

## **Growth and Instability in Food Grains Production in Post Reform Period**

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### **Introduction**

The growth rate of agricultural production is generally judged by the performance of food grains and non-food grains production. Of both items of agricultural production, food grain production is more significant due to two reasons. Firstly, it provides the base for subsistence by supplying basic food items and secondly, it is the only group of agricultural produce where Green revolution was introduced firstly and more successfully. Its importance has also increased due to the inception of World Trade Organization (WTO)

The initiation of economic reforms in India in 1991 brought about major changes in the macroeconomic policy frame-work of the planned economy that existed in India during 1950-51 to 1990-91. When agriculture is given a wider and stronger commercial orientation through diversification and value addition, this would encourage both public and private investment in the sector. The profitability in agriculture would induce further technological progress and rising productivity. Such improvement in output, productivity and income would further fuel manufacturing sector growth through increased demand for inputs and consumer goods. It is also argued that improvements in agricultural productivity would induce resource flows from agriculture to the manufacturing sector, thereby stimulating its growth.

In India there had been increasing trend in the production of food grains. The total production of food grains increased from 50.8 million tonnes in 1950-51 to 187.0 million tonnes in the Eighth Plan. The food grains output in the Tenth Plan was 202.9 million tonnes. However, because of drought conditions in the first year of the tenth plan 2002-03, the food grains output declined to 174.8 million tonnes but again rose to 213.2 million tonnes in 2003-04. Food grain production touched the record level of 259.3 million tonnes in 2010-11 and inceded to 264.77 million tones in 2013-2014.

While there is an obvious need for agricultural growth, the increased instability in production instills more uncertainty about sustainability of agricultural growth in India. Increased instability in agriculture augments the risks involved in farm production and adversely affects farmers' income and decisions to adopt modern technologies and make investments in farming. Instability in production affects price stability and it increases vulnerability of low-income households to market (Chand and Raju, 2009).

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### **Need for the study**

Study on food grains production would aid the policy makers to formulate suitable policies which would help to increase food grains production in general and to maximize the profit in particular.. This study will help the food grains producers to take proper measures to make food grains production profitable. The research would help the Government authorities to develop suitable measures to overcome the constraints faced by the cultivators.

### **Earlier Studies**

Pillai (2001) highlighted paddy productivity growth in West Bengal and Orissa. The study found that input productivity had played an important role in the growth performance in the 1980s and early 1990s in this region. While growth in inputs and total factor productivity had contributed significantly to the output growth in both the States, the performance of West Bengal had been better than Orissa. This improvement in input productivity in West Bengal had been brought about both by efficiency and technology in the presence of variations across seasons.

Sarkar and Chakraborty (2002) examined the growth crisis of foodgrains production in West Bengal. The study concluded that the growth in the foodgrain area, production and yield trends in the State of West Bengal had decreased significantly during reform period and overall period. This was mainly due to the significant decrease of the growth in rice production and yield trends and pulse area, production and yield trends, during reform period compared to the pre-reform period, although production and yield growth of pulse crop were negative during pre-reform period.

Hasan et al., (2008) measured the change and instability in area, production, and yield of two major cereal crops- wheat and maize in Bangladesh based on secondary data during 1980/81-2003/04 using different statistical techniques. They found that area and production of wheat increased satisfactorily. But yield was not increased to meet the demand of the country. In the case of maize, significant increment happened in yield during the study period. Area and production of maize also increased to fulfill the increasing demand of population. Presently production of maize increased more rapidly than it's area. They also found that the growth in area, production, and yield of wheat slightly improved in period-II, whereas the growth rate in area, production, and yield of maize improved rapidly.

Nath (2010) attempted a regional analysis of growth in Indian agriculture for the period 1952-53 to 1964-65 based on the data compiled from Indian Agricultural Statistics, Statistical Abstract of India and Fertilizer Statistics. The study noted that in the reference period the growth rate of agricultural production (3.42% per year) was higher than the growth rate of population (2.15). When the rate of population increase in the reference period is compared with the growth rate of food grains, the latter is found to be only slightly higher than the population growth rate. The growth of production of food grains was estimated as 1.60%. Within the food grains group, the growth rate of rice- 3.64% had been higher than that of the inferior grains.

