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Sources of Agricultural Growth in Food grains in Post-reform in India: A study of Rice and Wheat

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Abstract: In the present study, an attempt has been made to analyze sources of agricultural growth in food grains in post-reform period in India for the period from 1990-91 to 2013-14. It has been observed that the growth rates of rice and wheat have reached the plateau. A focussed effort is needed to introduced new technology, encourage farmers to use it with the help of extension services and an increase agricultural finding.

Key Words: Rice, Wheat, Area, Yield, Production, Semi- log model, Instability, Area effect, Yield effect and interaction effect, Agricultural growth, Post- reform.

1.1 Introduction

An analysis of growth in area, production and productivity of crop indicates the general pattern or growth and the direction of changes in area and productivity but this does not evaluate the contribution of area and productivity to the production growth. For that it is necessary to examine the sources of output growth (Kalamkar, 2003). Divergent views have been expressed regarding source of growth in food grains in post reform period in context of wheat and rice in India.

Easter et al. (1977) concluded that in the wheat region, continued increases in the quantity and quality of irrigation and improved crop varieties were promising sources of output growth. For the rice region, the development of rural roads and markets increases in irrigation quality, and improved rice varieties were important sources of output growth. During 1967-90, rice area increased at the

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annual rate of 0.6 per cent per annum and output showed an increase of 2.7 per cent, mainly because of yield growth (Kumar, P. and Rosegrant, M.W, 1994) .The locational shifts in fact became-important in the post-Green Revolution period (Ranade,1986).
Bhalla and Singh (1997) found that from 1980-83 to 1992 -95 a major change took place for cropping pattern both in terms of area allocation and share in total value of output from coarse cereals towards rice and wheat cultivation. In the light of these views this paper attempts to examine the growth performance of wheat and rice, measure relative contribution of area and productivity to the production growth in wheat and rice and analyze variations in Wheat and Rice in terms of area, production and yield with special reference to post reform period in India.

1.2 Review of literature

Roy (2017) evaluated the performance of agricultural growth after economic reforms in India. He observed that rate of growth of yield is the main source of agricultural output growth in food grains. Since the 1990s growth in food grains output was mainly because of rice and wheat. The increase in growth rate of production of wheat, more pronounced since 2000–01, was largely due to expansion in area under cultivation.

Balaji (2015) estimated the performance of agriculture in terms of growth and instability of yield, area and production of major crops in Telangana. The compound growth function was used for a period of 29 years from 1983 to 2012-13. The instability index was used to measure the magnitude of instability. The deceleration in area was experienced by almost all the crops except maize, sugar cane and cotton in the post reform period. Rice does not experience any significant changes through both the periods.

Mundhe (2015) examined the trend of agriculture growth and production in India for the period 1950-51 to 2012-13. He also analyzed the direction of agricultural productivity trends in five year plans. Production has significantly increased during the last three decades and Indian agricultural growth has also increased over the period of time. Nonetheless, the variation in annual production of all food grains is significant. Standard Deviation value obtained for rice, cereals, wheat and pulses have increased comparatively over the last few years.

Tripathi and Prasad (2009) found that agricultural production and efficiency largely depend upon the inputs applied and the methods adopted. For wheat, rice, pulses, oilseeds, cotton, jute and potato these measures show decrease in production instability during post reforms period. The production and yield instability for almost crops declined in post reforms period. The reduction in production instability is mainly due to reduction in instability of yield and present instability in production is mainly because of increasing instability in area.

Chand and Raju(2008) found that adoption of new technology had increased instability in food grains and agricultural production in India .Production was most stable in Punjab followed by Kerala, Haryana ,U.P. and West Bengal. Food grains production was highly unstable in the states of Maharashtra, Tamil Nadu, Orissa, M.P., Rajasthan and Gujarat.

Sawant (1995) stated that the production of food grains increased during 1970s and 1980s from the rate of previous decade but the 1990s witnessed a sharp fall in growth of food grain production.

