

Contribution of the National Sample Survey to Indian Agricultural Statistics¹

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1. INTRODUCTION

I feel very much honoured by the invitation of the Indian Society of Agricultural Statistics to deliver the presidential address in its 58th Session. I have got an opportunity to revive my contacts with the Society for which I worked for a very short time immediately after the completion of my studies in the Institute of Agricultural Research Statistics during 1969.

As we know, National Income is one of the important indicators for measuring performance and growth of the economy. But for working out the national income in India, there were no adequate data available prior to independence. In order to overcome the problem, at the instance of the then Prime Minister, Pandit Jawaharlal Nehru, a National Income Committee under the Chairmanship of Prof. P.C. Mahalanobis was appointed by the Government of India in 1949 to work out a reliable method of estimating national income. As a follow up of its recommendations, the Directorate of National Sample Survey (NSS) was set up in 1950 to collect essential data relating to socio-economic characteristics and agricultural production. Since then, gradually the NSS has been growing over the years. In 1969, Government of India set up a three-man Committee (Shri B. Sivaraman, Prof. V.M. Dandekar and Prof. Raghuraj Bahadur) to review the functioning of the NSS and as a follow up of the recommendations made by the Committee, the NSS was reorganized in 1970 by bringing out various activities like designing of surveys, field work and data processing under a single organization as National Sample Survey Organization (NSSO). Today, the NSSO is the largest organization of its kind in the world.

2. FUNCTIONS OF NSSO

The NSSO functions under the overall guidance of a high powered technical council known as Governing Council with requisite independence and autonomy in the matter of data collection, data processing and publication of survey results. The independence of the Governing Council ensures providing best possible inputs of technical skill in the system of designing the survey instruments, data collection, data processing and preparation of reports so as to improve and maintain the quality of data in terms of reliability and timely dissemination without any interference or influence by the Government. The Governing Council consists of a non-official chairman who is a man of eminence in either of the fields of economics, statistics and social sciences. Members of the Council are five academicians, five data users from Central as well as State Governments and Senior Statistical Officers of the Ministry of Statistics and Programme Implementation. The Director General and Chief Executive Officer of the NSSO is the Member-Secretary to the Council and is responsible for co-ordinating and supervising all activities of the organization.

The NSSO conducts nation-wide large scale, multi purpose and integrated socio-economic enquiries based on sample surveys for collecting data on various facets of the national economy in order to provide estimates of different parameters at state and national level. Household approach is used for socio-economic surveys and site approach is used for enterprise surveys. Generally the sample design adopted is a two stage one, first stage units being villages in rural areas and urban frame survey (UFS) blocks in urban areas. The second stage units are households in case of socio-economic surveys and enterprises in case of enterprise surveys. In case of the former, the frame for the first stage units is the list of census villages and UFS blocks, each block being a compact area-unit having 120-160 households

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or 600-800 population in the urban sector and in the case of the latter, it is the list of villages and blocks with the concentration of enterprises obtained through the Economic Census conducted periodically.

The NSSO conducts surveys on subjects like (i) Household consumer expenditure, (ii) Employment-unemployment, (iii) Health and medical services, (iv) Education, (v) Disability, (vi) Housing condition, (vii) Land and livestock holdings, (viii) Debt and investment, and (ix) Activities of unorganised manufacturing, trade and services as follow-up surveys of the Economic Census. In addition, it undertakes the fieldwork for the Annual Survey of Industries under the Collection of Statistics Act, 1953. It undertakes the Urban Frame Survey for preparation of urban frames used for drawing of urban samples. It also collects regularly price data from rural and urban sectors. In case of agricultural statistics, the NSSO provides technical guidance to States for conducting crop estimation surveys and keeps a continuous watch on the quality of crop statistics through the scheme of Improvement of Crop Statistics (ICS). Based on observations of the NSSO, necessary improvements are made in the estimates of crop yield.

3. EARLIER PIONEERING WORKS OF THE NSS

I shall touch upon in brief the work done by NSS in the past and presently being done in the NSSO.

