

Decomposition Analysis of Growth of the Major Foodgrain Crops in India

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ABSTRACT

The present study seeks to decompose the growth of major foodgrain crops in India. The study is pertained to the whole of the India and covers the period ranging from 1993-94 to 2022-23. Major foodgrain crops like Rice, Wheat, Coarse Cereals. Pulses and Total foodgrain 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 from 1993-94 to 2022-23 and also, the entire study period has been divided into three decades to extract the results. The decomposition analysis of growth suggests that for most of the cases, yield effect is the major source of growth in production of major foodgrain crops in India barring only few cases.

Keywords: Foodgrains, Agriculture, Yield, effect, decomposition analysis.

Introduction

The population of the world is growing at an alarming rate, especially in developing nations. The planners of these nations as well as international organisations continue to face a difficult challenge in feeding this population. The Indian economy's most significant sector is agriculture. Over the years, the Indian agricultural sector has experienced significant change, moving from a dire food crisis to self-sufficiency in the production of food grains. With an impressive rise in food grain production, India has moved away from reliance on food aid and is now a net food exporter. Agriculture production in India increased at a rate never seen before in its post-independence history. India is the second-largest producer of cereals, including wheat and rice, in the world. For the great majority of Indians, cereals are the staple food and a key source of calories in their diets. Cereals are an essential substitute for vegetables in the diets of most people in the nation because, when combined with pulses, they offer the ideal combination of vegetarian protein components with high biological value. The enormous demand for cereals on the international market is fostering a perfect atmosphere for Indian cereal goods to be exported.

Quantitative evaluation of the contribution of many elements to the growth of agricultural output is crucial to maintain the pace of sustainable economic growth. Numerous variables are contributing to the growth of agriculture. Area and yield are the two most important ones. These growth sources are critical to investment priorities and agricultural development programmes. The subject of growth decomposition in agricultural output continues to be of great importance to scholars and decision-makers. The breakdown of growth into several components, such as area, yield, and cropping pattern, is vital to support output projects with alternate aims and policies. The Present investigation was under taken to study the relative contribution of area and yield on production of major foodgrain crops in India

Methodology

This study pertains to the whole of the country India and covers the period ranging from 1993-94 to 2022-23. Major foodgrain crops like Rice, Wheat, Coarse Cereals. Pulses and Total foodgrain crops have been selected for the present study.

Selection of Period

The data have been compiled and analysed for the study period from 1993-94 to 2022-23 and 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 foodgrain 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 foodgrain crops in India, the decomposition method developed by Sharma and Subramanyam (1984) were used.

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

$P_0 = A_0 \times Y_0$ and

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

$$P_n = A_n \times Y_n$$

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

$$P_n - P_0 = \Delta P$$

$$A_n - A_0 = \Delta A$$

$$Y_n - Y_0 = \Delta Y$$

Where, A_0 and A_n represent the area and Y_0 and Y_n represents the yield in the base year and n^{th} year.

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 Rice production

Relative contribution of various components to aggregate growth of rice crop output in India is reflected through the figures presented in table 1. The percentage contribution of area, yield and their interaction for increasing production of rice in India is demonstrated for three sub periods as well as entire study period in table 1. It is revealed that yield effect was most responsible factor for increasing of rice production in India and it holds true for all periods for which analysis was done. Yield effect was found to be 72.97 percent during first period of the study which increased to 97.08 per cent during second period of the study. However, during third period of the study, the contribution of the yield was decreased in comparison to previous decade but it was still able to hold first position when it comes to the contribution made by various factors in the incremental production of rice crop in India. It was also found that yield effect was playing positive role in increasing production of rice in case of all periods of the study. However, the interaction effect of area and yield became negative for the first period of the study.

Table 1**Decomposition of Growth in Rice production**

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	29.26	72.97	-2.23
Second Sub-Study Period	2.47	97.08	0.46
Third Sub-Study Period	30.92	63.72	5.36
Overall Sub-Study Period	17.72	73.31	8.97

Decomposition of Growth in Wheat production

The decomposition analysis of wheat production in area, yield and interaction effect were presented in Table 2 and the furnished results demonstrate the per centage contribution of area, yield and their interaction in increasing production of wheat in India and it was found that yield was most responsible in the incremental production of wheat with 100 per cent change in production of wheat was taken place because of the increasing yield of wheat during first period of the study. During second period, yield was once again remained the strongest factor to contribute in the changing production of the wheat. However, its percentage contribution decreased from 100 per cent in first year to 50.35 per cent during second period of the study. During third period of the study, yield remained a major driving force in the differential production of Wheat in India.

