

PROF. P.V. SUKHATME MEMORIAL SESSION
Proceedings of the Symposium on 'Re-appraisal of the
Indian Agricultural Statistics System'

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Convenor : Dr. A.K. Srivastava and
Dr. Rajiv Mehta

This symposium was organised during 51st Annual conference of Indian Society of Agricultural Statistics held at Rajkot from 6th to 8th Dec., 1997. The Chairman emphasized the importance of the topic and pointed out that such re-appraisal is an important input in continuous monitoring and improvement of any system. After a brief introductory remark the Chairman invited the speakers to present their papers. In all 8 papers were submitted for presentation of which 7 papers were presented covering various aspects of the Indian Agricultural Statistics System. The abstracts of papers presented are as follows:

**The Retrospection of Indian Agricultural Statistics System in the Context
of Emerging Data Needs**

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The delivery of reliable statistics at right time in desired format to facilitate the process of planning and decision making is the most significant objective of a sound statistical system. The five decades of planned development has affirmed the dependency and trust of planners and policy makers on statistics and its indispensable role in the social and economic development of the country. The system over the years has come under constant scrutiny mainly on account of benefits derived and the risks involved in the data based decision making process. The complexities involved in any system are on account of the diversities prevailing in the domain and the dimensions of its coverage. Both these attributes are abundantly existing in the agrarian economy of India. If the Indian agriculture has transformed itself from a stage of being vulnerable to vagaries of nature and susceptibility to recurring droughts leading to frequent food shortages faced in fifties and sixties to a self-sufficient and food secured country, the credit on one hand goes to the pioneering work in the field of crop sciences and on the other hand to an effective policy mechanism and monitoring device, based on strong agricultural statistics system. The redeeming

feature of Indian agricultural statistics system is its coverage and its ability to modulate itself with the emerging needs of different periods. The timeliness and the quality of statistics had all along remained the driving force behind the efforts of strengthening a system. The National Commission on Agriculture had elaborately emphasised the need for strengthening the system and to incorporate the features emerging over time.

It is in this background, the evolution of Timely Reporting Scheme (TRS) in late 1960s may be seen as a milestone in the efforts of streamlining the system of Agricultural Statistics. The crop area is an important parameter for estimating the production and to form the basis for designing and other related sample surveys. The land is the most important factor of production in the sector of economy dealing with crop production. The efficacy of its use vis-a-vis the inputs applied for enhancing its productivity need a regular data base on different aspects of land utilisation. The Timely Reporting Scheme thus focused on workload of primary workers, missing of crops and crop areas and lack of cohesion for reporting seed variety and irrigation particulars. The evolution of TRS, coincided with the onset of green revolution where input application became a thrust area for enhanced productivity. The second milestone of strengthening the Agricultural Statistics System was the evolution for the scheme of Establishment of an Agency for Reporting Agricultural Statistics (EARAS) in the non land record States. The General Crop Estimation Survey (GCES) over the years expanded its domain and sample size to provide more exhaustive data base on productivity with higher degree of precision. The scheme for Improvement of Crop Statistics (ICS) initiated in early 1970s is amongst the most elaborate endeavour of its kind in the world, dedicated to analyse the cause and impact of non sampling errors in the gigantic exercise of generating crop statistics. The need for statistics for horticulture crops had been growing in view of their high value, value addition feature due to their processing and export potential. Hence in eighties, the scheme of Crop Estimation Surveys for fruits and vegetables was started to provide reliable data on acreage and production of these crops. The Comprehensive Crop Insurance Scheme put further demand of crop production statistics at lower administrative levels. The initiation of agricultural census, strengthening the farm management studies in the form of regular cost of cultivation studies, livestock census, consolidation of market intelligence and price statistics have been other important dimensions of agricultural statistics to cater to the emerging needs.

The decade of nineties has witnessed significant changes in the overall economic scenario. The Indian economy is gradually getting integrated with world economy in the process of globalisation. Several trade related restrictions are being relaxed. India is competing with other developing countries to enhance

its export. There is a greater awareness in improving the efficiency of economic activities to attain competitiveness in the world market. These developments have put greater stress on timely information in more details. The two dimensions of agricultural statistics have become prominently important. First is to have effective mechanism of forecasting well before the harvesting of crops is over. The existing system where area and yield statistics are primarily dependent upon ongoing process of generating such statistics, has been found to be not fully competent to cater to the needs of working out advance estimates. The demand for such advance estimates is not only to make an assessment of crop during the period of its maturity but having some realistic assessment at the stage of sowing itself. The time interval for which the advance estimate serves utility, is small but very crucial. The policy decisions regarding exports and imports and integration of production with the market, domestic as well as global, are linked to the time opportunity of such decision making. The Government in this regard had shown its keenness by setting up an Expert Group for Crop Forecasts and Advance Estimates of Agricultural Production. The report of the Expert Group has been accepted by the Government and its recommendations are being implemented. The emerging need in this context is to integrate exogenous parameters like rainfall and temperature for developing suitable models of crop forecasting. The advancements in the technology of remote sensing is expected to play a crucial role in providing realistic assessment of crop conditions well before its harvesting. The institutional arrangement to bring data bases of such diverse disciplines under an umbrella is a felt need.

Secondly, there is an emerging need to have deeper analysis of the vast data generated through cost of cultivation studies for the analysis of input applications and their efficacy in the crop production. The endeavour to increase production and productivity, to keep pace with the population growth led demand and the zeal to maximise profits in agricultural activities, is putting severe strain on natural resources, specially the land. The net sown area has become practically stagnant and is threatened to decline due to expanding urban population and other non-crop utilisation. The thrust, therefore, is focused on increasing cropping intensity and crop productivity through application of chemical fertilisers and other inputs. The study of optimality of input application has two-fold advantage. On the one hand, it may help in rationalisation in resource distribution and on the other hand, spell out the comparative advantages in Indian Agriculture. Further the fears of ecological repercussions of such measures have already been expressed and are not entirely unfounded. The agricultural statistics system, therefore, should tune itself to provide sound data base on such aspects for lasting gains to the society.

