

## Quality Aspects of Crop Statistics in India– Problems and Prospects<sup>1</sup>

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Respected President, distinguished invitees, delegates, ladies and gentlemen

I consider it a great honour that I have been asked to deliver the prestigious Dr. V.G. Panse Memorial Lecture during the 58<sup>th</sup> Annual Conference of the Indian Society of Agricultural Statistics here this evening. I am indebted to the President of the Society Dr. Panjab Singh, Dr. Prem Narain, Executive President and Dr. S.D. Sharma, Director, IASRI and Secretary of the Society with whom I was privileged to have very close association during the last ten years in matters relating to improvement in Agricultural Statistics System in the country. But I feel too small to deliver this lecture today when I see the names of great giants who were called upon to deliver this very prestigious lecture in the past. Dr. Panse was a towering personality among the Great Agriculture Statisticians of all times. On a personal note, I would like to tell you how much I feel honoured today by the Society in asking me to deliver Panse Memorial Lecture because even before I was born in a small village in Trichur district in Kerala in 1944, Dr. Panse had established his great credentials as a distinguished Scientist, Par Excellence, in diverse fields like plant genetics and plant breeding trials, design and analysis of agronomic experiments in farmers' fields and other related areas. Later, he became one of the most respected Agriculture Statisticians in the world. He served several National and International Agencies including Food and Agriculture Organization (FAO) and prestigious foreign universities since 1940's and has been an inspiration to statisticians not only in India but also abroad. He served the society for 15 years as its secretary and guided its

activities. Let us rededicate ourselves today for the noble causes to which Dr. Panse spent his fruitful career for the development of a credible Agricultural Statistical System in India.

### 1. INTRODUCTION TO CROP STATISTICS SYSTEM IN INDIA

Agricultural Statistics has played an important role in planning and policymaking relating to Indian Agriculture by providing reliable information on agriculture production and other related aspects. Important decisions relating to procurement, distribution, prices, export, import and the growth of the sector largely depend on production database. Currently, Agriculture sector contributes to about 27% of GDP and about 65% of the population depend on agriculture for their livelihood. The estimates of crop production in a year form the most important input in the policy exercise of food security of the country's population. This underscores the importance on the need for reliable crop production estimates. India has been a pioneer in obtaining estimates of crop production based on sample surveys from late 1930's. The pioneering work done by the Indian Statistical Institute under the leadership of late Prof. P.C. Mahalanobis during 1937-41 to estimate the acreage and production of jute in Bengal and Prof. V.G. Panse and Dr. P.V. Sukhatme of Indian Council of Agricultural Research in 1942-48 to estimate the yield rate of cotton and wheat have been acclaimed world over. Since then, the sample surveys have continued to play an important role in the system of agricultural statistics in India for deriving crop estimates.

Agriculture being a State subject and Statistics falling in Concurrent list, the Agricultural Statistics System is a highly decentralized one. In States, the State Agriculture Statistics Authorities (SASA) are responsible for compilation of agriculture statistics and more particularly the crop statistics. In many States, the SASA is the Director of Economics and Statistics. At the Centre,

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the Ministry of Agriculture and Cooperation plays the role of Nodal Agency in the field of Agriculture Statistics. Equally important is the role of National Sample Survey Organization in developing a sound crop statistics system in the States by providing them technical guidance in the conduct of crop estimation surveys. The subject of crop statistics consists of two elements viz. the area statistics and yield rate statistics. The area statistics broadly covers the utilization pattern of the land with detailed statistics relating to land put to agricultural uses; like area sown under different crops in different seasons. The yield statistics relates to the productivity of land, in respect of different crops. The estimates of crop production are worked out by multiplying the area under a crop with its average yield in the relevant season. More than 90% of area under crops and about 95% of yield rate is currently estimated based on sound statistical techniques. It is worth mentioning that the estimation of yield rate of principal food and non-food crops is being done in most of the states through well designed random sampling surveys known as General Crop Estimation surveys (GCES) wherein the yield rate is estimated based on crop cutting experiments on various crops. Since 1963, the NSS took over the role of central coordination of these surveys through the Agriculture Statistics Wing of Field Operations Division (FOD) and has been playing a major role in improving the quality of crop statistics in the country.

In my lecture today, I propose to make an overview of the System of Conduct of Area Statistics Surveys and General Crop Estimation Surveys in some detail based on my long experience of working in NSSO and would try to bring out the quality problems in the system of conducting these surveys and possible measures for improvement. I would try to give the state wise position to the extent possible so that one could get a better appreciation of the problems and prospects with regard to quality aspects of crop statistics in the country. The two components of Crop Statistics are: Area Statistics and Production Statistics.

## 2. CROP AREA STATISTICS

Timely availability of area statistics has been of prime consideration for making objective assessment of the performance of agriculture sector and in making estimates of crop production forecasts for policy making in respect of agriculture sector. The crop area is also an important parameter used in designing of GCES.

From the point of view of crop area statistics, the entire country can be divided into three broad groups:

- (i) **Temporarily Settled States :** These States have been cadastrally surveyed and therefore area and land use statistics form part of the land records maintained by the revenue agency. This group consists of 18 States which are: Andhra Pradesh, Assam (excluding hills), Bihar, Chhattisgarh, Goa, Gujarat, Haryana, Himachal Pradesh, Jammu and Kashmir, Jharkhand, Madhya Pradesh, Maharashtra, Punjab, Rajasthan, Tamil Nadu, Uttaranchal and Uttar Pradesh and five Union Territories of Chandigarh, Dadra & Nagar Haveli, Daman & Diu, Delhi and Pondicherry. Area statistics is compiled by the lowest revenue functionary in the village commonly known as Patwaris in most of these States/UT's. In some States they are called Karnam or some other designation. Area estimates in these States/UT's are based on complete enumeration of all fields by the patwari which is called the girdawari. Normally, a patwari is in charge of a village or a group of villages, to carry out field to field crop inspection in each season and to record crop areas and land utilizations in a register called the Khasra Register. The crop-wise and utilization wise area figures compiled by patwari at village level are successively aggregated at the circle, tehsil and district levels. The district wise figures are reported to SASA and State level figures are transmitted to Centre, Ministry of Agriculture who is responsible for issuing all India estimates. About 86% of reporting area are covered by these States/UT's.
- (ii) **Permanently Settled States:** This group has three states viz. Kerala, Orissa and West Bengal. In these States, there is no land revenue agency at the village level and therefore there is no girdawari done based on 100% crop inspection. The estimates of crop area and land utilization are made based on sample surveys. These three States account for about 9% of reporting area.
- (iii) **Third group** consists of North-Eastern States and some UT's. About 5% of reporting area is covered by the States: Assam (hill districts), Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura and the UT's of Andaman & Nicobar Islands and

Lakshadweep. In these areas, crop area estimates are made as per “conventional” method. These are generally “eye estimates” made without any statistical basis.