The earlier studies failed to analyse the growth and instability in food grains production. In this context the research study on "Growth and Instability in food grains production in Post reform period" was formulated with the following objectives

- ❖ To find out the trend in area, production and productivity of food grains in post reform period.
- ❖ To find about the extent of instability in area, production and productivity of food grains in post reform period. and
- ❖ To decompose the output change into area effect, yield effect and interaction effect.

## Methodology

### Period of the Study

The study was related to the period 2004-2014. since it is the latest years for which the required data were available.

### Data Base of the Study

The required information relating to area under food grains, production of food grains and yield of food grains were compiled from the following source:

Directorate of economics and statistics, Department of Agriculture and cooperation, Government of India.

### Hypothesis Formulated

1. There is increasing trend in growth of area, production and productivity of food grains
2. There is no instability in area, production and productivity of food grains
3. The change in production of food grains was more caused by the yield effect.

### Tools used

#### Compound Growth Rate

Compound growth rate was calculated for area, production and productivity of food grains. The growth rate was calculated on  $y=ab^t$  where b is regression coefficient of y on x. Compound growth rate was expressed as percent  $r=(b-1) \times 100$ . Significance of growth rate was tested by using t test statistics as  $t=\frac{r}{SEr}$  which follows t distribution with (n-2) degree of freedom and n is number of years included in this study

$$SE(r) = \frac{\sqrt{\frac{\sum \log y^2 - \frac{(\sum \log y)^2}{n}}{n-2} - (\log x)^2 \sum x^2}}{0.43429 (n-2) \sum x^2}$$

#### Coppock's Instability Index

This was used to find out the extent of instability in area, production and productivity of food grains. The formula used was

$$V/\log = \frac{\sum \frac{|\log X_t + 1 - m^2|}{X_t}}{N}$$

$$\text{Instability index} = (\text{antilog} \sqrt{\frac{V}{\log}} - 1 \times 100)$$

$X_t$  is equal to the area, production and yield

N is the number of years minus 1

M is arithmetic mean of the difference between the logarithms of  $x_t, x_t + 1$  and  $x_t + 2$  and

V log is logarithmic variance of the series.

#### Decomposition analysis

As per this analysis, change in food grains production was divided into area effect, productivity effect and interaction effect. The formula used was

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

Where  $\Delta A = A_n - A_0$ ;  $\Delta Y = Y_n - Y_0$ ;  $\Delta P = P_n - P_0$ .

$A_0$ ,  $Y_0$  and  $P_0$  are area, yield and production respectively in the base year and  $\Delta A$ ,  $\Delta Y$ ,  $\Delta P$  are the changes in area, yield and production respectively.

### Findings of the study

#### Trend in area under food grains

Table 1 represents the trend in area under food grains

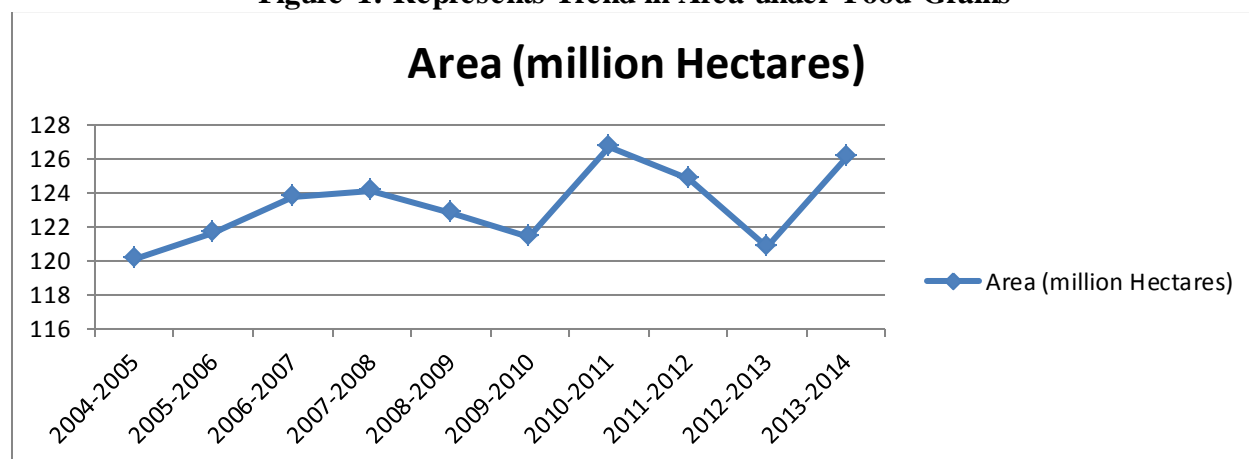
**Table 1: Trend in Area under Food Grains (million hectares)**