The behaviour of market has direct implications on the interests of producers as well as consumers. The aggregated food security alone may not be sufficient if the market mechanism with stability of prices is unable to safeguard the entitlement of general public. The close monitoring of the prices of essential commodities is a felt need in a situation where agricultural production is gradually getting market oriented. A phenomena of shift in cropping pattern witnessed in late eighties is the outcome of farmers' entrepreneurship, keeping in view the comparative advantages in cultivation of crops. The price forecasting in agriculture is an un-explored area but is expected to be of relevance in the time to come.

The tuning of Indian agriculture with the international agricultural scenario will necessitate the strengthening of statistics on international prices comparisons, productivity and inputs. These statistics are essential to seek comparative advantages of Indian agriculture vis-a-vis rest of the world. Another related issue on which statistical base is required is the subsidies applicable in the sector. The provisions of world trade organisation's resolution referred to a fair trade practices in the global market. The positioning of Indian agriculture produce in the international market cannot be adequately defended in the absence of such statistics.

Strengths and Weaknesses of the System of Agricultural Statistics as Revealed Through Scheme for Improvement of Crop Statistics

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Crop production continues to play dominant and vital role in the Indian Economy by contributing around **one-fifth** of gross domestic product. The importance of timely and reliable statistics of production of crops needs no emphasis. Agriculture being a state subject, the responsibility of collection and dissemination of crop statistics rests with the State Governments. To maintain timeliness in making available area statistics, Timely Reporting Scheme (TRS) in land record states was introduced since 1969-70. The Scheme for Establishing an Agency for Reporting Agricultural Statistics (EARAS) in three permanently settled states of Kerala, Orissa and West Bengal was introduced in 1975-76, 1976-77 and 1981-82 respectively. For collection of yield statistics, the General Crop Estimation Surveys (GCES) are also carried out by State Govts. in respect of principal (forecast) crops. The year of initiation of the survey varies from state to state as well as from crop to crop. However the earliest was that of 1943-44 in Haryana in respect of Wheat crop.

Improvement of Crop Statistics

The scheme for Improvement of Crop Statistics (ICS) was introduced in 1973-74 with the main objective to locate the deficiencies/lacunae in the State System of Crop Statistics and to suggest improvements therein. The Scheme envisages sample checks by the staff of National Sample Survey Organization, NSSO in about five thousand villages on area enumeration and about fifteen thousand crop cutting experiments in sample villages. State Agricultural Statistics Authority also undertakes the sample on equal matching basis. Under the scheme, training is imparted to the field staff of the state governments to ensure adoption on uniform basis the concepts, definitions and methods of data collection. Sample checks are based on selection of villages plots using sampling techniques in order to obtain reliable estimates. Thus, scheme for ICS ensures effective implementation of TRS, EARAS and GCES schemes.

Strengths of Agricultural Statistics System

As ICS does not cover the system of agricultural statistics as a whole, the subject of our examination is confined to the Indian system of crop statistics. The strength of crop statistics as revealed through ICS lies in the scientifically designed method of area enumeration and yield estimation for generating estimates of crop production. The availability of comprehensive land records constructed on the basis of cadastral survey duly supported with detailed instructions in the form of manuals for collection and updation of area and yield statistics in most of the states and UTs may be considered one of the strengths of the system. The system provides a primary revenue agency at the village level for maintaining and updating the land records through field to field inspection which greatly adds to its strength. At the time of cadastral survey, village land is partitioned mainly on the basis of ownership rights and each division is assigned a unique identification number called survey number. In the case of further division/partition of land, sub survey numbers, etc. are given to each parcel of land. Boundaries of each piece of land is earmarked with bundings. Clear-cut demarcation of boundaries of each parcel of land and the availability of its area from the land records help building reliable estimates of area sown under different crops through field to field inspection. This also helps identification of a sample plot under a given crop for the purpose of crop cutting experiments for maintaining accuracy and reliability of survey results. Crop cutting experiments conducted through scientifically devised sampling procedures enhance the reliability of yield statistics. The existence of State High Level Coordination Committee which is responsible for policy decisions relating to improvement of agricultural statistics including crop production statistics may be listed as one of the strengths of the system. Further,

the existence of ICS which acts as the watch dog of the State system of crop estimation strengthens the system.

Weaknesses of the System

The scheme for ICS reveals many weaknesses of the system of crop statistics. **First**, non-updation of land records with respect to the crop statistics timely and regularly weakens the system considerably. The above phenomenon may be largely attributable to the over-loading of the village revenue agency with the unmanageable workload of maintenance and updation of the above records as well as with multifarious activities and responsibilities. **Second**, as the land records serve the basis of production of crop statistics the non-updation of these records regularly and in time affects the quality and reliability of crop statistics. **Third**, untrained personnel are seen carrying out field work of crop cutting experiments although the instances of the kind as revealed through ICS are as low as 2% in 1994-95, **Fourth**, the ICS supervision brings to light the fact that field workers are not provided necessary equipment for conducting crop-cutting experiments. In some cases the field workers are not using the equipment supplied to them.

No systematic efforts have been made to assess the adverse effects of the above deficiencies of the system as revealed by ICS on the crop production estimates.

An Appraisal of the System of Agricultural Statistics from National Accounts Statistics Perspective¹

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Extended Summary

The Central Statistical Organisation in the Department of Statistics is responsible for the preparation of national accounts statistics. The Gross Domestic Product (GDP) is one of the main aggregates of national accounts statistics. For estimating the GDP, the whole economy is broadly divided into various sectors comprising primary, secondary and tertiary activities. Agriculture and livestock which belong to the primary sector of the economy, have substantial contribution to the national income of India. The GDP of the country for the year 1995-96, for which the latest detailed estimates are available, is

¹ Views expressed are personal views of the authors and not necessarily of the organisation to which they belong.

Rs. 9,85,787 crore at current prices at factor cost and out of which the contribution of agriculture sector, which includes the livestock sub-sector, is Rs. 2,52,544 crore i.e. about 26 per cent. In this background, the importance of statistics of area, production and yield of crops, their reliability and timeliness assume utmost importance to the planners, administrators, policy makers and research workers. Though the system of agricultural statistics, which had been evolved over a period of time and is a decentralized one, has generated the agricultural data base for meeting the requirements of various users quite satisfactorily; nonetheless it needs to amplify its scope further to make available the information on account of changing economic scenario and ensure quality in terms of timeliness and reliability. An attempt has been made in this paper to highlight some of the areas, of course from the point of view of national income accounting, where more detailed data requirements are being increasingly felt.

