

Performance of Agricultural Sector in Eastern U.P. 'A District-Wise Analysis of Food grains

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Agricultural development means higher level of food and other farm products, higher income and better standard of living for the farm families. When agricultural sector grows, the impact of its development is felt in the other sectors of the economy and it accelerates the overall economic development of a region.

Rapid economic growth and development has been a major goal of all underdeveloped countries since the world war second. A major difference between the developed and undeveloped economy is the dominance of non-agricultural sector in the former and agricultural sector in the later. From this, one may infer that development requires the rapid growth of non-agricultural sector, but the role of agricultural sector in the process of economic development should not be underestimated.

Agricultural development in eastern Uttar Pradesh has been characterized by wide disparities. On the 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 this state affairs.

Objectives:

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

Methodology:

The Kendrick Index:-

This index is based on the assumption of a linear production function of the following form 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 converted 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 Eastern Uttar Pradesh 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 27 districts of Eastern Uttar Pradesh. We have taken rice, wheat, jowar, bajara, maize, barley and gram crops as foodgrains.

Eastern Zone	Pratapgarh, Allahabad, Bahraich, Gonda, Faizabad, Ambedkar Nagar, Sultanpur, Sidharthnagar, Maharajganj, Basti, Gorakhpur, Kushinagar, Deoria, Mau, Azamgarh, Jaunpur, Ballia, Sant Ravidas Nagar, Varanasi, Ghazipur, Mirzapur, Sonbhadra, Kaushambi, Shrawasti, Balrampur, Sant Kabir Nagar, Chandauli
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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:

$$CAGR = \{ \text{antilog}(b) - 1 \} * 100$$

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.

There are two sections. Agricultural performance of U.P. at the district level, 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 Eastern Uttar Pradesh.

SECTION I: District-wise Agricultural Performance of Eastern U.P.

The results of estimation of compound average growth rate (CAGR) of area, output and yield in respect of foodgrains of the Eastern zone of U.P. for the two sub-periods i.e.1990/91-1999/2000,2000/01-2007/08 and as also for the complete period i.e., 1990/91-2007/08 are presented in Table 1.

The district-wise results make clear that CAGR of Agricultural output for foodgrain crops in Eastern 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 in case of seven districts (Bahraich, Ambedker Nagar, Sidharth Nagar, Azamgarh, Jaunpur and Ghaziabad). It is also observed from these results that all districts except Gonda, Faizabad, Deoria, Sant Ravidas Nagar, Ghazipur and Mirzapur experienced a rise in output growth rate of food grains over the study period 1990-91 to 2007-08. But the CAGR of output of foodgrain crops varied across the state. In case of foodgrain crops, it has been estimated between 1 to2 % per annum for Sultanpur, Sidharth Nagar, Maharajganj, Gorakhpur and Jaunpur during the study period. In case of Varanasi and Mirzapur have not so good experienced over the entire period of study. During this period, the Shrawasti district of Eastern zone of U.P. recorded the highest growth performance of the order of 50.64% per annum followed by Kausambhi, Kushi Nagar and Sant Ravidas Nagar in that order. The performance of Varanasi nad Mirzapur is found relatively poor.

