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# Foodgrain Production in Uttar Pradesh Since 1950: A Study for Growth and Instability During Period

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**ABSTRACT**

Foodgrains are an essential major food crop in India, with Uttar Pradesh leading the way, followed by Madhya Pradesh and Punjab, in second and third place, respectively. Uttar Pradesh is a major agricultural grain producer and distributor. This paper investigates agricultural food grain production growth and instability in terms of area, production, and yield in the state of Uttar Pradesh from 1950-1951 to 2018-19. The majority of people in Uttar Pradesh make their living through agriculture, both directly and indirectly.The impact of area and yields on production growth was examined using the compound annual growth rate and decomposition analysis. As a result, it is divided into three sub-periods. The area under food grain increased in all sub-periods except (I), which showed negative growth for the state. Production and yields, on the other hand, have increased. The Cuddy Della Valle Index is used by scholars to assess Instability. After conducting an instability analysis, it was discovered that the area has a higher level of instability when compared to foodgrain production and yields. The results of the decomposition analysis revealed that the dominance interaction had the greatest impact.

**Keywords.** Growth, Instability, Foodgrain, Cuddy Della Vell, Index, Decomposition

## I. INTRODUCTION

Agriculture is an essential part of the Indian economy. It is the backbone of the country's growth. The normal Indian nevertheless spends about half of their overall food spending, and Agriculture employs roughly half of India's workforce. Agriculture provides a source of income and food security to the great majority of low-income, disadvantaged, and vulnerable members of society. Given that India continues to have the world's highest proportion of Impoverished and malnourished people. Only by making agriculture a significant priority will India fulfill its aims to decrease poverty, malnutrition, and inclusive growth. Because agriculture provides the foundation for many agro-based companies and agro-Services, it is more beneficial to see agriculture as a holistic value chain encompassing farming, whole selling, warehousing (including transportation), processing, and retailing.Uttar Pradesh is India's top producer of food grains, responsible for roughly 17.83 percent of total food grain output in 2016-17. In 2016-17, the state produced 49,903.1 thousand tonnes of food grain, and 51,252.7 thousand tonnes in 2017-18.(www.ibef.orge).Uttar Pradesh contributes significantly to the national food grain supply. In 2013–14, this state produced 5 crores (50.05 million) tonnes of food grain, accounting for 18.90% of total production in the country. This is owing in part to the fertile Indo-Gangetic plain and in part to irrigation systems like as canals and tube wells. LakhimpurKheri is the country's most densely inhabited sugar-producing district. It has been the most prevalent producer of food grains in India since the 1950s, owing to high-yielding seed types, increasing fertiliser supply, and increased irrigation use. In terms of agriculture, Western Uttar Pradesh is more progressed than the entire state.The most of the state's population is employed in agriculture. Wheat, rice, pulses, oilseeds, and potatoes are among the most important agricultural

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crops. The most significant cash crop in the state is sugarcane. (Wikipedia, the free encyclopedia)

The study made no distinction between different stages of technology adoption, including such early and constrained use and broad adoption. In contrast to the findings of this investigation, (Sharma et al. 2006) conducted a study using the same approach as (Larson et al. 2004).On the one hand, there are many agricultural reforms, such as land reforms, green revolution, minimum support prices, and new economic reforms.All other policies have directly impacted the agricultural Indian economy(Sihmar 2014). Decent agricultural development, achieving inclusive growth, reduces poverty levels is a prerequisite for developing the rural economy and increasing farm incomes (Swain, 2012). Contribute to such planning and strategy for the state's growth rate across several regions (Singh et al., 2003).

In contrast, if there is fluctuation in production, there is an instability in prices. Thereby, it affects low-income families and increases their vulnerability. (Acharya, 2001),Instability in production and growth rates. The Green Revolution in the context of Indian agriculture has been studied at a holistic level, and we have conflicting evidence about the impact of the Green Revolution on sustainability. Major Problems and Achievements It examines the development and instability at the district level. (Anjaniet al.2013)The enormous rise in average yield increased food grain production in the country, implying that technology had a major role in encouraging it. (Sharma et al. 2006), The improvement of foodgrain production is vital; the government needs to examine those areas wherein food production is recorded on paper to support agricultural growth (Samal et al., 2017). Instability is an essential feature of agriculture. But agriculture is dependent on weather conditions, so the area, production, and yield of crops are subject to significant change over time (Anjum et al., 2018); Rice yield and production were positive but reduced over the period. Uncertainty can be minimized by offering institutional support and inputs to marginal and small farmers. (Jain et al. 2018), Modest and considerable growth in production is desirable for any crop with slow growth compared to a high level of volatility for large production sustainable growth of Indian agriculture.(Senapati et al. 2018), Increase and Instability in the production of the main crops grown in Odisha's regions.and, examine its responsiveness to weather conditions at different process phases. (Senapati et al. 2019)