System of National Accounts

Before listing the gaps in the present agricultural statistical system, it will be worthwhile to describe briefly the circumstances which have necessitated more data requirements. It is well known that national accounts statistics (NAS) are compiled based on internationally accepted concepts and definitions and agreed standards, which are recommended from time to time, by the international agency, the United Nations through System of National Accounts (SNA), first introduced in 1953 and revised periodically. At present we are compiling the NAS following broadly the recommendations of 1968 SNA. In 1993, United Nations Statistical Commission has adopted the latest revised version of the SNA, popularly known as 1993 SNA, which has been prepared under the auspices of the Inter Secretariat Working Group on National Accounts (ISWGNA) comprising the Commission of the European Communities (Eurostat), International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD), United Nation (UN) and the World Bank (WB), 1993 SNA retains the basic analytical framework of 1968 SNA and is a much more comprehensive system harmonising other major statistical systems, like, Balance of Payments Statistics and Government Finance Statistics of the IMF. It recommends preparation of sequence of accounts for all the institutional sectors into which the economy has been divided, namely, (i) non-financial corporations, (ii) financial corporations, (iii) general government, (iv) households, and (v) non-profit institutions serving households. Several satellite accounts including the environmental accounts have been recommended. The Statistics Division of the Food and Agricultural Organisation (FAO) has recently developed a System of Economic Accounts for Food and

Agriculture. Production and assets boundaries of the 1993 SNA have been enlarged. As per the extended production boundary the production of the households for own-account consumption, illegal and underground production are required to be reckoned with in the national accounting framework.

Of late the IMF have come out with a Special Data Dissemination Standards (SDDS). India has subscribed to this SDDS w.e.f. 1-1- 97. To meet one of the requirements of the SDDS, India has to compile and release the quarterly national accounts with a timeliness of one quarter. These requirements demand more information both in terms of coverage and timeliness from the Indian statistical system in general and agricultural statistical system in particular.

In this background agricultural statistical system needs to be revitalized which could gear itself to overcome its deficiencies in the following areas:

Gaps in the Agricultural Statistical System to Cater the Needs of National Accounts Statistics

The crop production statistics which are now based on objective sampling methods, provide estimates on area and yield are available with reasonable time lag in the case of only 45 principal crops. However, in the case of minor crops, the yield estimates are available only after considerable time lag. The yield figures are also not generally based on scientific methods. Although some of the states have initiated a Scheme for "Crop Estimation Surveys on Fruits and Vegetables and Minor Crops" to estimate the yield rates of fruits and vegetables as well as minor crops, the same is not being done in all the states.

In the case of unspecified crops like other oilseeds, other cereals, etc., the yield figures are not at all available, although area figures are available from the Directorate of Economics and Statistics in the Ministry of Agriculture (DESAg) alongwith the land use statistics (LUS), with a time lag of about 2 to 3 years. In the case of grass and fodder, the estimates are based on very old yield rates, relating to 1952-53. The estimate of area under grass is also based on very old norms based on LUS.

A major data gap in the agriculture sector is with respect to separate data on many minor crops as well as crops which have recently been taken up on large scale as commercial crops. There is considerable demand for production data of individual items which now figure in other cereals, other pulses, other fruits and vegetables, other spices, etc. In fact, the category of others in the total value of output of fruits and vegetables account for about 75 per cent. It is essential that details of the important crops these 'others' are separately available.

Further, a major data gap is being felt relating to the production of mushrooms, flowers and other parts of plants, medicinal herbs, tissue culture etc. It is possible that most of these are not being covered in the present estimates of production as they are likely to be carried out in areas other than the farmlands. These are high value added crops and their operations are similar to those of running the enterprises. Being missed in production statistics, these relatively new areas of cultivation consequently do not get covered in the estimation of GDP. The other ancillary activities, like cut flowers and dried flowers and other parts of plants are also not being covered in the estimation of GDP, due to absence of data.

As mentioned earlier, production by the households for own-account consumption is required to be reckoned with in the national accounting framework. As far as agriculture is concerned, the production in the foreyard/backyard in the rural areas and of the kitchen garden in the urban areas are not being accounted for in the present reporting system as these do not form part of the revenue records. Present system need to be modified to account for these production on regular basis as production could be substantial.

Estimates of the agricultural production and area should be generated on the quarterly basis so as to meet the requirements of the SDDS. Indeed it is a difficult task as crop calendar do not follow quarterly system but ways and means required have to be devised to accomplish this.

In respect of livestock products, reliable estimates of production are available for the three major products, namely milk, egg and wool, although the time lag of these estimates is of the order of two years. However, estimates of milk from animals other than cows, buffaloes and goats are not available and thus, not included in the GDP estimates. Similarly, the utilisation rates of milk in fluid form or after being converted into desi ghee, butter, lassi, khoa, cream, etc., are not available. In the absence of these data, estimates of value of output of milk are being prepared as if milk is consumed as such.

In the case of meat, the estimates of yield are not generally based on any scientific techniques. Besides no reliable estimates of number of animals slaughtered in places other than the slaughter houses like unorganised slaughter houses, religious slaughters, etc., are available. The estimates of yield rates of meat products and by-products are based on very old norms derived from the Directorate of Marketing and Intelligence (DMI) studies. In addition, there is no data on number of fallen animals and these are estimated using DMI 1961 studies on the subject.

In the case of poultry meat, the estimated number of fowls, ducks killed and average meat yield per bird are not available. These are based on some very rough norms and studies conducted by Indian Agricultural Statistics Research Institute (IASRI). The estimates of hair and bristles suffer due to lack of scientific studies on the yield of these items. The present estimates are based on DMI 1958, 1961 and 1962 studies. The evacuation rates of animals in terms of dung, and its utilisation as manure and for fuel purpose too are based on a limited study conducted by few states and co-ordinated by the Department of Animal Husbandry & Dairying (AHD) in 1984-85. In the case of estimates of increment in livestock, the estimates are based on successive All India Livestock Census (ILC) and using extrapolation techniques. The ILC is unfortunately not conducted at the same time by all the states. Besides, if the reference period happens to coincide with a drought year, as happened in the case of 1987, the estimates for the subsequent years based on extrapolation would totally go awry.

