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Performance of Agricultural Sector in Varanasi and Mirzapur Divisions of 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 seven districts of two divisions of U.P. was assessed. Seven districts were selected for the present study. Findings indicated that four 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

The role of agriculture in the Indian Economy is very important. It is the backbone of Indian economy without the development of agriculture, economic development can not move very far.[1] Development economists and planners in India in the 1960s and 1970s, when considering the agricultural sector, were primarily Concerned with the constraining real effects of a low rate of agricultural output expansion on industrial growth via the wage goods availability route.[2] In the mid-1960s, India faced a severe situation on the agricultural front, with successive drought, a foreign exchange crisis and mounting inflationary pressure. The need to accelerate agricultural output became compelling. The strategy of agricultural growth, followed earlier, which relied upon extensive growth of cropped area and on raising through irrigation and mainly the traditional means, seemed to have reached a limit.[3]

Objectives of the Study

1. To measure the district-wise total factor productivity (TFP) for foodgrain crops in seven districts of two divisions 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 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. 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.

Tornqvist index is exact for homogenous translog production function. The Fisher index is geometric mean of Laspeyre’s and Paasche indices. This index is exact for the quadratic production function, which is flexible. The homogenous translog production function also provides a second order approximation to an arbitrary twice differentiable

homogenous production function. In contrast to the assumption of perfect substitutability in case of linear function, the Translog function does not require inputs to be perfect substitutes. Keeping in view the advantage of Tornqvist Divisia index, it was recommended for use in analysing most production situation.

Wanglian and Hallam (1986) made an original attempt towards finding ways to estimate total factor productivity change on individual crops, especially when certain input quantities, cost and profit data were unavailable.

Dholakia and Dholakia (1993) studied the sources of growth of Indian agriculture for three time periods : the pre-green revolution period (1950-51 to 1966-67), initial phase of the green revolution (1967-68 to 1980-81) and the modernization phase (1981 onwards). It also estimated the contribution of adverse weather conditions and intensity of resource use to total factor productivity growth. It was found that TFPG has contributed significantly to the acceleration of agricultural growth facilitating release of scarce resources from agriculture to other sectors in the economy. Thus, TFPG in agriculture has been the prime driving force behind the acceleration of overall growth in the Indian economy achieved during the eighties. The main determinant of TFPG has been found to be use of modern inputs like fertilizer, HYV seeds and irrigation.

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.

Kiani et al. (2008) measured total factor productivity in the crops sub-sector of Pakistan's Punjab and analyzed the relationship between productivity and agricultural research expenditures during 1970-2004. The Tornqvist-Theil index approach is applied for the measurement of TFP using outputs and inputs for 24 fields and horticulture crops. Almon distributed lag model involving different lag length specifications were estimated taking TFP as a dependent variables. Besides research expenditures, the explanatory variables include factors such as road kilometer, numbers of tube wells, improved seeds distributed and numbers of tractors etc. The results indicated that agricultural research expenses, numbers of tractors, and tube wells have positive and significant impact on TFP in the crops sub-sector. Empirical evidence showed attractive marginal rates of return to investments in agricultural research in Punjab.

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. Above method has its own merits and demerits.

In the present paper due to limitation of data, we have used kendrick index for measuring the Total Factor Productivity (TFP) in agricultural sector. In this paper 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 seven districts of two divisions 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 paper covers 7 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 = {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 seven districts of two divisions 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 Seven Districts of two divisions of U.P.

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

The district-wise results make clear that CAGR of agricultural output for foodgrain crops in Mirzapur division 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. CAGR of agricultural output for foodgrain crops in Varanasi division 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 Varanasi district. 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 Varanasi and Mirzapur districts. But the CAGR of output of foodgrain crops varied. All the districts have so bad experienced over the entire period of study except Sant Ravidas Nagar.

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	Varanasi	-14.49	1.38	-8.75	-12.26	-1.95	-9.27	2.60	-3.29	-0.56
2	Ghazipur	-0.47	-0.90	-0.90	0.01	0.58	0.00	0.48	1.49	0.90
3	Jaunpur	-0.60	3.79	0.66	1.05	2.61	1.16	1.66	-1.14	0.50
4	Chandauli		3.03			2.50			-0.52	
5	Mirzapur	-0.11	-0.72	-1.17	3.97	-5.79	-1.22	4.08	-5.11	-0.05
6	Sonbhadra	1.38	-2.84	-0.96	8.76	-9.46	0.25	7.28	-6.81	1.23
7	Sant Ravidas Nagar	55.25	-0.08	20.26	74.98	-3.61	24.48	12.71	-3.53	3.51

Section II: Total Factor Productivity: District-wise Analysis of Seven Districts of Two Divisions of U.P.

The compound annual growth rates of total factor productivity (TFP) seven districts of two divisions of U.P. 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. During this period, Ghazipur 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 seven districts of Two Divisions (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	Varanasi	2.38	-3.05	-1.23	-8.14	-0.16	-1.01	11.46	-2.90	-0.23
2	Ghazipur	1.25	1.49	1.18	-2.82	1.65	-0.81	4.19	-0.15	2.01
3	Jaunpur	1.31	-1.14	0.06	1.90	-3.58	-0.92	-0.59	2.53	0.99
4	Chandauli		-0.52			-1.93			1.44	
5	Mirzapur	2.00	-5.11	-1.65	3.02	2.78	2.78	-1.00	-7.68	-4.31
6	Sonbhadra	5.01	4.82	4.31	-0.43	8.93	4.75	5.47	-3.77	-0.43
7	Sant Ravidas Nagar	13.24	-3.53	1.11	1.16	-0.14	1.79	11.94	-3.40	-0.67

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 Varanasi, Mirzapur, Sonbhadra and Sant Ravidas Nagar districts of two divisions of U.P., especially in low productive regions. For this the following suggestions for raising the productivity may be recommended.

1. The infra structural facilities i.e. road, electrified villages, banking system, transport etc. are also very poor in the state. But the situation is more distressing in Varanasi, Mirzapur, Sonbhadra and Sant Ravidas Nagar districts of Uttar Pradesh. Therefore, development of Infra structural facilities should be development at fast pace in these districts.
2. Farmers should adopt multiple farming and crop rotation.
3. The measures of land reforms should be strictly observed in all the districts and surplus land should be expeditiously distributed among land less persons.
4. Priority must be given to check the floods & water logging and soil erosion hazards.
5. Arrangements must be made to ensure the regular water by canals.
6. The highest priority in all the districts should be given to the promotion of cropping Intensity.
7. The rural credit facilities at more liberal rates and in great amount should be made available to the farmers.
8. Good quality of manure and fertilizer.

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Footnotes

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