Table 2**Decomposition of Growth in Wheat production**

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	0	100	0
Second Sub-Study Period	43.22	50.35	6.44
Third Sub-Study Period	11.03	87.29	1.68
Overall Sub-Study Period	29.81	55.62	14.57

Decomposition of Growth in Coarse Cereals production

The final results related to the decomposition of growth in cereals production shows that yield effect remained major force for changing production of cereals in India. It was only during first period of the study when area effect was proved stronger than yield effect. During first period of the study, the area, yield and interaction effect was noticed as 115.45 per cent, -18.77 per cent and 3.32 per cent respectively. During second period of the study, the area and interaction was remained negative that was offset by the positive contribution of the yield effect. Same picture was emerged for third period of the study and overall study period for cereals crops in India is no exception to it.

Table 3**Decomposition of Growth in Coarse Cereals production**

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	115.45	-18.77	3.32
Second Sub-Study Period	-293.65	488.89	-95.24
Third Sub-Study Period	-30.16	141.74	-11.58
Overall Sub-Study Period	-36.03	189.06	-53.03

Decomposition of Growth in Total (Rice +Wheat +Cereals) production

The decomposition of the growth of the total of rice, wheat and coarse cereals shows that the contribution of the area in the changing production of these crops was recorded as 167.27 per cent while the contribution of yield remained negative during first period of the study. As far as second period is concerned, the most crucial factor which was accountable for bringing change in these three crops was emerged as yield effect and almost same picture was emerged for the yield effect for third and overall study periods as it was proved potent factor for bringing change in the production of rice, wheat and coarse cereals in India during the study periods under consideration.

Table 4**Decomposition of Growth in Total (Rice +Wheat +Cereals) production**

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	167.27	-72.38	5.11
Second Sub-Study Period	-12.25	115.13	-2.88
Third Sub-Study Period	9.78	88.21	2.01
Overall Sub-Study Period	3.35	94.22	2.44

Decomposition of Growth in Pulses production

The figures presented in table 5 shows that the change took place in the production of pulses was due to the area and yield effect. However, yield played more strongly in comparison to area when make a comparative analysis of different study periods selected for the study. In relation to the first period, the parentage contribution of area and yield were recorded as 48.84 per cent and 55.65 per cent while the interaction of both these effects remained negative for the same study period. Regarding the decomposition of growth in pulses during second period of the study, the change in the production of pulses took place because of the yield as the contribution of yield during this period was measured more than 100 per cent that indicates that the negative effect of area and interaction between area and yield was offset by the positive effect of yield. It is also worth

mentioning here that during third and overall study period, the area, yield and effect of interaction between area and yield were found to be positive.

Table 5
Decomposition of Growth in Pulses production

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	48.84	55.65	-4.49
Second Sub-Study Period	-3.67	104.56	-0.89
Third Sub-Study Period	36.26	55.20	8.54
Overall Sub-Study Period	28.77	54.59	16.65

Decomposition of Growth in Total Foodgrain production

The analysis for three sub-study periods and overall study period shows that during first sub-period, the area effect contributed to the incremental total foodgrain production was found highest in comparison to yield and interaction effect. During second sub-period, yield effect was major contribution force to the change in the production of foodgrain crops in India and it

Table 6
Decomposition of growth in Total production

Periods/Effects	Area Effect	Yield Effect	Interaction Effect
First Sub-Study Period	140.82	-44.013	3.19
Second Sub-Study Period	-11.07	113.65	-2.58
Third Sub-Study Period	19.80	76.43	3.76
Overall Sub-Study Period	9.65	83.92	6.42

maintained its position during third and overall study period also. During second period of the study the yield effect was estimated at 113.65 per cent while during third period it came down to 76.43 per cent. Regarding overall study period, 83.92 per cent change was taken place in total foodgrain production just because of change in the yield. So, yield proved major factor as the percentage contribution of area and interaction was remained meagre except for the sub-study period first.

Conclusion

It is concluded on the basis of the above discussion that it was found that yield effect was playing positive role in increasing production of rice in cases of all periods of the study. However, the interaction effect of area and yield became negative for the first period of the study. Yield was remained a major driving force in the differential production of wheat in India. The final results related to the decomposition of growth in cereals production shows that yield effect remained major force for changing production of cereals

in India. It was only during first period of the study when area effect was proved stronger than yield effect. Yield proved potent factor for bringing change in the production of rice, wheat and coarse cereals in India during the study periods under consideration. Regarding pulses, yield played more strongly in comparison to area when make a comparative analysis of different study periods selected for the study. In case of the decomposition of growth of total foodgrain crops, yield proved major factor as the percentage contribution of area and interaction was remained meagre except for the sub-study period first.

So, it is concluded that incentives provided by government have proved helpful in increasing the productivity of foodgrain crops in India but to increase area under these crops, more efforts are needed. To meet the need for cereals, farmers must be provided with subsidies and a range of facilities for crops like wheat and rice, in addition to awareness initiatives led by extension experts. Furthermore, state extension agencies will impart knowledge to farmers about the technology developed thus far by State Government Institutions and other agencies.

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