, agriculture still forms the foundation of the Indian economy; its contribution to GDP has decreased, despite the fact that it supplies foodgrains and raw materials to certain industries, both of which are essential for steady and uninterrupted growth. Since the majority of the workforce works in agricultural, income from this industry also contributes significantly to the demand for industrial produce.

Over the course of years of deliberate economic growth, Indian agriculture has advanced significantly. Despite a remarkable rise in population, the nation has managed to accomplish food security to a certain extent and self-sufficiency in foodgrains. The gradual transition of the farming industry from traditional to modern needs to be maintained and expedited in order to rapidly improve the economy overall as well as increase incomes in the relatively underdeveloped agriculture sector. Therefore, the present study covers sources of agricultural growth for which some major crops were selected.

Methodology

This study pertains to the whole of the country India and covers the period ranging from 1993-94 to 2022-23. Major selected crops like sugarcane, tea, coffee. Cotton (Lint), Raw jute and Mesta and Tabacco crops have been selected for the present study.

Selection of Period

The data have been compiled and analyzed for the study period from 1993-94 to 2022-23and also, the entire study period has been divided into three decades to extract the results.

Period I: 1993-94 to 2002--03

Period II: 2003-04 to 2012-13

Period II: 2013-14 to 2022-23

Sources of Data

The time series data on area and yield of major selected crops were collected from Handbook of Statistics on Indian Economy published by Reserve Bank of India.

Decomposition analysis

To measure the relative contribution of area, yield to the total output change in the major selected crops in India, the decomposition method developed by Sharma and Subramanyam (1984) were used.

$$P = \frac{A_0 \Delta Y \times 100}{\Delta P} + \frac{Y_0 \Delta A \times 100}{\Delta P} + \frac{\Delta Y \Delta A \times 100}{\Delta P}$$

Po = Ao x Yo and

A_0, P_0 and Y_0, are area, production and yield in base year respectively

Pn = A_nx Y_n

A_n, P_n and Y_n are area, production and yield in n^{th} year respectively

$P_n - Po = \Delta P$

$A_n - Ao = \Delta A$

$Y_n - Yo = \Delta Y$

Where, Ao and A_n represent the area and Yo and Y_n represents the yield in the base year and n^{th} year.

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Results and Discussion

The source of production growth was partitioned to area, yield and interaction effects, examined individually three sub-periods (sub-period I and sub-period II and sub-period-III) and the overall study period and the furnished results for the same have been presented through the following heads:

Decomposition of Growth in Sugarcane production

The decomposition analysis is carried out to decompose the production growth of sugarcane production in India. Table 1 shows the period– wise decomposition of sugarcane production growth into area effect, yield effect and interaction effect of both area and yield

growth. During first period of the study, production growth of sugarcane was dominated by the contribution of area that was observed as 127.71 per cent which offset the negative contribution of yield and interaction of both area and yield. Second period of the study was also marked by the dominance of area effect as 58.88 per cent was contributed by area in the increasing production of sugarcane in India. Production growth of sugarcane during third period of the study was contributed positively by area effect (44.19 per cent) and yield effect (47.36 per cent). interaction of both also presented positive results during all study periods barring only first period of the study.

Table 1
Decomposition of Growth in Sugarcane production

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	127.71	-20.96	-6.74
Second Sub-Study Period	58.88	32.32	8.80
Third Sub-Study Period	44.19	47.36	8.45
Overall Sub-Study Period	62.45	21.84	15.71

Decomposition of Growth in Tea production

The final results related to the contribution of area, yield and their interaction are reflected through the figures presented in table 2. The most powerful factor was found as area during first period of the study as 182.37 per cent contribution was made through effect of area which was enough to offset the negative contribution of yield and interaction of area and yield. During second period of the study, yield effect overpowered the area effect by contributing by 68.30 per cent to the total production of tea in India. As far as third period of the study is taken into consideration, once again, area of tea emerged as the most powerful factor to increase the production of tea. The contribution of area, yield and interaction of both were noticed as 57.80 per cent, 28.59 per cent and 13.61 per cent respectively during overall study period.