The present study aims to analyze the agricultural production of food grains in Uttar Pradesh since 1950: a study on Growth and Instability over time. Since independence and the Green Revolution, the nature and sources of increased production and Instability have been debated. In this paper, an attempt has been made to analyze the nature and sources of Instability in the area, production, and productivity of food grains in Uttar Pradesh with specific objectives that are easy to understand. Some objective is taken in this, making it easy to know what is to be achieved. Some objectives are given below.

**Objective**

**(a)** To assess the area, production, and productivity of food grains in Uttar Pradesh, as well as their growth and instability.

(b) To explore the effects of area and productivity in increasing food grain production.

**Research gap**

Based on a comprehensive review of the previous literature, it is observed that previous studies mainly covered a single crop or were done over a shorter period. This study aimed to cover vital food grain production in Uttar Pradesh for a more extended period**.**

**The hypothesis of the study**

**Null Hypothesis H0:**There was no instability in the area, production, or productivity of foodgrains production over the years.

**Alternative hypothesis** H1: Over the years, there has been Instability in the area, production, and yield of foodgrain crops**.**

## II. DATABASE AND METHODOLOGY

The study looked at the growth and instability of food grains across the state's districts. The yearly compound growth rate was calculated using secondary time series data obtained from several Uttar Pradesh agricultural statistics issues provided by the Uttar Pradesh Directorate of Agriculture and Food Production. Period I (1950-51 to 1990-91) and Period II (1990-91 to 2009-10) were followed by Period III (2001-10) to 2018-19). The study is based on the area, production, and total food grains in terms of yield.

The production CAGR was calculated as follows:

**(A)**$Yt=ABt$

Where Yt indicates the time of production.

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B stands for (1+r).

The compound annual growth rate of Y is indicated by r.

A indicates the first year of production and B indicates the final year of production.

t denotes the passing of time in years.

Following log transformation and approximation of the relevant function as

InYt = lnA + t.lnb, the compound growth rate is assumed to be

r = analogue (lnb) – 1 x100

**(B)**Cuddy-Della Valle Index of Instability

Instability index=CV×$\sqrt{1-R^2}$

Where I denotes the Instability index (percentage);

CV denotes the Coefficient of variation (percentage);

$R^2$ is the adjusted (coefficient of correlation);

| S.No. | Instability Index values (in per cent) | Ranges of instability |
|---|---|---|
| **a** | Low degree of instability | 0 to 10 |
| **b** | Moderate degree of instability | 10 to 20 |
| **c** | High degree of instability | Greater than 20 |

**(C)** Decomposition analysis was used.

The formula used:

$$P=\frac{A0(Yn-Y0)}{\Delta P}+\frac{Yo\,(An-Ao)}{\Delta P}+\frac{\Delta A\Delta Y}{\Delta P}$$

Where P changes in production

Yo is yield in the base year

Yn is yield in the current year

Ao is an area in the base year

An is area in current year

ΔA is change in area

ΔY is change in yield

ΔP is chang in production

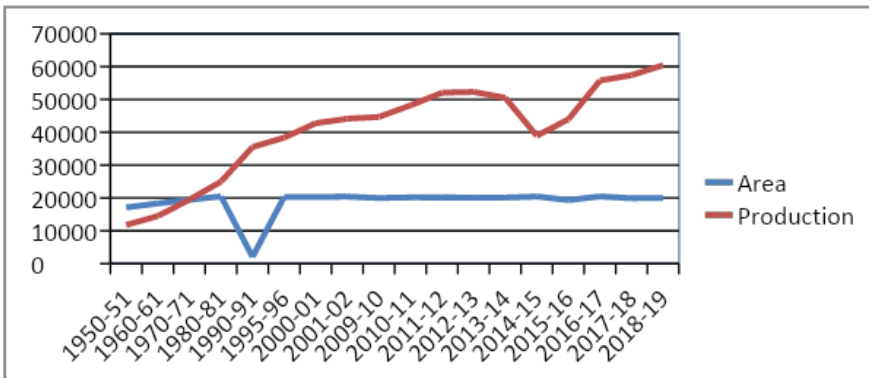
The yield impact (productivity contribution) is represented by the first component of the above equation, the area effect (area contribution) is represented by the second component, and the interaction effect of area and productivity is represented by the last component.