In the case of inputs, the seed rates of crops other than those for which Cost of Cultivation Studies (CCS) is being conducted, relates to National Sample Survey (NSS) 1951-52 and various marketing reports of DMI. Even the CCS is not conducted in all the states and norms of neighbouring states are applied to the states where CCS is not being done. This is a major data gap as different states have different farm and soil conditions. In the case of chemical fertilisers and pesticides and insecticides, instead of the consumption figures, the estimates are being prepared using the dispatch figures. The estimates are very weak as far as the feed of livestock is concerned. The benchmark estimates of production of fodder and grass are based on NSS, 1955-56 survey. The estimates of yield rates of stalks and straws other than those available from CCS are based on NSS 1951-52. The estimates of quantity and percentage of different components of concentrates consumed per cattle are based on NSS 1975-76 survey and studies conducted by IASRI. The itemwise consumption of roughage and concentrates consumed by different categories of livestock is not available, which is essential both for the construction of input-output transaction table as well as reliable estimates of livestock feed. Such data separately for rural and urban areas will help in evaluating the value of output of animals used in sectors other than agriculture and livestock i.e. transport animal services. The data on operational costs and repair and maintenance is very weak. The estimates of repair and maintenance are based on rough norms based on All India Debt and Investment Survey (AIDIS) conducted once in ten years.

As regards the prices, ideally, these should relate to the first point of transaction at which income accrues to the producer. Unfortunately, such data is not available and estimates are usually based on prices prevailing in the

primary marketing centres. Further, the actual quantity of transactions at different price levels give accurate estimates of value of output. In the absence of these, the output of a district is treated as transacted at the average price prevailing in different primary marketing centres during the peak marketing period in a district. In the case of milk, due to its peculiar nature of marketing, separate data on prices is required in respect of co-operative marketing federations and milk sold directly, which is presently not available. Reliable estimates of prices of meat products, dung used as fuel and dung used as manure and various categories of animals, are not available.

For estimating the contribution of different factors in the generation of income, namely, land, labour, capital and entrepreneurship (which respectively generate rent, including imputed rent on account of owned land, compensation of employees, including that of family labour, interest and profits), data required in detail on these is not available. Although, data is available from CCS with considerable time lag, no such details are available as far as livestock sector is concerned. In order to implement the 1993 SNA, which interalia, recommends preparation of sequence of accounts for various institutional sectors, data in detail is required on factor incomes cross-classified by type of institutions.

For compiling the environmental accounts information relating to the imputed cost for degradation and depletion on the non-produced natural assets like soil and water etc. are required. Initially this may require extensive research work to be initiated at a place like IASRI with the co-operation of the agricultural universities.

On Utilisation of Sample Registration from Areas for Improving the Quantity of Agricultural and Allied Statistics

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Introduction

There has been a growing concern about deteriorating quality of official statistics pertaining to many vital sectors including agriculture. Statistics on acreage and yield of major agricultural crops are derived from the number of operational holdings and their land use. These are maintained by village patwaris in the land record states. One of the main reasons for qualitative deterioration in the official statistics is that the statistical work assigned to village patwaris and their supervisory land revenue officials are given lower priority by the land revenue staff. One way of improving the situation is to provide regular

training of revenue officials (specially for the new comers) and introduction of some penalty for indifferent statistical work. In addition to it, independent sample checks on the quality of primary statistics (maintained in administrative records) which are used for deriving estimates of land utilisation and yield of various crops would be useful. Sample registration areas (SRA's) which are sampling units under the sample registration system (SRS) should be used for carrying out this additional sample check. The present paper, provides an outline for the approach to be followed for this type of sample check.

Sample Registration System and SRA's

Demand of SRAs under Sample Registration System was felt by Registrar General, India (RGI) in 1969-70 to derive reasonably good estimates of birth rates (BR), death rates (DR) and the resultant natural growth rate (GR) for each state (rural/urban) and the whole country. Initially about 3700 SRAs were selected from 1961 population census system both in rural and urban areas. In due course of time the coverage has increased considerably and in 1994 the sample areas was 6,613 (4,420 rural and 2,193 urban) covering a total population of 5.9 million (4.7 million rural and 1.2 million urban) covering all the states except J & K and Mizoram. The system provides not only collection of vital data in these SRAs but also a verification plan by supervisors. The vital events recorded by part-time enumerators residing within the SRA are verified by an independent six-monthly retrospective survey by a full time supervisor from the office of the Registrar General, India. Each vital event collected by the enumerator and the supervisor is matched. The matched and partially matched events are re-verified in the concerned SRA to get an unduplicated count of the vital events within the sampled area. One supervisor is usually assigned a set of 10 SRAs for conducting half-yearly surveys. The supervisors are stationed at the concerned State Headquarters. Planning and organising various field operations, training of the field staff, effecting proper and timely supervision and control so as to ensure regular flow of returns as well as further processing of data with minimum tabulations are undertaken by the supervisor with a complement of staff at the State Headquarters.

Some special features of the SRAs are—

- (i) The sample size has been based on the desired precision of vital rates at State (rural and urban areas separately) level.
- (ii) Panel/longitudinal data from the usually resident population within a SRA are available for a period of 10 years till fresh sampling is done based on the latest available population census frame.

Intensive Use of SRA's for Collection of Quality of Data

SRAs should be used not only to derive reliable estimates of vital rate but also:

- A. to generate additional data pertaining to the SRA for carrying out post-enumeration check on a few key agro-socio-economic variables covered in the livestock census, economic census as well as agricultural census to the extent possible;
- B. for probing into quality of doubtful agricultural and livestock statistics as well as the number of operational holdings, acreage under various crops, livestock number and employment, animal feed, poultry statistics, etc. by using the panel data for a number of consecutive years;
- C. for deriving dependable estimates of complex socio-economic variables like (a) time use data of selected female members within a household (b) chronic unemployment and underemployment (c) annual income, expenditure and indebtedness among poorer segments of the rural population where repeated visits to the same household are necessary;
- D. to collect dependable data on change in the level of living of the poorest segments of the population who are 'visibly deprived' of basic human needs like food, health and nutrition, shelter, fuel, literacy, drinking water, sanitation etc. This is possible through repeat surveys among the usually resident population in the SRAs at regular intervals of 3-5 years.