Year	Area
2004-2005	120.08
2005-2006	121.60
2006-2007	123.71
2007-2008	124.07
2008-2009	122.83
2009-2010	121.33
2010-2011	126.67
2011-2012	124.75
2012-2013	120.78
2013-2014	126.04
Average	123.18

**Source:** Directorate of economics and statistics, Department of Agriculture and cooperation, Government of India.

In the reference period the area and food grains increase from 120.08 million hectares to 126.04 million hectares. The estimated compound growth rate in area under food grains was 1.006

**Figure 1: Represents Trend in Area under Food Grains**



#### Trend in production of food grains

Table 2 Represents the Trend in Production of Food Grains

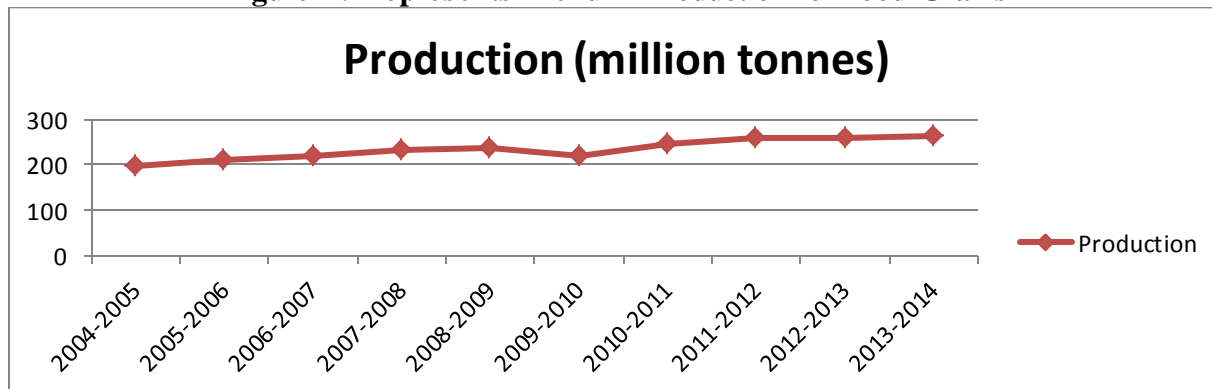
**Table 2: Trend In Production of Food Grains (million tonnes)**

Year	Production
2004-2005	198.36
2005-2006	208.60
2006-2007	217.28
2007-2008	230.78
2008-2009	234.47
2009-2010	218.11
2010-2011	244.49
2011-2012	259.29
2012-2013	257.13
2013-2014	264.77
Average	233.32

**Source:** Directorate of economics and statistics, Department of Agriculture and cooperation Government of India.

Between 2004-2005 to 2013-2014 food grains production increased from 198.36 million tonnes to 264.77 million tonnes representing the compound growth rate of 1.073