The NSS conducted many pioneering enquiries in 1950's and its work was acclaimed in the international circles. Some of these are as follows:

(i) The first All-India consumer expenditure survey was conducted in the first round of NSS during October, 1950 to March, 1951 in rural areas only in a sample of 1833 villages out of about 5,60,000 for the whole country. The sample units were selected in two stages. First, the villages were selected after suitable stratification. Within each sample village all or a sub-sample of 80 households, whichever was less, were stratified into agricultural and non-agricultural classes. Sample households were then selected at random from each of these strata. About 350 investigators were deployed to collect data by interview method. The reference period of data collection was one year July, 1949 to June, 1950. The report based on this survey has given the picture of rural India as regards the level and patterns of consumption expenditure. The early NSS

surveys had to cope with enormous difficulties due to conflicting systems of weights and measures prevailing then in the country. The first survey detected 143 different systems of measurement of weight, 150 different systems of measurement of volume, and 180 different systems of measurement of land area. As a result, whenever the estimates of quantities were made, very careful scrutiny was necessary to convert local measures into standard units. Thus a great deal of additional work had to be done for scrutiny and conversion to standard units at the stage of analysis in comparison with surveys in other countries. Over the years, these measures have stabilised to standard metric units in case of consumer expenditure survey.

(ii) The first household survey of landholdings was conducted in its 8th round during July, 1954 - March, 1955. The concepts, definitions and standards of the survey were settled at a conference of central and state statisticians held at Calcutta in March, 1954. Dr. F. Yates, FRS who was fortunately in India then, participated in the discussions. This historic enquiry threw up data on the size distribution of ownership. The survey was of immediate interest in connection with the land policy of the Government of India. Information on the distribution of land owned by size on a country-wide scale was obtained for the first time. It was observed that the distribution of land was extremely concentrated with a small minority owning most of the land. It was the first time that the NSS report on land holdings provided a comprehensive measure of the margin of uncertainty of the results for a number of items.

(iii) The NSS conducted the crop survey in its 13th round during September, 1957 - May, 1958 for estimating the productions of the major cereals. It covered the autumn, winter and spring crops and gave estimates of both area sown and total production. The data on land utilisation were collected by actual observation of a number of selected survey numbers (plots) in a sample village whereas the data on yield of cereal crops were collected by actually harvesting the crop from a circular area at random in the plots selected for crop cutting experiments. The survey gave an estimate of 68.1 million tons for seven major cereals of rice, wheat, jowar, bajra, ragi, maize and barley as against the official estimate of 51.3 million tons given by the Ministry of Food and Agriculture. The official figures of production were prepared by the Ministry of Food and Agriculture based on the acreage figures and yield rates supplied by

different State Governments. Data collection methods and also concepts and definitions used by the States for crop acreage and yield rate varied from State to State, whereas the NSS adopted uniform procedure and used well trained investigators for data collection. Obviously there was difference between the two sets of estimates, which was of high magnitude. However, the NSS continued the crop survey up to 24th round which was conducted during July, 1969 - June, 1970. Naturally, two sets of estimates of crop production were generated and the differences between two sets also continued during those years. In order to probe into these high differences, a technical committee on crop statistics was set up in 1963 and the committee favoured, *inter alia*, the estimate based on complete enumeration. As a consequence, the NSS discontinued Land Utilization Survey and also Crop Cutting Experiments in the year 1970-71 under household survey. Thereafter, the NSSO introduced the ICS scheme in place of crop survey.

4. WORK PRESENTLY BEING DONE IN AGRICULTURAL STATISTICS

(a) The Scheme of Improvement of Crop Statistics

The ICS was introduced by the NSSO in 1973-74 with a view to locate, through joint efforts of central and state authorities every year, the weakness in the state system of crop estimation in different states and suggest remedial measures to effect long-lasting improvements in the system. It also envisaged that the NSSO should provide technical guidance to states to organize crop estimation surveys. Since the introduction of the scheme, the NSSO has been playing a very important role in providing technical guidance to the States/UT's for organizing and conducting Crop Estimation Surveys (CES) for estimating yield rates of principal crops and also in training the field staff. This work is being done by the Field Operations Division (FOD) of NSSO. In fact, the NSSO undertakes the following activities:

- (i) Physical verification of crop enumeration done by the patwaris in a sample of about 5,000 villages in each agricultural season
- (ii) Checking about the accuracy of the area statistics transmitted from the village level through crop abstracts in the same set of villages
- (iii) Providing technical guidance and supervision at the harvest stage in the conduct of about

15,500 crop-cutting experiments distributed among principal crops in various states

Of course, states are also doing similar jobs on equal number of samples.

In the case of sample checks on crop cutting experiments, FOD associates itself with all aspects of operations, which include selection of sample villages, training of field staff, supervision of fieldwork and estimation of crop yield. It ensures the adoption of uniform concepts and definitions, standard methodology and procedures. The CES data are then analyzed and the results are brought out in an annual publication. Presently CES provides information for 22 major States and 6 other States & Union Territories, which account for about 95% of the production of food grains in the country.