Organisational Set up

Some suggestions regarding the organisational set up are as follows—

- (i) Additional data collection in the SRA has to be done by trained resident enumerators. Training and supervision of their work should preferably be done by NSSO in collaboration with the concerned State Statistical Bureau.
- (ii) Work on post-enumeration Sample check of a few selected socio-economic variables after the main census should be handled by the same administrative department which is responsible for the main census. This is essential to ensure that comparable agro-socio-economic data pertaining to SRAs are collected during the post-enumeration check also.
- (iii) Organisational details for collection, supervision and analysis of longitudinal data on agro-socio-economic variables pertaining to the SRAs have to be worked out by the Central Dept. of Statistics in

consultation with RGI and other concerned administrative departments at the Central and State levels who are keenly interested with the results of the longitudinal study. It has to be ensured that additional data collection work in an SRA does not impair the quality of work of the part-time enumerator engaged by RGI for vital statistics work in the same area. The overall responsibility for undertaking special studies using longitudinal/panel data should preferably be assigned to the Central Deptt. of Statistics.

Concluding Remarks

The following points need to be taken into consideration for the proposed plan of work:

The sample size decided for SRAs is based on desired precision of vital rates at State (rural/urban areas separately). It may not be adequate for many socio-economic variables that are decided to be studied.

- The representativeness of SRAs for the country is likely to be affected due to 'conditioning effect' on SRAs on account of continuing use of the same area for several consecutive years.
- The SRAs can be used as 'social observatories' to study the change in socio-economic variables over time amongst the usually resident population, more or less as case studies.
- Additional data collection on a continuing basis in an SRA has to be done by resident enumerators in the concerned SRA. Repeat surveys can also be undertaken by trained field investigators visiting the SRA at regular intervals. However, supervision of field work in the SRAs has to be organised by the regular staff of the data collection agencies such as NSSO under Central Deptt. of Statistics or SSBs in different states or by the supervisory field staff of the concerned Central Department associated with results of the selected study. Analysis and preparation of technical reports might be entrusted to suitable research institutions on contract basis.
- There is need for a pilot study before taking up study on a nationwide basis.

Re-appraisal of Indian Agricultural Statistical System— Methodological Issues

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Agricultural statistics is backbone of planning and allocation of limited resources to the different sectors of economy, which primarily depend on agriculture. There are two major sources of such statistics. First is agricultural census, by which data on changes in agricultural structure is collected as they are not very rapid in nature. Second very important source is agricultural surveys in which data on agricultural production, utilization, prices etc. are collected on continuous or seasonal basis, if possible, several times in an agricultural year. The reliable estimate of agricultural production and other agricultural inputs have been extremely important in the planned development of the country. However, it has gained additional impetus in rapidly changing agro-economic scenario.

In early stages the emphasis of agricultural surveys was mainly on agricultural production. In case of crop production surveys, most important issue was the estimation of yield of the crop, as the area under the crop could be obtained on the basis of complete enumerations from the land records. Therefore, the main methodological issues in crop surveys pertained to the crop cutting approach in which the emphasis was on the random sampling approach, measurement errors and conformity to the infrastructural setup of the country. Subsequently, same approach was extended for the estimation of livestock products. Here, the estimation of number of animal and yield per animal were important methodological issues. Following the similar approach methodologies for estimation of production of fruits and vegetables, fish catch from water resources were developed. In the whole process of development of agricultural statistics various organization/departments/Institutes have been participating. The role of Indian Agricultural Statistics Research Institute has been mainly in development of suitable methodology for conduct of agricultural sample surveys. Feedback and updation of the methodologies is most crucial in this process.

In the last few decades rapid changes have taken place in agriculture. The whole agricultural production and marketing system have been changing due to impact of various technological revolutions in crop, livestock and fisheries sectors. Consequently, there are changes in socio-economic structure specially in rural areas. Enforcement of land reforms in most of the states

accelerated these changes to a greater extent. The liberalisation policy also influenced the agricultural scenario due to establishment of large number of agro-industries and agro-processing units. These advancements have resulted in improvements in socio-economic status of the rural population. On the one hand the emphasis and the workload of the data collection machinery at the lower level has changed, while on the other hand the awareness and attitude of respondents have also undergone significant changes. There is a general feeling that the quality of data have suffered considerably in agricultural surveys due to these factors. This feeling also gets corroborated through various studies such as V.R. Rao (1993). There are also growing demands of information at desegregated levels for micro-level planning purposes. Therefore, there is an urgent need for reappraisal of methodological issues both from quantitative as well as qualitative aspects of the agricultural statistics. Some important points relating to methodological issues in agricultural surveys are:

Crop Surveys

- (i) One of the most important issues in this area relates to implementation of the available methodologies in the field.
- (ii) Studies indicated that the crop-cutting approach adopted for these surveys lead to overestimation of production. Farmers estimates have been suggested as an alternative. The mode of utilization of farmers estimate for improvement of crop estimate needs investigation.
- (iii) Qualitative aspect of these surveys needs to taken care immediately. There is need for deeper analysis of data from ICS scheme and the results should be utilised for methodological improvements and their implementation.
- (iv) There is need to incorporate the in-built mechanism in the already developed methodology to get the statistic at smaller area levels.
- (v) The method of area and yield estimation for hilly area should be developed by taking care of geographical features of the region.
- (vi) There is need to incorporate the recent technological developments like remote sensing and geographical information system in the existing methodology for getting quicker and reliable estimate.
- (vii) There is wide gap between data collection and its utilisation. The data collected in the surveys should be utilised for the deeper analysis which can give a better idea of the data generation process. Modern techniques of complex survey data analysis needs to be explored in special situation.

- (viii) The most important issue in this era of information revolution is the accessibility of the data which can be done with the help of developing appropriate databases in this area.