Table1: District-wise CAGR in Area, Production and Yield for Foodgrain in Eastern Zone (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	Pratapgarh	-0.37	-0.16	-0.97	1.97	-0.58	0.24	2.35	-0.42	1.22
2	Allahabad	-3.37	-0.66	-2.68	-1.26	-0.06	-1.42	2.19	0.61	1.30
3	Bahraich	-7.34	7.82	-2.09	-4.05	6.09	0.35	3.55	-1.60	2.50
4	Gonda	-7.65	2.06	-4.45	-3.24	0.95	-2.27	4.77	-1.09	2.28
5	Faizabad	-8.49	-4.39	-6.83	-7.19	-3.61	-5.68	1.42	0.82	1.24
6	Ambedkar Nagar		-0.45			1.44			1.89	
7	Sultanpur	-0.29	0.06	-0.83	3.24	0.52	1.50	3.54	0.46	2.35
8	Sidharthnagar	-1.56	1.98	-0.68	3.29	3.50	1.55	4.94	1.49	2.25
9	Maharajganj	0.11	1.19	0.27	3.50	-0.49	1.47	3.39	-1.66	1.19
10	Basti	-7.81	0.37	-4.64	-4.44	-0.87	-3.47	3.65	-1.24	1.23
11	Gorakhpur	-0.43	0.16	-0.19	2.00	1.48	1.29	2.44	1.32	1.48
12	Kushinagar	43.99	-0.17	18.02	66.65	-0.08	26.84	15.74	0.09	7.48
13	Deoria	-7.90	-1.85	-4.06	-6.97	-2.50	-3.56	1.01	-0.66	0.52
14	Mau	-1.18	0.15	-0.75	0.94	-0.23	0.43	2.15	-0.38	1.18
15	Azamgarh	0.10	1.47	0.30	1.80	1.74	0.78	1.70	0.26	0.48
16	Jaunpur	-0.60	3.79	0.66	1.05	2.61	1.16	1.66	-1.14	0.50
17	Ballia	-0.58	3.19	0.03	3.09	2.39	0.89	3.69	-0.77	0.86
18	Sant R.Nagar	55.25	-0.08	20.26	74.98	-3.61	24.48	12.71	-3.53	3.51
19	Varanasi	-14.49	1.38	-8.75	-12.26	-1.95	-9.27	2.60	-3.29	-0.56
20	Ghazipur	-0.47	-0.90	-0.90	0.01	0.58	0.00	0.48	1.49	0.90
21	Mirzapur	-0.11	-0.72	-1.17	3.97	-5.79	-1.22	4.08	-5.11	-0.05
22	Sonbhadra	1.38	-2.84	-0.96	8.76	-9.46	0.25	7.28	-6.81	1.23
23	Kaushambi	35.06	0.12	19.69	48.51	-0.17	27.37	9.96	-0.29	6.42
24	Shrawasti	78.21	2.53	42.10	99.87	-0.21	50.65	12.15	-2.67	6.01
25	Balrampur		2.33			6.67			4.24	
26	Sant K.Nagar		1.13			0.08			-1.04	
27	Chandauli		3.03			2.50			-0.52	
	E.Zone	-2.49	0.88	-1.58	0.26	0.56	-0.30	2.82	-0.33	1.30

The results of estimation of CAGR of area, output and yield in respect of foodgrains of the U.P. for the two sub-periods i.e. 1990-91 to 1999-2000, 2000-01 to 2007-08 and as also for the complete period i.e., 1990-91 to 2007-08 are presented in Table 2.

The Eastern zone results make clear that CAGR of agricultural output for food grain crops in Uttar Pradesh in the later period i.e. 2000-01 to 2007-08 has significantly decreased as compared to first period i.e. 1990-91 to 1990-2000 in case of Eastern U.P. Yield for food grain crops in U.P. has significantly decreased during the entire period.

Table 2: CAGR in Area, Production and Yield for Foodgrain in Uttar Pradesh and India (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.	E.Zone	-2.49	0.88	-1.58	0.26	0.56	-0.30	2.82	-0.33	1.30
2.	U.P.	-1.49	0.89	-1.04	1.22	0.25	0.47	2.76	-0.64	1.52

SECTION II: Total Factor Productivity: District-wise Analysis of Eastern UP

The movements in TFP index of foodgrain in eastern zone (U.P.) over the period 1993-94 to 2007-08 are presented in figure (a) and figure (i). 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 Ambedkar Nagar. In figure (b), an average TFP levels have been the highest in Kaushambi. In figure (c) and figure (d), an average TFP levels have been the highest in Sidharthnagar, Shrawasti, respectively.

