FIFTH CONFERENCE
OF
AGRICULTURAL RESEARCH STATISTICIANS

(23rd to 26th Dec., 1980)

CONTRIBUTED PAPERS

&

PROCEEDINGS

INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
(I.C.A.R.)
LIBRARY AVENUE, NEW DELHI-110012 (INDIA)

Compiled & Prepared

By

R. K. KHOSLA

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PREFACE

The First and Second Conferences of Agricultural Research Statisticians of the ICAR Institutes, Agricultural Universities and State and other Central Departments of Agriculture and Animal Husbandry, etc , engaged in research, were held in 1974 and 1976 respectively with the objective of mutually discussing the problems by them on Design and Analysis of Experiments, Sample surveys, Use of Computer in Agriculture and Animal Sciences Research, Statistical Techniques in Plant and Animal Breeding, Teaching of Statistics in Agricultural Institutes and Universities and Research and Training Facilities.

The Third Conference was held in April, 1978 where in the pattern of sessions was changed and the participants discussed the main topic, i.e., the role of agricultural statistics research in Sixth Five Year Plan with a special reference to integrated rural development with respect to agriculture, forestry, livestock and fisheries, because one of the main policy objectives in the next Five Year Plan is the Agricultural and Rural Development which would play a great role in the growth of social justice, employment in rural areas and removal of the poverty.

The Fourth Conference of Agricultural Research Statisticians was held at H.P.K.V.V., Palampur in June, 1979. There were five technical sessions besides plenary session. The sessions broadly related to (i) Agriculture and Forestry (ii) Livestock and Fisheries and (iii) Quality of Data.

The Fifth Conference of Agricultural Research Statisticians of the I.C.-A.R. Institutes, Agricultural Universities and other Central and State Departments of Agriculture, Animal Husbandry Forestry and Fishery engaged in research was held in collaboration with the 34th Annual Conference of the Indian Society of Agricultural Statistics from 23rd to 26th Dec., 1980 at Directorate of Agriculture, Lucknow (U.P.).

In this Conference a total number of 215 Agricultural Statisticians (Appendix-I), representing Agricultural Universities, ICAR Institutes, State and Central Departments of Agriculture, Animal Husbandry, Forestry and Fisheries, engaged in research, participated.

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Sh. Balram Singh Yadav minister of Agriculture & Animal Husbandry, U.P. inaugurating the Conference.

Sh. Shumshad Ahmad delivering Welcome Address.

(L to R) Dr. M. S. Swaminathan, Shri Balram Singh Yadav and Dr. P. V. Sukhatme on the Dias at the Inaugural Session.

(L to R) Sh. Shumshad Ahmad, Dr. V. Kurien, Dr M. S Swaminathan, Dr P V. Sukhatme, Dr. K.C. Seal and Dr. Daraga Singh on the Dias at the Inaugural Session.

INAUGURATION

23rd December (Tuesday), 1980

11.00 A.M. to 12.00 Noon

Presided by :	Dr. M. S. Swaminathan, Member (Agriculture), Planning Commission, New Delhi.
Welcome Address :	Sh. Shumshad Ahmed, Agriculture Production Commissioner, Uttar Pradesh, Lucknow.
Inaugural Address :	Sh. Balram Singh Yadav, Minister for Agriculture and Animal Husbandry, U.P.

WELCOME ADDRESS

by

Sh. Shumshad Ahmed

Agricultural Production Commissioner, Uttar Pradesh

Mr. Chairman, Krishi Mantriji and Friends,

It is a matter of great pleasure and proud privilege for me to extend a hearty welcome to the distinguished statisticians, economists and other experts working in the field of agricultural research who have come from far and near to attend this joint Conference of the Indian Society of Agricultural Statistics and Agricultural Research Statisticians. More than a decade ago, Locknow had the good fortune of hosting the Annual Conference of the Society, but it is for the first time that we have this privilege of hosting the Fifth Conference of the Agricultural Research Statisticians. On my behalf, on behalf of the Agriculture Department and on behalf of the State of Uttar Pradesh it is my pleasant duty to welcome all of you to this Conference.

(2) Agricultural Statistics in our country has had a long history dating back to Kautilya's Artha Shastra. In this classic work, Chanakya has presented a vivid description of the various useful types of statistics relating to tenancy, land utilization, crop production and land revenue. Since then, agricultural statistics in this country has been, by and large, a by-product of revenue administration, especially in the temporarily settled States like Uttar Pradesh.

(3) There was a time when the agricultural statistics, as a by-product of revenue system, were considered to be adequate and sufficient for general administration. However, with the advent of the planning era, these statistics, though useful in providing the basic framework for all policy decisions and planning, are not considered sufficient. There is a generally felt need for a much detailed and elaborate informative system relating to various aspects of agricultural development. To illustrate this point, I would quote the example of statistics of the irrigated area. What is being recorded in the khasra only indicates if a particular plot is irrigated and, if so from what source. This is totally inadequate because in this age of micro-planning we should also know the number

of waterings which have been provided to the field. Similarly, accurate statistics of various inputs applied to the different crop have to be taken into account for policy decisions. Similarly, mere recording of the name of a crop is not enough; we should also know what particular variety of that crop has been sown. Now that the development and planning of agriculture is becoming more and more complex in the sense that the results of scientific research have to be increasingly used for giving a boost to production, the new situation arising out of this interaction demands new statistical methods for meeting the needs of agricultural reaserch workers and those engaged in planning and implementation of agricultural programmes in the field. The important goal in agricultural development is growth with stability. Undoubtedly, there has been spectacular growth in agricultural production during the past two decades, but the problem of stability has yet to be tackled on a scientific basis. The traumatic experience of last year's drought reminds us that we have yet to go a long way before achieving this goal of stability. The statisticians have a great role to play in studying the behaviour of rainfall pattern and evolving methods for predicting the rainfall and its effect on crop production. Detailed analytical studies employing sophisticated statistical techniques would help in identifying such problems. Hence, I would appeal to all participants of this Conference to ponder over these problems and suggest way and means for stabilizing growth in agricultural production. I would also like to draw your attention to the new area which is likely to be ushered by the introduction of Crop Insurance. Such insurance against the vagaries of nature is now generally recognised as a prerequisite for accelerating the growth rates in crop production. Most of you are, perhaps, already siezed of the problem of data requirement for evolving a sound and effective framework for introducing crop insurance in the country. The present availability of statistics of production is not considered to be quite satisfactory for these purposes. Generally reliable statistics of production for important crops are available at the district level. Crop Insurance, however, requires such statistics at much lower levels, namely, block, tahsil and village. Further more, a sound information system relating to occurrence of hail, droughts, floods, fire and other natural calamities and consequent crop losses has yet to be developed.

(4) It would not be out of place to mention here that the introduction of computers in the sphere of compilation and interpretation of statistics has opened up new vistas for development in this important field. It is no doubt true that, at present, we are taking the help of Electronic Computers for statistical purposes, but in view of the great advances which have been

made in the field of computerization, it will be fully worthwhile to utili ze this system for obtaining statistics which are not only precise and accurate but which can be obtained in a much shorter time.

(5) This brings us to another important aspect of statistics which has not received adequate attention so far. Till now, statistics has remained confined to tabulation compilation and collection of figures and related data. However, this is only one aspect of the matter. What is even more important is that this data should be shifted, analysed studied with the object of finding out certain significant trends which can act as unmistakable pointers towards shortfalls which should be remedied or deficiencies which should be made up. Electronic Computers can prove highly useful aids for such studies which are so essential for planning modern and scientific agriculture.

6. In regard to current agricultural statistics, Uttar Pradesh is in a happy position in the sense that we have a well established system of revenue administration. The statistics of area and land utilization are regularly collected on complete census basis and are available at the village level. Large-scale sample surveys are being carried out annually for estimating the yield rates for almost all the important crops. Significant progress has also been made in regard to census of agricultural holdings, sample surveys for estimating the use of various inputs on important crops, concurrent evaluation of development programmes, formulation of yard-sticks of various development measures, pre-harvest forecasting of area and production of crops, etc. You will also be glad to know that integrated livestock surveys are being carried out in this State for providing reliable estimates of various livestock products However, we are not in a very happy position with regard to the fisheries statistics. As fisheries development is of recent origin in this State, so is the status of fisheries statistics. I would like that intensive research may be undertaken for improving the status of fisheries statistics in this State. This is also the case with the statistics pertaining to horticulture, In the Sixth Plan, we are making provision for a Cell to deal with horticultural tatistics.

7. Although we have a sound base for crop statistics, there is no room for complacency; for improvment in agricultural statistics including crop statistics or for that matter in any field of science is a continuous and never ending process and we have still a long way to go to find a satisfactory solution to the statistical problems connectcd with agricultural research and development.

8. Before concluding, I would like to add a word of apology. We have tried our best to make the stay of participants in the Conference as comfortable as possible but owing to paucity of basic amenities in city. I am afraid you may have to experience some inconveniences, particularly because of Power constraints, for which, I would crave your indulgence.

9. In the end, I, on my own behalf, and on behalf of the State Government, extend once again a warm welcome to all of you and wish the deliberations of this Conference all success.

INAUGURAL ADDRESS

BY

Sh. Balram Singh Yadav,

Minister for Agriculture and Animal Husbandry,

Uttar Pradesh

Friends,

It gives me great pleasure to be in your midst today to inaugurate the Thirty Fourth Annual Conference of the Indian Society of Agricultural Statistics and the Fifth Conference of Agricultural Research Statisticians of the I. C. A. R. Institutes, Agricultural Universities and State and Central Departments of Agriculture, Forestry and Fisheries engaged in research and teaching. The Society has done great service to agriculture during the 34 years of its existence since 1947. The organization of the annual conferences, symposia and seminars in addition to publishing the journal have been of immense help in promoting research both theoretical and applied, which has proved very useful and effective in the fields of agriculture, animal husbandry and allied sciences. The Indian Council of Agricultural Research has also taken a lead in organizing annual conferences for the workers engaged in developing statistical techniques in the field of agricultural research which provide opportunities to exchange views and experiences at the various research centres in the country.

2. As all of you know, that the Society was fortunate enough to have the late Dr. Rajendra Prasad as its Founder President under whose guidance the Society developed to its present form. The Society has been equally fortunate in having eminent statisticians of international repute, like Dr. P. V. Sukhatme and late Dr. V. G. Panse as its founder members. Now the Society is working under the stewardship of Dr. M. S. Swaminathan as its President and Dr. P. V. Sukhatme as its Executive President. A Society, which has the patronage of such distinguished scholars, would, no doubt, prosper in promoting the aims it was founded for.

3. One of the activities of the Society is to publish books on statistical methods in agricultural research. I am glad to know that the Society is performing this function very efficiently by publishing a number of books written by statisticians like Dr. P.V. Sukhatme and late Dr. V. G. Panse, I understand that the Society has also established a research unit for undertaking some independent research projects and offer scholarships for the award of Ph. D. degree in Agricultural Statistics. By organizing the Annual Conference of the Society and agricultural research statisticians working in various places of the country, an excellent opportunity is provided to exchange ideas regarding current problems in agricultural statistics and the manner in which the problems could be tackled and solved.

4. I have gone through these agenda of the conferences and I am happy to know that you would be discussing a number of problems having vital bearing on various aspects of agricultural research and development. The discussions in the two symposia organized by the Society would be really a great help to planners and the administrators in formulating the policies and reviewing the progress of the various developmental measures undertaken so far. I hope that the discussions in the symposium entitled "Inter-regional disparties in growth rates" would identify the areas with varying degrees of development and factors responsible therefor and would suggest effective measures so that such regional inequalities are reduced to a minimum. The symposium on the 'Use of Ancillary Information in Sample Surveys and Design of Experiments', I belive, would lead to significant progress in refining our techniques of sample surveys and designing of experiments for agricultural research.

5. I would like to present before you some highlights of status of agricultural statistics in Uttar Pradesh. Most of you are perhaps aware that, in Uttar Pradesh, the land utilization statistics are being obtained as a bye-product of revenue administration. Usually, these statistics become available at the State Headquarters only after the harvest of the crops. In a welfare State, Government have the responsibility not only of maintaining law and order but of economic development of people. For a purposeful and realistic planning of agricultural development and food policies and their administration, the information regarding the area brought under crops in a season is required as soon as the sowings are over. In order to meet the demand of timely availability of area statistics, Uttar Pradesh Government started a scheme of collecting these statistics on a random sample basis from about 2,500 villages during the Second Plan period without adding to the work of the reporting agency. The results obtained from the sample provided very

reliable estimates at the State level but they were not sufficient at the district level. This lacunae has now been removed by expanding the sample size with the assistance of the Government of India under the Timely Reporting Scheme. For providing estimates of production of important crops, large-scale sample surveys involving about 50,000 crop-cutting experiments are being annually carried out.

Qualitative improvement is being sought through a scheme called Improvement of Crop Statistics under which direct information relating to land utilization and production of various crops on a matching sample basis through the staff of the State Government and the National Sample Survey Organization is being collected. This scheme has proved very effective and qualitatively agricultural statistics of Uttar Pradesh have now considerably improved.

Although the hilly areas of Uttar Pradesh are cadastrally surveyed but till recently there was no reporting agency for undertaking the crops enumeration work, like the plains portion of the State. The State Government have now recognised the need for this work and have considerably strengthened the revenue agency of patwaris in these areas with a view to start the crop enumeration work on a sample basis. At present, the crop enumeration work in the hilly portion is undertaken in 1/5th randomly selected villages of each patwari circle. For estimating the production of important crops, sample surveys have also been extended. These developments have now brought the hilly areas of Uttar Pradesh to a very satisfactory position in the statistical map of the State.

Community blocks have been established throughout the country as the basic unit for rural development. For any effective planning and implementation of policies, it is no doubt necessary to have a sound data base at the block level. It is, however, a matter of great concern that this data base is quite weak in so far as the statistics of production of crops are concerned. I realise that for providing reliable estimates of production of important crops at the block level, the present crop-estimation surveys have to be considerably expanded which require a sizable amount of our scarce resources. I would nevertheless urge upon you to develop suitable statistical techniques for coping the situation under these constraints. As far as the statistics of land utilization are concerned, there should be no difficulty for these statistics are collected on a census basis and are available in revenue records for each village. What is needed is retabulation and compilation in a way that these become available at the block level. You will be too glad to know that Uttar-

Pradesh has undertaken this work and now land utilization statistics are being regularly made available at the block level.

Since 1967-68, a scheme of annual surveys for the estimation of livestock products in Uttar Pradesh is being operated. The results of these surveys provide reliable estimates of production of various livestock products, namely, milk, eggs, meat, wool, hides and skins. These surveys have now been expanded so as to provide precise estimates at the divisional level. Some basic information is being collected in regard to fisheries production in Uttar-Pradesh but the position is not very satisfactory and there is plenty of room for improvement.

6. I would like to avail this opportunity to draw your attention to some of the areas which continue to defy satisfactory solution because of the inadequacy of the information system and methodological problems which I and my other colleagues in the Government have to face in real life. I am, no doubt, aware that for every bit of information, a certain cost has to be incurred and Uttar Pradesh being a poor State, cannot invest unlimited funds on the development of a comprehensive data system. It sometimes happens that like all other professionals, the statisticians also tend to insist on a high degree of exactitude for items on which a margin of 10 to 15 percent would not make any difference for policy purposes. I would, therefore, urge upon you to develop appropriate statistical techniques and attempt to integrate the system of information building, monitoring and evalutation with the existing administrative set up so that the scarce resources are optimaly used.

In this context, I would like to draw your attention to the problems of pre-harvest forecasting of crop production. As the Government have now assumed the responsibility of public distribution system, particularly of food-grains, we require very reliable estimates of likely production of important crops sufficiently before the harvesting season so that proper arrangments of finances and other material may be made for purposes of procurement, storage and transport. There had been occasions when elaborate arrangements were made for large quantities on the basis of the estimates provided by the Department and previous production figures but the actual production was far short of the expectation and vice-versa. Both the situations are embarassing for the Government. In one situation, there was over-preparedness resulting in wastage of resources and in another the administration was overwhelmed by a bumper crop which led to the exploitation of the farmers by the traders and middlemen. I am afraid that this is a very difficult area but I am confident that the

Indian statisticians, who are second to none in the world, would cope this problem and develop methodology with the help of which fairly precise estimates of production are available to the administration well before the harvest.

I am given to understand that a good deal of research work is being carried out in connection with optimising use of available fertilizer and water. As both these inputs are very scrace in the country, I hope the results of this research work would be very useful. The measurement technique for losses in production on account of various diseases and pests in fields and during storage is another area which deserves immediate attention. I understand some work has been done but I think it should be expanded and intensified in close collaboration with the plant protection scientists. Detailed studies on cost of production of various crops, marketing and farm management should also be undertaken.

I would also like to refer to another area where the current agricultural statistics are deficient. In most of the States, the statistics of horticulture and vegetable crops are so far not being collected by utilizing the modern methods of sample surveys. I am told that suitable methodological techniques are yet to be evolved for some of these crops. The Indian Agricultural Statistics Research Institute has, no doubt, done pioneer work in evolving suitable sampling techniques for some of the horticulture and vegetable crop for studying the extent of area and cultivation practices. There are, however, some crops for which such studies have not so far been undertaken. I would, therefore, urge that appropriate sampling techniques should be developed which can fit in the existing administrative set up of the State Governments and which can fill up these gaps.