Livestock Surveys

- (i) One of the most important issues in these surveys are estimation of minor livestock products.
- (ii) The data on milk, meat, egg and wool production is collected with the help of integrated survey. The methodology developed for this data collection needs some flexibility to take care of the major and minor livestock products of the region.
- (iii) The production from organised farming like dairy, poultry etc. should be taken care of in the existing methodology.
- (iv) The small area statistical models should be developed to estimate the livestock statistics at smaller area level such as small region, breedwise etc. and the related auxiliary information for this purpose should be collected.

Other surveys

- (i) For estimation of production of fruits and vegetables, adequate implementation of the methodologies is one of the major problems.
- (ii) The most important methodological issues in case of fruits and vegetable surveys are due to its special nature like multiple picking. There are problems in taking actual observations. Integration of surveys for different minor crops also pose problems in terms of stratification as well as sample selection.
- (iii) The increase in cooperative and regulated markets should be properly accounted in the surveys with the help of multiple frame approach.
- (iv) In case of evaluation studies, due to dynamic nature of population a methodology for estimation of flow and change needs investigation.
- (v) The other important issue which need attention in evaluation studies are availability of control and isolation of impact from other developmental forces which are in operation simultaneously.
- (vi) Surveys with repeated measurements need special attention in view of efficiency and cost aspects.

Reappraisal and upgradation of the methodologies is a continuous process. Research investigations in some of these aspects are already in progress at IASRI.

Re-appraisal of the Agricultural Statistical System in India— Contemporary Issues

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India have a long tradition of collection of agricultural statistics right from the time of the Arthshastra of Kautilya (321-296 BC). Then some agricultural statistics was collected during the Mughal period (12th to 17th century) as part of the revenue administration. However, systematic efforts on regular collection of agricultural statistics particularly crop estimates were initiated in 1884 when crop forecast for wheat was initiated and collection of statistics on land use was also taken up. Over the years, there had been significant development in the field of collection of agricultural statistics. As a result, India is amongst the few countries having a well established system of collection of agricultural statistics. The extensive coverage of the Agricultural Statistics in India can be gauged from the fact that at present the complete land use statistics exists for 304.9 million hectares i.e. about 93% of the total geographical area of 328.7 million hectares. The subject coverage is also equally extensive and its domain encompasses the land use statistics, crop area and production estimates, statistics on prices, agricultural wages, inputs, land and livestock holdings, cost of cultivation, procurement, imports, exports and on comparative advantages of Indian agriculture in the global perspective. The demand for these statistics is increasing over the years and the strengths and weaknesses of the system are coming under close scrutiny of various quarters. There are several contemporary issues associated with the agricultural statistical system and salient few are discussed in this paper.

Contemporary Issues Related to Land Use Statistics

1. The States are collecting land use statistics as per nine fold land use classification following in general uniform concepts and definitions. However, the application of these uniform concepts and definitions followed by different States need to be examined.
2. There is need to have a uniform system of collection of land use statistics and related information on irrigation and area under crops by all the States. The north-eastern states, where there is no reporting agency functioning at present, need to be cadastrally surveyed.
3. In the land records states, the primary duty of the field level worker of the revenue department, generally known as patwari pertains to

recording of area under different crops grown in each and every survey number in the basic register, called the khasra register, and prepare the village abstract statement for all the seasons every year. Because of his involvement in multifarious activities relating to election process; rural development activities, census jobs of population, agriculture, livestock and in all other activities taken up by the Central as well as State Governments at the village level, the primary work of area enumeration gets ignored by the patwari in the process.

4. With the change in cropping pattern as well as the introduction of the short duration varieties of various crops, there is need to examine the Girdawari period prevalent under the land record States. There are apprehensions that the gross cropped area and resultantly the production is under estimated due to rigidity in the land record system.
5. The information of irrigation under the land use system forms a part of the regular area enumeration. The defaulting States mostly in eastern parts of the country and even the major producing State of West Bengal, need to be oriented so as to take up the important aspect of agricultural development and provide the basic information relating to irrigation statistics for crop/source-wise.
6. There should be regular monitoring of the area recorded under permanent pastures, culturable waste and fallow lands at the districts level and onwards so that the cultivation being done in these area gets accounted for in the area enumeration work.
7. As per the definition laid down under the land use statistical system, all the land classified as forests under any legal enactment would be recorded as area under forests. In the process the area under cultivation in forests gets missed. Therefore, there is need to change the definition for area under forests so that the cultivated area of forests gets accounted for in different States and Union Territories.

Contemporary Issues Related to Crop Statistics

The Ministry of Agriculture has been implementing a Scheme for 'Timely Reporting of Estimates of Area and Production of Principal Crops' (TRS) in a phased manner since 1968-69 in the land records States and the scheme of Establishment of an Agency for Reporting Agricultural Statistics (EARAS) in non land records States since 1975-76. The TRS scheme in essence, provides for complete enumeration, on a priority basis, in a sample of 20% of the villages selected at random and builds up estimates of area sown under principal crops by using ratio method of estimation.

1. The primacy of area statistics is not only on account of providing the data base on the land use pattern but also to be the base for structuring other surveys of vital importance. The operation of agricultural census depend on primary land use statistics developed at village level. The Crop Estimation Survey (CES) design and estimation procedures require latest information of crop area and crop utilization at the village level as well as at the stratum level. The reliability of production estimates depend on the conformity of the conduct of CES to the statistical design and also on the area estimates used as the multiplier with the yield estimates.
2. It was in this background of the primacy of area statistics in the system of agricultural statistics, the scheme of TRS was conceived. In doing so, specific emphasis was made to consider the TRS villages as the core villages for which the timely availability of grassroots crop area statistics would become available on priority and the design of CES was accordingly dovetailed with it. The intermediate stage sampling unit in CES is the field growing experimental crop which is selection of subsequent sampling units. This feature of the design is assimilated in the procedure of estimation of the yield rates. The timeliness and the quality in TRS and in EARAS thus assumes additional importance to safeguard other linked surveys from the menace of non sampling errors.
3. The TRS and EARAS cover most of the crop growing area of the country and only a negligible portion is left out of the scope of generating crop statistics. But the intensity of deviations from the basic objective of timeliness and completion vary from State to State. This leaves variable impact on the quality of various dimensions of agricultural statistics. The findings of the Scheme of Improvement of Crop Statistics (ICS) effectively bring to focus different aspects of deficiencies creeping in the process of generating crop statistics from TRS, EARAS and CES.
4. The performance of TRS/EARAS as per ICS findings can be judged on following four key parameters,
 - (i) Timely completion of area enumeration
 - (ii) Non completion of area enumeration
 - (iii) Submission of statements
 - (iv) Submission of statements without completing the area enumeration

The first two of the above parameters have direct impact on the village level data and resultant impact on subsequent stages of the operations.