The estimation of the yields of principal food and non-food crops based on sound sampling method is now carried out regularly in almost all the states. The traditional method of estimation of crop production by eye-estimation has been gradually replaced by the objective assessment through the crop cutting experiments and the crop estimation surveys, which form the basis of production estimates. As already stated, one of the main objectives of the ICS scheme is to monitor the performance of the primary reporting agency in the Timely Reporting Scheme (TRS) and Establishment of an Agency for Reporting Agricultural Statistics (EARAS) villages. Under the TRS, the primary agencies are entrusted with the task of collecting and aggregating crop areas at village level in all the temporarily settled states. The scheme was introduced by the Government of India in the year 1968 in order to meet the requirement of timely and reliable data on crop areas. EARAS provides for setting up, in a phased manner, a whole time agency having statistical personnel specially trained for the purpose to cover a sample of 20% villages every year in such a way that all the villages of permanently settled states (Kerala, West Bengal and Orissa) are covered in a time span of 5 years as there is no elaborate system of land records in these States. Estimates of land use and area under crops are generated through random surveys. With a view to toning up the system of area reporting to obtain reliable and timely estimates, EARAS has been set up. The major findings of the ICS survey during the agricultural year 2001-02 in regard to area statistics are as follows:

- (i) Only in about 58 % of the villages, TRS work is done in time at all India level. In some of the States like Assam, Bihar and Jharkhand timely completion of TRS work is very poor.
- (ii) The patwaris submit crop statements without completing the girdawari in about 9 per cent of the villages.
- (iii) Village crop statements are submitted from only around 63 per cent of the sample villages and around 39 per cent only by due date.
- (iv) Crop entries of the patwari and the supervisor do not tally with each other in about one third of the survey numbers.

The above findings are a clear indication of the patwari's neglect of one of his major functions. This has also been pointed out by the National Statistical Commission. It is a matter of concern that this has been going on for many years. Based on ICS findings, the following major shortcomings and deficiencies have been observed in the conduct of crop cutting experiments:

- (i) Wrong selection of survey number and plot
- (ii) Incorrect measurement of the plot
- (iii) Use of non-standard weights and balance and
- (iv) Delegation of field-work to untrained staff

These findings have been brought to the notice of the State Governments by the NSSO (FOD) through the season wise status reports regularly. Further, these are also highlighted by the NSSO (FOD) in the meetings of the high-level coordination committees for agricultural statistics in various States, which are attended by senior officers from the Union Ministry of Agriculture & Cooperation and also from State Departments of Agriculture, Revenue, and Directorate of Economics & Statistics and others. However, it has been observed that remedial measures are not taken generally with due attention by the agencies concerned to remove the bottlenecks and deficiencies due to which similar mistakes are found repeated over the years. It may be mentioned that such observations in the status report cover deficiencies with regard to both area and yield rates. It is, therefore, necessary that these issues are addressed by the States seriously.

(b) Crop Calendar

As the Crop Calendar is an important tool in the formulation of Governmental policies relating to Agriculture Sector, the Indian Crop Calendar was first prepared and published by the Ministry of Agriculture in 1966-67. During 1998-2000, the FOD of NSSO took up the task of updating the Indian Crop Calendar on priority basis in consultation with the State Agricultural Statistics Authorities (SASAs) in two phases. The calendar brought out by the NSSO provides useful information on agricultural practices prevalent in various parts of the country. The phases are as follows:

- (i) **Phase-I** : Providing information at State level, relating to the periods of different agricultural operations namely: sowing, harvesting and marketing for principal crops.
- (ii) **Phase-II** : Providing information on
 - District-wise periods of sowing, harvesting and marketing of principal crops for different Agro Climatic Zones in a State.
 - Month-wise different agricultural operations in the State like preparation of the soils, sowing and transplanting, growing & maturing, harvesting and threshing.
 - Crop-wise agricultural operations in a State.
 - Crop seasons and rotations.
 - Ancillary information regarding use of various equipment, technology, source of irrigation, agencies for providing financial assistance etc.

(c) Land and Livestock Holdings

In addition, the NSSO conducts decennially the survey on land and livestock holdings. The latest in the series of land and livestock holdings surveys is the NSS, 59th round conducted during January to December, 2003. The survey data are being processed for tabulation. Results will be brought out in the form of reports in due course.

