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ON

LONG-TERM PROSPECTS OF AGRICULTURAL GROWTH VIEWED IN THE LIGHT OF SOIL-CLIMATIC, TECHNOLOGICAL AND INSTITUTIONAL CONSTRAINTS, AND COSTS INVOLVED IN THEIR REMOVAL

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Twenty papers have been accepted for discussion on this topic at the Conference. They may be broadly classified under the following groups: (*i*) Studies on growth trends and (*ii*) Studies on determinants of growth. There are five papers in the first group and fifteen in the second group.

I

STUDIES ON GROWTH TRENDS

Studies on growth trends of area, productivity, production and input use in specific crops, for groups of crops such as foodgrains, oilseeds, fibres and for the overall agricultural production are attempted to show the likely crop pattern in the future and its implications. P. K. Joshi and T. Haque, M. S. Bhatia, and K. Sain study the trend at the all-India level. Joshi and Haque assess the scope for balanced agricultural growth in India. By analysing the compound growth rates in aggregate agricultural output and input use they conclude that the inter-regional disparities in agricultural productivity would continue through 1990 and 2000 A.D. But with the basic assumption that the past trends would continue into the future, implied in any trend analysis, the result seems to be obvious. In fact, the consequences of the continuing disparity are more important than their persistence or causes thereof. Since the disparity in growth rates is, for a large part, due to regional differences in agro-climatic conditions and in resource endowments, particularly soil fertility and water supply, the disparity in growth rates is inevitable. Then, the more crucial question is to what extent it is tolerable and to what extent it can be removed by policy measures.

In their analysis the choice of Punjab, which has shown remarkable progress, as the basis for comparison has resulted in wide disparity. All-India averages may be the more suitable basis for the purpose. Inclusion of credit as an explanatory variable in the production (output) function has its limitation. Credit is very important to increase production especially the aggregate production for a region, but its impact on output is really indirect. Credit is used to buy hybrid seeds, fertilizers, chemicals, irrigation water and even part of labour and without credit the appplication of these

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inputs is curtailed. But when most of these inputs are defined as explanatory variables and included in the production function, they explain a major part of variations in output and credit has a non-significant coefficient as shown by the results.

M. S. Bhatia studies the trends in production and productivity of major foodgrain crops for India as a whole and those of rice and wheat Statewise, with the help of analysis of their trends for two periods 1960-61 to 1978-79 and 1967-68 to 1978-79 and brings out the impact of high-yielding varieties (HYVs) introduced in 1965. To explain the growth in production and productivity of crops linear and Cobb-Douglas functions are fitted. The results show that irrigation, fertilizers and HYV seeds contribute to growth since 1967-68. The paper analyses, in depth, inter-regional differences in the growth of foodgrain production in India.

Anandamoy Sen fits exponential and Gompertz trends for production and productivity of wheat in Punjab and Uttar Pradesh and of rice in West Bengal and Kerala and tries to explain the difference between the trends by the differences in the trends in the use of fertilizer, irrigation and HYVs. The results indicate that the exponential fit is better for the two States Uttar Pradesh and West Bengal and Gompertz fit for the other two States and there is no reason to prefer one over the other. His final statement that dominance of agricultural labour might have limited the growth in agricultural production in the rice growing States is, however, not supported by his analysis.

H. K. Saxena estimates the compound growth rates of area, productivity and production of major crops in a progressive Kangra district and a backward Chamba district of Himachal Pradesh. The results show vast scope for the improvement of agricultural development in Chamba. But an important limitation of the study is lost sight of. Growth rates in the two districts are estimated on different basis and hence their simple comparison may conceal real differences. A backward district with a low base can show a high growth rate which may not be possible with an already developed district. So an objective comparison of the base period production levels in the two districts may contribute to better inferences. Their component analysis with the help of the Minhas-Vaidyanathan model shows contribution of area, yield, crop pattern and their interaction to growth. In Kangra district only the yield has contributed to growth positively and all other factors contribute negatively, whereas in Chamba district all the three factors, *viz.*, area, productivity and crop pattern and two interactions have added to growth. This probably explains the differences in the base period conditions of the two districts.