I would also like to draw your attention to the organization pattern for collection, analysis and interpretation of agricultural statistics. In some States, the statistical wing responsible for agricultural statistics have been created in the Directorate of Economics and Statistics and in the Directorate of Agriculture in some others. As the basic field work in most of the States is carried out by the personnel belonging to the Revenue Department, there is great need of co-ordination between these departments. You will be glad to know that in Uttar Pradesh this aspect was studied in depth and a solution to ensnre perfect co-ordination was obtained in designating the Officer Incharge of agricultural statistics in the Directorate of Agriculture, U.P., as an ex-officio officer in the Board of Revenue, U.P., who is responsible for revenue administration. The system is working very smoothly and Government of

india have recommended this system for adoption by other States. Although most of the participants are engaged in research work and consequently, have not faced such problem of co-ordination, this is an aspect of great practical importance which I think, should be adequately delibrated upon and concrete recommondations made.

7. I would also like to refer to the programme of work for the Fifth Conference of Agricultural Research Statisticians. The deliberations of this Conference have been spread over three sessions, namely (1) Action taken on the recommendations made at the last Fourth Conference (2) Current statistical research in agriculiure, forestry, livestock and fisheries and (3) plenary session. I hope the statisticians would mutually discuss their current statistical problems and exchange their views in solving these for developing statistical tools in the fleld of agriculture, forestry, animal husbandry and fisheries.

8. I have taken the liberty of raising some issues before this Conference only becuse I am convinced that the participants of this Conference would give their thoughts to these problems and would come out with proper recommendations and solutions. The Indian statisticians have done commendable research work in the field of sample survey theory, design and analysis of field experiments, statistical genetics plant and animal breeding and other related fields of statistics. I am proud to say that India has a prominent place on the statistical map of the world. I am sure that Indian statisticians would accept the challenge of the developing economy of the country. You can no longer remain content with compiling descriptive statistics but have to work in close collaboration with scientist in other disciplines of economy. Mere compilation of statistics is a very minor role of statisticians. The major role the statisticians are expected to play lies in developing and refining techniques for research, data collection, analysis, interpretation and prediction or projection.

9. With these words and with great pleasure I inaugurate the Thirty Fourth Annual Conference of the Indian Society of Agricultural Statistics and Fifth Conference of the Agricultural Research Statisticians and wish you success in all your deliberations.

TECHNICAL SESSION—I

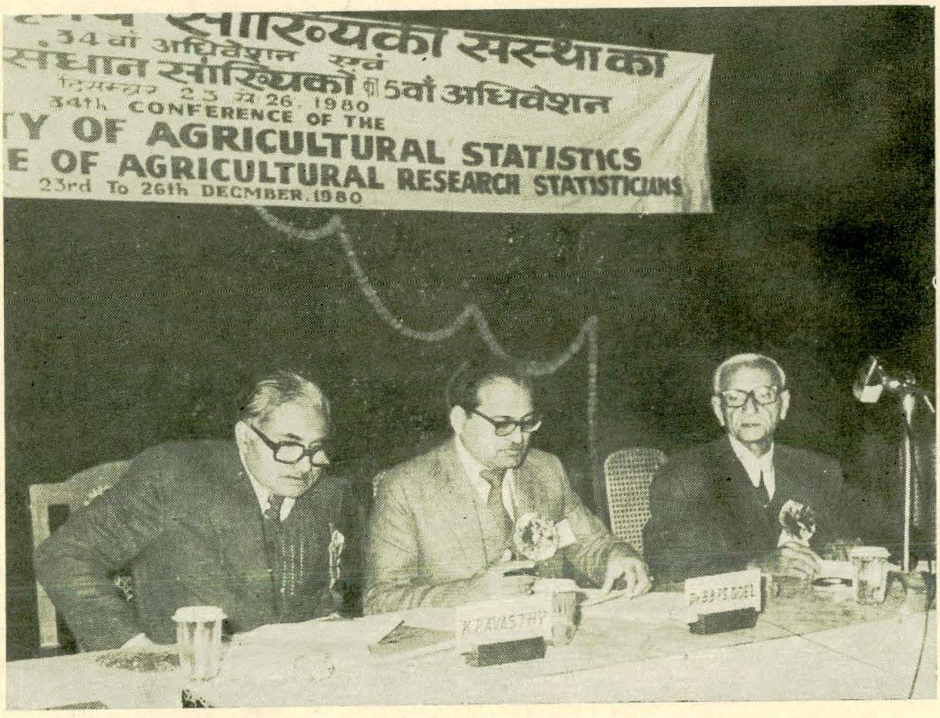
Action on the Recommendations made in the last conference 24th December, (Tuesday), 1980.

9.00 A.M. to 11.00 A.M.

Chairman : Dr. Daroga Singh,
Director,
I.A.S.R.I., New Delhi.

Rapporteurs :
1. Shri R. K. Khosla,
I.A.S.R.I., New Delhi.
2. Shri D. S. Aneja,
I.A.S.R.I., New Delhi.

(L to R) Sh. D. S. Aneja (Rapporteur), Sh. R K Khosla (Rapporteur) and Dr. Daroga Singh, (Chairman) on the Dias at the Technical Session-I.



(L to R) Sh. K. P Awaswath/ (Rapporteur). Dr. B.B.P.S. Goel (Rapporteur) and Dr. K Kishan (Chairman) on the Dias at the Technical Session-II

Dr. Daroga Singh, Chairman of the Plenary Session.

Dr P. V. Sukhatme, addressing the participants.

The Chairman Dr. D. Singh in his opening remarks informed that there were more than 60 recommendations made (Appendix-II) during the last 4 Conferences and the action taken/to be taken on each of those recommendations by the different organisations had been prepared by the Indian Agricultural Statistics Research Institute and presented to the Members for discussion. This Conference provides an opportunity for the Agricultural Statiscians working in the Research Organisations such as ICAR Institutes and Agricultural Universities on the one hand and the Statisticians working in the State and Central Organisations on the other who utilise their methodologies evolved by tnem. There are many gaps in Agricultural Statistics where research work is required to be done and methodolgies to be evolved on priority basis. The Statisticians engaged in research and teaching in the Agricultural Universities and ICAR Institutes and the Statisticians of the other organisations should work together to fill-up those gaps for improving the present official statistics. He further informed that the Achievement and the Audit Committee, constituted some years back at the IASRI, recommended that the Conference of Agricultural Statisticians, engaged in research, should be held atleast once in a year to discuss and formulate plans for solving the current fleld oriented problems. Thereafter the Chairman initiated dicussions on the action taken/to be taken on the recommendations as per statement presented by the IASRI, After a long discussion the major recommendations made by the Members were as follows :

1. Regarding the earlier recommendations where the action was not yet complete, it was suggested that those should be carried forward for taking follow-up action. till the action is complete, Such recommendations were on the Sr. Nos. 1 to 12, 16, 18, 22, 23, 26, 27, 32, 34, 36, 37, 40 and 41 as per statement given in in Appendix—II.

   (Action : Concerned Organisations).

2. It was recommenned that the salient results obtained by carring out the studies by the different organisations should only be reported in the column "Action Taken" instead of presenting the information collected in the present form, wherever applicable. It was further recommended that the following Institutes should

be held responsible for different disciplines like crops, animal husbandry, forestry and fisheries for taking follow-up action on the retained as well as new recommendations made in this Conference who would directly make corresponndence with the concerned organisations for collection and consolidation of the material for presentation in the next Conference,

Name of the Institute	*Discipline*
1. Indian Agrieultnral Statistics Research Institute (IASRI), Library Avenue, New Delhi-110012.	(i) Statistical Research in Agriculture (Crops), and (ii) Statistical Research in Livestock (A,H.).
2. Forest Research Institute (FRI), Dehra Dun.	Statistical Rcsearch in Forestry.
3. Central Inland Fisheries Research Institute (CIFRI), Barrackpore (W.B).	Statistical Research in Inland Fisheries.
4. Central Marine Fisheries Research Institute (CMFRI), Cochin.	Statistical Research in Marine Fisheries.

It was also recommended that the personnel of the above mentioned co-ordinating Institutes should meet atleast once in six months to discuss about the progress made regarding follow-up action and take further necessary action, if need be. The IASRI would convene the meeting to co-ordinate and consolidate the material so obtained by these Institutes.

(Action : IASRI, FRI, CIFRI and CMFRI).

3. It was pointed out that since the Agricultural Universities have got limited resources, it is difficult for them to carry out field oriented research studies. In view of this it was suggested that the field survey work, should be carried out by the staff of the

State Departments with the help of Technical guidance provided by the ICAR Institutes or the Agricultural Universities.

(Action : State Deptts./ICAR Institutes & Agri. Universities).

4. The various recommendations retained and new ones might be be arranged priority-wise before taking follow-up action and presenting in the next Conference.

(Action : IASRI, FRI, CMFRI and CIFRI).

5. A manual of the lectures delivered in the "Summer Institute on Advanced Statistical Methodology as applied to Animal Sciences" organised at the IASRI in May, 1980, might be prepared and circulated.

(Action : IASRI).

6. For determining yield rates of crops like cotton and those vegetables involving multiple pickings, component sampling approach with independent sample of fields at different pickings with a larger number of fields for the first and second pickings and a smaller number of fields for the first and remaining pickings have been found to be convenient and efficient. However, investigations for studying the efficiency of alternate sampling procedures may be conducted in other areas to test and standardise these procedures.

Priority should be given to estimates of production where such estimates are not available.

(Action : IASRI).

7. In view of the value of straw as cattle feed there is need to estimate the availability of all types of straw which can be used as feed. Straw to grain ratio for H.Y.V. is likely to be different from similar ratio for conventional varieties. Efforts should be made to estimate straw to grain ratio for such varieties.

Total volume of grain and straw should also be recorded, then grain to straw ratio should be worked out by conducting the crop cutting experiments and be presented in the next Conference.

(Action : IASRI).

2.1 Current Statistical Research on Agriculture (Crops) with respect to rural development

by

S.D. Bokil and P.N. Bhargava
Indian Agricultural Statistics Research Institute
New Delhi.

INTRODUCTION

The output of Agriculture has more than doubled during the last 30 years. This is a good measure of the progress of Agriculture in the post-independence years. It also reflects the economic development of the rural areas. In this development statistical techniques and statistical research have played a very useful part. Before coming to the current statistical research with reference to crops we may review briefly the role played by statistical techniques in agricultural development in the last three decades.

Initially the Government and policy makers needed techniques of collection of reliable data on extent of cultivation of various crops in various regions and the production of the crops. The need was met by the development of crop cutting survey techniques which has been extended over a course of years to more and more crops in all parts of the country. This has enabled us to measure the output of agriculture and its growth.

The most significant development in our agriculture in the early post-independence years was the use of chemical fertilizer on crops. Initially there was resistance to the use of these fertilizers even from some experts. However, large scale and scientifically designed experimental programmes and statistical analysis of data collected/convinced the agricultural scientists as well as the policy makers of the need to promote the use of those fertilizers. Even so their adoption by the cultivators was slow and in the early sixties the Government of India took up the package programme to demonstrate what scientific techniques could do for the development of agriculture and through it, the economic development of the country side. Statistical evaluation formed an essential part of the programme.

While development of agricultural technology opened up possibilities of agricultural growth the economic aspects of cultivation had also to be taken

care of. These cover mainly the prices of agricultural commodities and credit availability. With the development of agricultural price policy, there was greater demand for data on cost of cultivation of various crops. For this purpose it was necessary to develop sample survey technique for collection of data on cost of cultivation. Such a technique was developed and its utility demonstrated in the large scale surveys on sugarcane and cotton conducted between the years 1955 and 1965. In 1965 the Govt. of India set up the Agricultural Prices Commission. To meet their needs of cost of cultivation data a comprehensive scheme for collecting data on cost of cultivation of principal crops on an all India basis was taken up by the Govt. of India adopting the methodology of the earlier surveys.

Simultaneously large scale experimental programmes were also undertaken on statistically sound lines to provide reliable information of agronomic interest that is, on varieties, fertilizer responses, etc. All these developments have helped the rural areas by making available to them better agricultural technology and by providing to the government at the centre and the states the data required by them for policy formulation. Some studies on horticultural crops viz. fruits and vagetables, were also carried out in this period. These activities have continued with some modifications in recent years. Some of these being pursued at the I.A.S.R.I. will be briefly described.

Sampling investigations into high-yielding varieties programme

The role of High Yielding Varieties in the Green revolution is well-known. However the progress of the Green Revolution during the last decade has not been uniform in all states or with regard to different crops. It was important to study the progress of this programme in the different states and discover constraints and bottlenecks so that they could be dealt with the impediments in the progress of their adoption could be removed. Sample Surveys for assessment and evaluation of the programme were carried out by the Indian Agricultural Statistics Research Institute during the fourth plan period in 88 selected districts covering 15 states of the country. The main objectives of the survey were to determine (i) the yield rates of high yielding varieties of five major cereals viz; rice, maize, jowars, bajra, and wheat and comparable estimates of local varieties (ii) the area brought under high yielding varieties of those crops and (iii) the extent and intensity of adoption of improved agricultural practices recommended for high yielding varieties under cultivators' conditions. Stratified multi-stage random sampling plan was adopted for the survey. In the selected districts in each state the community development blocks constituted the strata. Villages, cultivators, fields and plots of specified size and

shapes constituted the sampling units at successive stages. Estimates of various parameters like yield, area under high yielding varieties, etc., were estimated on the basis of data collected in the surveys. It was found that with the sampling design and sample size adopted the precision of estimates varied a good deal from state to state and the standard errors were rather large in some cases. With new varieties of major cereals and cash crops being introduced rapidly in different parts of the country acute need was felt for undertaking more intensive methodological investigations in typical areas of different states to enable an objective evaluation of the impact of high yielding varieties programme in terms of changes in area, productivity, cultivation practices, etc., to provide sound and realistic basis for planning and policy formulation at the district and state level. Accordingly in the fifth five year plan the study was confined to 38 districts in 15 states and greater emphasis was placed on studying changes in area and productivity and adoption of improved practices with reference to high yielding varieties of crops and investigating the limiting factors. Two cash crops namely, cotton and groundnut were also covered in the study. The sampling plan adopted was broadly the same as during the fourth plan. However, a part of the sample selected each year was retained for the next year to facilitate estimation of change as well as for building up the current estimates with increased precision. The sample size was 60 villages per district with 10 cultivators per village for the area estimation survey and 48 villages with 6 cultivators per village for the agronomic and agro-economic enquiry.

Annual reports for the first 3 years of the survey have already been brought out while that for the fourth year, namely, 1977-78, would be brought out very shortly. The results available so far from the V plan surveys have provided valuable data on the yield rates and spread of high yielding varieties of crops, the extent and intensity of use of manures and fertilizers, extent of adoption of various improved practices, as well as on bottlenecks in the wider adoption of the new varieties and associated improved cultivat on practices.

Pilot sample survey for estimation of yield of cotton

One of the major difficulties in estimating the yield of cotton is the relatively long period of its harvest on account of the large member of pickings involved. The problem has become more acute with high yielding varieties of cotton for which the number of pickings is some times as large as 10 or more. A study was undertaken in the Hissar district of Haryana State during 1977-78 to develop technique for estimation of yield of cotton on the basis of data of first few pickings. The results showed that it was possible to estimate the

yield of cotton with a good precision adopting double sampling approach wherein the data on the first picking was collected from a large number of fields but for subsequent picking a smaller sample of fields was taken. Another procedure investigated for estimating the yield of cotton was of component sampling which consisted in estimating the yield of different pickings from independent samples of fields and then obtaining the average yield of cotton as the sum of the picking-wise averages. This procedure was found to be even more efficient than that of double sampling. The results of the survey also indicated that a quick estimate of the average yield can be obtained by multiplying the first picking yield with the average expected number of pickings. The survey was repeated in Hissar district during 1978-79 and also extended to Jalgaon district during the same year. The analysis of the data collected during 1978-79 are in progress.

Estimation of fodder resources

Though our country possesses the largest cattle population in the world we are no where near the top as for as production of milk is concerned. While small countries like Holland and Denmark export large quantities of milk products, our production of these commodities is not sufficient even to meet the home demand. One important reason for this situation is the inadequacy of production of cattle feeds. A substantial proportion of the feed requirement of bovines is met by stalks and straws obtained as by-products in the cultivation of foodgrains. They are supplemented by production of cultivated fodder crops especially grown in agriculturally progressive regions. While planning for cattle development it is necessary to estimate the total feed availability in any region and for this purpose, to estimate the production of cultivated fodder crops. Such estimation calls for two steps. One is to estimate the area under these crops. Unfortunately these data are not available regularly from patwari records as in the case of the forecast crops. It is necessary therefore to collect them by a sampling procedure. The other step is to estimate the yield per hectare of these crops. This is some what more difficult than in case of foodgrains since for fodder crops there is no fixed harvesting period and in case of a number of crops repeated cuttings are taken. To deal with these problems the I.A.S.R.I. undertook two pilot surveys in Meerut and Karnal districts between 1972-73 and 1974-75. The surveys have demonstrated that with a sample of 75 villages selected after suitable stratification in a district or such compact area the areas under principal fodder crops could be estimated with reasonable precision. Similarly with 1 or 2 crop cutting experiments per village for each fodder crop the yield per hectare could be

estimated with satisfactory precision and thus the production of cultivated fodder crops in the region of enquiry estimated. The problem of repeated cuttings in fodder crops is analogous to the problem of cotton and a double sampling procedure may also be adopted in this case with advantage.

Another important source of cattle feed is grazing. Data on area under permanent pastures is available for a major part of the country from land utilisation statistics. However those data need up-dating. Secondly certain other areas such as current fellows also serve as grazing areas for limited periods. Further it is not known how much feed actually becomes available from these areas. To deal with these and allied problems the I.A.S.R.I. undertook a pilot survey in Jhansi district during 1968-70. More recently such a survey was taken up in Puri district during 1978-79 and 1979-80. In this survey the district was divided into 9 strata and sample of 45 villages was selected by simple random sampling without replacement from the strata, at the rate of 5 villages per stratum. In these villages areas available for grazing were enumerated by plot to plot inspection. The year was divided into three seasons, rainy, winter and summer, each of 4 months duration and enumeration of grazing areas was carried out in each season. Fellow lands available for grazing were also included in grazing areas.