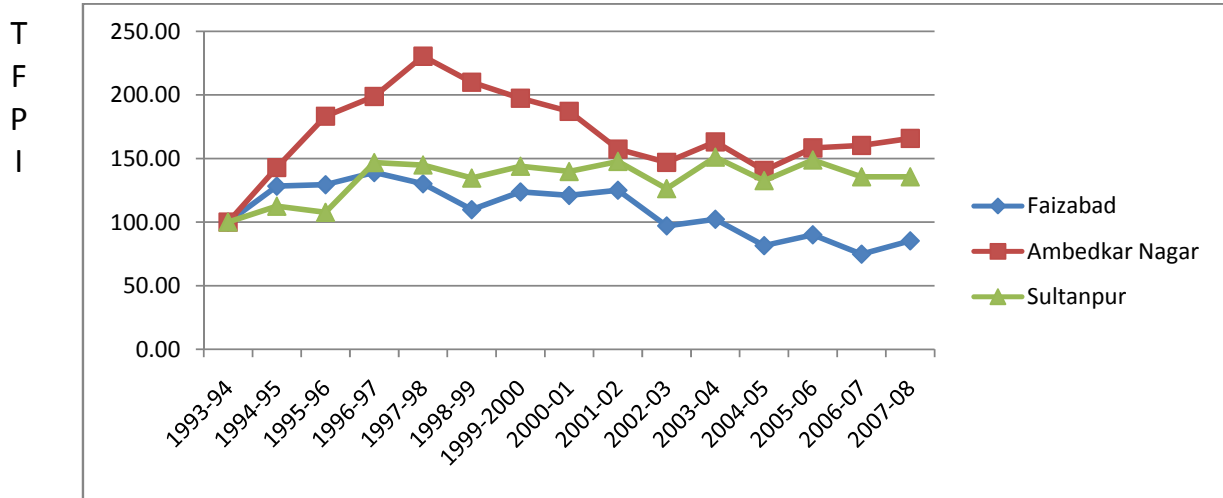


Figure (a)

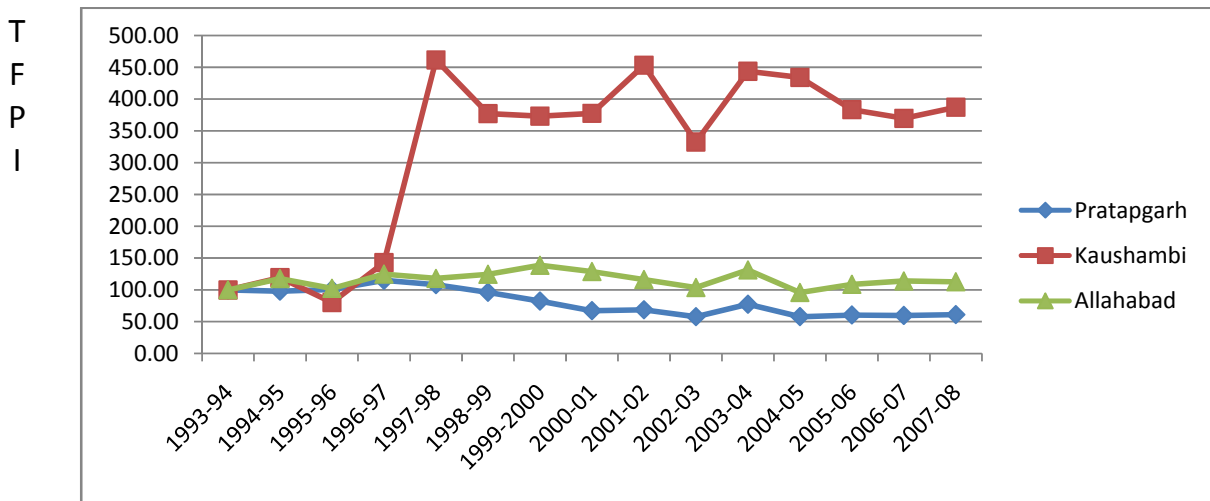


Figure (b)