System of girdawari suffered both from quality and timeliness over a number of years. The single most important reason has been associated with the patwaris who with their multifarious activities have not been able to devote time and attention to their most important work namely the girdawari and by default this work suffered the maximum; huge workload of patwaris have also contributed to the problems. The delay in availability of area statistics and its quality standards have been serious concerns of both the Centre and States which resulted in taking up of two new schemes in the States to overcome these serious problems of quality and timeliness, the Timely Reporting Scheme (TRS) in temporarily settled States and Establishment of an Agency for Reporting Agriculture Statistics (EARAS) in 3 permanently settled States.

#### **Timely Reporting Scheme**

TRS therefore was an important initiative of the Ministry of Agriculture and Cooperation and was taken up from 1968-69 covering land record States. The main objective of this important scheme was to reduce the time lag in the availability of area statistics between period of sowing and availability of estimates of area sown in respect of major crops. This was sought to be achieved through completion of girdawari by patwari on priority in a random sample of 20% villages and he should submit the village crop statistics statement to higher authorities by a stipulated time for preparation of advance estimates of area under crops. The sampling scheme was done in such a way that all the villages in every State would be covered under TRS during a period of five years. The idea was to use the TRS estimates of area under crops while preparing the “forecasts” by Ministry of Agriculture as the area figures based on 100% crop inspection by patwaris would not be available for this purpose. In each State, for each season, the prescribed time schedule for taking up and completing the area enumeration in TRS villages was specified for the compliance of patwaris and it was therefore expected that the objective of the scheme would be met as patwari was to do this work only in 20% of his allotted villages on priority under TRS. Rest of the villages would be

covered later after completion of TRS in a season. But in practice, this never happened and TRS did not yield the desired results. We shall see this in detail a little later.

#### **Establishment of an Agency for Reporting of Agriculture Statistics Scheme**

In the States of Kerala, Orissa and West Bengal a scheme similar to TRS was introduced with the same objective of obtaining area estimates based on a 20% sample for use both by Centre and States. Here also, it was envisaged that crop area figures would be available for all villages over a period of five years.

In my view, one of the serious limitations of the crop statistics system in the country is non-coverage of North-Eastern States except Assam from implementation of important schemes like TRS/EARAS and CES. These States were not included in these schemes when they were taken up for implementation; even now, the situation remains the same. This is a matter, which should receive urgent attention of Ministry of Agriculture and NSSO, and proposals should be formulated for obtaining crop area and production estimates of principal crops in these States/UT's.

### **3. GENERAL CROP ESTIMATION SURVEYS (GCES)**

In India, estimates of yield rates of principal food and non-food crops are obtained based on crop cutting experiments conducted on scientific basis in most of the States and UT's under the national programme of General Crop Estimation Surveys. In all, more than 5 lakh crop-cutting experiments are conducted covering 50 food and 16 non-food crops. Currently, it is estimated that about 95% of the production of food grains is estimated on the basis of yield rates obtained from crop cutting experiments. FOD coordinates the work under CES in all the states and UT's and also give technical guidance to them on crop estimation surveys. Special attention is given to ensuring uniform concepts and procedures are followed by State staff while conducting these surveys. The State also send crop estimation survey data to both NSSO and Ministry of Agriculture and Cooperation. FOD publishes every year the Consolidated Results of Crop Estimation Surveys on Principal Crops giving detailed position of the conduct of the surveys, state wise and the results from these surveys for use by the States and Centre.

#### 4. IMPROVEMENT OF CROP STATISTICS SCHEME (ICS)

After implementation of the above schemes for a few years, it was decided by Ministry of Agriculture to implement a new scheme called the Improvement of Crop Statistics Scheme (ICS) through an independent agency, the National Sample Survey Organisation (NSSO) from 1973-74 to act more as a watchdog on the implementation of TRS and EARAS. The main objective of ICS was to locate the deficiencies in TRS, EARAS and CES through the joint efforts of Centre and States and suggest remedial measures for improvement in quality of crop statistics. Thus in ICS programme, NSSO from the Centre and most of the State Govts. also participate on equal matching basis. ICS scheme aims at conducting sample checks by NSSO supervisory staff from Regional Offices of Field Operations Division of NSSO and State supervisory staff of DES/SASA on the primary field work done by state staff through :

- (a) Physical verification of the crop inspection done by the village level worker in a sample of about 10,000 sample villages in each season
- (b) Checking of crop abstracts in these sample villages and
- (c) Inspection of about 30000 crop-cutting experiments at the harvest stage

Currently, ICS scheme is in operation in 20 States and 2 UT's of Delhi and Pondicherry. As you know, the ICS scheme is in a way an evaluation system on the working of TRS, EARAS and CES. With regard to area check, it may be noted that it not only probes into the qualitative aspects but also attempts to make quantitative assessment of the extent to which discrepancies are observed in crop and land use pattern and the resultant impact on area statistics. Possible errors in reporting of area figures by the primary worker are brought out by the supervisory staff and the impact of these errors in area estimates can be made by comparing the two sets of entries in the schedule. Sample check also gives an idea about the extent of under or over reporting of area by patwari.

Similarly, under the sample check on crop cutting experiments, the supervisors bring out deviations from the prescribed procedures while doing crop cutting experiments by primary workers, with regard to use of random numbers, selection of plots, harvesting of

produce, use of standard equipments and weighing of grains etc. The supervisor also corrects the mistakes observed during his field visit in the filled in schedules and thus only corrected version of the schedules used for tabulation. Therefore, based on observations of the supervisory staff in the schedules, it is possible to bring out lacunae in the system of conducting the crop cutting experiments in the reports. Therefore, the ICS scheme provides a tool for assessment of quality of work done under the TRS, EARAS and GCES in various States. Before, I dwell upon these aspects, it would be relevant to briefly mention the sampling design and procedures of conducting the ICS programme.

#### Sampling Design of ICS Scheme

The sampling design for sample check on area enumeration is that of stratified multistage random sampling with taluks/tehsils/CD blocks/group of taluks in a district as strata, villages within the stratum as first stage units and survey numbers within the village as the ultimate sampling units. Sample villages are selected from the set of TRS/EARAS villages in a stratum for the current year concerned, following simple random sampling without replacement (SRSWOR). In all, 4 clusters of 5 survey numbers each, within the village are selected through circular systematic sampling with equal probability. For selection of clusters, all survey numbers or sub-survey numbers are given serial numbers treating each such sub-survey number as a sampling unit. This constitutes the sampling frame in all states except UP where sub-survey numbers are not taken as sampling units. Supervisors will retain the selection of survey numbers made during the first season for sample check during the subsequent season(s) also.

The sample size under sample check for area enumeration under ICS scheme, state wise is given in Annex 1. It may be seen from Annex. that only two States of Andhra Pradesh and West Bengal cover additional samples while the remaining States participate in ICS work on equal sampling basis.