For estimation of the quantity of grass actually consumed by grazing animals. two grazing areas were selected randomly in a villages and 10 plots, each 1 metre x 1 metre were located in them in a systematic pattern with random start. These were harvested early in the morning before grazing by animals. Similarly 10 plots were located in the evening after grazing by animals and their yield recorded. Difference between the two provided an estimate of the quantity of grass consumed. The yield estimate was *per unit area per day*. To estimate the growth of hervage when undisturbed by grazing animals, a plot 10 metres x 5 metres was located in a sample of grazing areas, fenced and left undisturbed for one month, Then the yield from such plots was estimated by locating 1m x 1m plots randomly in the fenced plots before and after grazing and recording their yield. The data of the survey are still being analysed but the results obtained so far have shown the feasibility of obtaining estimates of feed available from grazing lands.

Survey on fruits and vegetables

With the objectives of estimating the extent of cultivation and production of fresh fruit crops, the Institute conducted a series of pilot sample surveys during 1958 to 1973. These surveys were conducted in three phases. In the

first phase surveys, a single fruit crop was covered in a district. In the second phase surveys, several fruit crops were taken and the coverage was increased from a district to a wider compact region. In the third phase surveys, all the important fruit crops in a State were covered. On the basis of these surveys, a suitable sampling methodology has been finalized for estimating the extent of cultivation and production of fresh fruit crops.

For the estimation of area and production of vegetables three pilot sample surveys were conducted by the Institute in Delhi (1964-67), Poona and Nasik (1966-69) and Bangalore (1971-74). For the estimation of the losses taking place in the marketing of vegetables and to study their price spread, a survey was conducted in Delhi during 1976-77. The results indicated that keeping in view that growers have to incure entire, expenditure on cost of production of vegetables, their share in the consumers rupee spent is very meagre. The grower's share for different vegetables lies between 30 to 40 paise per rupee which is of the same order as that of retailers' share. The losses reported which are mainly at retailers' level are very small (Less than 2%).

In order to study as to how far the vegetable cultivation is remunerative to the grower's it becomes important to study the cost of cultivation, besides the estimation of grower's share in the consumer's rupee spent on vegetables. A survey for estimating price spread, losses and cost of cultivation of vegetables was carried out in Ahemdabad during 1978-79. In Delhi also, a survey on cost of cultivation of vegetables has been taken up for which the field work is still in progress. It is expected that the results of these surveys will throw considerable light on the vegetable cultivation and its marketing aspects.

Surveys for studying cost of production of fruits and other perennial crops have also been undertaken in recent years. In these surveys the cost of production has to be estimated in two stages. In the first stage cost of raising the orchard to the bearing stage is estimated and in the second, cost of maintaining orchards and harvesting and marketing produce is estimated. For both the stages a representative sample of orchardists is taken and data are recorded by cost accounting as far as possible. The technique has been more or less standardized and its utility has been demonstrated. At present the I.A.S.R.I. is conducting two surveys, one to study cost of production of Orange in Nagpur and Amaravati districts of Maharashtra and the other, on Mango and Banana in Bulsar and Surat districts of Gujarat state. The data collected in these surveys are being analysed.

Experimental Programmes

Apart from sampling surveys statistical research in relation to crops covers experimental work. Rural development is very much dependent on research in new agricultural technology and this is based on large scale experimental work. The Institute is intimately associated with the All India Coordinated Agronomic Research Project in respect of planning, analysis and interpretation of the data of experiments planned at the Agricultural Research Stations and on cultivators' fields. The detailed results obtained in the project are being published regularly in annual reports. Some of the interesting results obtained in multiple cropping experiments are presented here.

In the past, the main emphasis was on the development of the improved practices for an individual crop. However, with the increase in the population and the limited availability of cultivated land in the country, the emphasis of production strategies shifted to the development of cropping system in an area. Bulk of the farming community possesses 2 to 3 hectares of land per holding. Therefore, any production strategies developed must take in to account the limited land resources available to them and their capacities to absorb any renovation. One way of improving the income of farmers as well as providing them useful employment during the year is to develop an intensive farming system for such farmers in an area. For this purpose, an experiment was planned under the Project at different agronomic research centres spread over different parts of the country. The experiment consisted of dividing an area of one hectare of the land into 4 or 5 sub-plots each of equal size and on each of these sub-plots, a particular crop rotation was followed with scheduled manurial and cultural treatments. The selected crop rotations included cereals, pulses, cash crops, oilseeds and fodder. The area occupied by different crops in the rotations varied from 45% to 75% for cereals, 8% to 25% for pulse crops, about 20% for oilseeds and remaining area was under fodder and vegetables. For each of the rotations, the production potentials and its economics for one hectare holding under the intensive cropping system was examined. For the purpose, the results of the experiment carried out during the years 1974-75 to 1976-77 were utilised. In table 1, the results in respect of crop intensity, gross return, input cost and net return from one hectare holding averaged over the period for various research centres are presented. Results, suggests that the crop intensity could safely be increased to 250% while in some areas like Tamil Nadu (Bhawanisagar), Maharashtra (Akola), Gujarat (Navsari) and Uttar Pradesh (Varanasi) it could be increased even to 300%. The annual net income could also be increased with proper crop intensity to the extent of Rs. 10,000 p.a. in Tamil Nadu (Karaiyiruppu) and around 9,000 in Himachal Pradesh (Palampur).

It is known that to exploit the full potentiality of a cropping system, it is necessary to apply the inputs like fertilizers, irrigation plan protection chemicals at optimum level. However it is generally observed that the cultivaters do not have the resources to apply fertiltzers at recommended level for the cultivation of a crop. Some experiments were planned to determine the level upto which the use of scarce input resource like fertilizers can be lowered without affecting the crop yields in the selected crop sequences. The results of this study were also utilised to develop the proper distribution of a given quantity of fertilizer over different crops (in the sequence) in such a way that the reduction in total yield is minimum. It was, in general, observed that with the increase in fertilizer doses, there was consistent reduction in the yield also. The magnitude of the decrease however varied from region to region in different crop sequences. The result however suggested that in rice-rice sequence, fertilizer application could be reduced to 75% of the recommended level both for kharif and rabi rice in Karnataka (Mangalore) and Orissa (Bhubneswar) without much adverse effect on total crop yields. For Kerala (Karmana) reduction in quantity of plan nutrient by 25% was possible for kharif rice, but for rabi rice fertilizer recommendation had to be adopted at full rate to ensure that loss in yield was neglible. In rice-wheat sequence, it is observed that fertilizer levels for Kharif rice could be reduced to the extent of 75% of the recommendation but for wheat, it was necessary to maintain the recommended level of fertilizers. Result for jowar-wheat sequence, by and large, indicated that application of fertilizers to jowar could generally be scaled down to $\frac{1}{4}$ or $\frac{1}{2}$ of the recommended level but for wheat, $\frac{3}{4}$ of the recommended dose need to be applied. The results for bajra-wheat sequence followed the same trend.

Water is another important input for the agricultural production and has a direct impact on the rural development. In the country, more than 70% of the area is cultivated under rainfed conditions. The contribution of these areas to the agricultural production is around 42%. Almost the entire production of coarse grains like pearmillet and sorghum, Pulses and most of the industrial raw materials like, cotton and oil seeds come from these areas. Very often, the performance of these areas makes all the difference between scarcity, adequacy and plenty in respect of availability of foodgrains and materials. People in these areas, primarily depend for their livelihood on agriculture and their income levels are also quite low. This situation is mainly caused by the low and unstable production due to variations in rainfall. These areas have low or medium annual rainfall that is 500mm-1250 mm. per annum. Some distinctive features of these regions are short monsoon

season, long dry spells within the monsoon season and a high variation in the timing and amount of rain-fall, a high rate of evapotranspiration, soil erosion and widespread of pests and diseases.

For the proper crop planning and effecient rain water management in these areas, it is necessary to develop suitable statistical parameters. The nature of the statistical parameters required for different areas would depend on the quantum of water available at different points of time of the crop season. In this context, the Institute examined the rain fall data for some of the districts like, Raipur, Jalgaon and Jamnagar which differ not only in respect of their total rainfall but also in respect of variation and its distribution over different month of the monsoon season (Table-3), It was observed that for Raipur, having an annual rainfall of about 12.00 mm. the probability estimates for the occurance of different amount of rainfall during different phases of crop season can be effectively utilised for crop planning since the crop productivity in these regions depend on the amount of rainfall during different phases of the crop growth, on the other hand in a region like, Jalgaon receiving an annual rain fall of about 7.00 mm. the total rainfall in the season and its distribution was found to have a limited influence on the crop production. The number of dry and wet days and their distribution pattern over short crop growth phases of the crop season showed a pronounced influence on the crop growth in the region. A simple stochastic model for studying the distribution of dry and wet spells over short crop growth intervals was therefore developed. The results were utilised for identifying the safe growth season for jowar crop which is the principal crop of the district grown during Kharif season (Table-4). The result shows that the expected length of dry and wet spells according to the various crop growth phases compares favourably with that of the ideal length of such spells for the corresponding crop growth phases. Incidently, it was also observed that by adopting the proposed crop season for growing jowar crop, the total average rainfall would generally be more as compared to the total average potential evapotranspiration (PET) during various crop growth phases. For region like, Jamnagar receiving an annual rainfall of about 5.00 mm. statistical parameters using conditional probability estimates for the occurance of different amounts of rain fall for various small crop growth phases (WEEK) based on knowledge about the amount of rainfall received in the proceeding week were found to be useful for crop planning.

TABLE-I : Cropping intensity, gross return, input cost and net return from one hectare holding averaged over three years (1974-75 to 1976-77).

State/Centre/ Soil Group	Cropping intensity	Gross return (value of produce/straw) (Rs.)	Input cost (Rs.)	Net Return (Rs.)
HARYANA				
Hissar (Sierozem)	250	8284	5444	2840
HIMACHAL PRADESH				
Palampur (Submountainous)	250	15245	6436	8809
MAHARASHTRA				
Akola (Med. Black)	300	12357	5902	6455
Karjat (Med. Black)	200	9815	4616	5199
GUJARAT				
Navasari (Deep Black)	300	9584	5353	4231
KARNATAKA				
Siruguppa (Deep Black)	275	11103	7567	3536
TAMIL NADU				
Bhavanisagar (Red Sandy)	300	10894	7658	3236
Karaiyiruppu (Med. Black)	267	15750	5578	10172
Thanjavur (Coastal Alluviam)	267	7009	4916	2093
UTTAR PRADESH				
Pantnagar (Tarai)	267	11675	6629	5046
Varanasi (Alluvial)	300	12415	6026	6389

Table 2 : Reduction in yield under different fertilizer constraints in crop sequences.

Fertilizer Schedule (Percentage of recommended dose $N+P_2O_5+K_2O$)		RICE-RICE Percentage reduction in yield over the recommended level				RICE-WHEAT Percentage reduction in yield over the recommeded level.				
Kharif	Rabi	Mangalore (Karnataka)	Karamana (Kerala)	Bhuvneswar (Orissa)	Karaiyiruppu (T. Nadu)	Palampur (H.P.)	Rewa (U.P.)	Masodha (U.P.)	Pantnagar (U.P.)	Kharagpur (W. Bengal)
100	100	—	—	—	—	—	—	—	—	—
75	100	2.70	2.59	**	7.51	0.82	1.56	5.33	2.59	6.60
75	75	2.40	6.88	1.12	15.28	7.97	8.06	13.23	7.18	14.65
50	100	3.77	5.75	4.37	14.94	10.88	7.67	16.87	9.81	18.17
50	75	6.60	7.12	7.71	22.77	16.39	10.78	24.58	12.74	27.28
25	100	9.40	6.82	9.38	20.88	16.00	11.61	27.64	11.98	32.13
50	50	7.91	9.76	10.91	29.00	21.19	20.27	33.65	15.98	32.13
25	75	10.14	10.58	10.70	28.03	20.72	17.79	37.09	17.81	39.47
25	50	10.04	15.40	17.94	33.45	25.19	25.62	41.05	17.96	42.19
Recommended dose of (N-P_2O_5—K_2O) Kg/ha										
Kharif	:	100-75-88	90-45-45	100-50-50	120-60-60	120-60-60	120-60-40	120-60-60	120-60-60	120-60-60
Rabi	:	100-75-88	90-45-45	100-50-50	120-60-60	120-60-60	120-60-40	120-60-60	120-60-60	120-60-60
Soil Type	:	Leterite	Leterite	Leterite	M. Black	Submontainous	Mixed Red & Black	Alluvial	Tarai	Laterite

**Yield rate was higher than that at the recommended level.

TABLE : 3 Average amount of rainfall, PET, P_{11}, P_{22} and the expected lengths during the four crop growth phrases for Jowar crop in Jalgaon district

Crop growth phases	Period	No. of days in the period	Total average in PET (mms)	Total rainfall (mms)	P_{22}	Expected length of wet spell (days)	P_{11}	Expected length of dry spell (days)
Seedling stage	21 June to 10 July	20	91.7	99.2	.500	2.00 (2-3)	.739	3.80 (2-3)
Plant growth	11 July to 31 August	52	126.6	243.9	.474	1.89 (2-3)	.601	2.57 (2.3)
Pre-flowering and flowering	1 Sept. to 15 Sept.	15	39.6	65.2	.491	1.90 (2-3)	.806	4.50 (3 5)
Grain formation	16 Sept. to 30 Sept.	15	49.7	32.3	.439	1.80 (1-2)	.904	6.20 (5-7)

Figures in brackets shows the ideal length of dry/wet spells

P_{11}-Probability of a day being dry given that previous day is dry

P_{22}-Probability of a day being wet given that previous day is wet.

Table 4 : Monthly average rainfall (cms) and C.V. for Raipur (M.P.), Jalgaon (Maharashtra) and Jamnagar (Gujarat)

Month	Raipur		Jalgaon		Jamnagar	
	Mean	C.V.	Mean	C.V.	Mean	C.V.
June	17.19	45	10.39	90	7.34	132
July	38.01	28	16.01	48	17.94	96
August	36.42	29	14.21	59	12.47	126
September	23.17	39	9.75	74	5.14	116
June-September	114.78	18	50.38	46	42.89	53

2.2 Current Statistical Research on Forestry with respect to rural development.

By

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Before considering current statistical research in Forestry let us see how forests are related to rural development. Any statistical research which will help in managing forests can be interpreted as helping rural development also. Forests give direct and indirect benefits to rural people.

1. Role of Forests in Rural Areas

In rural India most of the houses are built using good a mount of timber and bamboos. They, infact, form the main ingradients in any rural house construction. The furniture and other fittings in the house are also mainly made of wood, especially in the rural areas. The livestocks of those rural areas which are bordering forests usually find their pasture land in forests. For bordering rural areas the main fuel for cooking and other purposes come from forests. If the area happens to be surrounded by forests every activity including employment of these people are mainly dependent on the forests. Tribals are an example for this kind.

2. Indirect help from Forests

"Forests represent the largest, most eomplex and most self generating of all eco-systems. At the world level they cover about the third of the land area and constitute one half of the total bio-mass. Forests have a direct and benificial influence on all parts of the bio-sphere as a result of their heat capacity and conductivity, aeri-dynamic roughness, influence on the water cycle and emissivity in the infra-red land. Forests act as buffer zones between man made eco-system and represent half of the world's photo synthetic fixation of carbon from the atmosphere, with its concurrent release of oxygen" —Thus in a nut-shell the report by a task force on Forest Resources Survey describes the benifits of forests. The main point is that for ecological-balancing the presence of forests is a must.

3. Latest Statistical Research helping Forest Management

From the above given facts it is evident that the much valuable forest resource has to be carefully managed. An excessive felling of trees will lead to slow reduction in the existing forest trees and, if the felling is continued without caring for the warning that nature will give when eco-system changes, ultimate extinction of forests also may come up. So the policy should be to extract only the growth and leave the forests to do its ecological-balancing. The process is just like that of using only the interest while a critical size of the capital is kept safe in bank. Obviously an important fact which should be known to follow this golden rule is the amount of growth that can take place, over a given period of time, in our forests. The latest researeh in predicting the growth of the trees using stochastic process is worth considering.

4. Application of Stochastic Process to predict Forest Stand Dynamics

Trees have certain peculiar characteristics. They grow from seeds in a steady way over a number of years. If one observes tree growth at constant intervals of time, one necessarily comes to the conclusion that how a tree will grow in the future is much influenced by the way it has grown in the past. Thus the growth dynamics of a forest stand can be studied by the use of Markovian stochastic process theory. In this paper the derivation of the maximum likelihood estimates of the transition probabilities, and their asymptotic distribution are considered. For details concerning the application the reader is referred to the author's thesis,

Assumptions and Definition

Let us consider a particular species of trees growing in a given area. The growth dynamics can be considered as the simplest generalization of a Markov chain in which the outcome of any trial is considered to depend on the outcome of the directly preceeding trial only. In the case of tree growth, the trees in diameter class d_i move in a specified pattern to a higher diameter class irrespective of the fact the trees in d_i consist of different age group classes, i.e. they have taken different times to reach d_i. This assumption is regarded as valid since, from a homogeneous group, if a tree can reach a certain level of growth the potential for further growth is inbuild irrespectively of the earliness or lateness that the level is reached. To put this in another way, in a uniform plantation the group of trees in th

d_i class interval at any point of time will not be very heterogeneous and when a tree after reaching a level of growth has the potential for further growth in the given environmentally dictated pattern. This assumption has been checked on sample plot data available at the Forest Research Institute, Dehra Dun, and found to hold for teak (Tactona grandis) for the tested areas.