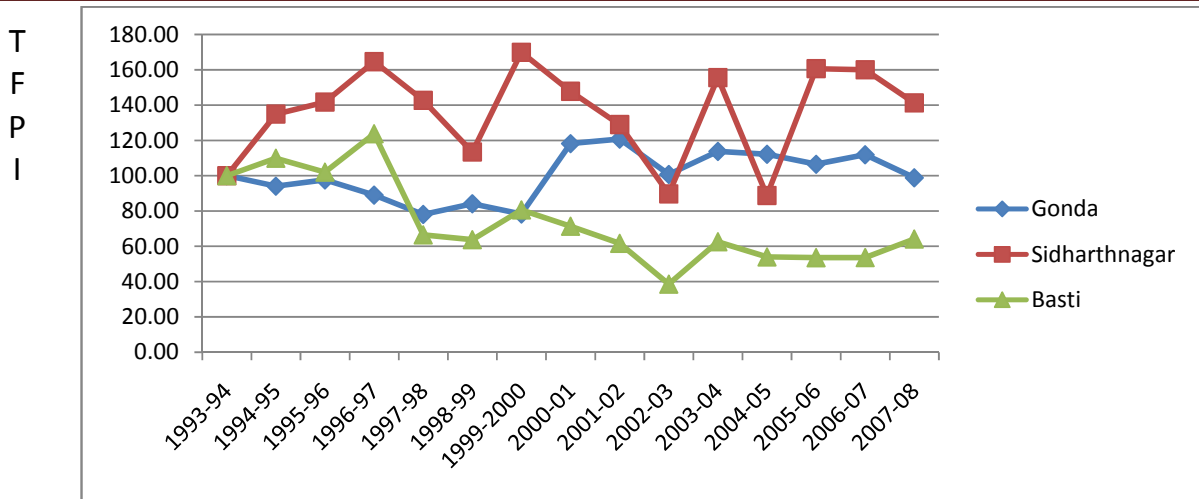


Figure (c)

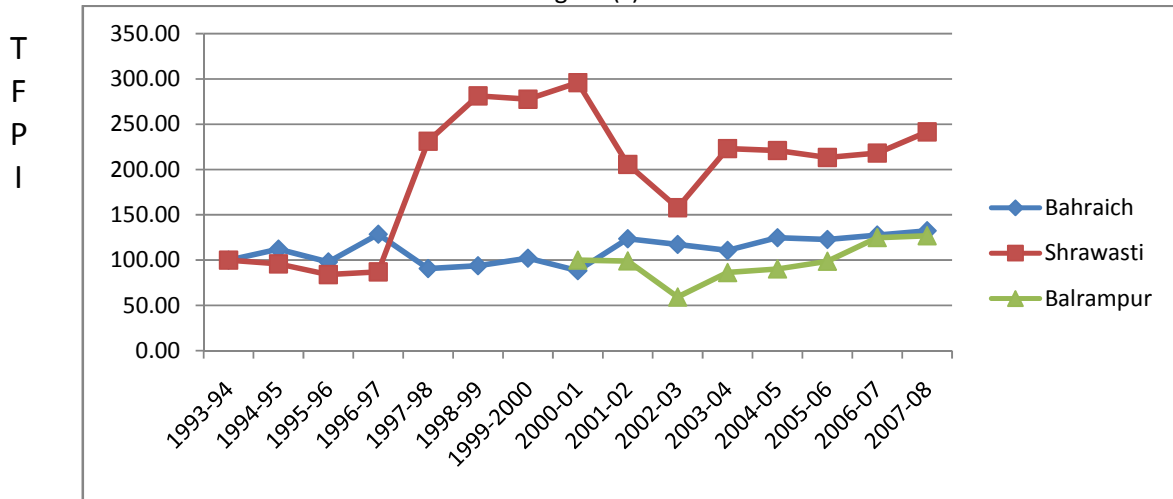


Figure (d)

The level comparisons among these districts over the period of study in figure (e) show that on an average TFP levels have been the highest in Gorakhpur. In figure (f) to figure (i), an average TFP levels have been the highest in Kushi Nagar, Ballia, Varanasi, and Sant Ravidas Nagar respectively.