A. J. Singh, B. S. Bhuller and Nirmal Singh study growth trends in Punjab agriculture. Overall, for some major crops and for groups of crops such as oilseeds, foodgrains, etc., growth and stability in production are studied. A clear trend is for foodgrains to substitute for oilseeds and fibre. Therefore, the future of agriculture in Punjab depends on foodgrains. Linear, exponential and Gompertz trends are fitted and compared with the help of Kendall's Tau test, but no conclusion can be drawn regarding preference among them; all the fits are equally good.

Rajinder Singh and T. V. Moorti analyse the growth rates in area, productivity and production of principal crops of Kangra district and for a few groups of them. In all of them productivity has contributed to growth more than area. Few crops show decline in growth rates and require special attention. But the authors do not discuss future policies.

In sum, all the papers are descriptive and try to indicate future trends in crop pattern and use of inputs. But they fail to relate the results to the topic of the Conference, *viz.*, long-term prospects viewed in the light of constraints. Inherent weakness of the trend analysis arising from the assumption of past trends continuing into the future is not overcome by any innovative methods of analysis, even though all the papers use conventional trend analysis to estimate the growth rates. As no difference is observed regarding goodness of fit between linear, exponential and Gompertz trends, linear fits may be used for its simplicity of estimation.

II

STUDIES ON DETERMINANTS OF GROWTH

Papers grouped under this head focus their attention on several factors that contribute to the growth of agriculture. One paper studies the decision behaviour of farmers under conditions of risk and uncertainty. Another discusses dry farming. There are six papers on resource use, three on prices, one each on technology, rural electrification, small farms, rainfall, and Five-Year Plans.

I. J. Singh and K. N. Rai focus their attention on risk in dry farming. The standard linear programming and risk evaluation models are used to derive optimum farm plans. Analysis of rainfall characteristics and occurrence of droughts and income variability shows the importance of risk in dry farming. However, it is stated that in the absence of time-series data on cost of production of crops, the risk coefficients are derived from the gross returns. This is equivalent to the assumption that variation in cost is zero. But with the present day fluctuations in prices of inputs this assumption seems to be too strong. Moreover, the sample consists of 240 farms but programme results are shown for just six farms—three in each zone at the rate of one for each size-group. The method of selection of farms is not indicated, but it is crucial for the definition of crop activities and resource constraints. Probably, it must be a typical farm of the particular size-group. Furthermore, livestock activity is also included and the optimal plans are shown to include 2-3 buffaloes. But this involves integer programming or suitable definition of livestock activity. No such details are available in the paper. The suggestion to adopt graded technology in dry farms needs to be supported by a detailed discussion of income risk trade-off. In the absence of this the suggestion tends to be tautological.

Alfred S. J. Jacob gives interesting and voluminous data on dry farming, but mostly on agronomic details and does not discuss the economics of it.

The 'obstacles in the area of social organization' is emphasized but it has not been established by the facts of analysis. Similarly, S. K. Chakravorty gives an objective account of the problems of small farmers. But it is purely a descriptive account, devoid of any empirical analysis. A case study of tiny farms would have yielded more convincing results.

P. M. Sharma and B. S. Rathore define the use of rainfall as an independent variable in models for projecting agricultural growth and convincingly also. But their quadratic equation for crop area irrigated is highly significant and indicated a very strong relationship between rainfall and area irrigated. Yet they include both rainfall and area irrigated in the production function for agricultural output in the State. This will involve the problem of autocorrelation and the estimates lose their desirable properties. The model could have been validated by the estimates for the years in the recent past, say 1979 or 1980. In the absence of such validation its predictive power cannot be assessed.

Sain defines technological progress as a factor that causes larger output and less cost to yield extra benefit. But this definition as an all embracing factor finds no application in the discussion. Technological innovations such as fertilizers, pesticides, irrigation and HYVs of crops are studied individually for their growth rates and correlation with foodgrain production. But no attempt is made to study the impact of technology as a whole. Further, the correlation coefficients indicate just association and cannot be interpreted as regression coefficients. Comparison of the levels of use of inputs in the developed and other developing countries contributes little to the objectives of the paper.

Another study that deals with technology is by Sib Ranjan Misra. The study estimates output responses of tea to prices and variable cost which is considered to be a proxy for technology. The elasticity coefficients are all significant, suggesting price policy and innovation of new technology to be powerful tools for production increases in tea. But his discussion on employment of labour is not related to the analysis.

