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Performance of Agricultural Sector in Nine Districts of Western U. P. since 1993 to 2008

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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 nine districts of u.p. was assessed. Nine districts were selected for the present study. Findings indicated that six districts showed the negative total factor productivity growth during the period of the study.

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

Introduction

Achievement of significant increase in agricultural production depends upon the technology used in the farm production and its organization. The scope for increasing agricultural production by using the traditional technology is limited. An increase in the productive capacity of the agriculture can be brought about by the combination of two courses (a) by extending the area under cultivation and (b) by improving the yield per hectare on intensive cultivation. The extensive agriculture's elasticity would not bear much stress. Increase in the agricultural productivity has therefore to be sought for largely on the intensive side and here is obvious scope for improvement. A remarkable illustration of possibilities of intensive cultivation was furnished by pre-war Japan which supported population of nearly 60 million on the cultivated area of barely 17 million acre.

Intensive agriculture can be pursued firstly by increasing area under multiple crops. Secondly by increasing the yield per-acre. In the second one, we have to use new technology such as high yielding varieties of seeds, new methods of irrigation, fertilizer etc. agriculture can be viewed as a chemical processing industry where the seeds, water, plant nutrients and other inputs present in the soil are converted into foodgrains, foods, fibres, fodder and other, needed by the people and animals. To fulfil their requirements, the intensity of cultivation is required.

For increasing the level of cropping intensity and yield of land, orientation to new production technique can be provided through modern input i.e. high yielding varieties of seeds. HYVs are early maturing, highly productive that the yields from the new varieties exceeded 25 to 100 percent compared to the yields from traditional varieties.[1] HYVs are more water responsive than traditional varieties.So increase in agricultural production and productivity depends to a larger extent on the availability of water.[2] The adoption of new high yielding varieties and irrigation entail a high cost of cultivation and hence a cultivator can not afford to loss his crop due to weeds, diseases insects, nematodes, storage pests, rodents and birds.

Objectives of the Study

1. To measure the district-wise total factor productivity (TFP) for foodgrain crops in nine districts of U.P.
2. To suggest policies and strategies to sustain the growth in TFP by district.

Review of Literature

Totals 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 er 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 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.

Shetty (1970) analysed agricultural production trends at all India level and measured the contribution of area, yield per acres and crop pattern to the growth of agricultural production (period 1920-21 to 1964-65). His conclusion was that the long term trend in agriculture productive over this period showed a rising tendency, and acreage expansion was the most important source of growth of production at all India level.

Christensen (1975) discussed the various index numbers advocated by different authors and more particularly the Laspeyre's index and Tornqvist index. The Laspeyre's index is exact for linear production fuction, which specifies a priori that all factors are perfect substitute in the production process.

Patil and Jha (1978)[3] studied the changes in output, input and agricultural productivity growth in Maharastra state, India for the period 1951-52 to 1971-72. During the sub-period 1951-52 to to 1960-61, 18 out of 25 districts recorded positive output growth, and the growth in input varied between 0.82% and 2.89% per annum in different districts. The average growth in inputs was nearly 1.84% and growth in modern inputs, it was negligible. The total factor productivity growth rates were positive in 14 districts and were between .85% and 5.92% per annum. During the sub-period 1960-61 to 1971-72, the rate of TFP growth decreased. Only 9 of 23 districts which showed growth had rates of over 2.5% per annum. Only 3 districts recorded productivity gains while other showed a decline in productivity. During the 1960s, the agricultural output stagnated in spite of rapid growth in inputs mainly because the technological assets acquired in the 1950s had depreciated largely and this completely nullified the contribution of modern inputs. Agricultural research and extention to disseminate new technology has a critical role in rapid output growth.

Kumar et al. (2002) analysed the performance of irrigated agriculture by measuring TFP indices at district and regional levels in the Indo-Gangetic Plains (IGP). The result revealed that the TFP index of the crop sector in IGP had risen by 1.2 percent during 1981-1997. It was higher in the Lower Gangetic Plain (3.1 PERCENT) and Lowest in the middle Gangtic Plain (0.4 percent). Productivity alone had contributed to the total output growth in IGP. The TFP had contributed in 65 percent of the GCA in IGP. Only one third of the GCA did not witness any contribution of technical change. The public policies such as investment in research, extension and infrastructure had been the major source of TFP growth in IGP. They have concluded that the sustainability issue of the crop system in the IGP has to be addressed for maintaining the country's overall economic development and the national food and household security.

Pratt et al. (2008) indentified and TFP is measured using a non-parametric Malmquist index which allows the decomposition of TFP growth into its components: efficiency and technical change. Comparing TFP growth in China and India it is found that efficiency improvement played a dominant role in promoting TFP growth in China, while technical change has also contributed positively. In India, the major source of productivity improvement came from technical change, as efficiency barely changed over the last three decades, which explains lower TFP growth than in China. Agricultural research has significantly contributed to improve agricultural productivity in both China and India. Even today, returns to agricultural R and D investments are very high, with benefit / cost ratios ranging from 20.7 to 9.6 in China and from 29.6 to 14.8 in India.