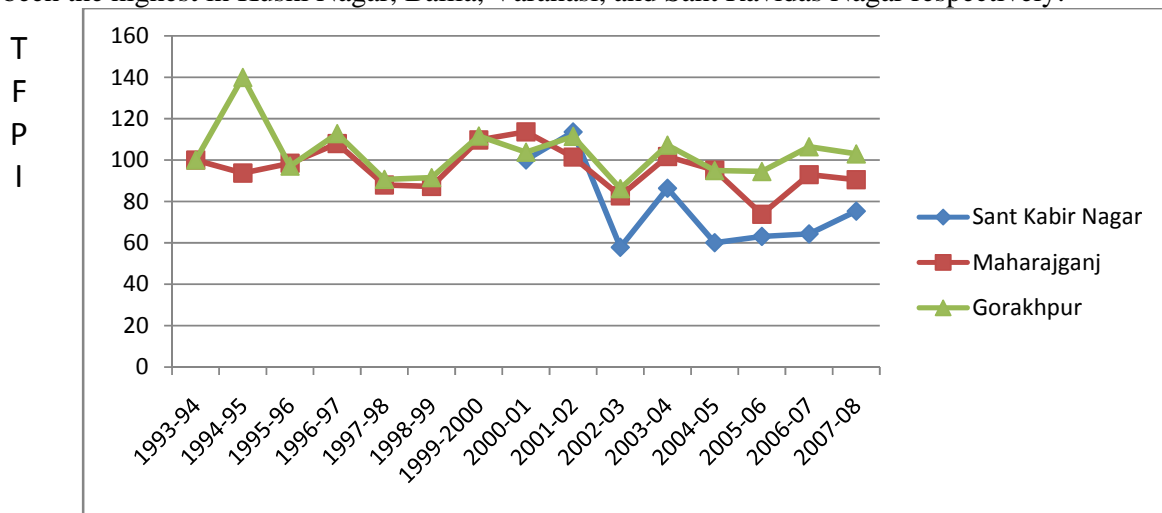


Figure (e)

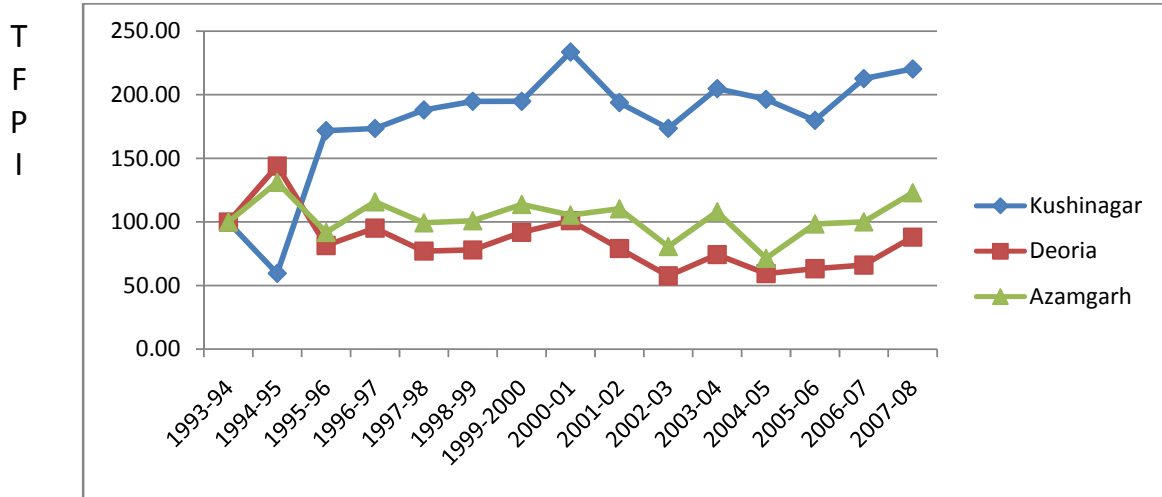


Figure (f)

