WHAT NEXT IN INDIAN AGRICULTURAL STATISTICS ?*

BY

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I would like to thank the Indian Society of Agricultural Statistics for inviting me for this, the third time, to address its Annual Conference.

The first time I did so was in 1959, when I spoke on '*Statistical Priorities for Agricultural Planning*.'

The second time I addressed the Conference was in 1967, when my theme was '*Growth and Instability in Indian Agriculture*.'

This time the theme that I have chosen is '*What Next in Indian Agricultural Statistics ?*'

RETROSPECT

Four decades ago, the agonising experience of the Bengal Famine, made the Government and the people of India wake up to the importance of sound agricultural statistics in its macro as well as micro aspects.

In the absence of reliable estimates and timely forecasts of area and production of the main crops, the formulation and implementation of policies and programmes for food production and distribution were virtually shots in the dark.

Without appropriate statistical designing and testing, most agrobiological research experiments were characterised by unknown and often large margins of error.

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The then Statistical Branch of the Indian Council of Agricultural Research, the Economics and Statistics Section of the Ministry of Agriculture in New Delhi and the Indian Statistical Institute in Calcutta took up the challenge under the inspiring leadership of three pioneers, P.V. Sukhatme, W.R. Natu and P.C. Mahalanobis.

There was remarkable progress, measured by any standard, during the following decade.

Sukhatme (together with Panse) developed objective crop cutting experiments on a sampling basis to replace the traditional subjective *Annawari* estimates of crop yields at the macro level and statistical methods to help designing and testing of agrobiological experiments at the micro level.

Natu worked untiringly to bring large unreporting areas of the country into the reporting fold, improve the quality of area statistics collected on a complete enumeration basis and replace the *annawari* method of yield estimates by the crop cutting sample survey method devised by Sukhatme.

Mahalanobis set up the largest sample survey organisation in the world for the collection of socio-economic data, one of the objectives of which was framing of crop estimates on the basis of sample survey of both area and yied.

I was fortunate enough to be close to all these three pioneers and recall the challenge and excitement, hopes and fears, of those early years with considerable wistfulness.

I had the privilege to carry forward the work begun by Natu (as his successor to the Office of Economic and Statistical Adviser), help bring to a conclusion the famous controversy between Sukhatme and Mahalanobis techniques for crop estimation (as Chairman of the Committee on Crop Estimates) and most recently conduct a constructive review of the world renowned Indian Statistical Institute set up by Mahalanobis (as Chairman of the Statutory Review Committee).

Thanks largely to the efforts of these three, statistics was one field in which the contributions of Indian scientists were among the best in the world.

The large scale recruitment of Indian statisticians, agricultural and others, not only in under-developed countries but also in UN

Agencies and in some of the developed countries like the USA that followed, is one proof, if any proof is needed, of this.

Another is that when Chou en Lai, the then Prime Minister of China, was told by me (as Member-Secretary of the Indian Agricultural Delegation to China) of my finding that the Chinese crop production data suffered from serious subjective bias, he promptly sent a team of three Chinese statistician to India to study the crop-cutting technique developed here.

PRESENT STATUS

Unfortunately, in recent years the tempo of statistical research has not kept pace with the growing needs and bulk of the Indian agricultural statisticians appear to be resting on their past laurels or refining known techniques instead of seeking new challenges to overcome.

Is it because there are not many new challenges to seek ?

Certainly not. Even a cursory comparison of the agriculture related statistics available and variety of research papers published in the developed countries with those in India will indicate the many deficiencies that we still have.

We may have more complete and more reliable estimates of area and yield available now than earlier for staple crops. But forecasts for even these crops continue to be as unsatisfactory and as delayed as ever.

The work done on crop-weather relationship for over two decades now has yet to yield any useful result or even to indicate a technical break through.

The oft-repeated suggestion that for every agro-climatic zone there should be identification of periods when rainfall is particularly erratic and of crops which can avoid these erratic periods has yet to be implemented.

Methodology for quick estimation of disaster losses has not been developed.

We have not yet been able to devise effective measures to safeguard our crop estimates from subjective bias induced by non scientific considerations, especially at the lower levels.

The margin of error in conventional allowances for seed, feed and wastage used for deriving estimates of net production from those of gross production has not yet been scientifically tested and reduced.

The well known discrepancies between data from alternative sources even for such a key item as irrigated area continue to be unresolved.

Data on response coefficients (or yardsticks) for agricultural inputs used for planning purposes are still rather crude and subject to large margins of error.

Statistics for animal products and fisheries as well as non-staple crops, vagetables, fruits, marketed surplus, stocks, agro-business and agro-industry continue to be very deficient.

There is a number of unresolved methodological problems relating to small scale diagnostic surveys as well as large scale estimational surveys in diverse fields which call for urgent attention of research workers.

New approaches to and techniques of planning and programming in the agricultural production and distribution field (including the development of regional planning models with provision for such information flow as would help implementation) need to be developed.

Estimation of long term supply and demand balances in the face of different degrees of uncertainty need special attention.

It is not constructive to say, as some colleagues often do, that the requisite basic data are missing.

In contrast with the forties, there is now a vast mass of data relating to area, production, input, output, costs, prices, rainfall, marketing, processing, credit, investment, employment, levels of living etc. collected through crop estimation surveys and cost of production studies of the Ministry of Agriculture, various research projects of the ICAR, National Sample Survey of the Department of Statistics and studies made by the IASRI, ISI, Agricultural Universities, Agro-economic Research Centres, State Departments of Statistics, Department of Meteorology and the Reserve Bank of India, which are lying largely unanalysed.