It can be shown that the process thus described is simple Markovian with a finite number of stages or categories (i.e. diameter classes) with the property of ergodic tendency because the transition probability matrix will be triangular. Let us denote a finite number of diameter classes, in ascending order or magnitude by $d_1, d_2, d_3 \ldots\ldots\ldots, d_e$, where d_e represents a diameter class with an open upper end. Then the transition probability matrix, T, takes the form.

$$T = \begin{bmatrix} p_{11} & 0 & 0 & \ldots & 0 & 0 \\ p_{12} & p_{22} & 0 & \ldots & 0 & 0 \\ p_{13} & p_{23} & p_{33} & \ldots & 0 & 0 \\ \cdot & \cdot & \cdot & & \cdot & \cdot \\ \cdot & \cdot & \cdot & & \cdot & \cdot \\ \cdot & \cdot & \cdot & & \cdot & \cdot \\ \cdot & \cdot & \cdot & & \cdot & \cdot \\ p_{1(e-1)} & p_{2(e-1)} & p_{3(e-1)} & & p_{(e-1)(e-1)} & 0 \\ p_{1e} & p_{2e} & p_{3e} & & p_{(e-1)e} & 1 \end{bmatrix}$$

Where P_{ij} denotes the stationary probability that a tree in the i^{th} diameter class will grow in the jth diameter class after a fixed time interval of, say, k years.

It is easily seen that

$$P_{ij} = 0 \text{ for all } i > j$$

and

$$\sum_{j=1}^{e} P_{ij} = 1 \text{ for all } i = 1, 2, \ldots\ldots e \qquad (1)$$

since no tree can grow into a lower diameter class and must either remain in the same class or grow into a higher diameter class.

ESTIMATION

The scheme of data collection is to observe n randomly selected trees at two times, once at time t and again at time t+k, and record the diameter class of each tree at each time. We wish to estimate the transition probabilities from such data.

Let n_{ij} denote the number of times we observe a transition from the d_i class to the d_j class. Then the joint probability for the set (n_{ij}) to arise is

$$\pi\,\pi\; P_{ij}^{\,n_{ij}}$$

Where the products are over all values of i and j for which $n_{ij} > o$.

To derive the probability density function we recall the restriction

$$\sum_{j=1}^{e} P_{ij}=1(1) \text{ and if } \sum_{j=1}^{e} n_{ij}=n_i \text{ is known}$$

for all i=1, 2, ... e (n_i corresponds to the total number of trees ; d_i is the starting point of the diameter class) then the conditional probability distribution can be readily deducted as

$$\prod_{i=1}^{e} \left[\left\{ \left(\sum_{j=1}^{e} n_{ij} \right)! \Big/ \prod_{j=1}^{e} n_{ij}! \right\} \prod_{(i)} p_{ij}^{\,n_{ij}} \right] \qquad (2)$$

where j(i) denotes all those j's from 1 to e for which $n_{ij} > o$.

Further if $p_1, p_2, \ldots . p_e$ are the probabilities that, out of a total of

$$\sum_{i=1}^{e} \sum_{j=1}^{e} n_{ij} = n.. \text{ observations, } \sum_{j=1}^{e} n_{ij} \cdots \ldots \sum_{j=1}^{e} n_{ej}$$

observations are in the $d_1, d_2 \ldots d_e$ diameter classes, respectively, to start with, we have probability density

$$\frac{n\ldots!}{\prod_{i=1}^{e}\left(\sum_{j} n_{ij}\right)!}\prod_{i=1}^{e} P_i^{\sum_{j=1}^{e} n_{ij}} \tag{3}$$

Since $P(AB) = P(A)\,P(B/A)$ we have the unconditional probability density as

$$\frac{n\ldots!}{\prod_{i=1}^{e}\prod_{j=1}^{e} n_{ij}!}\prod_{i=1}^{e}\left(\sum_{j=1}^{e} n_{ij}\prod_{j(1)}^{e} p_{ij}^{n_{ij}}\right) \tag{4}$$

It may be easily verified from the above probability density function that the maximum likelihood estimates of the P_{ij} transition probabilities, under the restriction

$$\sum_{j=1}^{e} P_{ij}=1, \text{ are}$$

$$\hat{P}_{ij} = n_{ij} / n_{i.} \quad \text{for all i, j(i)}$$

and

$$\hat{P}_i = n_{i.}/n.$$

$$p = \begin{bmatrix} \hat{P}_{ij} \\ \hline \hat{P}_{ij} \end{bmatrix} = (\theta)$$

Under fairly general conditions, analogous to those of the single variable case. it can be shown that $(\hat{p}-p)$, the difference between the vectors of the

maximum likelihood estimates and the true values has a multivariate normal distribution with zero mean vector. The variance co-variance matrix of $\left[\overset{\wedge}{(p-p)} : \lambda\right]$, where λ is the vector of lagrangian multipliers, is the matrix whose inverse is given by

$$\begin{bmatrix} -V & -H \\ \hline -H^1 & O \end{bmatrix}^{-1} \begin{bmatrix} -V & O \\ \hline O & O \end{bmatrix} \begin{bmatrix} -V & -H \\ \hline -H^o & O \end{bmatrix}^{-1}$$

Where $E\left(\frac{\partial^2 \log L}{\partial \theta_r \, \partial \theta_s}\right)$ gives the $(r, s)^{th}$ element of the matrix

$$\begin{bmatrix} -V & -H \\ \hline -H^1 & O \end{bmatrix}$$

The use of predicting growth :

In fact if we know how a given forest stand will get changed after a certain number of years, this information can be used in solving a variety of problems. Here we will see how the consistant yield of a forest stand can be determined using this prediction process.

If T is the transformation matrix as described before and I_k is the inventory at $_k$th time point.

$$\begin{aligned} TI_o &= I_1 \\ TI_1 &= I_2 = T^2 I_o \\ TI_2 &= I_3 = T^3 I_o \end{aligned}$$

and so on.

If E is the consistant extraction that can be obtained from the stand I_o $E = (I_1 - I_o)$

So $T I_o = E + I_o$

or $(T-I)\ I_o = E$

Now we can find out the initial inventory which can give us E the given pattern of consistant yield.

$$I^* = (T - \overline{I})\, E$$

Where $(T-\overline{I})$ means a generalised inverse of $(T-I)$

l^* is the pattern of stand that is required to give us E extraction consistantly.

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2.3 Current Statistical Research on Forestry in U.P. with respect to Rural Development.

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Broadly speaking application of statistics in Forestry may be classified into two categories :—

(i) In assessment of Forest resources and

(ii) In management of Forests.

In both directions statistical research in forestry in U.P. has made considerable headway.

Assessment of Forests Resources.

Just like revenue districts, the entire forest area in the state is divided into forest divisions. As a district consists of human population of various age groups, religion, socio-economic status etc; similarly a forest division consists of trees of various diameter classes, species, site qualities etc. Foresters prepare working plan of each forest division for a period of fixed tanure, usually ten years. The annual outturn or annual cut of trees of various diameter classes in each division is prescribed in respective working plans of the division in such a manner that total volume of growing stock remains intact or allowed to increase and annual cut of the division is equal to or less than the annual *increament* in volume of the growing stock.

In working plans of forties and earlier periods the forsters were very rarely using sampling methods and resorting to total enumeration for the assessment of growing stock, because they had little faith in application of sampling methods for the assessment of total growing stock of the division. As we all know that total enumerations suffer from non-sampling errors and some times these errors are so large that a sample estimate is better than total enumeration or in other words a sample estimate takes us more closer to reality than total count of the population. The breed of foresters after independence were quick to realise the truth of above statement and they

started using sampling methods, though cautiously. In forest surveys, after the epoch making publication. Sampling and assessment of forest crop in 1955 (U P. Forest bulletin No. 21 by S. K. Seth) the use of sampling if forestry became continuous.

The methodology adopted for the assessment of growing stock is generally as follows :-

The entire forest area of the division is stratified into various working circles, periodic block or felling series then each stratum is further divided into sampling units (known as compartments, sub-compartments or topographical units). All the sampling units have well defined bounderies with known accurate area and are marked on stock maps prepared by Survey of India. In early surveys the determination of sampling intensity was kept as high as 50% as little was known abouts the heterogenity of the crop, but as soon as the estimates of crop variability become available as a result of sampling unit wise forest surveys the sampling intensity reduced considerably, as area of the population (division) as well as the sampling units are precisely known combined ratio- estimate is used to arrive at the estimate of volume per hectare, i.e.,

$$R_{n_c} = \frac{\text{Av. Volume of timber sampled units}}{\text{Av. Area of sampled units}}$$

using the property of proportional allocations

$$\hat{V}(R_{n_c}) = \frac{1}{\left(\sum p_t \bar{x}_{nt}\right)^2} \frac{N-n}{Nn} \left\{ \sum t_t S^2_{t_y} + R^2_{n_c} \sum p_t S^2_{t_x} - 2R_{n_c} \sum Cov_{x_{y_t}} \right\}$$

where P_t is the stratum weight, variable x refers to area and y to volume of the unit respectively, other notations have their usual meaning.

The lower safe limit of volume per hectare is calculated as :--

$$S = R_{n_c} - t \sqrt{\hat{V}(R_{n_c})}$$

multiplying S by total area of the division say A, we get lower safe estimate

of total volume of growing stock present in that division. If t value is read at .05 probability level than it can be asserted with 95% confidence that the total growing stock of the division is SXA.

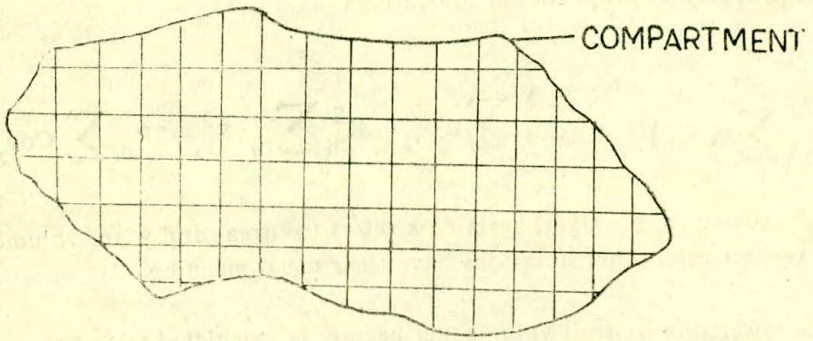
Once it was established that total enumeration and sample estimates of growing stock are very close to each other many refinements of sample methods were used for assessment of growing stock.

FOREST SAMPLING ON SUCCESSIVE OCCASIONS.

As stated earlier that working plans are repeated after a period of ten years there is therefore, an opportunity of making use of past experience for improving the precision of current estimates. Apart from this an estimate of c ange in volume of growings stock can also be obtained from matching sampling units (compartments or topographical units).

Sampling by circular plots

Sometimes foresters are interested in knowing the flora of each sampling unit for preparing compartment history. In such cases systematic grid sampling method has been extensively used in recent years by P.N. Gupta. The method is as follows :—



On the map of each compartment points are marked systematically by randomly placing a transparent grid. At the point of each intersection a circular plot of 0.05 hectare is circumscribed to measure the standing volume therein. In this case the total volume of the growing stock is obtained by

$$\hat{y} = \sum M_i \bar{y}_i$$

Where $M_i = \frac{\text{Area of } i_{th} \text{ compartment}}{\text{Area of circular plot}}$

as the estimate of the variance of $\hat{y}$ is given by

$$\hat{V}(y) = N^2 M^{-2} \left(\frac{1}{n} - \frac{1}{N}\right) s_b^2 + \frac{N}{n} \sum M_i^2 \left(\frac{1}{m_i} - \frac{1}{M_i}\right) s_{w_i}^2$$

in our case N=n

$$\therefore \quad \hat{V}\left(\hat{Y}\right) = \sum_{i=1}^{N} M_i^2 \left(\frac{1}{m_i} - \frac{1}{M_i}\right) s_{w_i}^2$$

$$\text{where, } S_{w_i}^2 = \frac{1}{m_i - 1} \sum_{j=1}^{m_i} \left(Y_{ij} - \bar{Y}_i\right)^2$$

Where m_i is the number of plots actually anumerated in the $_i$th compartment.

STEP BY STEP SAMPLING IN FOREST SURVEYS

As area of each sampling unit is known in advance there is always an opportunity of selecting a sampling unit with probability proportional to size of units. Using the estimator 't' defined by Des Raj as follows :—

$$t_1 = \frac{Y_1}{p_1}$$

$$t_\lambda = Y_1 + Y_2 + \ldots\ldots + Y_{\lambda-1} + Y_\lambda \frac{1 - \sum_{i=1}^{\lambda-1} p_i}{p_\lambda} \quad (\lambda = 2, \ldots n)$$

where the variable Y refers to volume of the compartment. The first selection is made with probability proportional to size (area) of compartment and selection of i th compartment is made with probability proportional to remaining (N−i+1) compartments. This type of sampling gives a sequential nature in forest surveys.

At every stage.

$$t=\frac{(t_1+t_2+\ldots.t_n)}{n}$$

gives an unbiased estimate of growing stock and as

$$V(t_n)< V(t_{n-1}) <----<V(t_2)$$

The sampling may be stopped when sufficiently small confidence interval has been reached.

A note of caution is necessary at this point since

$$\hat{V}(t_n) <\hat{V}(t_{n-1}) <----< \hat{V}(t_2)$$

does not necessarily hold good therefore, initial aberations of small confidence interval when the sample size is small are overlooked but as soon as sample becomes large. The law of large numbers begins to operate and confidence interval shrinks at each stage of new selection of compartment after certain value of sample size.

PLANTATION SURVEY

U.P. Forest Department has raised plantation of pure and mixed species over large area in past two decades. The rotation of most of these plantations is as little as 8 years, that means trees of these plantations are ready for cutting after 8 years. In order to assess growing stock and success percent the department has conducted large scale plantation surveys.

As these plantations are usually raised by lines the method of sampling adopted is systematic sampling with random start. In order to simplify post survey analysis work, two systematic samples are usually collected from each plantation by fixing lower intensity of sampling say 5%.

If T_1 is the number of trees enumerated in the first sample and T_2 in the second. The total number of trees present at the time of survey is estimated by

$$T = \frac{T_1 + T_2}{2} \times 20$$

With its associated standard error simply calculated as

$$\frac{T_1 - T_2}{2}$$

If the number of plants initially planted is N then success percent of the plantation at the time of survey is given by

$$\frac{T}{N} \times 100$$

STATISTICAL APPLICATIONS IN THE MANAGEMENT OF FOREST RESOURCES

Data in this branch of forestry are required for research and working plans which includes evaluation of forest resources, evolving and applying sampling techniques in forest surveys and the analysis of data emanating from such surveys (this aspect has already been dealt in depth in the assessment of forest resources to arrive at what we call forest inventory), preparation of statistical designs for conduct of silvicultural experiments and utilisation research and analysis of data collected from such projects, preparation of scientifically tested volume table for different species and site qualities based on statistical analysis. A series of volume tables have been published by A.N. Chaturvedi for various species. He has also developed computor programs for testing the efficacy of volume tables by using appropriate regressing and analysis of variance.

He has also prepared yield table which are also used for inventory of resources and their analysis. Apart from above two branches of forestry some statistical and economic analysis has been done on Economics of Eucalyptus plantations. D.N. Lohani has published tretise on Eucalyptus Plantation in India, which contains very useful information on investigations on nursery and planting techniques, Survival and rate of growth and yield management, use of fertilizeres and manures in plantations, it also deals with utilization aspect, cost and return.

In addition to this, efforts are also being made to improve the quality and accuracy of official forestry statistics by posting statistical staff down to the grass root level (i.e. division) standardised forms for compilation of forestry statistics have been prepared by the Directorate of Economics and Statistics (DES) Ministry of Agriculture and Irrigation Govt. of India and are

invogue since 1958-59. This return does not meet the present requirements of planning and forest management.

On setting up of the Central Forestry Commission (CFC) in 1965 efforts are being made to compile standard statistical forms relating to forestry, some progress has been made, CFC has already standardised forms relating to

1. Forest Area Statistics.
2. Out-turn statistics.
3. Statistics relating to wood based industries.
4. Forest Revenue and Expenditure Statistics.

As there has been considerable shift in forestry planning from division to district level much more work has yet to be done in standardisation of forms relating to forestry statistics.

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2.4 Current Statistical Research on livestock with respect to Rural Development.

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Application of statistical methodology to animal husbandry was made as early as in 1944 when critical analysis of goat breeding data in a project at Etah (U.P.) was undertaken. But its application to livestock and related fields has been recognised as a necessary tool only recently particularly when emphasis was given for rural development in later Plan periods. During the past three decades research in agricultural statistics has been in progress mainly to evolve statistical methodology and improve the existing methodology to meet the requirements of the livestock sector. Current statistical research as applied to livestock can broadly be discussed under two heads :

(A) Refinement/modification of methodologies already developed; and

(B) Methodology being developed in areas in which appropriate technique is not available.

(A) (i) The estimates of livestock products in a country are major indicators of development. The IASRI developed appropriate methodology for estimation of individual livestock products like milk, wool, poultry and egg. These methods were suitably modified later under an integrated approach to get the estimates of more than one livestock product simultaneously. This methodology is being adopted by various States to get the estimates of annual as well as seasonal production. Since a number of operational difficulties are experienced under varying conditions, further work is in progress to suggest suitable modifications, in the existing method. For example, the existing method of getting data on milk yield is to obtain the yield by actual weighment both in morning and evening in the sample households. An attempt is being made to combine the estimates on the basis of actual weighment and by enquiry and to decide the appropriate sample for

each in order to get the estimates within a reasonable degree of precision and at a reduced cost Moreover, studies are in progress to record milk yield of animals either in the morning or in the evening in view of high correlations between the two occasions so as to get the reasonable estimate by suitably modifying the sample size and to the convenience of the field staff to adjust the operation in addition to their normal duties.

