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Review Study on Growth and Instability of Rice and Wheat Production

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Abstract

Rice and wheat are the staple source of nourishment of billions of Indians. India is the second largest producer of rice and wheat after China, indicating the role of both the crop in food security of the nation. Both the crops played key role in transforming the nation from a food deficient nation to a food sufficient nation. The study revealed that throughout the whole period, there is positive significant growth rate in area, production and yield. The analysis over the sub periods showed variations in rate of growth. The analysis of instability showed that in both rice and wheat production recorded more variation as compared to area and productivity. Decomposition analysis showed that yield effect contributed more to rice production, whereas in wheat interaction effect was more dominant factor.

Keywords: Rice; wheat; India; CAGR; Instability; Decomposition

Introduction

Rice and wheat together make up for about 30% of the global calorie intake (FAO), making both the crops a predominant source of nourishment for billions of people across the globe. Both the crop had been among the earliest cultivated crops and has been the staples in the diet of many civilizations. Rice and wheat are grown widely almost in all the continents, making them globally important cereal crops. Rice is majorly grown in Asian, African and Latin American countries, whereas, wheat is majorly grown in North America, Southern European countries and Australia. Wheat is the most versatile crop of all cereal grains because of its high adaptability of different climatic regions, while rice is the chief and cheapest source of carbohydrate in majority of the developing nations. There has been a rise in global consumption of rice and wheat with subject to global population growth, raising the need to increase production with improvement in technology. India is the second largest producer of rice and wheat after China, as the country produces 101.29 million tonnes of wheat and 175.58 million tonnes of rice annually (FAOSTAT, 2018) [1]. Approximately 44 million ha and 29.5 million ha area are under rice and wheat production in India, symbolizing the importance of both the crop in Indian agriculture.. The study of growth and instability in both the crops is of higher significance as it would enable us to understand the nature of food security and income stability. The division of the whole study period into sub periods aims at better understanding of in which sub period there was growth and in which period there was lag. On viewing the importance of both the food crop in Indian economy, the study was aimed to analyze:

To analyze the growth and instability in the area, production, and productivity of rice and wheat 2. To study the relative contribution of area and yield in the production of rice and wheat to analyze which factors contributed to growth.

Methodology

The study was based on secondary data collected from India stat website. The study period for rice and wheat growth and instability analysis was from 1950 to 2016 for the variables area [2], production and productivity.

Compound annual growth rate

Compound annual growth rate (CAGR) was estimated using the following functional form:

$$\ln Y = a + bt$$

Where, Y is the time series data of area, production or yield of wheat - for which growth rate is calculated, 't' is the trend term and 'a' is the constant coefficient [3]. The slope coefficient 'b' measures the relative change in Y for a given absolute change in the value of explanatory variable 't'. Compound annual growth rate can be calculated from the value obtained for 'b' as:

$$CAGR = [antilog\ b - 1] \times 100$$

The values of compound growth rates obtained were also tested for their significance using student 't' test.

Co-efficient of Variation

Instability is the deviation from the trend. It can be measured by using the coefficient of variation. The standard deviation as a percentage of means is called as the coefficient of variation.

$$CV = (SD / MEAN) \times 100$$

Where CV is the Co-efficient of variation, SD is the standard deviation of the variable.

Decomposition analysis

Decomposition helps us to get to know about the constituent elements of a particular parameter. To estimate the contribution of area, productivity and interaction of the two in total production, following model was used.

$$\Delta P = A_0\ \Delta Y + Y_0 \Delta A + \Delta A \Delta Y$$

The per hectare yield of rice in India multiplied thrice during the period of 1950-51 to 2015-16. The productivity of the crop increased from 668 kg/ha in 1950-51 to 2400 kg/ha in 2015-16 at a compound growth rate of 1.9 per cent. Positive growth was observed in all sub periods except in third sub period. First, fourth, fifth and sixth

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Page 2 of 2

subperiod showed significant growth rate [4]. Per hectare yield of wheat in the state

Change in production = Yield effect + Area effect + Interaction effect

Where, ΔP is change in production, A0 is area in the base year, ΔA is change in the area and ΔY is the change in yield. $\Delta A \Delta Y$ corresponds to the interaction effect [5].

Conclusion

From the analysis of growth in rice and wheat, it was found that area, production and productivity observed an increasing trend, they increased at a growth rate of 0.5 percent, 2.4 precent and 1.9 percent in rice, and 1.6 per cent, 4.1 per cent and 2.3 percept in wheat respectively. Significant growth was observed in both crops over the whole study period. Instability analysis showed that in both the crops production recorded more variations in growth followed by productivity and area respectively. The stability in the area under rice and wheat cultivation implies that both the crops holds a significant portion in cropping pattern of the country. Comparatively earlier sub periods observed more instability than the later sub periods, it may be due to Green revolution and various other development schemes launched by government to increase production and improve Indian important factor to increase production in case of rice, whereas, in wheat the interaction effect was more prominent. The sub-period wise analysis in rice suggests that yield effect was key factor in increase production in all sub periods except in seventh sub period where area effect was comparatively more. In wheat, it was observed that though in the sub periods the area effect and yield effect were more prominent but for

the overall period the interaction effect was more as compared to area effect and yield effect.

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