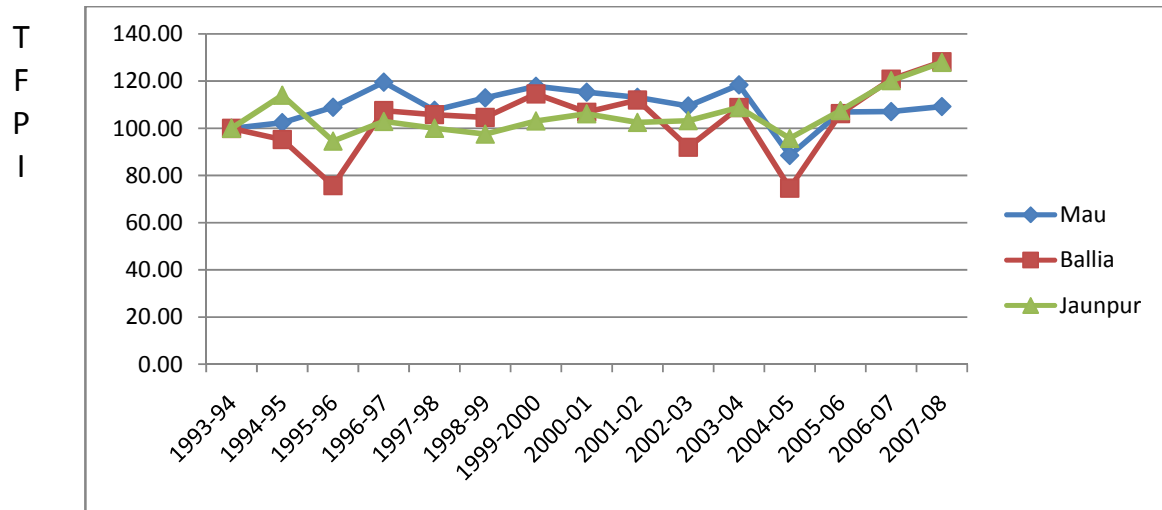


Figure (g)

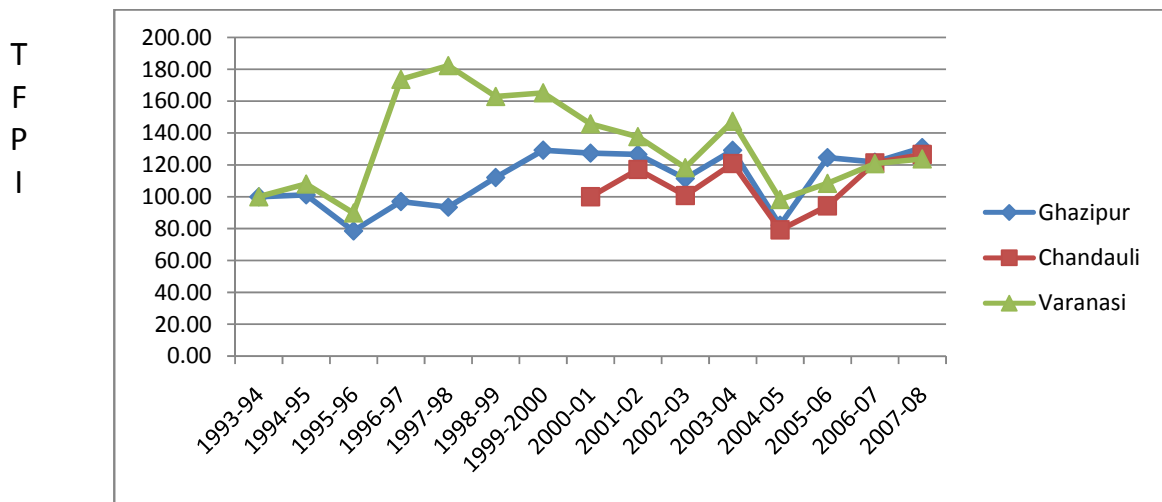


Figure (h)