Madan Mohan Batra uses few different models to study agricultural supply response, but the need for alternate specifications is not discussed. Most of the coefficients are not significant. Output varying with area planted significantly, is a trivial result. Other significant variables are fertilizer application and lagged price in a few equations. But a negative and significant coefficient for rainfall in most of the seasons and non-significance of coefficients of irrigated area are unexpected results. In general, the results show the dominance of the variable 'area' in all the models. Conclusions are not discernible from the analysis.

K. Kalirajan shows that the location specific research shifts paddy production function neutrally upward over that for exotic varieties. Limitations of the small sample are recognized and the results are shown to be just indicative of the benefits of location specific research.

Among those studying resource use, J. P. Bhati and R. Swarup describe the economy of Himachal Pradesh to point out the static conditions in respect

of pattern of land use and crop pattern and slow spread of technology. They plead for an integrated approach in development strategy to interrelate climate, man and food and for development without destruction of ecological balance. But they state neither the reason for the approach nor the ways and means of achieving it.

G. D. Diwakar discusses the economic constraints in the efficient use of tubewell in Rajasthan. He estimates minimum and maximum areas of command for 7.5 H.P. tubewell as 4.38 hectares and 20.77 hectares. This definition of the rational size of area for operation of tubewell is not disputed, but the suggestion to install tubewells on co-operative basis is not based on the results of his analysis. Another study on use of water is by C. P. Sinha *et al.* They discuss the need for optimization of crop-mix in the selected area to make the best use of the available water. A fixed yield (coefficient) linear programming model is used. The results show three optimal crop-mixes and the third model is advocated for adoption by the administrators. But the implications of the model for the policy and its limitations arising from simplifying assumptions of the normative approach are not discussed. The criteria to choose the three specific results out of several computer run are not stated.

M. L. Jhala analyses the changes in prices of edible oils, particularly groundnut in India, over the years 1958-59 to 1977-78. The good fit of the price function and the farm harvest price equation have explained temporal variations in groundnut oil prices—wholesale and farm harvest prices. The implications of the results require some more detailed discussion. The conclusions are mostly unrelated to the results of analysis and therefore appear to be overdrawn.

K. C. Talukdar studies the impact of Indian Five-Year Plans on agricultural growth in Assam, with the help of the decomposition model. The interpretation of each of the components identified in the decomposition model will help the reader to follow the discussion more closely. This is missing. Moreover, the significance of interaction terms both between Plans and years and between districts and Plans point to the problem in isolating the impact of Plan efforts from general trends, but this problem is overlooked. Nevertheless, the effort to show the relative contribution of various factors is informative and elaborate.

The problem of energy is discussed only by V. Nath. He presents a case study of a rural electrification project. On the basis of an economic rate of return estimated at 19.33 per cent, he recommends taking up many more such projects. While he discusses the viability of the project, its contribution to growth, the problems in extending this project to other areas and policy supports necessary for such extension are not discussed.

In general, important problems listed for study have not evoked the interest they should have. It is surprising that energy crisis has not received the attention of the agricultural economist. Only Nath deals with the problem but his micro level study on rural electrification has very limited application. Optimization of enterprise mix is again attempted only by Sinha *et al.* but they do not discuss the policy implications. Similarly, there are a few

contributors on technology and research. Sectoral linkages of agriculture have been out of consideration completely. In sum, the last part of the title of the subject, *viz.*, institutional constraints and costs involved in their removal, has been completely lost sight of. Except for the studies on trend analysis, most of the studies have limited scope, and problem solving approach and estimation of pay-off for alternative approaches are not attempted by many.

III

ISSUES FOR DISCUSSION

The papers reviewed in this report lead to the formulation of following issues for discussion in the Conference:

(*a*) How to optimize crop pattern in the country in the future ?

(*b*) What strategies will help in achieving optimum crop-mix in the context of national goals, regional disparities and growing scarcity of land, water and energy resources ?

(*c*) How to account for risk in farm income in formulating strategies for future growth in agriculture ?

(*d*) How can we make use of studies in growth trends for policy decisions?

(*e*) How important is the location specific research in removing constraints for agricultural growth ?