(ii) Estimates of cost of production of livestock products is of fundamental importance from the point of view of producers. Nothing acts as a greater incentive than the remunerative market for enhancing production. For maximizing individual farmer's returns as well as for improving overall efficiency, information of cost of production is indispensable. Appropriate methodology for estimation of cost of production of milk has been developed. But the milk collection agencies require, in addition to the cost of production of milk, the production and marketed surplus of milk in the collection areas. Considering the requirements, methodologies are being developed and modified for estimation of availability of milk and its cost of production based on the work in different regions.

Methodology for estimation of cost of production of poultry and egg under commercial management conditions has been developed. Work is in progress to know to what extent these methodologies can be applied for obtaining estimates under small scale poultry farming conditions.

(iii) Based on some preliminary investigations, it was observed that dairy farming and mixed farming are as remunerative as arable farming. Since such farming systems offer significant employment opportunities to small and marginal farmers and agricultural labourers, investigations are being carried out by different organisations and agricultural universities to demonstrate the feasibility of alternative sources of income and employment.

(iv) In some breeding tracts where farmers prefer to rear the calves of the pure breeds, it is desirable to know the cost of rearing so as to provide an indicator in knowing the extent of return to the farmer through sale of calves. The IASRI developed, on the basis of studies carried out in a breeding tract, the technique for estimation of rearing calves upto various age groups. As this methodology may not be directly applicable in the case of cross-

bred calves, the work is in progress to know how far the available technique is suitable to estimate the cost of rearing crossbred calves and incorporate necessary changes required.

(v) The problem of measuring the availability of nutrients for livestock from fodders and grasslands is extremely complex but at the same time rather important. The method of estimation of production of cultivated fodders has been worked out based on the studies in a few areas and on a few fodder crops. Similar studies are being extended to other cultivated fodders so as to finalise the appropriate methodologies for such studies.

(vi) The milk producers are paid for their milk on the basis of fat and SNF content. The percentage of SNF in milk is determined on the basis of a formula obtained earlier using percentage of butter fat and density of milk. This formula, however, needs modification as it is used for both cow milk and buffalo milk irrespective of the variability in different seasons. Work is being carried out to modify the existing formula to determine SNF separately for cow milk and buffallo milk and for three different seasons.

The foregoing, in brief, is an indication of the current research for improving the existing methodologies. It is well realised that there is considerable data gap in livestock sector both for planners and research workers. One of the reasons for this gap is the lack of appropriate statistical methodology for obtaining valid and precise information. Towards this end attempts are being made to evolve suitable methods on the basis of pilot investigations. Some of these are discussed in what follows.

(B) (i) Developmental programmes are being launched to improve the economic status of the people in rural areas. For enhancing milk production in rural areas. a number of developmental programmes are in progress. These programmes are oriented towards changing level of production of animals, employment pattern and income of the producers. In order to evolve methodology to assess such changes, studies are in progress. The study of impact of milk supply schemes on rural economy in milk collection areas is one such project.

(ii) The studies on age specific mortality and fertility rates among cattle and buffaloes are essential for construction of life tables and

projection of bovine population necessary for formulating scientific plans for future development. This is more required for cattle insurance programmes in which farmers would be immensely benefitted if the programme is formulated on a more scientific basis. Since no appropriate methodology is available for estimation of these parameters. the IASRI has taken up pilot investigations in different animal husbandry regions to meet this objective.

(iii) Pig rearing is one of the important occupations of a sizeable section of the weaker rural community particularly the Scheduled Tribe and Scheduled Caste people who are traditional breeders of pigs. Study of economics of pig rearing will provide guidelines for efficient utilisation of available resources and for giving economic return to the farmers. Study is in progress to work out suitable methodology for working out the economics of pig rearing.

(iv) Studies undertaken so far use to provide estimates of feed available to bovines through stall feeding. It is well-known that animals get their feed partly through grazing in addition to stall feeding. It is desirable to know the extent of feed available to bovines through this source as well. From the knowledge of the extent of feeding through both the sources the nutritional status of animals can be assessed. Some work has been done to work out the methodology for estimation of area of grazing land and its utilisation. These studies would provide the availability of the quantum of various species of grass to animals as well as the chemical composition of the grasses. Further work is in progress in this direction. The results obtained from such studies will indicate the measures that can be taken by develomental agencies to improve the grazing areas and thereby providing resources through grazing for the animals maintained by the rural mass.

On the basis of the data available on feed both through stall feeding and grazing, the availability and requirement of feeds both in quantitative terms and in terms of their nutritive values can be worked out. Further improvement measures can bridge the gap of the requirements. Considering the resources available, one can work out the various feed combinations both from nutritive and economic angles. A small beginning has been made in this direction based on scarce data available.

(v) Experimental investigations in various livestock farms are carried out to provide the level of production and this can be called as "potential output". The difference between "potential output" and the production in the existing farmers' management conditions will provide the production gap. Factors responsible for such gap can be called as "production constraints". The magnitude of production gap and the production constraints can be known only if reliable and adequate data are available. Moreover, in a country like ours, the production gap is not uniform. It is desirable that studies are made to know the extent of production gap and the production constraints. Utilising the available data from various studies carr ed out, detailed studies are being made to have an idea about the factors responsible for such product on gap. Once these are brought out, efforts can be made by the organisations to take necessary steps to reduce the production gap and thereby increasing the production and improving the economic status of the rural people.

(vi) The present level of production can be enhanced to a certain extent if adequate measures are taken to avoid losses due to premature mortality and morbidity of livestock. Hardly any study has been made to know the extent of loss due to these causes. A beginning has been made to work out the extent of loss due to mortality of milch stock and also calves, based on data collected in a few centres for some other objectives. Such studies if carried out in different regions, can provide valuable information about the extent of loss and provide guidelines to reduce these losses, The farmers would be benefitted even with their existing stock when adequate measures are taken to reduce these losses.

(vii) It is well realised that livestock and dairy sectors have great potentiality in providing employment opportunities in rural areas where both unemployment and under-employment are prevalent. The studies need to be carried out to know the potentiality of such employment in these sectors. In this context, it is necessary to know the extent of labour required for livestock management in different areas and in working out norms so as to work out the availability of working force and the extent of their utilisation for these sectors. These studies are great in demand particularly because of the emphasis laid under integrated rural development. Realising the im-

portance, attempts are being made to work in this direction utilising the available data.

(viii) Management is considered to be an important factor in enhancing livestock products. Certain management factors are to be taken care of individually and some in group. After defining such management factors, efforts will have to be made to improve the management system. Most of the management factors are qualitative. Studies should be carried out to know the influence of management on production and likely returns through improved management. After working out various aspects of management, the rural mass can be properly educated to convince the utility of efficient management and thereby the extent of return they are likely to get. A beginning has been made to know the factors of management and their effect on various production traits of livestock.

(ix) The progress in the field of animal husbandry is slow mainly because of the fact that most of the rural people are uneducated and ignorant of the quantitative aspects of their enterprise. If they can maintain the records of their enterprise and know the extent of input and output and thereby the return, they are likely to take necessary steps to enhance production. Efforts should be made to convince the farmers to maintain the data on their farming aspects and to explain them the various procedures in working out the input-output relationships. A beginning has been made in taking up a project called "Statistical efficiency and operational feasibility of securing data on livestock and its products through different systems of collection". In this endeavour, in addition to collection of data by trained field staff, the farmers are maintaining the essential aspects of the livestock enterprise.

The statistical methodologies already developed and being developed are for the ultimate use of the extension workers and planners. Today, the progress in the field of animal husbandry sector is slow due to the lack of understanding by all concerned agencies about the utility of the studies made and methodologies developed. Unless adequate steps are taken to utilise the methodologies already developed further progress in this direction will not gain desired impact. It is suggested that the policy-makers and

administrators like Directors of Animal Husbandry, Milk Commissioners, Deans of Agricultural Universities dealing with Animal Sciences, should meet together and to this learned body, the utility of statistical methodologies developed so far should be emphasised. Unless they are convinced about the importance of these studies, the future work in this direction, both in Central and State Sector will remain stagnent.

2 5 Current Statistical Research in Marine Fisheries Sciences with Emphasis on Rural Development.

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India with over 6000 kms of coastline has traditional inshore fishing grounds rich in pelagic resources such as oil sardines, mackerel, seerfish, tuna, anchovies and ribbon fish, demersal resources such as sciaenids. catfish, perches, pomfrets, eels and sharks, crustacean resources such as prawns, lobsters and cravs and molluscan resources such as chanks, oysters, mussels, clams and cephalopods. The caputre fisheries however cannot be expected to be of a sustained nature along the narrow coastal belt where the fishing pressure has been steadily increasing with the operation of a large number of indigenous as well as smaller mechanised crafts. To circumvent the situation and to augment fish production increasing attention is being paid in the recent past in evolving technically feasible and economically viable coastal aquaculture practices and seaforming techniques.

Research in different disciplines such as fishery biology, nutrition. pathology, genetics, oceanography, statistics and economics is being con i-nuously carried out to facilitate framing of suitabie policies for the proper management of the vast resources in the seas. Many of the research findings have a direct bearing on the development of coastal areas leading to the prosperity of the coastal rural fisherfolk. The paper briefly gives under various programme heads the current status of statistical methodology as applied to marine fisheries research linked up with rural development.

Fishery population and infrastructure facilities :

For effective rural development, planning should start at the village level. A pre-requisite for such planning is the information base on the potentialities of man power involved, the number and types of fishing crafts and gears possessed by fisherfolk and the infrastructure facilities available in the villages. This is possible only through a well organised census conducted at regular intervals in the coastal areas. Such a census will automatically provide

information for the preparation of frames essentially required in the actual selection of samples while carrying out sampling schemes.

The Central Marine Fisheries Research Institute has been carrying out frame surveys since 1948. The All India Livestock census combines with it the job of collection of information on the fisheries side as well. There are many complex problems peculiar to marine fisheries and to get an integrated picture for fisheries in the entire coastal area it is desirable to carry out an exclusive census for marine fisheries sector coordinated by a team of experienced subject-matter specialists. Keeping this in view the National Commission on Agriculture has recommended that the C.M.F.R.I. with the cooperation of State Fisheries Departments should conduct quinquennial census to up date periodically the inventory of available resources.

The Commissions' recommendation has given a fillip for the conduct of a detailed census and the Institute has now taken it up as a major programme to be implemented once in five years. Accordingly in 1980 during May-July a massive census operation manned by over 2000 persons was organised and carried out by the Institute throughout the coast of India with the help and co-operation of the State Fisheries Departments.

Prior to the census, serveral statistical aspects were finalised, scheduled for collection of data were prepared and tested, the modus operandi up to the household level was decided upon and procedures for sample checks and rational supervision were formulated. During the actual census period of about 3 weeks, extensive data on all aspects of marine fisheries were collected and the analysis of data are nearing completion. With the conduct of this census it has been possible to evolve a methodology for carrying out a comprehensive census of marine fishermen population and available infrastructure facilities.

Catch monitoring

Another important information base essential for formulating development plans in the coastal area is on the extent of fish landings by mechanised and non-mechanised vessels species-wise composition of catches. biological characteristics of fishes and the effort expanded. It is a major task to estimate the fish landings that take place both day and night throughout the year in about 1300 landing centres located in the long coastline of the country. Only scientifically planned sampling scheme can help in achieving the target.

From a purposive sampling scheme followed in 1950, a stratified multistage probability sampling design has been evolved through years of research carried out and experience gained by the C.M.F.R.I. The pilot studies carried out by the I.C.A.R. during 1956 helped in the original formulation of the scheme. Many modifications have been made in the sampling procedure to cope up with the changing pattern of fishing. With more innovations expected to be introduced in fishing industry, the sampling strategy will also undergo modifications.

States like Maharashtra, Gujarat and Tamil Nadu are also collecting catch statistics by employing probability sampling designs. Discussions have been initiated by the C.M.F.R.I. with State Departments and in the coming years it would be possible to formulate an integrated sampling methodology and to arrive at pooled estimates.

Mariculture experimentation

Increasing attention has now been paid to coastal aquaculture and open seafarming with a view to augmenting fish production in areas suitable for the purpose. Research Institutions in the country have been carrying out quite a lot of pioneering work in mariculture research. Many species of fishes such as milk fish, mullets, perches and eels, marine and back-water prawns, mussels, edible and pearl oysters are found adaptive to culture practice. Seaweed culturing is another area which is directly related to the income and employment potential of fish farmers. Suitable areas are being identified in the coastal belt for the development of culture fisheries.

Several experiments are in progress and several more planned especially at different centres of the C.M.F.R.I. to try and perfect the technology to be eventually transferred to the coastal rural fisherfolk. Statisticians have an important role to play in designing the experiments. Simpler designs like the randamised block and latin square are being followed at present. Complex designs are being introduced so that maximum information become available from the experimental investigations which have their own very many constraints.

Stock assessment

Assessment of the stocks of fishes is essential for a rational exploitation of the marine resources. It is a formidable task to quantify these renewable resources available in the vast expense of the seas. A good deal of work has been done in India mostly at the C.M.F.R.I. to estimate the stock commercially important fishes.

A method of estimation of potential fishery resources is through primary productivity studies using C^{14} techniques. Another procedure of assessment is on the basis of catch, efforts and biological data and results of tagging experiments, involving estimates of age specific numbers, rates of recruitment, growth, natural mortality and fishing mortality. Several mathematical models like Beverton and Holt, Schaefer and Ricker are extensively used for these studies. Some of the often-used procedures are developed in western countries where the problems are comparatively simpler. In India we have a muitispecies fishery operated by multigears and even standardization of effort is a difficult problem The scientists of C.M.F.R.I. are critically examining the existing statistical procedures followed in population dynamics in order to suggest, if need be, modifications to suit varying situations.

Technology

Mechanisation has been an important contributing factor for the increase in fish production. With good scope for further exploitation of fishery resources it is imperative to carry out research in designing of fishing crafts, gears and fishing techniques. Several experiments have been conducted by the C.I.F.T. to replace the traditional dug-out canoes and catamarans with motorised boats. A number of prototypes were constructed and tried. In all these experiments statististical designs are suggested keeping in view of the constraints inherent in such trials.

On the processing side statistical quality control techninques are already put into practice. Sampling inspection plans have been found useful in checking the quality of frozen fish and fish products.

Impact analysis

The traditional methods of fish capturing are given place to modern methods using mechanised crafts and gears. Some of the changes often have a serious impacts on the artisanal fisherfolk. It is essential to quantify such impacts so that timely and suitable remedial measures can be planned to ameliorate their grievances. As an example during 1977 - 78 a large number of purse-seiners which have tremendous catching capability of the pelagic fishes sardines and mackerel, were introduced in Karnataka coast. It was soon felt that this would adversely hit the traditional Rampani operators who also depend on the shoaling fishes sardines and mackerel coming near the shore. A rapid study of the problem in coastal villages was made by the C.M.F.R.I. By following a suitable sampling procedure relevent data were collected and the processed results were disseminated to the concorned authorities along with suggestions for remedial measures.

Mechanisation in general has thrown out many technic-economic and socio-economic problems. Sampling and cost accounting procedures are being followed to collect the relevant information needed for making in-depth studies on many of these aspects.

Benchmark and assessment surveys

In order that the rural-folk get a share of the fruits of research, a number of Institutes are trying to transfer proven technologies to the farmers' field. on the marine side C.M.F.R.I., C.I.F.T. and C.I.F.E. have many such programmes. Scientific methods of fish culture, prawn culture, polyculture, oyster culture, mussel culture and sea-weed culture are being promoted in selected areas.

In actual implementation of the programmes there are many practical problems faced. To identify the problems and to suggest ways and means of clearing the bottlenecks there is a need for benchmark surveys before the introduction of such projects followed by periodic assessment surveys. There are a number of statistical aspects to be taken care of in these surveys such as stratification, selection of units, items on which information is to be eollected, frequency of visits, supervision, gathering of feed-back information, procedure of analysis of data and final presentation of processed results. The information thrown out through these surveys help in detectlng the technical and physical constraints faced during the programme implementation and in suggesting workable action plans.

Market research

The fishermen depend upon fish merchants or household members for disposal of the catch. In big centres catches are auctioned by middlemen. These are then iced and transported to important cities through rail and trucks. Price of fish fluctuates very sharply depending upon the availability of catch. Prices shoot up when catches are rare while a situation of glut is created when the catches are exceptionally good. The only way to stabilise the prices and ensure reasonable returns to the producer is to have large-scale frozen fish marketing system.

There is a good scope for market research in the fishing industry which is fast expanding. Attempts are being made by C.M.F.R.I. to formulate and estimate econometric models pertaining to production, cost, demand and supply. Programming methods are also envisaged to study transportation and allied problems.

Discussions were held on the papers presented on different topics in the ession. Shri K.K. Ghosh also gave a talk on Inland Fishery Statistics in India. After prolonged discussion the following recommendations were made.

. There should be a periodical get-together of the planners, policy-makers and extension agencies, both at the Central and State levels, with a view to acquainting them with the utility of statistical methodologies developed so far for bringing about improvements in the collection of agricultural statistics for their speedy implementation.

2. For the speedy implementation of the statistical methodologies developed by I.A.S.R.I. and other agencies in the field of agriculture, animal husbandry, forestry, fishery, dairy, etc., IASRI should take vigorous follow-up action.

3. A Co-ordinated Project should be formulated for assessing the benefits of crop-breeding programmes in important tracts in the country.

4, Studies should be undertaken to compare the efficacy of artificial insemination in relation to that of natural servicing for impregnation. In such studies the perfomance of frozen semen, vis-a-vis, chilled semen should also be studied separtely.

