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Trends of Total Factor Productivity in Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki Districts of Uttar Pradesh Since 1990 To 2008

Abstract

It is well known fact that productivity is the key factor in agriculture sector. In this paper, total factor productivity of foodgrain crops of four districts of u.p. was assessed. Four districts were selected for the present study. Findings indicated that two districts showed the positive total factor productivity growth during the period of the study.

Keywords: Compound Average Growth Rate (CAGR) and Total Factor Productivity.

Introduction

Agriculture in India is the means of livelihood of almost two thirds of the work force in the country. It has always been INDIA'S most important economic sector. The 1970s saw a huge increase in India's wheat production that heralded the Green Revolution in the country. The increase in post-independence agricultural production has been brought about by bringing additional area under cultivation, extension of irrigation facilities, use of better seeds, better techniques, water management, and plant protection.

Indian economy is predominantly agriculture economy. In India agriculture had to serve as the base for capital formation and industrialization in the early stages of economic development. The importance of agriculture in the Indian economy can be assessed by its contribution to national income, supply of raw material to agro-based industries, foreign exchange earnings and employment.

Agricultural development in Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki districts of central Zone (U.P.) has been characterized by wide disparities. One hand there are districts which has experienced a very high level of per capita agricultural output caused by a sustained rise in per hectare agricultural output. In view of this it becomes necessary to study the extent of the inequalities in agricultural productivity and to identify the factors underlying these state affairs.

Objectives of the Study

1. To measure the district-wise total factor productivity (TFP) for foodgrain crops in four (Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki) districts of central zone of U.P..
2. To suggest policies and strategies to sustain the growth in TFP by district.

Review of Literature

Total Factor Productivity

The increased use of input, to certain extent, allows the agricultural sector to move up along the production surface by increasing the yield per unit area. Their use may also induce an upward shift in production function to the extent that technological change is embodied in them. It has long been recognised that partial productivity measure, such as output per unit of individual inputs, is of limited use as indicater of real productivity change as defined by the shift in a production function. The concept of total factor productivity (TFP), which implies an index of output per unit of total factor input, measures properly this shift or increase in output, holding all inputs constant. The relative sectoral growth rates of productivity are important determinants of structural transformation of economy, and the rate of growth of productivity in the long-run ; productivity being the ' engine of growth '. Since the publication of

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solow's paper in 1957 , voluminous literature dealing with the measurement and analysis of productivity at different levels of aggregation has appeared. Until recently , much of it was concerned mainly with developed countries.

Parikh (1974) Obtained an agricultural output growth rate of 3.73 %, per annum for Maharashtra state over the period 1952-53 to 1961-62. Decomposing this growth into components he found that the contribution of area, change in cropping pattern and productivity were 0.42, 2.68 and 0.63 % respectively.

Singh and singh (1973) studied the impact of new technology on agricultural production and resource productivity in Tarwa Block of Azamgarh district of Uttar Pradesh and pointed out that pace of adoption of HYV has been slow in the region. They stressed upon the capital to get the fruits of improved technology.

Ahmad (2001) measured agricultural productivity growth differential in Punjab, Pakistan. He analyzed the agricultural productivity growth differentials at three levels in Punjab-district, cropping zones, and the province levels. The results showed that crop output increased at the rate of 2.6 percent per annum, dominated by the share of TFP growth. The mungbean zone emerged as a leader with 3.6 percent per annum growth in TFP, followed by barani (3.2 %), cotton (1.9 %), mixed (1.1 %), and rice (1 %) zones. Rice, mixed, and cotton zones showed a negative trend in TFP growth.

Aiyar et al. (2004) developed a " dual " method to compare levels of total factor productivity (TFP) across nations that relies on factor price data rather than the data on stocks of factors required by standard " primal " estimates. Consistent with the development accounting literature based on primal estimates, they found that TFP accounts for the bulk of differences in income per worker across countries. However , they also found that there are significant differences between TFP series calculated using the two different approaches. They traced the reason for this divergence to inconsistencies between the data on user costs of capital and physical stocks of capital. In addition, they established that the standard Cobb-Douglas methodology of assuming a constant capital share of one-third for all countries is a very good approximation to a more general formulation under which countries have different aggregate production functions which do not require a constant elasticity of substitution between factors.

Methodology

The Kendrick Index

This index is based on the assumption of a linear production function of the following from assumed by Kendrick (1961)

Q = aL + bK.

Where a and b are positive constants, and Q, L and K convey the usual meanings.

This index is the ratio of output to weighted average of the two factors of production, where base year rates of reward are taken as weights.