## III. RESULT AND DISCUSSION

**Table 1**

**Trend of Agricultural Production Food grain in Uttar Pradesh.**

**Area in Hect/Thousand and Production M.T/ Thousand figure 1.0**




1.1

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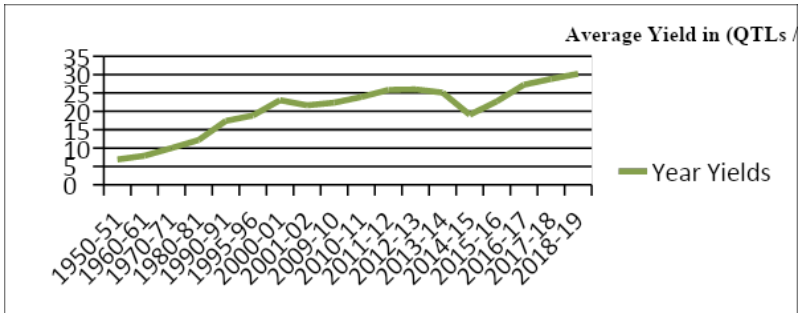


The diagram above can help you grasp it. What exactly is going on in terms of area, production, and yield? The red colour represents production, the navy blue colour represents area, and the green colour represents yields; the area, production, and yield of agricultural food grains in Uttar Pradesh have increased over time, with thousand area being 17089, production being 11775, and yield being 6.89 quintal per hector being in 1950-51. The area in this region was 1,83,43 in 1960-61, the production was 14486, and the yield was 7.90. The area decreased in 1990-91, although this had no effect on productivity or yield. In terms of yield, the year 2000-01 saw less and less drop, while the year 2014-15 saw even less reduction.This indicates a decrease in both production and area, comparable to 2009-10, 2015-16, and 2017-18, although production decreased in only one place in 2014-15.

The illustration above will assist you in understanding this. How is the state of field productivity and yield? As previously stated, this will have to be separated into three sub-periods. We can perceive both its expansion and its instabilities.

**Table 1 Compound Annual Growth Rates of Area, Production, and Yield of Foodgrain in Uttar Pradesh**

| Particular | Periods | | | Overall Periods |
|---|---|---|---|---|
| | I | II | III | |
| Area | -5.05 | 12.09 | 0.01 | 0.22 |
| Production | 2.73 | 1.15 | 3.41 | 2.36 |
| Yields | 2.28 | 1.26 | 3.41 | 2.13 |

**Compound annual growth rate Foodgrain in Area, Production, and Productivity**

Table 1 shows that the three periods we have included in this study are the first period from 1950–51 to 1990–91. Second,1990-91 to 2009-10 and last from 2009-10 to 2018-19, the total area under food grains in Uttar Pradesh was 17089, in 1950-51, and in 2018-19 it increased to 19985.124. The growth trend as a whole shows 0.22 percent. The significant annual growth rate of percentage compound over the sub-period is 1950-51 to 1990-91 (-5.05) and the second is from 1990-91 to 2009-10 (12.09) and the last sub-period The trend analysis for the area under foodgrains from 2009-10 to 2018-19 (0.01) shows a declining trend in the compound growth rate except in the second sub-period.

Uttar Pradesh produced 1175 thousand tonnes of food grains in 1950-51, which increased almost five times greater to 60415.160. Millions of tons of food grains increased substantially in 2018-19. This rate was 2.36 percent from 1950 to 2019. Excluding the second sub-period of 1990-2010, which represented an optimistic growth forecast, the sub-period-by-sub-period growth trend analysis showed a positive growth rate in the third sub-period. The second sub-growth period's rate is much slower than the first and third sub-periods. In other words, the negative growth rate has persisted.

From 1950-51 to 2018-19, the state's foodgrain yield per hectare grew from 6.89 kg/ha to 30.23 kg/ha. According to the growth trend analysis, the yield was increased at a compound annual growth rate of 5% from 1950-51 to 2018-19. The yield indicates a positive growth rate in the sub-period-by-sub-period examination, other than in the previous sub-period, which is less than 1.33 percent. The yield from 1990-91 to 2009-10 is

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1.26, while the yield from 2009-10 to 2018-19 is 3.41. Nothing noteworthy has occurred in the last ten years.