The sampling design adopted for sample check on crop cutting experiments is that of stratified multi-stage random sampling. Districts within a State are taken as strata, villages within a stratum as first stage units, survey numbers/sub survey numbers within a village as second stage units and a plot of specified shape and size within a survey/sub-survey as the ultimate sampling unit. The

selection of sample villages is done in two stages. First, villages are selected through SRSWOR from the list of villages already selected for sample check on area enumeration and in which crop cutting experiments are planned under GCES. If the number of villages so selected is equal to the sample size for check on crop cutting experiments, then no further selection is necessary. But if there is any shortfall in the number of villages required for sample check on crop cutting experiments, additional number of villages will be selected in the second stage. This will be done from the remaining villages selected for GCES. Subsequent to the selection of villages, the successive sampling units as selected randomly in GCES are adopted for ICS.

The sample size at state level is allocated among the districts and specified crops in proportion to GCES plan. A minimum of two villages is selected from each stratum and two experiments in each selected village are supervised for each crop. Thus a minimum of four experiments is covered for a crop in a district for supervision in ICS scheme.

State wise sample size under ICS for sample check of crop cutting experiments is shown in Annex 1A.

#### **5. ASSESSMENT OF QUALITY ASPECTS OF WORK UNDER TRS, EARAS AND GCES BASED ON ICS EVALUATION**

I shall now attempt to do the most difficult but at the same time the most important part of my lecture to give an overview of the quality of work under area enumeration by patwaries and the conduct of crop cutting experiments by state primary workers for estimation of crop yield based on ICS programme. We shall try to look into the problems of data quality to the extent possible, State wise in respect of work relating to area statistics and yield rate estimation and some of the recent initiatives taken by both Centre and States for effective improvement in conduct of these programmes in future.

#### **TRS and EARAS—An Evaluation**

You will recall that TRS/EARAS were introduced by the Central Government with the primary objective of making available the crop area estimates in time for use in forecasts of agriculture production as per specified dates fixed by the Ministry of Agriculture. Therefore, timely completion of girdawari in the 20% villages and providing reliable area figures at village level first and

further aggregation, at block, district and state level. Therefore, we shall now look at the actual performance of the two schemes in some detail, state wise during 2001-02, particularly with regard to these important targets. The achievement figures are based on the combined observations of Central and State samples under TRS and EARAS as given in ICS reports brought out by the Agriculture Statistics Wing of FOD at Faridabad.

Accordingly, a statement giving the percentage of villages in which patwari carried out TRS as per prescribed time schedule for kharif and rabi, the two major seasons for 2001-02 are shown in Annex 2, State wise. It will be observed from this table that at all India level, pooled sample gives an achievement of 62% on timely completion of area enumeration in kharif of 2001-02 and for rabi, it was only 57%. The corresponding figures for 2000-01 were 60% for kharif and 58% for rabi, more or less of the same level. When we analyse the position separately in respect of Central and State sample, there is slight improvement in State sample compared to Central sample in both the years and for both the seasons. Reasons for this could be attributed to, among other things, agency bias, due to somewhat different professional background of the supervisory staff of NSSO and the States although there is no study done by NSSO or the States in this regard to my knowledge to substantiate this point. We should be more concerned with the very poor performance of several States on this very important aspect of TRS. There are States where the percentage of sample villages where area enumeration was done in time was as low as 12% in Bihar, 10% in Jharkhand, and even in a State like Andhra Pradesh, it was only 40%, these are all pooled estimates. If one takes only the Central sample figures, position is much worse in these States, e.g. Andhra shows only 13%, Bihar 0% and Jharkhand 2%. These are for kharif crops during 2001-02. For Assam, it is 0% both from central and state sample, which is shocking, as it would mean in no village the TRS, was done as per prescribed time schedule. The trends are more or less the same for rabi crop also in various States. On the other side of the spectrum, there are several States which have performed very well, like Himachal Pradesh (100% for kharif and 96% for rabi), T.N. (86% for kharif and 97% for rabi), Madhya Pradesh (84% in kharif and 91% in rabi), Uttaranchal (88% in kharif and 91% in rabi), Rajasthan (85% both in kharif and rabi), Chattisgarh (85% for kharif and 82% for rabi), Gujarat (86% for kharif, but only

35% for rabi during 2001-02). Generally the rate of achievement of these States was on similar lines during 2000-01 as well. The three states under EARAS showed generally better performance - Orissa showing best results, 72% in kharif and 82% in rabi, followed by Kerala 70% and 77% and then West Bengal, 38% and 46%.

The analysis shows a dismal picture of TRS in many States and therefore, you will agree that the overall achievement is nothing to be proud of. The other aspect is that even though NSSO and Ministry of Agriculture have been bringing this to the notice of the States and requesting for suitable steps taken for improving the situation, over a period of time, there has not been much of an improvement. In the meetings of the High Level Coordination Committee in each State normally chaired by very senior State Govt. Officers like Agriculture Production Commissioner or Additional Chief Secretary or Principal Secretary Agriculture with representation from Revenue and Planning, these issues are discussed in great details and decisions are taken to remove bottlenecks, but unfortunately, situation has not shown any perceptible improvement. This point was seriously noted down by National Statistics Commission also in their Report to Central Government and suggested several measures for bringing out improvement in TRS. NSC even suggested discontinuing 100% crop inspection by patwaris and restrict girdawari to only a 20% sample keeping in view the multifarious activities allotted to patwaris and they are not able to concentrate on this most important item of work allotted to them. The Working Group on Agriculture Statistics for 10<sup>th</sup> Plan also endorsed this view. Therefore, both Central and State Governments have to sit together to early reach an agreed view on this as States are reported to have reservations on this proposal as the land utilisation statistics system would get affected. But all steps are to be taken by all concerned to derive full benefits from such an important national programme when even after more than 25 years of its existence, the TRS has not been able to meet the basic objective for which it was introduced.

## 6. RELIABILITY OF AREA FIGURES REPORTED UNDER TRS

The sample check exercised by supervisory staff on area enumeration done by patwaris also gives certain quantitative assessment of the extent to which discrepancies are observed in crop and land use pattern

and the resultant area estimates. Supervisory staff in the area enumeration work by State primary staff has observed following three types of errors:

- (i) Missing of crops actually sown in the field (e1)
- (ii) Reporting of crops not sown in the field (e2) and
- (iii) Inaccurate assessment of area under crops (e3)

The incidence of occurrence of these errors and the impact can be measured by comparing the entries in the schedule made by the supervisory staff and the primary workers. One could also get an idea of under or over reporting of area by patwaris.

Annex 3 gives percentage of survey numbers in which the supervisory staff noticed the three different types of errors in reporting of area by patwaris during the year 2001-02 as per ICS report, the figures are based on the pooled data from Central and State samples separately for kharif and rabi.