During 1992-93, there were seven states where in the majority of TRS/EARAS villages, the completion of area enumeration by the primary workers was delayed and in three states, in majority of villages, the TRS/EARAS work was found to be incomplete. This analysis indicates the extent of dilution in meeting the basic objective of the schemes. Similarly, there were eight states, where the statements of the crop abstracts were found to be not submitted in the majority of villages. The undesirable phenomenon of submission of these statements by the primary workers without completing the area enumeration was noticed to be widely prevalent in three states. It gives little wonder that some of the states where such infirmities were of serious magnitude, the performance of related surveys such as Agricultural Census had seriously suffered.

5. As stated earlier, different surveys for generating agricultural statistics are often interdependent. Such interdependence is strong in case of TRS/EARAS and CES. The quality of one may significantly influence the output of other. The demand of the CES results is increasing. Not only the pre stratification according to irrigation and the seeds is the envisaged requirement for working out the yield rates, the productivity relations with other inputs like fertilizers, pesticides and even agricultural credit is the emerging needs of data users. However, the CES has been able to resort to pre stratification in some of the states only and that too for selected crops.
6. There is great importance of area generated under Timely Reporting Scheme in making fairly accurate assessment of area as the same are based on the 20 percent of sample of the villages. This required to be made available within 10-15 days after the sowing of the crops is complete and the infrastructure and other requirements need to be created for the same.

Other Salient Issues Related to Agricultural Statistical System

There are two general issues related to any endeavor of generating statistics i.e. timeliness and reliability of data. Timeliness being the first and foremost requirement for the requisite information suffers the most mainly on account of different agencies involved in the generation of area and yield estimates and statistics on other aspects of agricultural in coordination with a large number of States and Union Territories. The delays in submission of requisite information pertaining to agricultural statistics can be cut considerably if the same are generated and transmitted with the modern method of computing and transmission facilities.

Livestock Census

The Directorate of Economics & Statistics is also organizing quinquennial livestock census. The 16th Livestock Census is being conducted in the country with 16th October 1997 as the due date. Under this census, the information is collected on implements and machinery, fishing activities, and poultry besides the livestock.

The main issue in the conduct of livestock census have been observed to be the inconsistency in the reference date of the conduct of the livestock census in different States/Union Territories as it creates problems in the aggregation of the information so collected at the all India level.

Agricultural Census

The agricultural census is an important quinquennial activity organized in India since 1970-71 in collaboration with the States and Union Territories. The information on number and area of operational holdings, tenancy particulars, land utilization, source/cropwise irrigated area and area under major crops (irrigated/ unirrigated) is collected as a part of the agricultural census. The input survey is also being conducted since 1976-77 quinquennially along with Agricultural Census which provides information on levels of consumption of various inputs like fertilizers, pesticides, manures, agriculture implements and machinery, livestock and agricultural credit by major size classes of holdings.

- i. There is need to conduct the agricultural census as well as the input survey with the reference date, as decided which should be adhered to by all the States and Union Territories.
- ii. Besides the information on a subject like tenancy which is a sensitive subject is required to be collected on a special survey and the information need not be integrated on the basis of the land records made by the Patwari.

Statistics is expected to represent truthfully the situation or the phenomenon for which the same has been compiled. Or, it should be supported with the possible extent of deviations from the truth that may be inevitable in the process of its compilation. These two conditions are met when the statistical layout of data compilation is adhered to and the departures are kept to bare minimum. With the increase in the data demand, the coverage and intensity of data collection has increased involving concepts and procedures. The strengthening the agricultural statistics is an ongoing process in which the dynamism of the sector and of the economy set the agenda of data requirement. The control of non sampling errors may be regarded as an ingrained component of such exercises so the credibility of the data is retained.

Status of Livestock Statistics in India

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The livestock sector has been envisaged as an integral part of diversified agriculture, which contributes about 26 per cent to the total value of output from agriculture and about 8 per cent to the total GDP.

The basic statistics on livestock include the population (Number) of livestock in terms of breed, sex, age and utilisation pattern, distribution of livestock by size of land holdings, output of different livestock products and byproducts, marketing and economics of livestock products, infrastructural facilities, incidence of animal disease, animal husbandry practices and other related statistics such as feed and fodder statistics, consumption pattern of livestock products etc.

Sources of Livestock Data

(a) Censuses:

- (i) *Livestock Census*: It provides statistics relating to livestock numbers with sex, age, utilisation, classification of various species of animals and birds.
- (ii) *Agricultural Census*: It provides livestock number related to agricultural holdings.

(b) Surveys

- (i) Integrated Sample Survey for the estimation of production of major livestock products which provides estimates of production of milk, eggs, wool and meat and also cost of production of per unit of milk and eggs.
- (ii) Ad-hoc/pilot surveys conducted by the research institutes and experimental stations like IASRI, IVRI etc.

(c) Reports>Returns:

- (i) Administrative returns prescribed by the Planning Deptt., which provide data relating to financial and physical achievements.
- (ii) The periodic returns/reports from the State Department of Animal Husbandry provide information regarding veterinary dispensaries/hospitals/polyclinics, number of animals treated, number of animals affected by various diseases, number of State farms and infrastructures and other related statistics pertaining to animal health care and production.