5. Estimates of fodder for the livestock may be made available on a priority basis. Research needs to be intensified for finding the nutritive values of fodders and grasses.

6. In order to assess the availability and requirement of different types of feeds and fodders, it is necessary to record data on each type of fodder and concentrate separately as it is not sufficient to have data on total green, dry fodders and concentrates for working out the Total Digestable Nutrients (T.D.N.) and Digestable Crude Proteins (D.C.P.) values.

7. Studies should be undertaken to estimate the economic size of bovine, sheep fishery and poultry units for specific reasons in rural areas.

8. A study should be undertaken to estimate the employment in livestock and poultry keeping in rural areas as such a study will help in estimating the employment generated as a result of the various livestock development programmes.

9. Studies should be carried out to assess the contribution of management in livestock production. Although some studies have been carried out in this direction, more intensified work should be done to quantify the management factors and their impact on production.

10. Pilot surveys need to be conducted to estimate the fertilizer use on traditional and H.Y. Varieties of various crops. Studies should also be undertaken to assess the constraints in the use of HYV seeds of various crops.

11. Pilot studies should be undertaken to estimate the cost of production of fruits, vegetables and plantation crops.

12. Intensified research needs to be undertaken for increasing the total production per hectare per year and for prescribing suitable cropping pattern for the weaker sections of the farming community in the various regions in the country.

13. A study should be undertaken with a view to optimising the use of scarce and costly resources like fertilizers, water, insecticides and pesticides, etc., for increasing agricultural production.

14. A statistical unit under each Agricultural University be normally created which would also be responsible for the collection of data from all the research stations under the University and maintain a complete record on a uniform basis at the University level.

15. The present method of estimation of total volume of growing stock in forestry is subject to high sampling and non-sampling errors. The methodology being adopted for this estimation needs to be looked into.

16. It is understood that there is a considerable illicit felling of trees in the forersts. Pllot studies should be undertaken to estimate the number of such trees and consequent loss of revenue on this account.

17. Appropriate sampling techniques should be evolved to estimate the production of lac, gum, honey, resins and minerals from forests.

18. A study should be undertaken to assess the benefits of forestry to the weaker section of the society.

19. The Conference noted with deep concern that a number of useful recommendations made in the Fourth Conference of Agricultural Research Statisticians for evolving suitable methodologies for estimation of water resources and fisheries statistics have not been implemented so far. Vigorous and speedy follow-up action should be taken by all the concerned agencies in this regard.

20. The Fisheries Departments in the States should establish Data Centres, which should co-ordinate and process all the data for the assessment of fisheries resources and their economics. Such data should be available to the *bona fide* users.

SPECIAL SESSION

24th December (Wednesday), 1980

12.30 P.M. to 1. 30 P.M.

Chairman :	Dr. K. C. Seal
Special Invitee	Dr. P. V. Sukhatme, Honorary Prof. of Biometry, Maharashtra Association for cultivation of Science, Pune.

A view of the participants at the Conference Hall.

Dr. M.S. Swaminathan delivering the Presidential Address of the Indian Society of Agricultural Statistics.

Dr. K C. Seal, delivering the Technical Address of the Indian Society of Agricultural Statistics.

Dr. P.V. Sukhatme delivered a popular lecture on "Distinction between poverty and mal-nutrition and implications for Planning".

An abstract of Popular Lecture is placed below. The paper in full is being published in the April, 1981 issue of the Journal of the Indian Society of Agricultural Statistics.

ABSTRACT

The assessment that half of the total population in India is undernourished, is based on the criterion of average energy requirement and consequently erroneous since it ignores variation in individual requirement. A critical examination of available data shows that two-third of the individuals with intake below the average requirement belong to the category of normal healthy individuals of the 'reference' type. They are poor but there is no evidence that they are undernourished or that their health (morbidity and mortality) and work capacity are different from those of the normally nourished individuals of the 'reference' type.

Poor growth is taken by some research workers as a cardinal sign of mal-nutrition. While admitting that dietary intakes of children in India are much smaller than those in U.S A. it needs to be mentioned that small stature is not caused by small intake alone, but is also the result of chronically high morbidity rates to which the population is exposed, morbidity caused by gastroenrnic and infectious diseases, which have their origin principally in the unhygienic living conditions. The developing countries are led into believing that reduction in morbidity and mortality and improvement in work capacity can be achieved by improving nutrition. But a critical examination of the suggestive evidence from field studies of village community reported by Gautemala and India shows that the changes brought about by nutrition intervention are small.

Thus it is not correct to say that about half the population of the country is below the poverty line because it is undernourished. The proportion, of undernourished, correctly understood, would be roughly 15 to 20 percent of the total. The problem of poverty distinct from mal-nutrition also exists. To tackle the problems relating to poverty as well as mal-nutrition concerted efforts covering factors such as employment, income, food, sanitation and health services would be needed.

PLENARY SESSION

26th December (Friday), 1980

2.30 P.M. to 4.30 P.M.

Chairman : Dr. D. Singh,
Director, I.A.S.R.I.

Rapporteurs : 1. Dr. K.C. Raut,
I.A.S.R.I., New Delhi.

2. Shri R.K. Khosla,
I.A.S.R.I., New Delhi.

The chairman thanked the participants for taking part during technical session I and II of the Conference. He then requested Sh. R.K. Khosla and Dr. B.B.P.S. Goel to present the reports of technical session I and II respectively. The Chairman then declared these reports open for discussion and after a long discussion on each of the reports the recommendations made were summerised as below :—

Summary of Recommendations made during the 5th Conference of Agricultural Research Statisticians held from 23rd to 26th Dec., 1980 at Directorate of Agriculture, Lucknow (U.P.)

Sl. No.	Recommendation	Conf. No. and year when it was made/ and or reviewed.
1	2	3

A. GENERAL

1. It was recommended that the salient results obtained by carrying out the studies by the different organisations should only be reported in the column "Action Taken" instead of presenting the information collected in the present form, wherever applicable. It was further recommended that the following Institutes should be held responsible for different disciplines like crops, animal husbandry, forestry and fisheries for taking follow-up action on the following recommendations, after arranging priority-wise made in this Conference who would directly correspond with the concerned organisations for collection and consolidation of the material for presentation in the next Conference.

Name af the Institute	*Discipline*
1. Indian Agricultural Statistics Research Institute (IASRI), Library Avenue, New Delhi-110012.	(i) Statistical Research in Agriculture (Crops); and (ii) Statistical Research in Livestock (A.H.)

1	2	3
2.	Forest Research Institute (FRI), Dehra Dun.	Statistical Research in Forestry.
3.	Central Inland Fisheries Research Institute (CIFRI), Barrackpore (W.B.)	Statistical Research in Inland Fisheries.
4.	Central Marine Fisheries Research Institute (CMFRI), Cochin.	Statistical Research in Marine Fisheries.

It was also recommended that the personnel of the above mentioned co-ordinating Institutes should meet atleast once in six months to discuss about the progress made regarding follow-up action and take further necessary action, if need be. The IASRI would convene the meeting to co-ordinate and consolidate the material so obtained by these Institutes.

(*Action* : IASRI, FRI, CIFRI and CMFRI)

2. For the speedy implementation of the statistical methodology developed by IASRI and other agencies in the field of agriculture, animal husbandry, forestry, fishery, dairy, etc., IASRI should take vigorous follow-up action. — 5th, 1980

(*Action* : IASRI)

3. There should be periodical get-together of planners, policy makers and extension agencies, both at the Central and State levels, with a view to acquainting them with the utility of the statistical methodologies developed so far for bringing out improvements — 5th, 1980

1	2	3
	in the collection of agricultural statistics, for their speedy implementation. (*Action* : All Concerned Organisations)	
4.	A statistical unit under each Agricultural University should normally be created who would be responsible for the collection of the data from all the research stations/farms under the University and maintain a complete record on a uniform basis at the University level. The model proformae for recording of data on uniform basis should be obtained from IASRI. (*Action* : Agricultural Universities and IASRI)	5th, 1980
5.	Since the Agricultural Universities have got limited resources, it is difficult for them to carry out field oriented research studies. In view of this it was suggested that such studies should be carried out in collaboration with the State Deptts. who would conduct the field surveys under the technical guidance of the Agricultural Universities/ICAR Institutes. (*Action* : All State Deptts., Agricultural Universities/ICAR Institutes)	5th, 1980
	B. CROP SCIENCES	
6.	It was observed that the losses at the pre-harvest stage were mainly due to pests and diseases. Work for estimation of such losses has been done only on paddy, wheat and maize. There is need to extend this work to other crops also. (*Action* : IASRI)	3rd, 1978

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	Statistical methodology for estimation of losses due to floods, drought, hailstorm, etc. should also be developed.	4th, 1979
	(*Action* : IASRI and Other Concerned Agencies)	
	Follow-up action should be taken on the above in accordance with recommendation No.1.	5th, 1980
	(*Action* : IASRI)	
7.	Regarding losses at the harvest stage, it was pointed out that relatively the losses due to employment of manual labour were much less as compared with the use of mechanised harvestors. This observation needs to be further probed.	3rd, 1978
	(*Action* : IASRI, NSSO and Dte. of E & S, Ministry of Agriculture, Govt. of India)	
	Estimates of post-harvest crop losses currently available are based on guesses and limited field experiments. In view of the importance of the problem, research studies for evolving appropriate methodology for the assessment of post harvest losses of foodgrains at different stages and due to various causes should be taken up on a priority basis. In such studies provision may also be made to collect information on types of storage in use and their relative efficiency under field conditions.	4th, 1979
	(*Action* : IASRI, ICAR, Deptt. of Food, Ministry of Agriculture & Irrigation)	
	Follow up action should be taken on the above in accordance with recommendation No.1.	5th, 1980
	(*Action* : IASRI)	

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8.	Studies on forecasting of crops are being carried out by the IASRI on a few selected centres. It was pointed out that some biometric characters account for nearly 60% of the variation in crop yield. It was felt that such studies and also others for determination of crop weather relationship should be taken up in a number of homogenous agro-climatic zones. In addition, it was mentioned that an integrated approach should be adopted whereby, the biometric observations, weather parameters and also the effects of pests and diseases could be simultaneously studied. For this, various disciplines and Institutes should collaborate.	3rd, 1978
	(*Action* : IASRI, Other ICAR Institutes and I.M.D.)	
	A manual should be prepared by the IASRI for circulation for providing guidance for similar studies.	4th, 1979
	(*Action* : IASRI)	
	Follow-up action should be taken on the above in accordance with recommendation No.1.	5th, 1980
	(*Action* : IASRI)	
9.	For determining yield rates of crops like cotton and those vegetables involving multiple pickings, component sampling approach with independent sample of fields at different pickings with a large number of fields for the first and second pickings and a smaller number of fields for the remaining pickings have been found to be convenient and efficient. However, investigations for studying the efficiency of alternative sampling	4th, 1979

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	proccdure may be conducted in other areas to test and standardise these procedures. (*Action* ; IASRI and State Deptts. of Agriculture, Agril. Universities) Priority should be given for working out the estimates of production where such estimates are not available. (*Action* ; IASRI, State Deptts. of Agriculture and Agril. Universities)	
10.	In order to protect the interests of the producers and for the purpose of price fixations it was recommended that the cost of production data should be collected on a wider scale. (*Action* : IASRI, Agril. Universities, State Deptts. of Agri. and Dte. of E & S, Ministry of Agriculture, Govt. of India) Follow-up action should be taken on the above in accordance with recommendation No.1. (*Action* : IASRI)	4th, 1979 5th, 1980
11.	In view of the value of straw as cattle feed there is need to estimate the availability of all types of straw which can be used as feed. Straw to grain ratio for HYV is likely to be different from similar ratio for conventional varieties. Efforts should be made to estimate straw to grain ratio for such varieties. (*Action* : IASRI, Other ICAR Institutes, State Deptts. of Agri. and Agricultural Universities).	4th, 1979

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	Total volume of grain and straw should also be recorded. Then the ratio of grain and straw should be worked out while conducting the crop cutting experiments and be presented in the next Conference.	5th. 1980
	(*Action* : IASRI, ICAR Institutes, State Deptts of Agri. and Agril. Universities).	
12.	It was recommended that prices of inputs like fertilizers, irrigation, human labour, bullock labour, etc., may be collected from a fixed set of villages on a priority basis in order to study trend in prices.	4th, 1979
	(*Action* : Dte. of E & S, Ministry of Agriculture, Govt. of India and NSSO)	
	A study should be undertaken with a view to optimising the use of scarce and costly resources like fertilizers, water, insecticides and pesticides, etc. for increasing agricultural production.	5th, 1980
	(*Action* : IASRI, State Deptts of Agri., Dte. of E&S, Ministry of Agriculture, and NSSO)	
13.	Pilot studies should be undertaken to estimate the cost of production of fruits, vegetables and plantation crops.	5th, 1980
	(*Action* : IASRI, Other ICAR Institutes, State Deptts. of Agri. and Agril. Universities).	
14.	The need for more uniformity trials on different fields and horticultural crops was felt. The role of soil parameters in interpreting data from such trials also needs study. It was recommended that suitable trials for this purpose may be organised by various crops.	3rd, 1978
	(*Action* : IASRI and Project Co-ordinators of Crop Projects)	

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	Since there are post-graduate programmes in several agricultural universities, a student or staff can be entrusted such type of research work. (*Action* : IASRI and Agril. Universities)	4th, 1979
	Follow-up action should be taken on the above in accordance with recommendation No.1. (*Action* : IASRI)	5th, 1980
15.	The cultivation practices in Assam relating to perennial crops, viz; arecanut and coconut on the one hand and pineapple, orange and banana on the other were rather typical in so far as area under these crops was substantial but scattered over large tracts both in the hills and in valleys. No reliable statistics on the extent of cultivation or the yield of fruits was available in the State. It was recommended that pilot surveys to develop suitable sampling methodology for estimation of extent of cultivation and production of fruits under such conditions may be taken up. (*Action* : IASRI and Deptt. of Agri., Assam)	3rd, 1978
	Not only the IASRI but other research institutes and agricultural universities should also formulate the scheme and submit to ICAR Panel for Economics and Statistics. Assam Agricultural University should also formulate a scheme and submit to Economics & Statistics Panel of ICAR keeping in view the regional problems. (*Action* : IASRI, Other ICAR Institutes, Assam Agril, University and other Agril. Universities)	4th, 1979

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	Follow-up action should be taken on the above in accordance with recommendation No.1.	5th, 1980
	(*Action* : IASRI)	
16.	The programmes of experiments in cultivators' fields taken up so far, have covered largely crop response to fertilizer application. Other problems like plant protection, inter-cropping, etc., suitable for study in different areas should be identified. As experiments in cultivators' fields are in the nature of adoptive research State Deptts. of Agriculture may be involved in the execution of such investigations.	4th, 1979
	(*Action* : IASRI, ICAR, State Deptts. of Agriculture and Agricultural Universities)	
	Pilot surveys need to be conducted to estimate the fertilizer use on traditional and H.Y. Varieties of various crops. Studies should also be undertaken to assess the constraints in the use of HYV seeds of various crops.	5th, 1980
	(*Action* : IASRI, Other ICAR Institutes, State Deptts. of Agri and Agril. Universities)	
17.	Considerable variability had been observed in the performance of high yielding varieties of major cereals and cash crops even in compact region like a district. The performance of the HYV was also not very consistent from year to year. The extent of adoption of improved practices also varied widely from cultivator to cultivator. It was recommended that intensive investigations to study the constraints in the adoption of technology for increased agricultural production may be taken up in typical districts in different states under the VI Plan.	4th, 1979
	(*Action* : IASRI)	

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	Follow-up action should be taken on the above in accordance with recommendation No. 1. (*Action* : IASRI)	5th, 1980
	C. ANIMAL SCIENCES	
18.	A manual of the lectures delivered in the Summer Institute on "Advance Statistical Methodology as applied to Animal Sciences" organised at the IASRI in May, 1980 might be prepared and circulated. (*Action* : IASRI)	5th, 1980
19.	It was pointed out that based on the scientific investigations in the field of animal sciences, certain statistical methodologies have been evolved but these need to be adopted more widely by the organisation concerned. It was therefore, recommended that IASRI may prepare a list of all such studies made at various Institutes and Agricultural Universities and circulate to various organisations for their adoption. (*Action* : IASRI, Other Institutes, Agricultural Universities, State Deptts. of A.H. and Min. of Agri.)	4th, 1979
	Follow up action should be taken on the above in accordance with recommendation No. 1, 2 and 3. (*Action* : IASRI)	5th, 1980
20.	Although data collected in livestock farms are analysed to study the performance of a	4th, 1979

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	herd, it was felt that more efforts may be made to collect data on animals maintained under village conditions to judge their performance. (*Action* : IASRI, Other ICAR Institutes, State Deptts. of A.H. and Agril. Universities)	
	Data should be made available to Agricultural Universities/ICAR Institutes. It is also recommended that the organisations responsible for collection of data should have separate statistical staff for analysis of data. (*Action* : IASRI, Other ICAR Institutes, State Deptts. of A.H. and Agril. Universities)	5th, 1980
21.	It was felt that there may be a number of constraints for adopting the techniques already evolved. It was, therefore, recommended that these constraints may be examined in detail and necessary modifications be made in the methodology. IASRI may initiate action in this regard. (*Action* : IASRI, A.H. Division of Min. of Agriculture, Govt. of India and State Deptts. of A.H.)	4th, 1979
	Follow-up action should be taken on the above in accordance with recommendation No.1. (*Action* : IASRI)	5th, 1980
22.	As there is a need for working out projection of milk production and other livestock products in the near and distant future, it was recommended that suitable methodologies	4th, 1979