It is pertinent to note that for all States covered in the ICS programme, in only 65% of survey numbers, no error was noticed in kharif and in 67% cases no error was noticed in rabi crops. This is not a happy situation as in one third of the cases at all India level, one of the three mistakes was observed by supervisory staff while doing sample check of area enumeration. When we study the position state wise, it does not give any encouraging picture at all. "No error cases" were very low in States like Maharashtra (38%) and Karnataka (47%) during kharif and almost similar situation was observed in these states for rabi crops as well. Other states also which need to take this issue seriously, are Gujarat (60% in kharif and 65% in rabi), Madhya Pradesh (56% in kharif and 41% in rabi). In remaining States, the situation is a little better. In most of the States, it is also seen that patwaris are making more mistakes with regard to e1 (missing of crops) and e3 (inaccurate assessment of area under crops). This is all the more serious as e1 and e3 have serious implications on crop production estimates.

I would also like to make a special mention about certain very serious observations given in ICS report in respect of Assam, Bihar and Jharkhand States. With regard to issues like incidence of errors in recording crop area, irrigation particulars, submission of TRS statement and inaccuracies in area aggregation particulars, the entries recorded were found to be inconsistent and/or

not reflecting the true picture of discrepancies in the work in these States, Agriculture Statistics (AS) Wing could not accept the data for tabulation. These are very serious matters and therefore needs urgent action by NSSO and the States.

The errors in reporting of area could result in serious situations if area is under reported, it can lead to under estimation of production, which can have serious implications on policy. That is why e1 and e3 are more serious and these types of common errors should be controlled and avoided.

Another pertinent point to be noted is that generally the patwari estimates of area under crops are found to be lower than the corresponding area estimates obtained based on the supervisor's entries in the ICS schedules in respect of most of the major crops. Annex 4 gives the ratio of area estimates from ICS sample and the TRS sample done by patwaris; the ratio is calculated as area reported by supervisor divided by the area reported by patwari. During the last few years, 1999-2000 to 2001-02, it is seen that in respect of all crops except ragi, the patwari figure was less than that of the supervisor's figure. The extent of difference was more than 10% in respect of rice, jowar, maize, cotton, groundnut, wheat, rapeseed and mustard. This aspect had been studied in detail by an Expert Group set up by CSO a few years back in view of implications of under reporting of area figures which go into production estimates and its consequent impact on lower share of agriculture sector in GDP. Among other things, this group had recommended use of a correction factor based on ICS estimate to be applied to official area estimates compiled based on patwari figures. Perhaps, this is not being done as yet, as there are several implications on adopting such a procedure.

The National Statistical Commission was also seized with this matter and even the Sub-group on Agriculture Statistics of NSC set up an Expert Group under Prof. Arijit Chaudhuri of Indian Statistical Institute, Kolkata in which I also worked as a Member, to review the ICS programme and suggest modifications in the survey design including sample size for formulation of independent estimates at all India level as well as to provide correction factors for calibrating the state official estimates. The Expert Group had looked into the issues in great detail and also undertook some studies through the AS Wing of FOD and gave far-reaching

recommendations to the NSC. The major recommendations were:

- (i) Objectives of ICS should be broadened to include a) providing estimates of area under principal crops based on sample observations as early as possible after girdawari is over, (b) providing estimates of area and production for major kharif and rabi crops separately broadly corresponding to the timings of preparation of second and fourth advance estimates of Ministry of Agriculture.
- (ii) In order to calibrate the TRS area estimates, whenever need arises, a Correction Term may be applied, but only at the State level.
- (iii) Sample design for area check may be modified to include three sub-strata viz. large, medium and small within each stratum based on the gross cropped area of villages and selection of villages should be resorted to within each sub-stratum through SRSWOR.
- (iv) Sample design for crop cutting experiments needs no modification.

However, in the final report of NSC, these recommendations were not included and there is no development in this regard. But then, this is not unusual, as we know that recommendations of several expert bodies do not get implemented due to one reason or the other.

## 7. WORKLOAD OF PATWARIS

While considering steps for improving the quality of implementation of TRS/EARAS, one important issue needs to be considered is the implications of huge workload of patwaris and its adverse impact on timely completion of area enumeration and the reliability of area estimates. It goes without saying that the success of TRS depends largely on a motivated and sensitised patwari who should know the important purpose of TRS and there has to be an environment in which he is allowed to carry out this important work allotted to him as per the time table fixed for the same. His workload should also be reasonable so that he can do justice to their priority work. But in practice, these issues unfortunately have not been getting due attention over the years. The average workload of a patwari is 5 villages at all India level, but it is as high as 14 in Bihar, 22 in Jharkhand, 10

in Assam and Uttaranchal, 11 in Himachal Pradesh and 9 in Orissa. On an average, there is about 1100 survey numbers in a village; so, clearly, the patwari has a huge workload for crop area enumeration within the limited time of about ten days for TRS work in every season. It is also anybody's guess to what extent he is motivated about the actual use of this priority work of TRS. Therefore, by default he does not attach the importance or urgency for girdawari even in respect of his TRS villages and the result is there for all of us to see. The NSC also could not suggest a feasible solution to this serious problem. It is a catch 22 situation in a way, neither we can increase the number of posts of patwaris due to the Govt. policy of not recruiting any new staff and even restrictions on filling of vacant posts nor can we reduce his other miscellaneous jobs which take away all his time and left with very little or no time for field to field enumeration. Therefore, even NSC could not find a feasible solution to this problem and felt that 100% crop inspection may be dispensed within consultation with States and work may be carried out on sample basis, may be 20% sample of villages is good enough. Suffice to say, unless this problem is satisfactorily resolved, it would not be realistic to expect that TRS scheme can be streamlined and made successful.

I would like now to touch upon the technical and field problems which has got a serious bearing on quality of the work, observed through ICS, in the conduct of crop cutting experiments under General Crop Estimation Surveys (GCES).

### 8. QUALITY ASPECTS OF WORK UNDER GCES

It may be noted that unlike the sample check on area enumeration, which is done after the patwari has completed his work, the sample check on crop cutting experiments is concurrent and supervised at harvest stage by supervisory staff. He observes the conduct of the experiment with particular reference to the prescribed procedures, which are to be followed by the staff doing the crop cut. He also collects ancillary information on supply of equipments, training given to the primary worker, arrangements for driage experiments apart from gathering ancillary information on irrigation, type of seed, use of fertilisers/pesticides, general crop condition etc. The data collected also help the NSSO to calculate the yield rate of crops, which are sent to Ministry of

Agriculture for use in their production forecasts wherever necessary.