Agencies Responsible for Livestock Statistics

(i) At the Centre

- (a) Department of Animal Husbandry & Dairying, Ministry of Agriculture.
- (b) Directorate of Economics & Statistics, Ministry of Agriculture.
- (c) National Sample Survey Organisation (NSSO), Deptt. of Statistics.
- (d) Central Statistical Organisation (CSO), Deptt. of Statistics.
- (e) Directorate General of Commercial Intelligence and Statistics, Ministry of Commerce.
- (f) Indian Agricultural Statistics Research Institute (IASRI), ICAR.
- (g) Indian Veterinary Research Institute (IVRI), ICAR.
- (h) National Dairy Research Institute (NDRI), ICAR.
- (i) Grassland and Fodder Research Institute.
- (j) Directorate of Marketing and Inspection, Ministry of Rural Areas & Employment.

(ii) At the State Level:

- (a) Department of Agriculture/Bureau of Economics & Statistics.
- (b) Department of Animal Husbandry/Veterinary Services/Dairying.

Availability of Livestock Data

Livestock Population : Information relating to the number of different species of animals and poultry birds is collected through the quinquennial livestock census. This includes sexwise, agewise and breedwise information of livestock for rural and urban areas of each State/UTs. The data regarding distribution of livestock according to different size of land holdings are collected under Input-Output survey conducted under the agricultural census.

Estimates of production of major livestock i.e. milk, egg, wool and meat are worked out on the basis of sample surveys conducted under the Integrated Sample Survey for the Estimation of Major Livestock Products which is being implemented in all the States/UTs of the country. This also gives information regarding animal husbandry practices, utilisation of products, pattern of feeding etc. The surveys regarding cost of production of milk and eggs which are integral part of the Integrated Sample Surveys are also conducted in selected districts of some of the States.

The statistics relating to Vety. Hospitals dispensaries etc. and incidence of animal diseases are collected through the periodical returns/reports prescribed by the Deptt. of Animal Husbandry & Dairying.

Statistics relating to wholesale and retail prices of various livestock products are collected by the Directorate of Economics and Statistics, Department of Agriculture and Cooperation through some selected centres in the country.

The National Sample Survey Organisation has also conducted some surveys to collect information on livestock possessed by the households. The data collected covered age, sex, breed, mode of acquisition, purchase price, market value, disposal of animals, sale price etc. Similarly, surveys have also been conducted regarding consumption of milk and milk products, eggs, meat and fish (all India) etc. The other information collected through the National Sample Surveys includes household dairy enterprises, characteristics of household poultry enterprises, estimates of birth, death and calvings interval of bovine, number of bovines and yield of milk etc.

Requirement of Additional Data

(i) Number of important breeds of bovine. (ii) Productivity of different breeds of milch animals. (iii) Pattern of milk utilisation in rural and urban areas. (iv) Production of meat by-products. (v) Production of broiler and poultry meat. (vi) Production of dung. (vii) Losses of livestock due to diseases/calamities. (viii) Mortality rates of different animals and poultry birds. (ix) Cost of production of per unit of livestock products such as milk, egg, wool etc. (x) Price of livestock and livestock products (wholesale and retail prices). (xi) Production of roughages and concentrates as livestock feed. (xii) Area and production of fodder crops. (xiii) Availability of Vety. Services according to distances and population of livestock. (xiv) Availability of marketing facilities according to distances and livestock population. (xv) Information on rearing and animal husbandry practices. (xvi) Household/per capita consumption of livestock products such as milk, egg, meat etc. - Statewise.

RECOMMENDATIONS

Based on the papers presented and discussions held, the following recommendations were made :

Current Status of the System

1. The Indian Agricultural Statistics system has earned credibility for its structural strength to cater to the diverse planning, policy and decision

making requirements. However, on the quality of statistics and its timely availability the criticism of the system has become sharp and to some extent real. The orientation of the system to take corrective steps for addressing such criticism is essential.

2. The non-updation of land records and over-loading the primary agencies with multifarious duties, the lack of sensitivity, knowledge and appreciation of statistical tools and methods by the personnel engaged in Agricultural Statistics system at various levels are some of the salient causes for qualitative aberrations emerging in statistics.
3. The domain of Agricultural Statistics in the past five decades has broadly remained rigid or static. The system should have flexibility to respond to the dynamic character that has acquired by the agriculture sector in the post Green Revolution era.
4. The emerging market oriented economy, where agriculture is gradually getting integrated with domestic as well as international market, the statistics from non-official sources are being generated which are sometimes at variance from official statistics. Efforts should be made to standardise and streamline the procedures.

Concept & Coverage

1. The intra state variations as well as temporal changes in cropping pattern should be adequately accounted for in the crop enumeration periods.
2. The concepts, definitions and coverage of land use classification need updation on response to emerging needs.
3. The data gaps for traditionally important agricultural products such as horticulture crops and emerging high value products such as floriculture, export oriented crop varieties, mushroom culture, etc. need to be bridged either through focused sample surveys or through type studies.
4. The crop forecasting is identified as a weak organ of otherwise strong agricultural statistics system and the system of crop forecasting needs to be strengthened.
5. The large volume of data concerning input application for various crops compiled during conduct of crop cutting experiments remains generally unutilised whereas there is a growing need for input data and its impact on agriculture. The system to utilise such data needs to be streamlined.

Application of Tools and Methodologies

1. The methodologies used for generating agricultural statistics have been developed after intense theoretical considerations. However, there had been instances where the methodological details are not properly adhered to, particularly in crop estimation surveys which consequently have impact on quality. The agricultural statistics system should also check such methodological aberrations for protecting the quality of statistics.
2. In the forecasting of crops, there is need to develop and use suitable models using exogenous as well as endogenous data available with different agencies. The institutionalised arrangement for data assimilation and analysis is necessary to strengthen the forecasting mechanism. These issues have been addressed by the Expert Group for Crop Forecasting and Advance Estimates of Agricultural Production and actions on its recommendations may be expedited.
3. Dynamism of agriculture sector had led to optimum use of natural resources for cultivation of specific crops in localised area. The technique of small area sampling should be encouraged, to bridge the data gaps of minor and marginal cropping.

Future Challenges

1. The modulation of Agricultural Statistics to meet the emerging needs of environment planning and sustainable agriculture is necessary.
2. With the greater integration of production with market, agricultural statistics system should also strengthen the post harvest data system such as precise estimation of post harvest losses, marketable surplus, price forecasting and international trade comparisons.
3. The skill of statistical personnel should also be upgraded to enable them to adopt and apply modern statistical and analytical tools.