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	may be evolved for such projections, as also the demand projections. (*Action* : IASRI)	
	Follow-up action should be taken on the above in accordance with recommendation No. 1. (*Action* : IASRI)	5th, 1980
23.	A co-ordinated project should be formulated for assessing the benefits of cross-breeding programmes in important tracts in the country. (*Action* : IASRI and A.H. Division of Min. of Agriculture, Govt. of India)	5th, 1980
24.	Studies should be undertaken to compare the efficacy of artificial insemination in relation to that of natural servicing for impregnation. In such studies the performance of frozen semen, vis-a-vis, chilled semen should also be studied separately. (*Action* : IASRI, A.H. Div. of Ministry of Agriculture, Govt. of India and State Deptts. of A.H.)	5th, 1980
25.	Estimates of fodder for the livestock may be made available on a priority basis. Research should be intensified for finding the nutritive values of fodders and grasses. (*Action* : IASRI, A.H. Div. of Min. of Agriculture, Govt. of India and State Deptt. of A.H.)	5th, 1980
26.	In order to assess the availability and requirement of different types of feeds and fodders, it is necessary to record data on each type of fodder and concentrate separately as it is	5th, 1980

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	not sufficient to have data on total green, dry fodders and concentrates for working out the T.D.N. and D.C.P. values. (*Action* : IASRI, A.H. Div. of Min. of Agriculture, Govt. of India and State Deptts. of A.H.)	
27.	Studies should be undertaken to estimate the economic size of bovine, sheep, fishery and poultry units for specific regions in rural areas. (*Action* : IASRI, A.H. Div. of Min. of Agriculture, Govt. of India and State Deptts. of A.H.)	5th, 1980
28.	Studies should be undertaken to estimate the employment in livestock and poultry-keeping in rural areas as such studies will help in estimating the employment generated as a result of the various livestock development programmes. (*Action* : IASRI, A.H. Div. of Min. of Agriculture, Govt. of India and State Deptts. of A.H.)	5th, 1980
29.	Studies should be carried out to a sess the contribution of management in livestock production. Although some studies have been carried out in this direction, more intensified work should be done to quantify the management factors and their impact on production. (*Action* : IASRI, A.H. Div. of Min. of Agriculture, Govt. of India and State Deptts. of A.H.)	5th, 1980

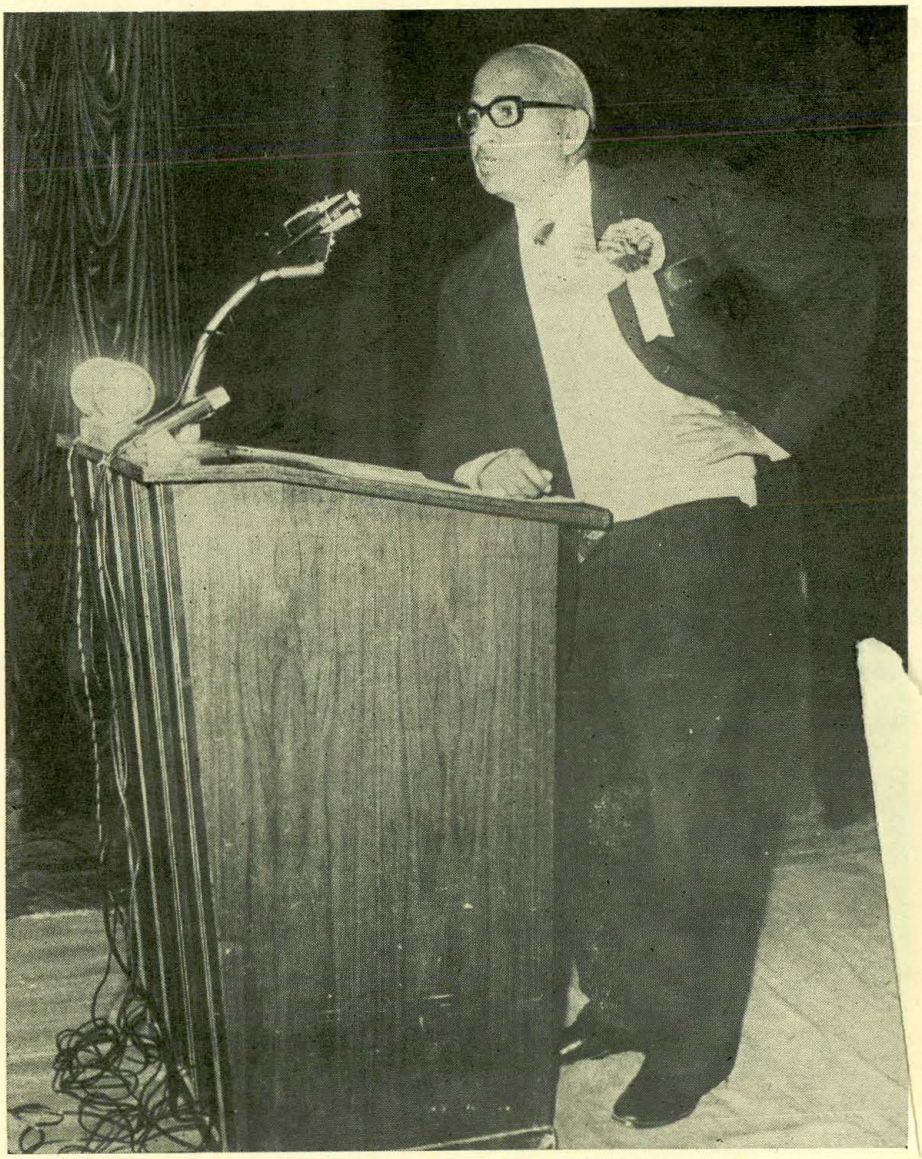
1	2	3
	D. FORESTRY	
30.	It was observed that even the bare statistics of forest resources like different types of wood and other forestry products were not available with any degree of reliability. Some data in this regard were being collected by Forestry Deptt. These data however, need to be put on sound statistical basis by developing appropriate sampling techniques. (*Action* : FRI and State Deptts. of Forestry)	3rd, 1978
	The need for initiating appropriate surveys and other studies for bringing out improvements in Forestry statistics was reiterated. It was felt that not much headway has been made in this regard though a similar recommendation was made in 3rd Conference. It was suggested that the Director, IASRI and the President Forest Research Institute, may jointly examine the problems as early as possible with a view to remove the impediments for the follow-up action expeditiously. (*Action* : FRI and IASRI)	4th, 1979
	Since the present method of estimation of total volume of growing stock in forestry is subject to sampling and non-sampling errors, the methodology being adopted for estimation needs to be carefully looked into. (*Action* : F.R.I.)	5th, 1980
31.	Appropriate sampling techniques should be evolved to estimate the production of lac, gum, honey, resins and minerals from forests. (*Action* : FRI and State Deptts. of Forests,)	5th, 1980

1	2	3
32.	A study should be undertaken to assess the benefits of forestry to the weaker sections of the society. (*Acti n :* FRI and State Deptts. of Forests)	5th, 1980
	E. FISHERIES	
33.	To assess the potential of inland fisheries, it is necessary to have reliable data for area under water. For this purpose, it was recommended that a census of fisheries may be conducted at two points of time, viz., monsoon and lean seasons. (*Action* : Fisheries Division, Ministry of Agriculture & Irrigation, Govt. af India)	3rd, 1978
	In order to obtain a basic data base at district level, required by the new planning process recommended by NCA, and village/panchayat level required by institutional financers and banks on items such as water areas, classified as perennial/seasonal under stockings/no-stockings, commercial/non-commercial exploitation, active fishermen/their operation zones, crafts and implementation etc., it is necessary to have a Quinquennial Fisheries Census. It has becn recognised as a basic need and recommended by NCA for implementation. (*Action* : Fisheries Div. of Min. of Agriculture, Govt. of India)	4th, 1979
	Since no complete record on fisheries statistics is available a separate census for fisheries should be undertaken,. (*Action* : CIFRI, CMFRI, Fisheries Div. of Agriculture, Govt. of India)	5th, 1980

2	3
34. It was recommended that a summer school or seminar of 2-3 weeks on "Quantitative methodology in inland fisheries research" be organised jointly by CIFRI and IASRI. (*Action* : CIFRI and IASRI)	4th, 1979
Follow-up action should be taken on the above in accordance with recommendation No. 1. (*Action :* CIFRI)	5th, 1980
35. The joint research project of CIFRI and IASRI for development of methodology for estimation of inland fisheries resources and catches therefrom is operating in a comparatively small area in West Bengal. In order to provide an enlarged scope to the project, it was recommended that the Fisheries Dtes./Agril. Universities/State Deptts. might provide necessary qualified manpower support for the purpose in different States so that an objective method is evolved quickly. (*Action* ; CIFRI, IASRI, Dte. of Fisheries (All States), BCKVV, (West Bengal), OUAT (Orissa), GBPAU (U.P.), RAU (Bihar) and TNAU (Tamil Nadu)	4th, 1979
Follow-up action should be taken on the above in accordance with recommendation No. 1. (*Action* : CIFRI)	5th, 1980

1	2	3
36.	Multi-disciplinary studies may be taken up for detailed micro-level data analysis in integrated use of water especially for multi-use water so that optimum water utility can be worked out. Such investigations may be taken in some selected reservoirs or tanks involving Irrigation/Agriculture/Fisheries/Power-Scientists representing different interests. (*Action* : CIFRI, IASRI and Project Co-ordinator (Reservoir Fisheries).	4th, 1979
	Follow-up action should be taken on the above in accordance with recommendation No 1 (*Action :* CIFRI)	5th, 1980
37.	It was recommended that Shri K.K. Ghosh of CIFRI might prepare a note for onward transmission to the Dte. of E & S regarding inclusion of item, i.e., area under water with sub-heads to identify ponds, tanks, reservoirs, rivers, seasonal, perennial, stocked with fish seed, not stocked under their land utilisation schedule for taking necessary action. (*Action* : CIFRI)	4th, 1979
	Follow-up action should be taken on the above in accordance with recommendation No. 1. (*Action* : CIFRI)	5th, 1980
38.	The Fisheries departments in the States should establish Data Centres, which should coordinate and process all the data for the assessment of fisheries resources and their economics. Such data should be made available to the *bona fide* users. (*Action* : Fisheries Deptts. of States)	5th, 1980

1	2	3
39.	Studies should be undertaken to estimate the economic size of fishery unit for specific regions in rural areas. (*Action* : CIFRI and CMFRI)	5th, 1980
40.	The Conference noted with deep concern that a number of useful recommendations made in the Fourth Conference of Agricultural Research Statisticians for evolving suitable mothodologies for estimation of water resources and fisheries statistics have not been implemented so far. Vigorous and speedy follow-up should be taken by all the concerned agencies in this regard. (*Action* : CIFRI and CMFRI)	5th, 1980



Dr. Daroga Singh presenting the Report of the Indian Society of Agricultural Statistics.

Officers & Staff of the Directorate ot Agriculture, U.P. with Dr. K. Kishan (Centre), the host of the conference.

A view of the Registration Counter at the Conference.

APPENDIX-I

List of Participants

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APPENDIX II

The Statement showing the action taken on the recommendations made during the 4th Conference of Agricultural Research Statisticians, held from 25 to 27th June, 1979 at H.P.K.V.V., Palampur (H P.), by the ICAR Institutes, Agricultural Universities, Central and State Departments of Agriculture, Animal Husbandry, Forestry and Fisheries, etc.

Sl. No.	Recommendations	Conf. No. and year when it was made/ and or reviewed.	Name of the Institutes/ Agricultural Universities/ Central or State Deptts. etc.	Action taken
1	2	3	4	5
	A. CROP SCIENCES			
1.	The need for more uniformity trials on different fields and horticultural crops was felt. The role of soil parameters in interpreting data from such trials also needs study. It was recommended that suitable trials for this purpose may be	3rd, 1978 (i)	I.A.S.R.I., (ICAR) New Delhi.	A uniformity trial on papaya has already been proposed and the trials will be laid out in Rajasthan in collaboration with the Deptt. of Agriculture. The project Coordinators of different crop projects have been addressed to lay out uniformity trial on some of the crops under intimation to IASRI.
		(ii)	I.I.H.R. (ICAR)	Uniformity trials on several vegetable and fruit crops are being conducted. A uniformity trial for pesticide

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	organised for various crops. (Action : IASRI & Project Co-ordinators of Crop Projects).		Bangalore	experiments where damage caused is important, has also been conducted.
			(iii) AICRIP (Dry-land Agri.), Hyderabad.	Uniformity trials with Sorghum and castor as test crops have been laid out which are the major dryland crops of the region. Soil samples have also been collected from the areas and analysed for P&K. This information will be incorporated with yield data at the time of analysis.
	Since there are post-graduate programmes in several Agricultural Universities, a student or staff can be entrusted such type of research work. (Action : IASRI & Agricultural Universities).	4th, 1979	(iv) H.A.U., Hissar.	Uniformity trials on groundnut, mustard and sweet lime were taken up by the reasearch workers of this University as ad-hoc projects. It is proposed to take up the problem systematically for various crops. A project will be submitted to ICAR in near future for financial assistance.
			(v) G.A.U., Anand	The recommendation was adopted.
			(vi) AICRP, (Fruits) Bangalore	Uniformity trials have already been taken upon pine-apple and it is proposed to take up on banana.
			(vii) Dte. of Oil-seeds Re-	The co-ordinators are requested to consolidate the information on the uniformity trials. In case it is

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			search, Hyderabad	inadequate, they are requested to organise the same in all the Main Centres of the respective crops in the ensuing season.
		(viii)	U.A.S, Bangalore	Uniformity trials have been conducted on cowpea by a staff member and on sunflower by a P.G. student. Efforts are being made to conduct uniformity trials in respect of other crops, wherever possible
		(ix)	M.P.K.V., Ahmednagar, Maharashtra	The uniformity trials on jowar crop has been taken up at this University.
		(x)	P.K.V. Akola, Maharashtra.	The uniformity trials will be taken up by the Deptt of Agronomy, Botany, Horticulture, Chemistry and Crop Scientists, as and when needed before utilising new areas for experimental purposes.
		(xi)	K.A.U., Trichur	Based on this recommendation a project "Conduct of uniformity trial for various crops", has been started.
		(xii)	G.B. Pant Univ., Pantnagar	There is no P.G. programme at Pantnagar as yet in Statistics. However, it is being tried to include such studies in existing crop projects wherever feasible, subject to availability of resources.

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			(xiii) I.A.R.I., (ICAR), New Delhi	Uniformity trials on different crops will be conducted as and when land is available. The data on the uniformity trials conducted on cotton is under process.
			(xiv) AICRP, Pantnagar (U.P.)	In this connection, I have to inform you that the action as per the recommendations in respect of All India Co-ordinated Research Project on Sugarbeet & Soyabean has already been taken while finalising the technical programme.
			(xv) AICRP, Gujarat	The research programme on plot size studies and on the development of new methods of analysis for varietal trials will be initiated.
			(xvi) Dte. of Agri., Lucknow (U.P.)	Action is already being taken in Uttar Pradesh in respect of laying of uniformity trials.
2.	It was observed that the losses at the preharvest stage were mainly due to pests and deseases. Work of estimation of such losses has been done only on paddy, wheat and maize. There is need to extend this	3rd, 1978	(i) I.A.S.R.I, (ICAR), New Delhi.	The proposal for undertaking studies on crops like oilseeds and pulses has already been suggested in the Sixth Five year Plan of the Institute. Some data collected from a few villages of Delhi State on the effect of drought is being studied. A suitable project would be taken up later for estimation of losses due to floods/drought/hail-storm.

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	work to other crops also. (Action : IASRI)		(ii) I.I.H.R. (ICAR), Banglore	Work on assessment of losses due to various pests and diseases are being conducted in different vegetable crops.
	Statistical methodology for estimation of losses due to floods/drought/hailstorm, etc. should be developed. (Action : IASRI and other Concerned Agencies)	4th. 1979	(iii) H A.U., Hissar	A pilot survey is being conducted in Deptt. of Statistics to asses the losses at the pre-harvest stage. This pilot survey will be useful for making future plans for a detailed survey.
			(iv) U.A.S., Bangalore	Some work has been done in respect of paddy during previous years. If IASRI desires & specific proposals come forth, the staff of the Department of Statistics is willing to co-operate.
			(v) P.K.V., Akola, Maharas-shtra	The urgency of the problem is agreed to. The work of estimation of such losses is being planned and will be studied by the Deptts. of Entomology and plant pathology for various requirements of facilities.
			(vi) G.B.Pant Univ., Pant nagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
			(vii) I.A.R.I (ICAR) New Delhi.	The losses due to pest and diseases will be estimated on other crops.
3.	Regarding losses at the harvest stage it was pointed out	3rd, 1978	(i) I.A.S.R.I. (ICAR)	Basic information is being collected from various places in the country before the technical pro-

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	that relatively, the losses due to employment of manual labour were much less as compared with the losses incurred with the use of mechanised harvestors. This observation needs to be further probed. (Action : IASRI, NSSO and Dte. of E&S) Agricultural Universities and other research institutes should also under take this type of work. (Action : ICAR Institutes and Agricultural Universities).	4th,	New Delhi.	gramme for the project is formulated.
			(ii) Dte. of E&S, Min. of Agri. & Irrig., New Delhi.	Action has already been initiated in the Research Division of our Directorate organised on this aspect through one of the Agro-Economic Research Centres. We have also requested the Marketing & Inspection Directorate to study this aspect. The Dte. of Marketing & Inspection have also intimated that this aspect will be taken care of when the new series of surveys are undertaken,
			(iii) N.S.S.O., Min. of Planning New Delhi.	The study of comparative loss at harvest stage by employment of manual labour and mechanised harvestor is to be done over a whole field or a farm. Under the crop Estimatian Surveys (CES) in the States, with which the NSSO is presently concerned, the plot size is small and the harvesting is done manually. The study cannot, therefore, be integrated with the present work of NSSO.
			(iv) H.A.U., Hissar.	The Economics Deptt. is handling some similar projects. A project will be initiated from the Deptt. of Statistics for approval in near future.
			(v) G.A.U., Anand	The recommendation was noted for future guidance.

