

Performance of Agricultural Sector in Faizabad and Allahabad Divisions of U.P. since 1993 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 eight districts of two divisions of U.P. was assessed. Eight 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 term 'agriculture' literally means the science and practices of the cultivation of the soil including the raising of live stock. In economic jargon, the word includes the production and distribution of goods of agriculture origin for consumption by the population at large, domestic or foreign. In this respect it is a complex sector encompassing many products. The understanding of the contribution of agriculture to economy and of their relationship with the growth process of economy is of special significance for setting goals of agriculture development for a region and for designing a strategy for agriculture development.

Agricultural development means higher level of food and other farm products, higher income and better standard of living for the farm families.¹ 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.² The contribution of agricultural sector in economic development can be viewed in term of food supplies, agricultural exports, transfer of labour force, additional capital –formation, additional purchasing power as a result of an increasing income, demand for industrial output, savings for development of the other sectors, etc.³

Objectives of the Study

1. To measure the district-wise total factor productivity (TFP) for foodgrain crops in eight 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 recognized that partial productivity measure, such as output per unit of individual inputs, is of limited use as indicator 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. Bhattacharya (1992)⁴ formulated a geometric index model to estimate quantitatively the impact of technological advancement in agriculture, and to analyse



Rajeev Sirohi

Associate Professor,
Deptt.of Economics,
D.A.V. (PG) College, Bulandshahr

the regional differences of such changes in Uttar Pradesh, India, using data collected over two time periods: 1950-51 to 1965-66 and 1987-88. Since a geometric index model was considered, technological change was estimated by the ratio of the output index and the input index. The study concluded that the areas benefited from new technology were those where water supplies were assured. Suitable varieties of high-yielding crops were, until recently, not available rain-fed conditions this development was welcoming step.

Tuteja (1992)⁵ examined the changes in factor proportion in wheat and rice farms in the Indian Punjab and Haryana. The role of price and technological change in terms of capital-output level was measured and the impact of technical change on factor proportions was analysed via capital-labour ratio, capital-land ratio and land-labour ratio. The capital-labour ratio had increased from 2.26 to 4.26 over the period 1970-71 to 1984-85. Generally, the capital-labour ratio was lower on rice than wheat farms. The capital-land ratio had risen with the changing level of technology. On wheat farms in the Indian Punjab, this ratio rose from 1.25 to 1.98 between 1970-71 and 1984-85. In Haryana, it rose from 2 to 2.67 over this period. The land-labour ratio also tended to rise with technological change. The land-labour ratios on wheat farms in the Indian Punjab and Haryana showed increase of 18.78 % and 11.25 %, respectively, over this period. The price parity indices were found to be favourable for land and wages and unfavourable for capital and output. This did not, however, pose a threat to the technological change due to the yield increasing impact of modern inputs. The policy implication is that investment in agricultural research, extension and irrigation could be more effective than manipulating input-output prices.

Fan (1997)⁶ measured the growth in TFP in Chinese agriculture, using newly estimated production and productivity growth indices. He observed that earlier studies over estimate the impact of rural reforms on the growth of production and productivity. Both production and productivity grew at a respectable rate during the reform period. The study also found that in order to promote the long term growth, which was much needed to feed the Chinese population in the future. It was imperative for the government to increase investment in agriculture as the effects of recent institutional changes has been exhausted.

Aiyar et al. (2004)⁷ 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 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. 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 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 paper, TFP is measured for foodgrain crop sector in eight 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 8 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:

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

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 eight 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 Eight Districts of two divisions of U.P.

Table 1: District-wise CAGR in Area, Production and Yield for Food-grain (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	Faizabad	-8.49	-4.39	-6.83	-7.19	-3.61	-5.68	1.42	0.82	1.24
2	Ambedkar Nagar		-0.45			1.44			1.89	
3	Sultanpur	-0.29	0.06	-0.83	3.24	0.52	1.50	3.54	0.46	2.35
4	Bara Banki	-2.87	5.03	-0.39	-0.31	3.83	1.44	2.63	-1.14	1.84
5	Allahabad	-3.37	-0.66	-2.68	-1.26	-0.06	-1.42	2.19	0.61	1.30
6	Fatehpur	-1.09	0.79	-1.41	0.83	0.85	0.17	1.94	0.06	1.60
7	Kaushambi	35.06	0.12	19.69	48.51	-0.17	27.37	9.96	-0.29	6.42
8	Pratapgarh	-0.37	-0.16	-0.97	1.97	-0.58	0.24	2.35	-0.42	1.22

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

The compound annual growth rates of total factor productivity (TFP) eight 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

Table 2: District-wise CAGR in Output, Input and TFP for Foodgrain in eight 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	Faizabad	1.02	0.82	1.07	-0.18	7.60	4.47	1.20	-6.30	-3.25
2	Ambedkar Nagar	0.49	1.89	0.52	-9.84	2.72	0.47	11.46	-0.81	0.05
3	Sultanpur	5.47	0.46	2.31	-0.91	0.80	0.68	6.44	-0.33	1.61
4	Bara Banki	2.90	-1.14	1.54	5.86	-3.53	0.97	-2.80	2.48	0.57
5	Allahabad	2.46	0.61	1.10	-1.95	2.06	1.23	4.50	-1.42	-0.12
6	Fatehpur	3.04	0.06	1.62	-1.27	-0.19	2.53	4.37	0.25	-0.88
7	Kaushambi	15.15	-0.29	6.37	-13.48	0.23	-3.87	33.08	-0.52	10.65
8	Pratapgarh	1.86	-0.42	0.77	3.87	1.40	5.90	-1.93	-1.79	-4.84

The results of estimation of CAGR of area, output and yield in respect of food-grains of districts eight districts of two divisions of 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 Table1.