Table 2
Decomposition of Growth in Tea production

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	182.37	-66.53	-15.84
Second Sub-Study Period	26.44	68.30	5.25
Third Sub-Study Period	63.58	33.49	2.94
Overall Sub-Study Period	57.80	28.59	13.61

Decomposition of Growth in Coffee production

The decomposition of coffee growth of area, yield and interaction is reflected through the figures presented in table 3 and it was revealed that area played major role in the increasing

production of Coffee throughout the study period. The area effect was calculated as 151.97 per cent, 91.53 per cent, 86.94 per cent and 133.38 per cent during first period, second period, third period and overall study period. The yield effect played negatively during first and overall study periods of the study while the contribution of yield in the growth of coffee production remained positive during the rest of the periods.

Table 3
Decomposition of Growth in Coffee production

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	151.97	-36.22	-15.75
Second Sub-Study Period	91.53	6.82	1.65
Third Sub-Study Period	86.94	11.43	1.63
Overall Sub-Study Period	133.38	-15.99	-17.38

Decomposition of Growth in Cotton (Lint) production

The source of growth of production of cotton (Lint) was partitioned to area, yield and interaction effects, examined individually for three sub-periods (first sub-period and second sub-period and third sub-period) and the overall study period and the results for the same are shown in table 4. It is revealed that out of the total increase in production, the area effect, yield effect and interaction effect were remained as -24.36 per cent, 118.69 per cent and 5.67 per cent respectively during first period of the study. Thus, it was established that increase in production was led due to breakthrough in yield during first period of the study.

It was observed that the highest contribution of yield in the total production growth was recorded during third period during which the yield effect was noticed as 287.83 per cent. Overall, the contribution of area, yield. and interaction effect to the production growth of cotton (Lint) was recorded as 35.60 per cent, 36.10 per cent and 28.31 per cent respectively. This is the result of the efforts made by the cotton farmers to increase the production of this crop owing to the increasing demand.

Table 4
Decomposition of growth in Cotton (Lint) production

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	-24.36	118.69	5.67
Second Sub-Study Period	38.54	38.99	22.47
Third Sub-Study Period	-214.30	287.83	26.47
Overall Sub-Study Period	35.60	36.10	28.31

Decomposition of Growth in Raw Jute and Mesta Production

It is revealed through the furnished results presented in table 5. During first, second and third sub-study period of the study, area effect was powerful while during overall study period yield effect was most powerful. Regarding interaction effect, the contribution remained positive for all study periods except overall study period.

Table 5
Decomposition of Growth in Raw Jute and Mesta production

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	50.01	42.78	7.21
Second Sub-Study Period	1109.39	-1160.22	150.83
Third Sub-Study Period	111.38	-14.48	3.10
Overall Sub-Study Period	-219.43	430.75	-111.32

Decomposition of Growth in Tobacco Production

The furnished results related to the contribution of area, yield and interaction in the incremental production of Tobacco are presented in table 6. It was found that maximum contribution was made by area effect during first and second period of the study while during third and overall study period, maximum contribution was done by yield effect. As far as interaction effect is taken into consideration, it was found that 3.65 per cent contribution was made during first period of the study while its contribution was recorded as 2.97 per cent during second period of the study. Regarding interaction effect during third period of the study, it was found as -120.95 per cent. During overall study period, it was noticed as 4.50 per cent.

Table 6
Decomposition of Growth in Tobacco production

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	124.07	-27.71	3.65
Second Sub-Study Period	78.74	18.30	2.97
Third Sub-Study Period	-383.81	604.76	-120.95
Overall Sub-Study Period	10.02	85.48	4.50

Conclusion

It can be concluded on the basis of the above discussion that area effect played significant role in the incremental production of sugarcane in India. Regarding contribution of different factors to the incremental production of tea, the most powerful factor was found as area during first period of the study while during second period of the study, yield effect overpowered the area effect. As far as third period of the study is taken into consideration, once again, area of tea emerged as the most powerful factor to increase the production of tea. As far as coffee is taken into consideration, area was observed as most instrumental factor in the increasing production of Coffee throughout the study

period. In case of the cotton (Lint), it was established that increase in production was led due to breakthrough in yield during entire study period. It was observed that the highest contribution of yield in the production growth was recorded during third period during which the yield effect was noticed as 287.83 per cent. It is revealed in case of raw jut and mesta production, area effect was powerful during first, second and third sub-study period of the study while during overall study period, yield effect was most powerful. Regarding interaction effect, the contribution remained positive for all study periods except overall study period. Maximum contribution was made by area effect during first and second period of the study in case of tobacco while during third and overall study period, maximum contribution was done by yield effect.

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