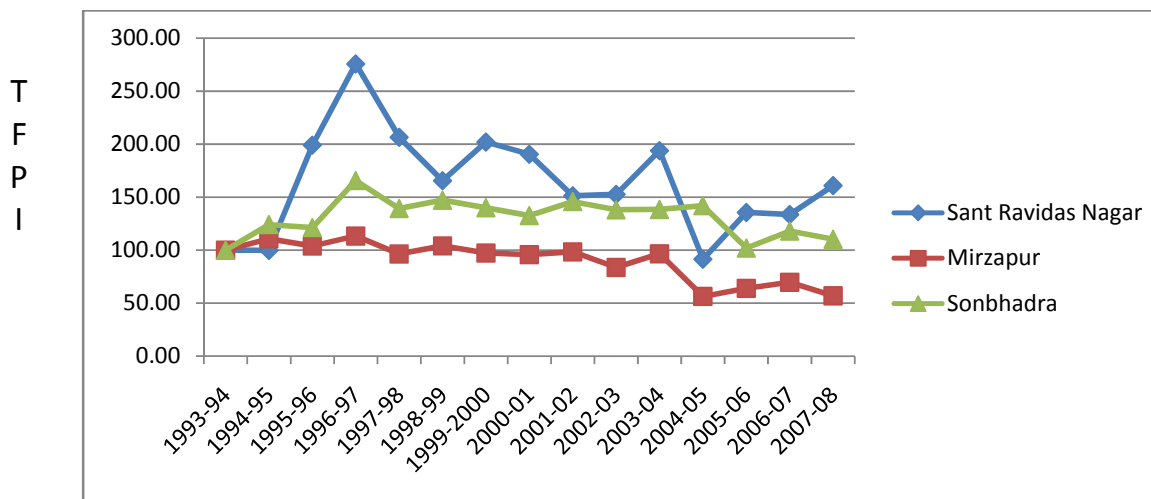


Figure (i)

The compound annual growth rates of total factor productivity (TFP) in Eastern 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 3. It is observed from these results in table 3 shows that most of district in Eastern zone (U.P.), experienced a fall in TFP growth over the period from 1993-94 to 2007-08. During this period, the Kausambi district of Eastern zone of U.P. recorded the highest TFP growth performance of the order of 10.65 % per annum followed by Shrawasti, Kushi Nagar, Ghazipur and Bahraich in that order. The compound average growth rate of TFP in eastern zone (U.P.) has grown significantly at a level of 0.59% per annum during the entire period.

The comparison between TFP growth rate in eastern zone (U.P.) over the periods from 1993-94 to 1999-2000 and from 2000-01 to 2007-08 very clearly establishes that a sharp deceleration has taken place from 6.34% per annum in the first period to -0.78% per annum at the significance level. The results also indicate that the CAGR of TFP in the later period in comparison to the first period for foodgrain crops shows a sharp deceleration.

Table 3: District-wise CAGR in Output, Input and TFP for Foodgrain in Eastern Zone (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	Pratapgarh	1.86	-0.42	0.77	3.87	1.40	5.90	-1.93	-1.79	-4.84
2	Allahabad	2.46	0.61	1.10	-1.95	2.06	1.23	4.50	-1.42	-0.12
3	Bahraich	3.89	-1.60	2.05	5.28	-5.34	0.24	-1.32	3.95	1.80
4	Gonda	4.20	-1.09	1.38	8.70	0.67	-0.15	-4.14	-1.75	1.53
5	Faizabad	1.02	0.82	1.07	-0.18	7.60	4.47	1.20	-6.30	-3.25
6	Ambedkar Nagar	0.49	1.89	0.52	-9.84	2.72	0.47	11.46	-0.81	0.05
7	Sultanpur	5.47	0.46	2.31	-0.91	0.80	0.68	6.44	-0.33	1.61
8	Sidharthnagar	5.86	1.49	1.67	1.23	-0.84	1.27	4.57	2.35	0.40
9	Maharajganj	1.69	-1.66	0.18	1.61	1.24	1.06	0.08	-2.87	-0.87
10	Basti	3.36	-1.24	0.41	11.66	-0.52	6.09	-7.43	-0.72	-5.35
11	Gorakhpur	1.71	1.32	1.09	3.87	1.48	1.77	-2.08	-0.16	-0.67