The results of estimation of CAGR of area, production and yield in respect of food-grains of eight districts of two divisions of U.P. in Table 1.

The district-wise results make clear that CAGR of agricultural output for food-grain crops in Faizabad 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 Sultanpur. CAGR of agricultural output for food-grain crops in Allahabad 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 except Fatehpur district. It is also observed from these results that all districts experienced a rise in output growth rate of food-grains over the study period 1990-91 to 2007-08 except Faizabad and Allahabad districts. But the CAGR of output of food-grain crops varied. All the districts have so good experienced over the entire period of study.

is observed from these results in table 2 that Four district, experienced a rise in TFP growth over the period from 1993-94 to 2007-08. During this period, Kaushambi 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.

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 Faizabad, Allahabad, Fatehpur and Pratapgarh 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 Faizabad, Allahabad, Fatehpur and Pratapgarh districts of two divisions of U.P., Therefore, development of Infra structural facilities should be development at fast pace in these districts.
2. The measures of land reforms should be strictly observed in all the districts and surplus land should be expeditiously distributed among land less persons.
3. Priority must be given to check the floods & water logging and soil erosion hazards.
4. Ground water development programs with modern methods in areas of water scarcity.
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. Soil and water conservation programs are to be needed.
9. Government should be give low rate of interest loan to farmers.

References

1. Abraham, J. P. and S. K. Raheja, "An Analysis Growth of Production of Rice and Wheat Crops in India", *Indian Journal of Agricultural Economics*, Vol. 22, No. 3, 1967, pp.1-15.
2. Ahmad, Munir, (2001), "Agricultural Productivity Growth Differential in Punjab, Pakistan: A District-Level Analysis", *The Pakistan Development Review*, 40:1, Pp. 1-25.
3. Bramhananda, P. R. (1982). "Productivity in the Indian Economy". Himalaya Publishing House, Bombay.
4. Braradwaj, Krishan, 'Agriculture Price Policy for Growth : The Emerging Contradictions', Terence J. Byres, *The state Development Planning and Liberalisation in India*, Oxford University Press, New Delhi, 1998. P.198.
5. Clark, Colin and Margaret Haswell, *The Economics of Subsistence Agriculture*, Fourth

Edition, MacMillan, Martin's Press, 1970, pp. 215-239.

6. *Census Report 2001, Government of India.*
7. Dhawan, B. D., *Role of Irrigation in Raising Intensity of Cropping*, *Journal of Indian school of political economy*, vol. 3, No. 4, Oct- Dec., 1991.
8. Fan, S. and P. Pardey (June 1997). "Research, Productivity, and Output Growth in Chinese Agriculture." *Journal of Development Economics*. Vol. (53), pp. 115-137.
9. Johnston, Bruce F. and J. W. Mellor, 'The Role of Agriculture and Economic Development', *American Economic Review*, Vol. 41, No. 4, Sept. 1961, pp. 566-93.
10. Jones, E. L., *Agriculture and The Industrial Revolution*, Basil Blackwell, Oxford, 1974.
11. Kiani, A. K., M. Iqbal and T. Javed (2008) , " Total Factor Productivity and Agricultural Research Relationship : Evidence from crops sub-sector of Pakistan's Punjab ", *European Journal of Scientific Research* , Vol. 23 , No. 1 , pp. 87-97.
12. *Statistical Abstract U.P, 2009, Economics and Statistics Division, State Planning Institute, U.P. Lucknow.*
13. Shetty, S. A. "Agricultural Production Trends and Components" *Indinal Journal of Agricultural Economics*, Vol. 25, No. 2, 1970, pp. 28-46.
14. Shujie Yao and Zinon Liu. "Determinants of Grain Production and Technical Efficiency in China." *Journal of Agriculture Economics*, Vol. 49, No. 2, pp. 171-184.

Footnotes

1. Lauren, K. Soth, Rinehart Holt and Winston, *Agriculture In An Industrial society*, INC New York, 1966.
2. Winters, paul, Alain de Janvry, Elisabeth Sadoulet and Kostas Stamoulis "The Role of Agriculture In Economic Development :Visible and Invisible Surplus Transfers ", *The journal of Economic Development Studies*, Vol.34, No. 5, June 1998 pp. 71-97.
3. Bhattacharya, S. B. (1992). "Technical Change in Agriculture in Uttar Pradesh (INDIA) – An Interregional Analysis." *Indian Journal of Economics*, Vol. 72, No. 3, pp. 363-369.
4. Tuteja, U. (1992), "Role of Prices and Technology in Changing Factor proportions: A Case Study of Wheat and Paddy Farms in Punjab and Haryana." *Agricultural Situation in India*, Vol. 47, No. 3, pp.201-203.
5. Fan, S., "Production and productivity growth in Chinese agriculture: new measurement and evidence", *China and the world food economy*. Vol. (22), No. (3), July 1997, pp. 213-228.
6. Aiyar, S. and Carl-John Dalgaard (2004), "Total Factor Productivity Revisited : A Dual Approach to Development Accounting " , *Economic Policy Research Unit, University of Copenhagen, Denmark.*