**Figure 2: Represents Trend in Production of Food Grains**



**Trend in Productivity of Food Grains**

Table 3 represents the trend in productivity of food grains

**Table 3: Trend in Productivity of Food Grains (kg/hectare)**

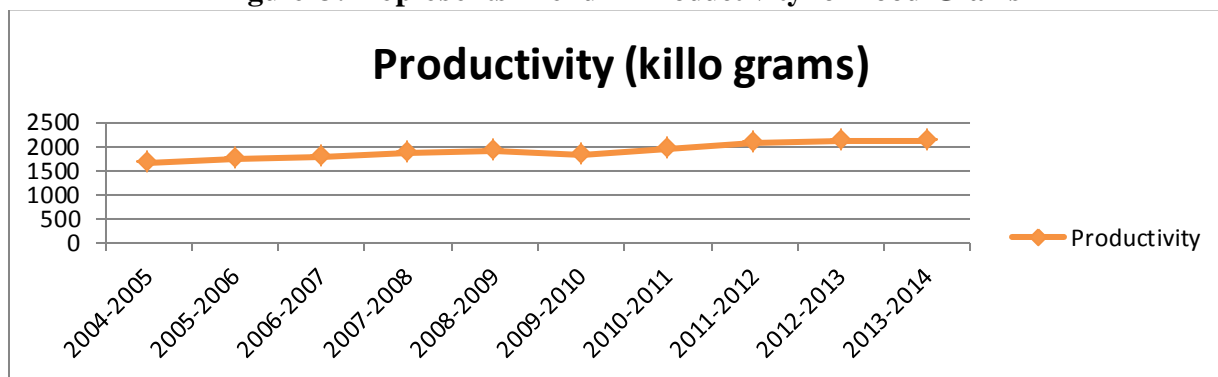
Year	Productivity
2004-2005	1652
2005-2006	1715
2006-2007	1756
2007-2008	1860
2008-2009	1909
2009-2010	1798
2010-2011	1930
2011-2012	2078
2012-2013	2129
2013-2014	2101
Average	1893

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**Source:** Directorate of Economics and Statistics, Department of Agriculture and Cooperation Government of India.

In the reference period the productivity of food grains increased from 1652 kilograms to 2101 kilograms. The estimated compound growth rate of productivity of food grains was 1.066

**Figure 3: Represents Trend in Productivity of Food Grains**



### Estimated Instability Index in Area, Production and Productivity of Food Grains in Post Reform Period

Table 4 represents estimated instability index in area, production and productivity of food grains in post reform period

**Table 4: Estimated Instability Index in Area, Production and Productivity of Food Grains in Post Reform Period**

S. No	Items	Instability Index
1.	Area	0.106
2.	Production	0.129
3.	Productivity	0.124

**Source:** Calculation based on compiled data

The estimated in instability index in the productivity of food grains was higher (.129) as compared to area (.106) and productivity (.124)

### Decomposition analysis of food grains production in post reform period

The study tried to analyses sources of the growth of food grains production based on the model formulated by Sharma (1971).The model measures the relative contribution of area, yield and the interaction effect on the rise or fall in production over certain period.

The current study tried to decompose the change in production into area effect, yield effect and interaction effect by using the following formula.

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

Where  $\Delta A$  is change in area,  $\Delta Y$  is change in yield,  
 $\Delta P$  is change in production,  $Y_0$  is the initial yield and  $A_0$  is the initial area.

Table 5 represents the estimated results of decomposition analysis of food grains production.

**Table 5: Estimated Results of Decomposition Analysis of Food Grains Production**

$\Delta P$	Area Effect	Yield effect	Interaction effect
66.41	9845.92 (15.3)	53915.92 (84.0)	395.80 (0.61)

**Source:** Calculation based on complied data

In the post reform period the area effect, yield effect and interaction effect were positive. Increase in food grains production was more brought about by increase in yield as compared to increase in area.

### Conclusion

1. There had been increasing trend in the growth and instability of area, production and productivity of food grains production in post reform period.
2. There had been high instability in production and productivity of food grains production in post reform period.
3. The change in food grains production was more caused by yield effect..

### Recommendations

To improve food grains production the study recommended the following measures

1. There is need for inventing new agricultural technology relevant to rainfed areas specifically
2. Continued genetic improvement to be introduced for better yields and
3. Support measure to increase food production through public policy, research and development, better management system, improvement in agriculture related infrastructure are to be provided,

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