Crop cutting experiment is the basic tool adopted in India for obtaining reliable crop yield rate through sound statistical techniques. The procedure consists of proper identification of sample plot, correct measurement of desired size and shape of the crop cut, harvesting of produce from the sample plot and its correct weighing and correct recording of ancillary information. Generally, the crop cut is done in a plot of 5 metre  $\times$  5 metre size for most of the crops in most of the States. However, in UP State, the shape of the plot is of an equilateral triangle of size 10 metres and in West Bengal, a circular plot of radius 1.745 metre is taken for crop cutting experiments. The crop cutting experiments are done by State Govt. staff belonging to Agriculture Department or Directorate of Economics and Statistics in most of the cases. The staff has to be trained in the procedures to be followed and detailed manual of instructions together with random number tables are also supplied to them. Further, ideally, they should also be supplied with the equipments required to conduct the crop cut and balance and weights for weighing of the produce.

### Type of Errors Observed in the Conduct of Crop Cutting Experiments

While supervising the crop cutting work done by primary workers, the following types of errors have been observed by the NSSO and State supervisory staff:

- (i) Error in selection of survey/sub-survey numbers
- (ii) Error in selection of field within survey/sub-survey numbers
- (iii) Error in measurement of field
- (iv) Error in selection of random numbers, location and marking of plots
- (v) Error in weighing of produce
- (vi) Error in reporting ancillary information
- (vii) Inadequate arrangement for storing the produce for driage and incorrect reporting of constituents in mixture and
- (viii) Others

From the ICS reports of NSSO (FOD), it has been observed that the States where incidence of error of one



type or the other which were found committed by crop cutting staff, was relatively large include J&K, Uttaranchal, Maharashtra, Rajasthan, Tamil Nadu and U.P. A statement giving the percentage of crop cutting experiments done where no error was noticed by supervisory staff, state wise, as reported in ICS report for 2001-02 may be seen in Annex 5. You will agree that if primary workers make such simple mistakes like selection of wrong field/plot, use of wrong random numbers, faulty measurement of field, and weighing of produce, it is a reflection of their lack of training or casual attitude in the work; obviously both situations call for serious action.

It is therefore hoped that due attention would be given by State Governments to impart intensive training with due emphasis on practicals to all the primary workers to ensure that they are thorough with the procedures of conducting the crop cutting experiments. As per present practice, in States like Goa, Haryana, HP, J&K, Maharashtra, Punjab, Rajasthan, UP, Delhi and Pondicherry, the training is held before each crop season and in other States, it is held at the beginning of the agriculture season. NSSO officers in the regional/sub-regional offices participate in these training programmes as trainers or observers. As regards attendance of trainees, it was quite low in Bihar (25%), other States where the attendance rate needs to be increased are: Andhra Pradesh, Haryana, HP, J&K, Maharashtra, Rajasthan and UP in respect of staff of different Departments. So, this is a real problem.

There could be another reason for problems of data quality. In several States, there have been large expansion in the number of crop cutting experiments being conducted since 80's and it is doubtful whether additional trained staff has been engaged for this additional work. This has happened along with the introduction of Comprehensive Crop Insurance scheme in the 80's. Some of the States where such large expansion has taken place in the size of the crop cutting experiments are Orissa, Maharashtra and UP. While increase in the size of the experiments would be welcome in order to meet the emerging needs of local level data for planning and policy purposes, such an exercise would be counterproductive if such expansion in work does not involve adequate expansion in trained manpower resources commensurate with additional workload. Otherwise, it would adversely affect the quality of the work and would lead to further

rise in non-sampling errors making the yield estimates unreliable.

During 2001-02, in all, 516045-crop cutting experiments were planned by all States put together covering food and non-food crops in kharif and rabi. The share of food crops is 413945 and non-food crops is 102100. NSSO has been repeatedly appealing to the States that when such large expansion takes place, they have to ensure making available adequate staff for the purpose. From ICS report for 2001-02, it is seen that in the States of Assam, Chattisgarh, Kerala, Madhya Pradesh, Orissa, UP and West Bengal, the workload of primary workers was huge and this obviously affect their quality of work. Also, this can lead to loss of experiments, as the cultivator cannot wait if the primary worker does not turn up on the appointed day for the crop cut. It should be remembered that after all, crop cutting is not the only work allotted to this staff and therefore, it is necessary that alternate arrangements are made if the concerned staff can not do the crop cut due to his other engagements, but this needs meticulous planning and remedial measures for making available adequate staff for the work which is not the case generally and ultimately, crop cutting work suffers.

While discussing this issue, I would also like to point out that the problem got worse due to the decision of the Ministry of Agriculture and Cooperation recently to have yield rate estimates for specified crops at Gram Panchayat level based on crop cutting experiments for use in the National Crop Insurance Scheme implemented in various States. It had been estimated by IASRI some years back that on an average about 16 experiments may have to be done for obtaining reliable estimates of crop yield at Gram Panchayat level for meeting any such requirement and this is not a practical proposition. This would have necessitated conducting more than 60 lakh crop cutting experiments at all India level, which is beyond the capacity of the States in the given situation today and therefore can not even be thought of. As an alternative, it was therefore suggested that one could think of only adoption of Small Area Estimation Technique to meet this demand. NSSO in association with IASRI and Ministry of Agriculture carried out a pilot study in five States based on the recommendations of a specially constituted Expert Group to test the feasibility of the suggested methodology, which was originally evolved by IASRI. The essence of this approach, as all of you know, is that certain assumptions /

models are conceptualised which are assumed to hold good at large as well as small area levels and this information is used for scaling down the estimates from higher to lower level. In the case of crop yield estimates, some auxiliary information at Village Panchayat level is generated which is not based on crop cutting approach. Then, this information is utilised to scale down the crop yield estimates at district/block level obtained through crop cutting experiments for developing estimates of crop yield at Village Panchayat level. For this purpose, Farmers' Appraisal Survey was carried out during the pilot study. Village level information collected included: area under crops, area irrigated etc. and from the selected farmers, his estimate of yield of crop grown, besides area under the crop, irrigation status, various inputs used, etc. were collected. The yield estimates from the survey were used only for generating correction factors for scaling down the estimates of yield under GCES based on crop cutting experiments. In this method, one has to make an assumption that all farmers in a sample village are likely to behave in the same way with regard to giving his assessment of yield from the crop. This type of small area estimation is generally called Synthetic Method of Estimation. I am happy to tell you that the pilot study gave encouraging results and it was found feasible to obtain Gram Panchayat level estimates of crop yield through the farmer's appraisal survey. Such initiatives and innovative methods have to be encouraged as Small Area Estimation Technique perhaps is the only hope in future for meeting data requirements at block and panchayat level, be in agriculture or socio-economic or other fields in the context of emerging data needs for decentralised planning.