5. SURVEYS OF SPECIAL INTEREST

The NSSO conducts occasionally surveys of special interest. Recently the NSSO has conducted such a survey tangentially related to agricultural statistics. The survey

is known as Situation Assessment Survey of farmers. The millions of farmers of India have made significant contributions in providing food and nutrition to the entire nation and provided livelihood to millions of people of the country. During the five decades of planned economic development, India has moved from food-shortage and imports to self-sufficiency and exports. Food security and well being of the farmers are major areas of concern of the planners of Indian agriculture. In order to have a snapshot picture of the farming community and also to analyse the impact of the transformation induced by public policy, investments and technological change on the farmers' access to resources and income as well as well-being of the farmer households at the end of five decades of planned economic development, the NSSO conducted the Situation Assessment Survey (SAS) of farmers in its NSS 59th round, January - December, 2003 on behalf of the Ministry of Agriculture. This survey is the first of its kind conducted by the NSSO. Though information on a majority of items collected through SAS has been collected in some NSS rounds, an integrated schedule, covering some basic characteristics of farmer households and their access to basic and modern farming resources was canvassed for the first time in SAS. Moreover, information on consumption of various goods and services was also collected to have an idea about the pattern of consumption expenditure of the farmer households. The survey data are presently being processed for tabulation and report will be brought out shortly.

6. INNOVATIVE TECHNIQUES FOR IMPROVING THE QUALITY OF NSSO DATA

The NSSO is always keeping a track of scientific and technological development and tries to adopt advance techniques for bringing improvements in the field of data collection, processing and dissemination after getting them successfully tested through series of experimentations. Advent of Remote Sensing technique and its application in generating agricultural statistics have given new opportunities to various agencies in the Government to provide timely and accurate agricultural statistics. Pre-harvest estimates of crop area and production are areas that have received large attention in remote sensing application studies in India. On examination of the experiences of different countries like USA, etc. on application of remote sensing technique, it

is felt that a beginning could be made in India by integrating the technique with agriculture surveys under the existing ICS programme so as to improve the estimate of crop areas. Using the supervised data under the modified sampling methodology, the estimate could be independently obtained against the TRS scheme through patwari. The pilot study for comparing remote sensing based area estimate at village level with that of completely enumerated area estimate through NSSO was taken up in 6 villages. The results were examined to see if the Remote Sensing Technology could be used for making better estimate of production and it is observed that there is need for further improvement in the technology for its adoption in crop statistics.

7. AREAS OF FUTURE THRUST

There is a large list of areas where agricultural statistics are required to be generated and also improvements are needed in a few existing areas where presently statistics are available. The National Statistical Commission set up under the chairmanship of Dr. C. Rangarajan has given an exhaustive list of 73 areas where either new data are to be generated or further improvement is required. I have taken only a very few of them to focus as thrust areas.

(i) The ICS Scheme is only meant for sample checking on the work relating to crop production but no correction factors are worked out for adjusting the total crop area as an alternate measure. Given the past experience of the land utilization surveys of the NSS, it may be possible to derive a correction factor. The National Statistical Commission also suggested to use the ICS data for improving the official estimate of crop area. An empirical study using the past ICS data and the patwari figures has been taken up for arriving at a correction factor under the supervision of a technical committee set up by the Ministry of Statistics & Programme Implementation. However, some more exercises are required to be undertaken to arrive at a final decision.

(ii) In order to formulate a methodology for estimation of yield at lower administrative level using the small area estimation technique, a pilot study was undertaken using Farmer's Appraisal Survey Results. Through this study, it was found that results at lower level i.e. at block level could be derived satisfactorily. This is one of the areas where more studies need to be

done with other auxiliary variables. If the technique is developed correctly then local area development can be taken up by the planners in a better way.

(iii) There is no suitable methodology presently available for estimating the production of crops such as mushroom, herbs and floriculture but their assessment is very essential in view of their growing importance in the market economy of the country and their contribution in the Gross Domestic Product. For evolving a suitable methodology in this regard, NSSO can associate with IASRI and Directorate of Economics & Statistics, Ministry of Agriculture.

I thank you all.

REFERENCES

NSS General Report No. 1 (1952) based on the first round October, 1950 - March, 1951.

NSS Report No. 2 (1953). Tables with notes on the second round April - June, 1951.

NSS Report No. 10 (1955). First report on land holdings, rural sector.

NSS Report No. 38 (1960). Some results of the land utilization survey and crop cutting experiments. *Journal of Income and Wealth* (January, 2000), **22(1)**.

Golden Jubilee Publication (May 2000). National Sample Survey, Fifty Years in Service of the Nation. CPD, NSSO.

Crop Calendar (1998-2000). FOD, NSSO.

Report of the National Statistical Commission. Vol. I and II, August, 2001.

Report on the Status of Estimation of Crop Production in India. 2001-02, FOD, NSSO.

Consolidated Results of Crop Estimation Survey on Principal Crops. 2001-02, FOD, NSSO.