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:

$$A_t^K(t) = \frac{Q_t}{W_0L_t+r_0K_t}$$

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

Each of the above three methods 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 study, TFP is measured for foodgrain crop sector in nine districts 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 9 districts 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:

$$CAGR = \{\text{antilog } (b) - 1\}$$

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 paper is divided into two sections. Agricultural performance of nine districts 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.

Section I: District-wise Agricultural Performance of Nine Districts of U.P.

The results of estimation of CAGR of area, output and yield in respect of foodgrains of nine districts 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 nine districts of U.P. in Table 1.

The district-wise results make clear that CAGR of agricultural output for foodgrain crops in nine districts of U.P. in the later period i.e. 2000-01 to 2007-08 has significantly decreased as compared to first period i.e. 1990-91 to 1999-2000 except Ghaziabad, Etah and Manipuri. 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 Ghaziabad, Etah and Mainpuri. But the CAGR of output of foodgrain crops varied. All the 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	Baghpat	1.11	-15.60	-4.18	10.49	-8.21	5.14	9.28	8.75	9.72
2	Ghaziabad	-4.18	0.45	-2.08	-2.62	0.50	-1.26	1.62	0.04	0.83
3	Gautam Buddha Nagar	18.39	-1.68	10.98	27.30	-3.36	16.38	7.53	-1.71	4.87
4	Mathura	1.08	-1.34	0.51	3.27	-0.04	2.02	2.16	1.32	1.51
5	Agra	2.09	-2.23	0.09	6.32	-1.91	1.59	4.15	0.32	1.50
6	Firozabad	1.24	-0.98	0.72	3.07	1.66	2.17	1.80	2.67	1.45
7	Etah	-0.85	3.91	0.03	2.00	2.43	1.73	2.88	-1.42	1.70
8	Mainpuri	1.02	5.81	1.33	3.13	5.58	2.83	2.09	-0.22	1.48
9	Budaun	-0.57	-0.44	-0.62	2.12	-1.65	0.81	2.70	-1.21	1.44

Section II: Total Factor Productivity: District-wise Analysis of Nine Districts of U.P.

The movements in TFP Index of foodgrain in nine districts (Uttar Pradesh) over the period 1993-94 to 2007-08 are presented in Figure (a) to Figure (c) shows that the level Comparisons among these districts over the period of study show that on an average in Figure (a) TFP levels have been the highest in Baghpat. In Figure (b), an average TFP levels have been the highest in Mathura and In figure(c), an average TFP levels have been the highest in Budaun.

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Figure (a)

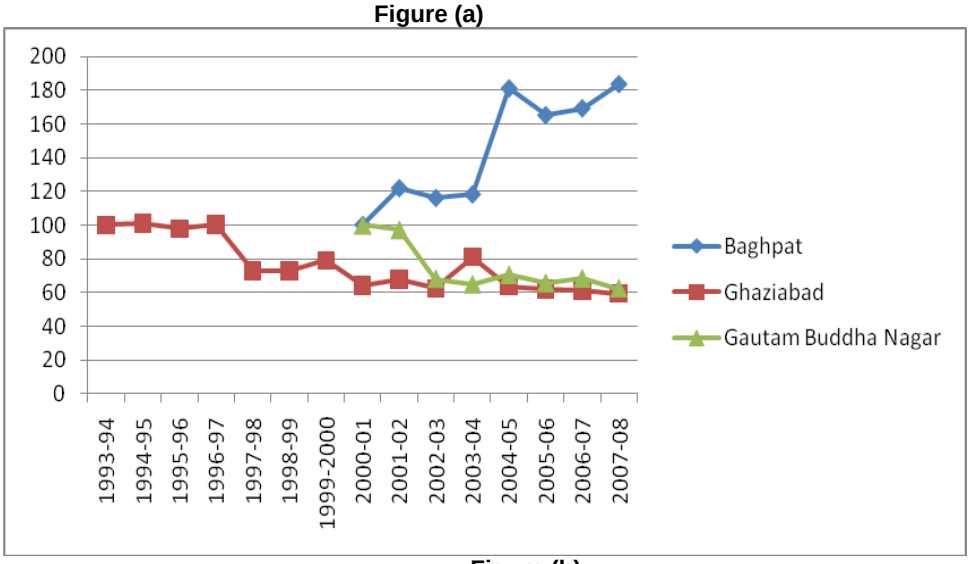


Figure (b)