I must also talk about another related subject while we are on the issue of problems associated with proposed such huge expansion on the size of crop cuts for NAIS. There has been a view in the Ministry of Agriculture and Cooperation that there should only be one set of crop cutting experiments both for use in estimation of agricultural production based on GCES and the very large number of crop cuts done for NAIS and they should be linked and one set of yield rate estimates only be made. This had far reaching technical implications on two grounds at least; firstly, how the States would be able to manage with such unmanageable number of crop cutting experiments without additional and trained staff for the purpose of NAIS is not clear, secondly, it is apprehended that biases are bound to creep into the system of crop cuts for NAIS due to the involvement of

several stake holders in the programme. Therefore, technically, it was not found to be a good idea to link the GCES experiments with NAIS set of experiments wherever they are being done. There is a danger that the reliability of GCES estimates would be adversely affected and therefore NSSO and Ministry of Statistics differed with the proposal of Ministry of Agriculture and suggested that the two sets of experiments should be delinked. The NSC and the Working Group on Agriculture Statistics for the Tenth Plan set up by Planning Commission have also advised on the same lines. It is therefore my belief that this advice of NSC would be honoured and there would be no attempt to adversely impact the reliability of GCES yield estimates any further. It is important to keep in view that even for the present size of crop cuts, most of the States are not fully geared up and therefore the effort should be to ensure that the existing size of experiments are conducted by trained staff strictly in accordance with the procedures laid down and non-sampling errors are controlled to the minimum.

I must also briefly touch upon the current position of supply of crop cutting equipments to the staff. NSS reports give a very discouraging picture in this regard as seen by supervisory staff while observing crop cuts. As per ICS report for 2001-02, it is seen that supply position of equipments like tape, pegs, balance and weights was poor in most of the States; percentage of experiments for which the staff had been supplied with tapes was 21%, corresponding figures for pegs, balance and weights were: 61%, 42% and 44% respectively. This is not all; about 20% of those to whom these were supplied had not carried the items to the field. So, they would make alternate arrangements for weighing the grains using local balance and weights, which may or may not be standard equipments. Obviously, use of non-standard equipments have serious impact on the yield rate and finally on the estimates of production. The only silver lining is that as per instructions, the supervisory staff has to record correct weight of the harvested produce by using proper balance and weights obtained locally. Balance and weights are the most important equipments in a way and in many states like Bihar, Gujarat, Haryana, J&K, Jharkhand, Punjab, Rajasthan and UP, the supply position was not at all satisfactory. So, this is another area of deep concern and States have to take suitable steps to overcome this problem. It has been reported by primary workers that it is not that they are to be supplied only with equipments, but some little contingency fund

should also be given to them for incurring small expenditure in connection with the conduct of the crop cut for any help that they might have to take from some body locally. This kind of practical problem has to be viewed sympathetically by State Govts/Centre in public interest.

### 9. STANDARD ERRORS OF YIELD ESTIMATES

A simple measure of the reliability of the crop yield estimates made based on crop cutting experiments is the associated standard error (SE) of these estimates. Many States have been computing the standard errors of yield estimates while others are not doing it for one reason or the other. But it is encouraging to note that AS Wing of FOD has been regularly computing the SE of yield estimate under both GCES and ICS based on data obtained from States and publishing them in the report on Crop Estimation Surveys. It is seen that the percentage SE at all India level for ICS estimates for 14 important crops is in the range of 0.9% and 5.1% for the year 2001-02. The corresponding figures under GCES are generally less in view of the fact that while the sample size under ICS is only about 30000 experiments, under GCES, it is about 516000. It is necessary that all States calculate the SE of yield estimates both in respect of major crops and minor crops and wherever the SE is high, say more than 5% at State level and more than 8 to 10% at district level, efforts may be made to review the sample size and take appropriate action. Annex 6 gives percentage of standard error of yield estimates from ICS and CES for rice (kharif) and wheat (rabi) during 2001-02.

### Scheduling of Crop Cutting Experiments vis-à-vis Girdawari

Another important factor which has a bearing on the quality of production data is the late time schedule fixed for certain crops in kharif season in some States. It has been observed that in these States, crop cutting experiments are conducted before completion of girdawari due to early harvesting. Such situation has been arising in respect of kharif crops like maize, jowar, bajra, groundnut, cotton, soybean, etc. in States like Gujarat, Haryana, Karnataka and MP. This leads to a peculiar situation because when patwari goes for crop enumeration, the crop is already harvested and therefore area under such crops will be underreported and hence the production too. The solution to this problem is simply to advance the time schedule for girdawari for the

relevant season; largely, the problem has been found in kharif season. This could be easily resolved after discussion in the meeting of State High Level Coordination Committee.

### 10. CROP FORECASTING, APPLICATIONS OF REMOTE SENSING AND USE OF IT

Crop forecasting got a major push with the commencement of the scheme for establishment of National Crop Forecasting Centre (NCFC) in the Ministry of Agriculture. Unfortunately, although the scheme was taken up from December, 1998, not much headway has yet been made with regard to the activities proposed for NCFC. The Working Group on Agriculture Statistics of 10<sup>th</sup> Plan has therefore recommended that the required professionals for NCFC should be provided so that data generation, its analysis and use of state of the art computational tools and skills are done to keep methodological development and its adoption in objective forecasting procedures. Underlining the importance of crop forecasting, the NSC also recommended that the objective method of forecasting of production should be put in place and NCFC should be made fully operational with all the required professional statisticians and experts in related fields. I should also like to add that lot of work has been done by IASRI and Space Application Centre, Ahmedabad on applications of remote sensing in the field of agriculture both with regard to area forecasting and yield estimation and this experience and knowledge gained from such initiatives should be fully utilised for improving the timeliness and reliability of crop statistics.

On use of remote sensing techniques in crop statistics, I would like to mention the very encouraging results NSSO (FOD) got from a pilot study carried out in association with Space Application Centre (SAC), Ahmedabad during 1999-2000 in Haryana, MP and Rajasthan. The aim of the pilot study was to examine the feasibility of integrating remote sensing method with normal crop survey methodology and to see whether we could obtain area estimates e.g. at village level. The pilot survey was done in six villages, two in each of the districts of Karnal, Bhopal and Kota during the rabi season of 1999-2000. In these villages, the NSS staff first collected crop area through field-to-field visit. Thereafter, the SAC took up the satellite imagery data and estimated the area under major crops vis-à-vis geographical area of the village. It may be noted that the

two agencies did the work independently. Both NSSO and SAC estimated major crops area (wheat in all cases) independently based on their respective study; major crop area was calculated as a percentage of geographical area of the village. It was found that the two sets of estimates were rather close; the difference was in the range of 2 to 7% only. This was a very encouraging finding because for the first time this study showed that it is possible to estimate area under major crops even at village level through remote sensing. The findings from the study would also suggest that it is possible to integrate remote sensing technology with standard survey sampling method used in agriculture surveys for estimation of crop area. I would earnestly wish further work is done in this field for the benefit of the agriculture statistical system in the country.