1.3 Methodology

The time period of this study is from 1990-91 to 2013-14. The data of Rice and Wheat at National level, has been taken from Agriculture Statistics at a Glance (various issues) published by Ministry of Agriculture, Government of India. The following tools and techniques have been used for analysis:

a) In this paper compound annual growth rates (CAGR) of area, production and yield are estimated by fitting semi-log model of the following form:

$\ln(Y_t) = b_0 + b_1 (t) + u_t$

Where

$\ln(Y_t)$ is logarithmic of Y_t

b_0 is intercept coefficient

b_1 is slope coefficient, represents instantaneous growth rate of dependent variable Y_t

t is time

u_t is error term

The compound annual growth rates (r) are estimated the formula:

$r = \text{antilog}(b_1) - 1$

b) The instability is calculated by using C. V. whose formula is as follows:

$C.V. = \frac{\sigma}{\bar{x}}$

Where

C.V. = Coefficient of variation

σ = standard deviation

$\bar{x}$ = mean

c) In order to measure the relative contribution of area, yield and the interaction of area and yield to the production of wheat and rice - area effect, yield effect and interaction effect was calculated for the period 1990-91 to 2013-14 by using the following formula:

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

Where,
ΔQ = Difference in production during two periods,
ΔY = Difference in yield during two periods,
ΔA = Difference in area during two periods,
A_0 = area under wheat and rice during the base year,
Y_0 = Average yield of wheat and rice during the base year,
Thus, the change in production (ΔQ) is due to:
$A_0 \Delta Y$ represents an area effect,
$Y_0 \Delta A$ represents yield effect, and
$\Delta A \Delta Y$ represents an interaction of area and yield effect.

1.4 Discussion

Table (a): CAGR of Area, Production and Yield of rice and wheat in India (1990-91 to 2013-14)

Crops	Area	Production	Yield
Rice	0.08	1.45	1.36
Wheat	0.9	2.1	1.2

Note: CAGR have been calculated by using the semi-log model

The above table shows the growth rates in post-reform period of two major food crops namely rice and wheat. In the case of rice whereas marginal increase in area. The growth rate of production and yield are also less than 2 percent. In wheat, again the growth rate in area is only 0.9 percent, the yield has increased only at rate of 1.2 percent, but the production growth rate is slightly more at 2 percent. This result is a reflection of the agrarian crisis which has gripped the agricultural sector after 1991.

In the table (b) below the instability in area, production and yield has been calculated by using the simple measure of coefficient of variation. It is observed that the highest instability seen in production in the case of both rice and wheat. Area shows the least instability in both the cases. The instability in the case of wheat in all three parameters is more than that of rice.

Table (b): Instability in Area, Production and Yield of rice and wheat in India (1990-91 to 2013-14)

Crops	Area	Production	Yield
Rice	2.67	11.79	10.69
Wheat	7.05	16.10	9.24

In the table (c) below the area, yield and interaction effects are observed for the economic reform period in the case of rice and wheat when we look at rice the yield effect is very high as compared to the area and interaction effects. Thus the major source of growth in the case of rice is increased productivity. In wheat, expansion in area and increase in yield are contributing equally. This shows that there is need for new technology infusion in particularly in wheat.

Table (c): Area, Yield and Interaction effects (1990-91 to 2013-14)

crop	change in output (Q_n-Q_0) (million tonnes)	Area effect $Y_o(A_n-A_o)$	Yield effect $A_o(Y_n-Y_o)$	Interaction effect $(A_n-A_o)*(Y_n-Y_o)$
Rice	32361.64	2523 (7.80 %)	28858.44 (89.17%)	980.2 (3.03%)
Wheat	46176.35	19819.8 (42.92%)	20907.05 (45.28%)	5449.5 (11.80%)

1.5 Conclusions

It is obvious from the above analysis that the growth rates of rice and wheat have reached the plateau. If we have took emerge out of this crisis of agricultural growth, a focussed effort is needed to introduced new technology, encourage farmers to use it with the help of extension services and an increase agricultural finding.

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