Kendrick index of TFP is given by:

$$A_t^K(t) = \frac{Q_t}{W_0 L_t + r_0 K_t}$$

W_0 and r_0 are the base year rates of reward for labour and capital respectively.

Each of the above method has its own merits and demerits.

In the present study due to limitation of data, we have used kendrick index for measuring the Total Factor Productivity (TFP) in agricultural sector. In this study we have taken yield as output and fertilizer, pesticides, Seeds, working capital used as inputs. Then this formula is convert as:

$$A_t = \frac{Y_t}{WC+F+S+P}$$

Where, Y_t= yield in 't' year
WC= Working Capital per hectare in 't' year
F= Fertilizer consumption per hectare in 't' year
S= Seed Consumption per hectare in 't' year
P= Pesticide consumption per hectare in 't' year
A_t= Index of Total factor productivity in 't' year

In the above formula, we take equal weightage of all inputs (Non availability of price data at district level) and we make indexing of inputs and outputs.

In this paper, TFP is measured for foodgrain crop sector in four (Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki) districts of central zone of U.P.during the period from 1993/94 to 2007/08. For analytical convenience this period has been divided into two sub periods, namely, 1993/94 to 1999/2000 (first sub-period) and 2000/01 to 2007/08 (second sub-period). The study covers 4 districts of central zone of U.P. We have taken rice, wheat, jowar, bajara, maize, barley and gram crops as foodgrains.

A widely accepted exponential model, $y = a\, b^t\, e^u$, has been fitted to the time series data for estimating growth rates. The logarithmic form of this function is given by;

ln (y) = ln(a) +t ln(b) + u

Where,

y is the dependent variable whose growth rate is to be estimated.

t is the independent variable (Time)

u is the disturbance or error term.

a and b are the parameters to be estimated from sample observations. The regression coefficient b is estimated by ordinary least squares (OLS) technique. The Compound Average Growth Rate (CAGR) in % term is estimated as:

CAGR = {antilog (b) − 1}

Results and Discussion

Productivity as a source of growth has been an important theme of analytical enquiry in economics all along. Analysis of total factor productivity, attempts to measure the amount of increase in total output which is not accounted for by increase in total inputs. There is a large residual which is the contribution of the knowledge sector; this is called technological

change or total factor productivity. The total factor productivity index is computed as the ratio of an index of aggregate output to an index of aggregate inputs.

This chapter is divided into two sections. Agricultural performance of four (Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki) districts of central zone of U.P., i.e, trend analysis of Area, Production and Yield, has been discussed in Section I. Section II appraises the district-wise trends and growth of total factor productivity in foodgrain crops at district level in Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki.

Section I: District-wise Agricultural Performance of Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki.

The results of estimation of CAGR of area, output and yield in respect of foodgrains of Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki of central zone of U.P.. for the two sub-periods i.e. 1990-91to 1999-2000, 2000-01 to 2007-08 and as also for

the complete period i.e., 1990-91 to 2007-08 are presented in Table1.

The results of estimation of CAGR of area, production and yield in respect of foodgrains of four (Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki) districts of Bundelkhand zone of U.P. in Table 1.

The district-wise results make clear that CAGR of agricultural output for foodgrains crops in four (Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki) districts of central zone of U.P. in the later period i.e. 2000-01 to 2007-08 has significantly increased as compared to first period i.e. 1990-91 to 1999-2000 except Kanpur Nagar. It is also observed from these results that all districts experienced a rise in output growth rate of foodgrains over the study period 1990-91 to 2007-08 except Kanpur Dehat. But the CAGR of output of foodgrain crops varied. All four districts have so good experienced over the entire period of study.

Table 1: District-wise CAGR in Area, Production and Yield for Foodgrain (in per cent)

S. No.	Districts	Area			Production			Yield		
		1990-2000	2000-2008	1990-2008	1990-2000	2000-2008	1990-2008	1990-2000	2000-2008	1990-2008
1	Kanpur Dehat	-5.70	0.81	-3.91	-3.53	0.99	-2.44	2.29	0.17	1.53
2	Kanpur Nagar	20.04	11.06	10.40	22.75	13.51	11.14	2.25	-2.76	0.67
3	Fatehpur	-1.09	0.79	-1.41	0.83	0.85	0.17	1.94	0.06	1.60
4	Bara Banki	-2.87	5.03	-0.39	-0.31	3.83	1.44	2.63	-1.14	1.84

Section II: Total Factor Productivity: District-wise Analysis of Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki.

The movements in TFP index of foodgrain in Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara

Banki districts of central Zone (U.P.) over the period 1993-94 to 2007-08 presented in figure (a). The level comparisons among these districts over the period of study in figure (a) show that on an average TFP levels have been the highest in Kanpur Dehat.