### 11. INSTITUTIONAL ARRANGEMENTS FOR REVIEW OF CROP STATISTICS SYSTEM

Currently, the most important forum to discuss various aspects of crop statistics system in the States is the institutional mechanism in the form of High Level Coordination Committee set up generally under Agriculture Production Commissioner/Additional Chief Secretary In charge of Agriculture/Secretary, Agriculture or Planning with representation from Department of Revenue, Planning, Agriculture, Horticulture, Space, IT etc. from the State side and Economics and Statistical Adviser of Ministry of Agriculture, Chief of NSSO(FOD), and Director, IASRI from the Centre. In this committee both technical and field problems relating to agriculture statistics are discussed and decisions are taken to solve the problems. The conclusions from the ICS reports brought out by FOD are also discussed and State Govt. is requested to resolve the problems highlighted in the report. But unfortunately, decisions are hardly implemented even when concerned Departments representatives are present in the meetings. From my experience in attending several meetings of HLCC in the States, I can very well say that unless the top administrator value the importance of reliable and timely agriculture statistics, and monitor the implementation of the decisions taken in a time bound manner and fix responsibility for non-compliance, situation may not improve much. As all of us know, in general, the statistician has not been given his due role either at the Centre or in the States; he is also not associated in a true sense in policy making. I would only

hope that this situation would change in the near future and Statistician would be given his important role in policy making and the system is duly benefited by his knowledge and expertise.

### 12. SOME OTHER SUGGESTIONS FOR IMPROVEMENT IN CROP STATISTICS SYSTEM

Before I conclude, I would like to give a few more suggestions for your consideration.

#### Area Statistics

- (i) First and foremost, patwari has to be motivated for doing the TRS work in a better way; for this, he has to be sensitised on the uses of this important work and need to complete it in the time allotted. I think it may be a good idea to give some kind of incentive to him. May be, some cash incentive for doing good work. Secondly, as suggested by the Working Group on Agriculture Statistics, he may be provided with pocket calculator to facilitate doing the area aggregation and other computational work. Ultimately, we should consider giving him training in computer and he has to be provided with a computer to facilitate submission of crop abstract and other statements in time as such facilities do not exist today at that level. If this is done, it can lead to improvement not only in timeliness of TRS information but also, quality of the information. Lastly, patwari's work has to be rationalised and reduced where it is warranted, taking a practical view in the matter and wherever the workload is unmanageable, minimum additional staff may have to be provided at least on contract basis with appropriate checks and balances.
- (ii) Supervision over the work of patwari has to be strengthened. Specific allotment of supervision of patwari's work should be given to Revenue, Agriculture and DES officers of the block/tehsil/ DSO and based on their inspection reports, defaulters should be punished.
- (iii) ICS scheme should be reoriented as per recommendations of the Expert Group set up by NSC in order to derive full benefits from this very important programme. This would enable

it to act not only as a watchdog on TRS and GCES but also to enable the Centre and States to have reliable and timely estimates of crop area and production in future.

### Yield Statistics

- (i) It appears that the increase in the size of crop cutting experiments in several States have been effected without proper examination of both technical and field issues involved in the matter; it is therefore necessary that this matter is entrusted to an Expert Group for critical review which may be set up urgently and it should work out the appropriate sample size for crop cutting experiments in future for working out production estimates. The Group should also look into other technical and field problems associated with crop statistics and advice the Centre and States. Ideally, this Group should be called the Standing Advisory Committee on Agriculture Statistics to advice both Central and State Govts. on all matters relating to agriculture statistics. It may be recalled that such an Expert Group called the Working Group on Agriculture Statistics has been there in 70's set up by the then Department of Statistics and it was reporting to the Governing Council of NSSO, but it is no more functioning now. Therefore, ideally, the Standing Committee may be set up in Ministry of Statistics and Programme Implementation wherein the CSO and NSSO are placed. IASRI should play a vital role in guiding the deliberations of the Committee.
- (ii) If ICS scheme is not revamped and reoriented as suggested by the Expert Group, then it may be necessary to review the scheme as it has already been in existence for about 26 years and so it may be a good idea to see whether apart from acting as a watchdog on TRS and GCES, how best, part of the resources from ICS scheme can be utilised to provide feedback to Government on the impact of drought, flood and other natural calamities affecting various parts of the country from time to time. Although NSS has so far not undertaken such activity, it is a dynamic organisation and so it has to reorient its activities to meet changing needs of the Government. For undertaking such nation wide
- (iii) Quarterly workshops should be held for the staff engaged in crop estimation survey work in the States for discussing field and technical problems faced by the staff in doing the surveys. In such workshops, NSSO, Ministry of Agriculture (ESA), IASRI, State Agriculture Universities, State DES and other agencies should participate. The findings from ICS and Crop Estimation Reports should also be discussed and primary workers should be guided suitably to do the work strictly in accordance with the Manual of Instructions.
- (iv) There is also need to look at the existing manuals of instructions and procedures and review for review and updating. It should also be ensured that every primary worker is supplied with one set of updated manual and instructions.

### 13. CONCLUSION

In conclusion, I would like to only say that the Crop Statistics System in India is by and large robust and it has provided the Central and State Govts. very valuable statistics based on scientifically conducted sample surveys in the country. The quality of work done under the vital schemes of TRS, EARAS, and GCES have been generally satisfactory as per the evaluation regularly done through ICS every year considering the vast reach of these schemes and the associated complexities in undertaking such work in a vast country like India. At the same time, Statisticians across the country have to put in their best brains together for bringing out further improvements in implementation of these schemes. India has to continue to lead the world in development of not only a sound system of Crop Statistics but also the larger field of Agricultural Statistics, as it has been the pioneer in sample surveys for estimation of crop production through statistically sound techniques from the 40's. I am sure this honerous role and responsibility would be played by the new generation of bright Statisticians working within the Govt. and outside in an exemplary manner.

Thank you very much.