12	Kushinagar	18.33	0.09	5.26	0.90	-0.05	0.16	17.27	0.14	5.09
13	Deoria	1.13	-0.66	0.36	6.83	1.48	3.85	-5.33	-2.11	-3.36
14	Mau	3.03	-0.38	1.02	0.57	0.83	1.10	2.44	-1.20	-0.08
15	Azamgarh	3.15	0.26	0.39	3.36	-0.65	1.10	-0.20	0.92	-0.70
16	Jaunpur	1.31	-1.14	0.06	1.90	-3.58	-0.92	-0.59	2.53	0.99
17	Ballia	2.08	-0.77	-0.22	-1.25	-2.77	-1.36	3.38	2.06	1.15
18	Sant Ravidas Nagar	13.24	-3.53	1.11	1.16	-0.14	1.79	11.94	-3.40	-0.67
19	Varanasi	2.38	-3.05	-1.23	-8.14	-0.16	-1.01	11.46	-2.90	-0.23
20	Ghazipur	1.25	1.49	1.18	-2.82	1.65	-0.81	4.19	-0.15	2.01
21	Mirzapur	2.00	-5.11	-1.65	3.02	2.78	2.78	-1.00	-7.68	-4.31
22	Sonbhadra	5.01	4.82	4.31	-0.43	8.93	4.75	5.47	-3.77	-0.43
23	Kaushambi	15.15	-0.29	6.37	-13.48	0.23	-3.87	33.08	-0.52	10.65
24	Shrawasti	10.88	-2.67	3.91	-11.23	-2.40	-2.53	24.91	-0.28	6.61
25	Balrampur		4.24			-1.08			5.38	
26	Sant Kabir Nagar		-1.04			4.94			-5.70	
27	Chandauli		-0.52			-1.93			1.44	
	E.Zone	3.60	-0.30	1.36	0.76	0.80	1.42	6.34	-0.78	0.59

Table 4 shows that the comparison between TFP growth rate in U.P. over the periods from 1993-94 to 1999-2000 and from 2000-01 to 2007-08 very clearly establishes that a sharp deceleration has taken place from 4.72% per annum in the first period to -1.30% per annum at the significance level. 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 4: District-wise CAGR in Output, Input and TFP for Foodgrain in Uttar Pradesh (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.	E.Zone	3.60	-0.30	1.36	0.76	0.80	1.42	6.34	-0.78	0.59
2.	U.P.	4.09	-0.57	1.13	2.51	0.66	1.72	4.72	-1.30	0.26

The district-wise results make clear that CAGR of Agricultural output for foodgrain crops in Eastern 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 in case of seven districts. It is also observed from these results that all districts except Gonda, Faizabad, Deoria, Sant Ravidas Nagar, Ghazipur and Mirzapur experienced a rise in output growth rate of food grains over the study period 1990-91 to 2007-08. But the CAGR of output of foodgrain crops varied across the state.

The comparison between TFP growth rate in U.P. over the periods from 1993-94 to 1999-2000 and from 2000-01 to 2007-08 very clearly establishes that a sharp deceleration has taken place from 4.72% per annum in the first period to -1.30% per annum at the significance level. 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.

To sum up the result of this study lead to the conclusion that It raises serious doubts about the sustainability of state's agricultural performance 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 Uttar Pradesh, it seems proper to evolve a sound strategy to raise the productivity of agriculture in different districts and regions of Uttar Pradesh, especially in low productive regions. For this the following suggestions for raising the productivity may be recommended.

- ❖ The density of population is very high leading to low land man ratio. For this, step should be taken to divert the population from agriculture sector to secondary and Service sectors.
- ❖ The measures of land reforms should be strictly observed in all the districts and surplus land should be expeditiously distributed among land less persons.
- ❖ Priority must be given to check the floods & water logging and soil erosion hazards.
- ❖ Ground water development programmes with modern methods in areas of water scarcity.
- ❖ Arrangements must be made to ensure the regular water by canals.
- ❖ The infra structural facilities i.e. road, electrified villages, banking system, transport etc. are also very poor in the Eastern Zone of Uttar Pradesh. Therefore, development of Infra structural facilities should be development at fast pace in these districts.
- ❖ The rural credit facilities at more liberal rates and in great amount should be made available to the farmers.
- ❖ Soil and water conservation programmes is to be needed.
- ❖ Regulated markets may be strengthened so that the farmers are able to obtain remunerative prices for their produce.
- ❖ Cooperative societies should be strengthened so that they are better to supply credit & other agricultural inputs to the farmers to market their produce.

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