Figure (a)
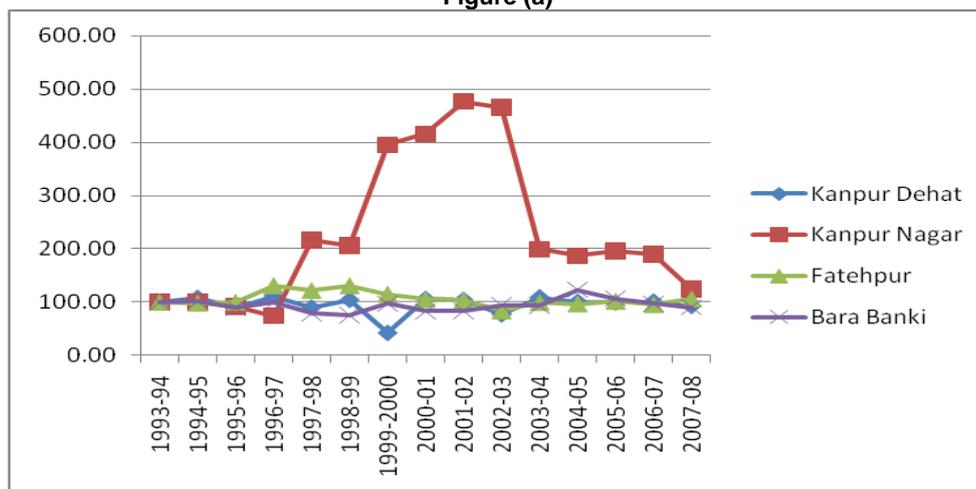
The compound annual growth rates of total factor productivity (TFP) in Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki districts of central Zone (Uttar Pradesh) for foodgrain crop over the two sub-periods of the study as well as for the entire period were at the district level, and the results are presented in table 2.

The comparison between TFP growth rate in Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki districts of central Zone (U.P.) over the periods from 1993-94 to 1999-2000 and from 2000-01 to 2007-2008 very clearly establishes that a sharp deceleration. All four districts showed the positive total factor productivity growth during the period of the

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study except Fatehpur. The results also indicate that the CAGR of TFP in the later period in comparison to the first period for food grain crops shows a sharp deceleration.

Table 2: District-wise CAGR in Output, Input and TFP for Foodgrain (in Per cent)

S. No.	District	Output			Input			TFP		
		1993-2000	2000-2008	1993-2008	1993-2000	2000-2008	1993-2008	1993-2000	2000-2008	1993-2008
1	Kanpur Dehat	3.55	0.17	1.48	13.99	0.66	1.49	-9.17	-0.48	0.00
2	Kanpur Nagar	3.37	-2.76	0.32	-17.81	17.22	-4.73	25.78	-17.04	5.30
3	Fatehpur	3.04	0.06	1.62	-1.27	-0.19	2.53	4.37	0.25	-0.88
4	Bara Banki	2.90	-1.14	1.54	5.86	-3.53	0.97	-2.80	2.48	0.57

To sum up the result of this study lead to the conclusion that It rises serious doubts about the sustainability of state's agricultural output and food security programmes in the face of no significant reduction being achieved in the population growth during the last two decade. It implies that the post higher growth rates of output and TFP observed in foodgrain crops may not be sustained without substantial technological improvements in future.

Suggestions

In view of the foregoing analysis of Agricultural Productivity of foodgrain crops in Utter Pradesh, it seems proper to evolve a sound strategy to raise the productivity of agriculture in Kanpur Dehat, Kanpur Nagar, Fatehpur and Bara Banki districts of central Zone (Uttar Pradesh), especially in low productive regions. For this the following suggestions for raising the productivity may be recommended.

1. The measures of land reforms should be strictly observed in all the districts and surplus land should be expeditiously distributed among land less persons.
2. Priority must be given to check the floods & water logging and soil erosion hazards.
3. Ground water development programs with modern methods in areas of water scarcity.
4. Arrangements must be made to ensure the regular water by canals.
5. The highest priority in Kanpur Dehat, Fatehpur and Bara Banki districts of central Zone (Uttar Pradesh) Should be given to the promotion of cropping Intensity.
6. The rural credit facilities at more liberal rates and in great amount should be made available to the farmers.
7. Soil and water conservation programs are to be needed.
8. Government should be open soil test center in every block.
9. Government should be give low rate of interest loan to farmers.
10. People should be planted more trees.
11. Proper tools and machinery.

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