**Table 2**
**Instability in Area, Production, and Yield of Foodgrain in Uttar Pradesh**

| Particular | | Periods | | | Overall Periods |
|---|---|---|---|---|---|
| | | I | II | III | |
| **Area** | Mean | 15479.400 | 16610.56 | 20065.794 | 18838.55 |
| | S. D. | 7618.85 | 8147.95 | 308.11 | 4279.55 |
| | CV | 49.21 | 49.05 | 1.53 | 22.71 |
| | Ad. $R^2$ | 0.116 | 0.315 | -0.109 | 0.036 |
| | **CDV. I.** | **46.26** | **40.59** | **1.61** | **18.17** |
| **Production** | Mean | 21238.400 | 41084.20 | 50411.268 | 40863.62 |
| | S.D. | 9432.65 | 3980.14 | 6624.57 | 14569.81 |
| | C.V. | 44.41 | 9.68 | 13.14 | 35.65 |
| | Ad.$R^2$ | 0.925 | 0.887 | 0.071 | 0.771 |
| | **C.D.V.I** | **12.16** | **3.25** | **12.66** | **17.06** |
| **Yields** | Means | 10.87 | 20.65 | 25.12 | 20.71 |
| | S.D. | 4.17 | 2.42 | 3.2 | 7.09 |
| | C.V | 38.36 | 11.71 | 12.73 | 34.34 |
| | Ad. $R^2$ | 0.891 | 0.587 | 0.200 | 0.768 |
| | **CDVI** | **12.66** | **7.53** | **11.39** | **15.78** |

**Instability in Area, Production, and Yield of Foodgrain in Uttar Pradesh**

Table 2 shows the area, production fluctuations, total yield period (1950-51 to 2018-19), and sub-period in Uttar Pradesh.

The area saw the highest Caddydella Valle indexes - production and yield - for the period. The region's Caddydella Valle index was 18.49 percent, while the gap between production and yield was 17.06 percent and 15.78 percent, respectively. During in the sub-period study, the first sub-period had the highest instability, with area production and yield accounting for 46.26 percent of area the Cuddy Della Index, 12.16 percent, and 12.66 percent of the production as well as yields. Cuddy Della Index, respectively.in the second-period area,40.59 percent in production and 7.5 percent in yield. 53 This means that the area is also providing the highest instability, and now in the third sub-period Area 1. 61, Production 12.66, andArea 1. 61, Production 12.66, and Yield 11. 39 are presently in the last third sub period. The area's instability has been higher in the most recent sub-period.

**Table 3**
**The effect of area, yield, and interaction on foodgrain production in Uttar Pradesh**

| Particular | Periods | | | Overall Periods |
|---|---|---|---|---|
| | I | II | III | |
| Area effect | 7.55 | 1.10 | 9.98 | 8.20 |
| Yield effect | -4.36 | 3.40 | 0.01 | 0.41 |
| Interaction effect | -6.65 | 9.74 | 0.04 | 1.38 |

**The effect of area, yield, and interaction on foodgrain production in Uttar Pradesh.**

The decomposition is aimed at determining the area, yield, and interacting effects on the improvement of agricultural foodgrain production in Uttar Pradesh from 1950-51 to 2018-19, and then separately for each sub-period. Table 3 presents the conclusions. The entire period analysis reveals that the area and yield effects were 8.20 and 0.41, respectively, while the interaction effect was 1.38. According to the study, both area and yield contributed to the state's increased foodgrain production. A sub-period analysis reveals that there was a 7.55 percent positive impact on area. While yield had a negative impact on foodgrain production during the first sub-period, yield had a positive impact on foodgrain production during the second sub-period. Area, yield, and interaction

effects were 1.10 percent, 3.40 percent, and 9.74 percent during the second sub-period of study, respectively. During the third sub-period, there was a favourable effect of area and yield on Foograin production. based on an analysis of growth and instability in the Foodgrain industry in terms of area compound annual growth rate Of other words, it was determined that the sector was 0.22 percent during the entire study period; however, sub-period wise analysis revealed a trend in increase over time, apart from sub-period I. Productivity Growth was found to be Positive in this study. Throughout the sub-period, both the production and productivity sectors have showed positive growth rates. In terms of Instability, production instability (17.06 percent) was found to be lower than area instability (18.17 percent) and yield instability (15.78 percent) over the entire time.When each sub-period was evaluated separately, the first sub-period used to have the highest Instability. Using decomposition analysis, it was revealed that the interaction effect played a significant role in the state's increase in food grain production over the study period.

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