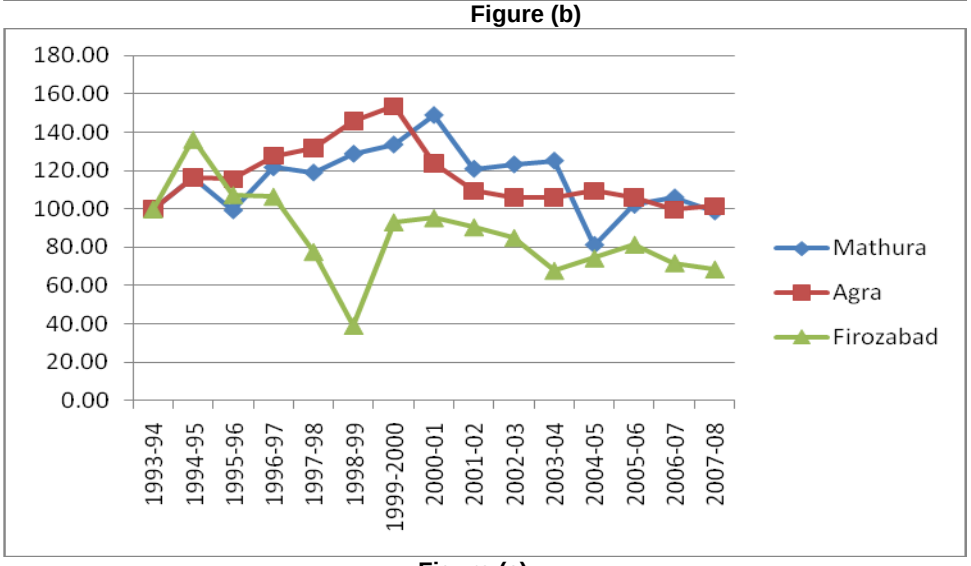
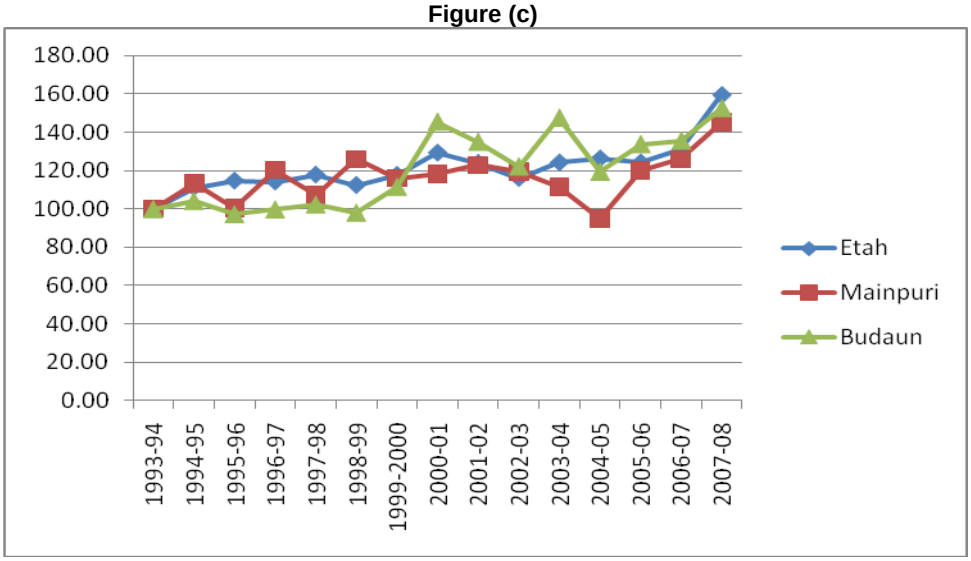


Figure (c)



The compound annual growth rates of total factor productivity (TFP) in 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 is presented in table 2. It is observed from these results in table 2 that most of district,

experienced a fall in TFP growth over the period from 1993-94 to 2007-08 expect Budaun. During this period, the Budaun district recorded the highest TFP growth performance. The results also indicate that the CAGR of TFP in the later period in comparison to the first period for food grain crops shown a sharp deceleration.

Table 2: District-wise CAGR in Output, Input and TFP for Foodgrain in nine districts (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	Baghpat		8.75			-0.41			9.20	
2	Ghaziabad	0.31	0.04	0.36	6.40	1.61	4.34	-5.73	-1.54	-3.81
3	Gautam Buddha Nagar		-1.71			4.48			-5.93	
4	Mathura	2.43	1.32	1.40	-2.05	6.98	2.20	4.57	-5.29	-0.78
5	Agra	5.92	0.32	1.11	-0.93	2.53	2.39	6.92	-2.16	-1.25
6	Firozabad	2.47	2.67	1.55	14.17	7.03	4.56	-10.25	-4.08	-2.88
7	Etah	3.75	-1.42	1.40	1.79	-3.72	-0.52	1.93	2.39	1.93
8	Mainpuri	1.54	-0.35	1.42	-1.04	-2.01	0.24	2.61	1.70	1.17
9	Budaun	3.45	-1.21	1.11	2.50	-1.69	-1.93	0.92	0.49	3.10

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 nine districts of Utter 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 all the districts 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.

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