## ANNEXURE

**Annex 1.** Sample size for sample check of area under ICS Programme, state wise (2001-02)

Sl. No.	State	No. of sample villages		
		Central	State	Total
1.	Andhra Pradesh	380	600	980
2.	Assam	160	160	320
3.	Bihar	240	240	480
4.	Chattisgarh	101	101	202
5.	Gujarat	340	340	680
6.	Haryana	200	200	400
7.	Himachal Pradesh	140	140	280
8.	J & K	100	100	200
9.	Jharkhand	60	60	120
10.	Karnataka	300	300	600
11.	Kerala	80	80	160
12.	M.P.	359	359	718
13.	Maharashtra	440	440	880
14.	Orissa	220	220	440
15.	Punjab	200	200	400
16.	Rajasthan	300	300	600
17.	Tamil Nadu	260	260	520
18.	U.P.	690	690	1380
19.	Uttaranchal	110	110	220
20.	West Bengal	250	400	650
21.	Delhi	10	10	20
22.	Pondicherry	9	9	18
For all States covered		4949	5359	10308

Source : ICS Report of FOD

**Annex 2.** Statement giving percentage of sample villages where crop area enumeration was done in time (2001-02)

Sl. No.	State	% of sample villages	
		Kharif	Rabi/Summer
1.	Andhra Pradesh	40	30
2.	Assam	0	0
3.	Bihar	12	12
4.	Chattisgarh	85	82
5.	Gujarat	86	35
6.	Haryana	72	84
7.	Himachal Pradesh	100	96
8.	J & K	41	36
9.	Jharkhand	10	10
10.	Karnataka	78	78
11.	Kerala	70	77
12.	M.P.	84	91
13.	Maharashtra	46	46
14.	Orissa	72	82
15.	Punjab	63	31
16.	Rajasthan	85	85
17.	Tamil Nadu	86	97
18.	U.P.	67	57
19.	Uttaranchal	88	91
20.	West Bengal	38	46
21.	Delhi	50	100
22.	Pondicherry	83	89
For all States covered		62	57

Note : Position of summer crops shown under rabi for Kerala and Orissa

Source : ICS Report of FOD (estimates based on Central and State combined)

**Annex 1A.** Statement showing sample size for sample check on crop cutting experiments- (Central Sample) (kharif and rabi)-(2001-02)

Sl. No.	State	Sample size	
		Kharif	Rabi
1.	Andhra Pradesh	830	330
2.	Assam	150	100
3.	Bihar	110	240
4.	Chattisgarh	216	62
5.	Gujarat	770	220
6.	Haryana	396	304
7.	Himachal Pradesh	150	150
8.	J & K	190	90
9.	Jharkhand	120	100
10.	Karnataka	638	170
11.	Kerala	160	200
12.	M.P.	624	528
13.	Maharashtra	838	466
14.	Orissa	380	200
15.	Punjab	364	336
16.	Rajasthan	520	420
17.	Tamil Nadu	180	500
18.	U.P.	1380	830
19.	Uttaranchal	90	100
20.	West Bengal	290	160
21.	Delhi	40	30
22.	Pondicherry	100	100

Note : The State Sample also mostly of same size.

Source : ICS Report of FOD

**Annex 3.** Statement giving percentage of survey numbers where different type of errors noticed during kharif (winter), (2001-02)

Sl. No.	State	% of survey nos.			
		e0	e1	e2	e3
1.	Andhra Pradesh	82	8	1	10
2.	Assam	*	*	*	*
3.	Bihar	*	*	*	*
4.	Chattisgarh	84	7	4	5
5.	Gujarat	60	10	2	27
6.	Haryana	87	5	4	3
7.	Himachal Pradesh	80	8	2	10
8.	J & K	96	2	0	1
9.	Jharkhand	*	*	*	*
10.	Karnataka	47	22	7	24
11.	Kerala	87	3	1	9
12.	M.P.	56	17	7	20
13.	Maharashtra	38	15	6	41
14.	Orissa	100	0	0	0
15.	Punjab	88	5	4	3
16.	Rajasthan	72	9	4	15
17.	Tamil Nadu	62	20	7	11
18.	U.P.	68	13	4	15
19.	Uttaranchal	70	13	7	10
20.	West Bengal	84	7	6	3
21.	Delhi	100	0	0	0
22.	Pondicherry	99	0	0	1
For all States covered		65	12	4	18

Source : ICS Report of FOD

\* Observations do not reflect true picture

**Annex 4.** Ratio of area estimates from ICS and TRS

Sl. No.	Crop	2001-02	2000-01
1.	Rice(K)	1.13	1.25
2.	Rice(S)	1.54	1.28
3.	Jowar(K)	1.09	1.13
4.	Jowar(R)	1.15	1.08
5.	Bajra	1.04	1.03
6.	Maize	1.17	1.10
7.	Ragi	0.97	0.99
8.	Cotton	1.12	1.12
9.	Groundnut	1.13	1.06
10.	Sugarcane	1.07	1.06
11.	Wheat	1.17	1.18
12.	Barley	1.07	1.07
13.	Gram	1.07	1.05
14.	R&M	1.11	1.15

Note : Ratio = ICS estimate divided by Patwari estimate of area

Source : ICS Report of FOD for 2001-02

**Annex 5.** Percentage of crop cutting experiments done where no error was observed by supervisory staff (kharif of 2001-02)-Central Sample

Sl. No.	State	% cases with no errors
1.	Andhra Pradesh	81
2.	Assam	97
3.	Bihar	90
4.	Chattisgarh	97
5.	Gujarat	88
6.	Haryana	87
7.	Himachal Pradesh	86
8.	J & K	4
9.	Jharkhand	81
10.	Karnataka	95
11.	Kerala	86
12.	M.P.	73
13.	Maharashtra	31
14.	Orissa	99
15.	Punjab	81
16.	Rajasthan	49
17.	Tamil Nadu	54
18.	U.P.	58
19.	Uttaranchal	30
20.	West Bengal	99
21.	Delhi	100
22.	Pondicherry	100

Source : ICS Report of FOD

**Annex 6.** Percentage of standard error of yield estimates from ICS and CES for rice (kharif) and wheat (rabi) (2001-02)

Sl. No.	State	% SE of yield estimates			
		Rice		Wheat	
		ICS	CES	ICS	CES
1.	Andhra Pradesh	2.2	0.4	NA	NA
2.	Assam	2.9	2.4	6.3	2.8
3.	Bihar	3.9	0.5	3.8	0.4
4.	Chattisgarh	3.6	1.3	NA	2.1
5.	Gujarat	6.4	3.3	5.6	1.4
6.	Haryana	2.7	2.0	1.6	0.5
7.	Himachal Pradesh	13.5	2.0	5.3	1.5
8.	J & K	6.1	1.5	12.2	3.7
9.	Jharkhand	3.8	NA	4.2	0.0
10.	Karnataka	3.8	2.8	6.3	3.9
11.	Kerala	4.1	0.8	no crop	
12.	M.P.	8.6	1.8	3.3	0.8
13.	Maharashtra	5.1	1.0	3.3	0.7
14.	Orissa	3.2	0.8	no crop	
15.	Punjab	0.6	0.5	1.3	0.4
16.	Rajasthan	cce not there		2.5	1.7
17.	Tamil Nadu	2.1	1.0	no crop	
18.	U.P.	2.2	0.0	1.7	0.11
19.	Uttaranchal	3.4	NA	6.4	0.0
20.	West Bengal	1.6	0.4	2.5	
21.	Delhi	10.3	2.5	4.5	
22.	Pondicherry	5.5	4.5	no crop	

Note : For ICS, the SE are related to Central Sample

Source : ICS Report of FOD