Some of these can be put to very useful analysis straightaway if there is the requisite will and imagination on the part of both the government and the research workers.

The deficiency of some others can be corrected, without undue expense or time, through small scale but carefully planned complementary surveys.

The Ministry of Agriculture is now making arrangements to release to the research workers most of these data including those on input-output relations.

The Scientific Panel of ICAR for Agricultural Economics, Statistics and Marketing has taken a policy decision to help finance computation of coefficients like elasticities of demand, supply, substitution, production functions, and other processing and analysis of secondary data by research workers, besides collection of primary data. It has also indicated priority areas for further research work which would be encouraged by financial grants from the ICAR.

I would request the participants in this Conference to bring these welcome decisions to the attention of all their friends and colleagues interested in statistical research.

SOME SUGGESTIONS

In this context, I may draw special attention to four very important but rather neglected areas of research related to agricultural statistics.

The first is the field of animal resources and products and fisheries which are of growing importance to our economy but the statistical information about which is not only very inadequate but almost primitive. As our per capita income increases these will assume progressively greater importance. The formulation of sound policies and plans for these will require collection of no less comprehensive, accurate and timely data than for crops. There is urgent need for both large scale use of known techniques and development of new techniques in these areas.

The second is the potential and need for large scale application of the techniques of cross section analysis to the massive data base that has already become available from various on-going country wide and state-wide surveys.

We should now go beyond averages and frequency distributions of an overall character and analyse in depth the comparisons and contrasts between the experiences of different relatively homogeneous zones, in which the country can be sub-divided from an agro-economic stand point, after suitable dis-aggregation of these massive data.

As the economy develops, it becomes more complex and there is greater need for such studies in comparisons and contrasts, linkages and constraints for the purpose of policy formulation and planning.

The third is the application of modern statistical techniques like pattern recognition and probabilistic graph theory to the large volume of both time series and cross-section data that has now become available regarding weather, crop yields, price movements, stock exchanges, market arrivals, etc., as this is also likely to be of considerable use to the policy makers. Wherever statistical pattern recognition becomes feasible, it helps considerably in forecasting.

The fourth is the statistical aspects of decision 'aiding' and decision 'making' exercises at different levels from the farm up to the state.

Since the ultimate objective of most agricultural statistics is to help in sound decision making, I may parhaps spend a few more minutes on this last items.

Decisions for agriculture are made at various levels—farm, agrobusiness and state.

All decisions involve, implicitly or explicitly, four basic steps *viz.* :

(*i*) definitions of objective,

(*ii*) identification of possible choices,

(*iii*) collection and analysis of relevant information, both quantitative and qualitative and

(*iv*) drawing appropriate inferences.

Statistics has a particularly an important role to play in the third and fourth steps. Quantitative imformation is, of course, the conventional domain of statistics and many of the measures suggested earlier will greatly help in this regard.

To the extent that 'scaling' and other statistical techniques can be used to categorise and possibly ascribe relative scales, if not, weights, to various types of qualitative (or non-quantifiable) information, it should be also of some help.

Even then, with the foreseeable improvement in our agricultural statistics and the present state of methodology in realm of decision making, it will be more realistic on the part of our statisticians to think more in terms of decision 'aiding' rather than decision 'making', at least in the near future.

A very important role that the agricultural statisticians and agricultural economists, working together, can play is to spell out carefully what kind of basic information needs to be looked into and developed at different levels and for different types of decisions, how it should be collected, processed and presented, how it can be best utilised by the relevant decision makers and what kind of research and extension facilities need to be provided to achieve the optimum results, initially in the short run and subsequently in the long run.

At the same time, they should take special care that at each level of decision making, the information to be considered is the most relevant, really strategic and the minimum needed.

If the variety and complexity of information provided are such as to go beyond the comprehension of the decision maker, it may do more harm than good in practice.

Anything more than elementary farm budgeting, short term forecasts and simple extension advice may be too complicated for most farmers, while extension agencies, policy makers and planners may be able to make good use of a large array of farms and market data, input-output matrices, R & D (Research and Development) findings, long and short term projections and results of modelling or stochastic exercises of various kinds.

But in all cases, it would be desirable for the statisticians to use such vocabulary as is easily comprehensible to the users, while presenting their findings.

Sophisticated techniques such as inter-active iteration and successive approximation, econometric models and general systems science simulation approach have recently been tired for developing some guidelines for decision making but with limited success so far. Much more work needs to be done in these areas.

Judgement reached after a systematic compilation, presentation and study of relevant key information and lessons from experiences is still the main basis for decision making, even at the State level.

The task becomes more difficult even at this level, if decisions have to be made in the context of basic transformation of agriculture, planned or unplanned

The rather simplistic projections, which long term planners tended to use until recently have been found to be very misleading in a world of dynamic technological and economic changes. Such projections based largely on time series data and R & D results tended to picture the future in terms of a single rising curve.

But in practice agricultural growth is perhaps more realistically represented by a series of 'S' curves.

In figuring out what will be the trend of growth at different points of the 'S' curve, when the 'inflection' points may be reached and when there may be shift from one 'S' curve to the next and how, results of a cross-section analysis, pattern recognition and studies on R & D trends and adoption rate will need to supplement the conventional time series approach.

All these are, no doubt, rather very difficult tasks. But I am taking the liberty of mentioning them to you, because I feel that some of you are anxious to leave the beaten path and take up new challenges.