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			(vi) S.B R I, (ICAR), Tamil Nadu	As mechanised system of harvesting of sugarcane crop is not in vogue in this part of our country, suitable action will be taken as and when it is being practiced. The Department of Farm Implements of T.N.A.U. will be contacted for further action.
			(vii) U.A.S., Banglore	Efforts are being made to carry out work in this regard.
			(viii) P.K.V., Akola Maharashtra	The study will be taken up as a part of Post-harvest technology scheme. The Deptt. of Agril. Economics and Statistics will colloborate with the study.
			(ix) J.N.K.V.V., Jabalpur	Dean, Agril. Engineering has been requested to allot the work to concerned scientist of the Faculty.
			(x) G.B.Pant Univ., Pantnagar	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
			(xi) I.A.R.I. (ICAR), New Delhi.	The machine and plant relations are very important. Most of the research in India for harvesting the crop with the manual labour is done and the harvesting with manual labour gives minimum losses. The machines have been introduced in the system and varieties have been

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				developed for manual harvesting, so it is very natural and expected that the losses may be very high. The machines are designed for specific conditions and unless these conditions are met the losses can not be minimised. So in view of the above, for the areas where the crop harvesting is to be done with machines, the complete system for raising crops is needed to be carried out and required varieties may be developed for the mechanical harvesting. At present no work in this area has been done in the division of Agril. Engineering.
			(xii) C.I.A.E, T.T.Nagar, Bhopal	It is possible that in manual harvesting the shattering losses are less in comparison to that of mechanical one as in the case of later, the impact force is more. In addition to this the mechanical harvesting also causes the damage to the seed. The moisture content at harvest effects significantly the extent of shattering and other field losses. Detailed and exhaustive study comparing the shattering losses and other seed damages due to manual and mechnical harvesting may be taken up in various parts of the country.
4. Estimates of post-harvest crop losses currently available are based on guesses		4th, 1979	(i) I.A.S.R.I (ICAR), New Delhi	A project to study-post-harvest crop losses has been included in the 6th Five Year Plan. This will be imp'emented after its clearance by ICAR.

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	and limited field experiments. In view of the importance of the problem, research studies for evolving appropriate methodology for the assessment of post-harvest losses of foodgrains at different stages and due to various causes should be taken up on a priority basis. In such studies provision may also be made to collect information on types of storage in use and their relative efficiency under field conditions. (Action : IASRI, ICAR, Deptt. of Food, Ministry of Agriculture and Irrigation).		(ii) H.A.U., Hissar	Some studies were conducted by P.G. Students of this University.
			(iii) P.K.V., Akola, Maharashtra	The research studies on post-harvest crop losses at different stages due to various causes have been taken up by the post-harvest technology scheme for few crops and will be extended for more crops.
			(iv) C.I.A.E., T.T. Nagar, Bhopal	Detailed study on various post-harvest losses in the different Agro-climatic zones of India, may be taken up.
5.	Studies on forecasting of crops are being carried out	3rd, 1978	(i) I.A.S.R.I. (ICAR),	It is proposed to take up such studies in the Sixth Five Year Plan of the Institute in colloboration with other

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by the IASRI on a few selected centres. It was pointed out that some biometric characters account for nearly 60% of the variation in crop yield. It was felt that such studies and also others for determination of crop weather relationship should be taken up in a number of homogenous agro-climatic zones. In addition, it was mentioned that an integrated approach should be adopted where by, the biometric observations, wheather parameters and also the affects of pests and diseases could be simultaneously studied. For this, various disciplines, and Institutes, should collobor-ate. (Action : IASRI, other ICAR Institutes and I.M.D.)		New Delhi		organisations. The question of preparation of manual is being examined.
		(ii) I.I.H R. (ICAR), Banglore		Methodology of forecasting is being worked out for various fruits and vegetable crops.
		(iii) National Bureau of Soil Survey & Land Use Planning (ICAR), Nagpur		In some areas depending upon the availability of meteorological data, staff and needs, rainfall data are superimposed on soil maps and moisture availability in different periods in different soils are estimated. Also on the basis of yield data from farmer's fields on soil management practices, yields of crops are estimated. Further studies would be undertaken if more staff viz, climatologist and Statistician is provided during VI Plan.
		(iv) U.A.S., Banglore		Some work on forecasting of crop production has been done in respect of wheat. Prediction in respect of Ragi & Cotton has been attempted.
		(v) P.K.V.Akola, Maharashtra		The study is being attended by the Deptt. of Agronomy.
		(vi) I.A R.I. (ICAR), New Delhi.		We do not conduct any experiment on cultivator's fields but in our operational research programme and other extension activities like 'lab to land' programme, all aspects of crop production including high yielding varieties, fertiliser use, plant protection measures, inter-cropping etc. are taken into consideration.

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	A manual should be prepared by the IASRI for circulation for providing guidance for similar studies. (Action : IASRI)	4th, 1979	(vii) AICRIP, Hyderabad	Studies on forecasting of crops will be taken up.
			(viii) JARI, Barrackpore (W.B.)	A project relating to pre-harvest forecasting of Jute Crop on the basis of important morphological character(s) and environmental factors has already been undertaken.
			(ix) C.P.R.I., Simla	We have collected data on the project "Pre-harvest forecasting of potato yields". From the preliminary analysis we have been able to identify some useful plant characters having a good degree of correlation with the yield. We are now using these characters for developing suitable predication models for forecasting potato yields.
			(x) I.M.D., New Delhi	Methods of remote sensing technique and canopy temperatures may be tried. In this connection, ICAR may be requested to collect data of canopy temperatures for a few principal crops over experimental areas for a number of years. These will be used in the future models relating to yield and canopy temperatures. Development of Dynamic models using the climatic and physiological data obtained from field experiments may be attempted.

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				A sub-committee with Agricultural scientists, Meteorologists and Statisticians may be formed to look into the various aspects of crop weather models.
6.	The cultivation practices relating to perennial crops in Assam namely arecanut and coconut on the one hand and pineapple, orange and banana on the other were rather typical in so far as area under these crops was substantial but scattered over large tracts both in the hills and in valleys. No reliable statistics on the extent of cultivation or the yield of fruits was available in the State. It was recommended that pilot surveys to develop suitable sampling methodology for estimation of extent of cultivation and production of fruits under such conditions may be taken up.	3rd, 1978	(i) I.A.S.R.I. (ICAR), New Delhi.	The matter has been taken up by the I.A.S.R.I with the Deptt. of Agriculture, Assam.
			(ii) I I.H.R- (ICAR), Banglore.	The division of economics is having a scheme for working out the problems of marketing of fruits and vegetables. No new scheme would be proposed till this scheme is wound up.
			(iii) U.A.S., Banglore	The Deptt. of Statistics will explore the possiblity of formulating some projects in consultation with the department of Horticulture.
			(vi) P.K.V. Akola, Maharashtra	The Deptt. of Horticulture is formulating a scheme for oranges and bananas in colloboration with the Deptt. of Agril. Economics and Statistics and will be submitted to ICAR panel.
			(v) G.B.Pant Univ., Pantnagar	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
			(vi) Assam Agril. University, Jorhat	In Dec., 1979, a scheme with the title 'A Survey to estimate the extent of cultivation and yield of coconut in Assam', has been submitted to the Economics and Statistics Panel of the I.C.A R.

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	(Action : IASRI and Department of Agriculture ,Assam).			The approval of the same is awaited.
	Not only the IASRI but other research institutes and agricultural universities should also formulate the scheme and submit to ICAR Panel for Economics and Statistics. Assam Agricultural University should also formulate a scheme and submit to Economics & Statistics Panel of ICAR. Keeping in view the regional problems.	4th, 1979		
	(Action : ICAR Institutes, Assam Agricultural University ond other Agricultural Universities).			
7.	The programmes of experiments in cultivators' fields taken up so far have covered largely crop response to	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	An approriate guidance and advice can only be given if the necessary repuest from the Directorate of Agriculture of the concerned department is received by the Institute. However, the Dy.

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	fertilizer application. Other problems like plant protection, intercropping, etc. suitable for study in different areas should be identified. As experiments in cultivators' fields are in the nature of adoptive research, State Department of Agriculture may be involved in the execution of such investigations. (Action : ICAR, State Departments of Agriculture and Agricultural Universities).			Directors of Statistics of various Deptt. of Agriculture are being addressed to include the experiment on these aspects in their experimental programmes.
			(ii) I.I.H.R. (ICAR), Bangalore.	Cultivators field trials are being extensively used in horticulture. Even full-fledged trials are being conducted in cultivators' fields.
			(iii) Deptt. of Agri., H.P.	In fact very little information is available on the components of plants protection and inter-cropping specially for hilly areas. The Agril. Universities should carry on the experiments on these problems intensively and pass on the information to the Deptt. of Agriculture who would co-ordinate and implement the same on cultivator's field.
			(iv) ADG (E&S), ICAR/Projects Co-ordinator (Millets), College of Agri., Pune.	ICAR informed that the millets project has conducted extensive experiments of inter-cropping with pulses & oil-seeds in bajra. The results have clearly indicated that total productivity of pearl millet-red gram system is maximum. Inter planting of red-gram in 30/70 cm paired rows of bajra has given additional returns without affecting the yield of the main crop. For control of diseases in bajra, 60:40 mixture of farm-yard manure & 10%

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				BHC is being recommended for incorporating into soil where white grubs are endemic.
			(v) AICRP (Dry-land Agri.), Amberpet, Hyderabad.	In the Operational Research Project attached to this project, various studies including intercropping have been undertaken on a large scale on farmers' fields. The sampling methodology on comparing various treatments has already been developed.
			(vi) G.A.U., Anand	Work pertaining to this item will be assigned to P.G. Students.
			(vii) Dte. of Agri., Maharashtra	This will be kept in mind while planning the future programmes.
			(viii) AICARP, Bangalore	A few experiments on mixed cropping and trials with herbicides were also proposed for inclusion in this programme at the XI workshop of the Projects held at Jabalpur during April, 1979.
			(ix) Dte. of Agri., Bangalore	The department is prepared to extend co-operation to the ICAR and University of Agricultural Sciences if these institutions come forward with any trials taken in farmer's fields in Karnataka on account of implementation of Agriculture Extension Programme (AEP) in the State. Thus the Department of Agriculture in Karnataka has already involved in such investigations.

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			(x) U.A.S., Bangalore	If IASRI has plans for co-ordinated trials in this regard, the Department is willing to co-operate.
			(xi) P.K.V.,Akola, Maharashtra.	This type of work is already going on under operational Research Project and National Demonstration Schemes and will be cotinued.
			(xii) J.N.K.V.V., Jabalpur	Scientists and Research Agronomist have been requested to identify the regional problems on plant protection, inter-cropping etc. and conduct trials on cultivators' fields under Intensive Extension & Research Project from next season. Already the department of agriculture has been involved in the conduct of the adoptive trials.
			(xiii) G.B. Pant Univ., Pant-nagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
			(xiv) Dte. of Agri., Pondicherry	At present, besides problems of crop response to fertilizer application these like plant protection, varietal trials, inter-cropping, spacing and agronomic practices etc. are being studied through organised experiments under the scheme Research on Ryats Holdings.
			(xv) Dte. of Agri , Ahmedabad,	At present, agency of V.L.W. serve as field agency for state series of crop estimation surveys. In view of T&V

N.B.-'T&V' stands for Training and visit,

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				Scheme, it is not possible to load them with additional field work of crop cutting experiments for the purpose of assessing benefit due to plan protection, inter cropping etc. Govt. of India can think of creating special field machinary for this purpose.
			(xvi) IARI (ICAR), New Delhi	We do not conduct any experiment on cultivators' fields but in our operational research programme and other extension activities like 'lab to land' programme, all aspects of crop production including high yielding varieties, fertilizer use, plant protection measures, inter-cropping etc are taken into consideration.
			(xvii) Directorate of Agriculture Nagaland, Kohima	Plant protection inter-cropping is already in practice in this state. the Deptt. is likely to take up a study on the chemicals and fertilizers used in cultivator's field.
			(xviii) AICRIP, Hyderabad	The scientists located at the various centres of the project have expressed difficulties in organising the experiments on cultivators' fields for want of adequate transport facilities. However, the matter will be discussed once again in the ensuing Annual Workshop of the project and attempts will be made to organise experiments on cultivators' fields wherever feasible.
8.	Considerable variability had been observed in the performance of high yielding vari-	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	This aspect is covered in the project on high yielding varieties programme included in the Sixth Five Year Plan.

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	eties of major cereals and cash crops even in a compact region like a district. The performance of the HYV was also not very consistent from year to year. Thc extent of adoption of improved practices also varied widely from cultivator to cultivator. It was recommended that intensive investigations to study the constraints in the adoption of technology for increased agricultural production may be taken up in typical districts in different states under the VI Plan. (Action : IASRI)		(i i) Dte. of Agri., H. P.	A scheme to study the constraint in the adoption of technology for increased agricultural production is already under the consideration of Govt. of H. P. and IASRI. The study will be initiated as soon as the scheme is sanctioned for the State.
			(iii) AICRIP, Hyderabad	We are conducting experiments on the cultivators' fields to identify the constraints for high yields in the farmers' fields.
			(iv) P. K. V., Akola, Maharashtra	The study will be taken up by the Deptt. of Extension and Deptt. of Economics and Statistics under collobora- tion.
			(v) Dte. of Agriculture, M.P.	The sanction of the Scheme "Sample survey for study of constraints in transfer of technology for increased agricultural production" to be taken up in 2 districts during VI Plan may be communicated early.
9.	For determining yield rates of crops like cotton and those vegetables invovling	4th 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	The results obtained by the IASRI will be circulated to the State Deptts. of Agriculture/Agricultural Universities for guidance and further study.

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	multiple pickings, component sampling approach with independent sample of fields at different picking with a larger number of fields for the first and second picking and a smaller number of fields for the remaining picking have been found to be convenient and efficient. However, investigations for studying the efficiency of alternative sampling procedure may be conducted in other areas to test and standardise these procedures.		(i i) I.I H.R. (ICAR), Bangalore	Work of advanced nature is being done on this aspect in case of vegetables like Brinjal, Tomotto, Okra etc. studies have been planned in fruit crops like Mandurim, Guava and Sapota.
			(iii) Dept. of Agri., H.P.	At present no studies have been taken up for determining the yield of vegetable crops on sampling basis in H.P. The IASRI may be requested to take up/sanction such a scheme for H.P. particularly for off season vegetable like tomatto, peas, capsium, etc.
			(iv) AICRP (Dryland Agri.) Amberpet, Hyderabad	Red gram & castor are two important dryland crops in the region and they require more than one picking. It is proposed to develop suitable sampling methodology for yield estimation.
			(v) H.A.U. Hissar	At present this study conducted by the department of statistics for crops like cotton, & fruits. After sometime it may be considered to extend this project for vegetables also.
	(Action : IASRI and State Departments of Agriculture/Agricultural Universities).		(vi) G.A.U., Anand	As and when possible post-graduate students will be assigned such problems for their studies.
			(vii) Dte. of Agri., Bangalore	As such this recommendation will be brought to the notice of the Bureau so that it can take action as per this recommendation. In the meanwhile necessary co-operation to the Bureau will be extended, in this behalf.

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		(viii) U.A.S., Bangalore		Some work of sampling aspects for cotton has been done by a staff member and a project on determining an optimum sampling scheme in respect of Sunflower has been taken up by a M.Sc. student for his thesis problem.
		(ix) Dte. of Agri., Maharashtra		IASRI is requested to furnish reports of the post-studies on this subject with a view to undertaking similar studies in the state.
		(x) P.K.V., Akola, Maharashtra		Study on yield rates of cotton crop is being taken by the department of Agricultural Economics and Statistics from ensuing season in which the component sampling approach will also be studied.
		(xi) G.B. Pant Univ., Pantnagar		These require research/technical/administrative personnel Appropriate action can be taken on the availability of such staff.
		(xii) Dte. of Agri., Pondicherry		Experiments of the nature are yet to be tried out in this territory. However experiments on cotton is going to be taken up shortly applying the methodology adopted by Tamil Nadu.
		(xiii) Dte. of Agri., Ahmedabad		This is a matter of research in agricultural statistics. IASRI may be entrusted with the task of evolving suitable methodology.

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		(xiv) Dte. of Agri., M.P.		A copy of the component sampling approach for determining yield rates of crops like cotton and those vegetables involving multiple pickings may be sent to take further action in the matter.
		(xv) Dte. of Agri., Nagaland, Kohima.		So far no sample survey or any other experiments has been undertaken to find out the yield rates of various items of vegetables in this state. Considering the very limited production of vegetables in this state, taking up of any study on this may not be useful at all.
10. In view of the value of straw as cattle feed there is need to estimate the availability of all types of straw which can be used as feed. Straw to grain ratio for conventional varieties. Efforts should be made to estimate straw to grain ratio for such varieties. (Action : IASRI, and other ICAR Institutes, State Departments of Agricultural Universities).		(i) I.A.S.R.I.. (ICAR), New Delhi.	4th, 1979	Utilising data collected in the survey under High Yielding Varieties Programme and also information collected from different states and other organisations, grain to s raw ratio are being worked out. Efforts are being made to utilies further available data to compile similar information.
		(i i) Deptt. of Agri., H.P.		In fact whenever any crop variety is released by a Research Institute, these types of data available from the fertilizer and other agronomical trials conducted by the Institute before the release of the variety. The Research Institute should work out the ratio of straw to grain at different fertility level by HYP and pass on the same to Deptt. of Agri., who can estimate on the basis of crop cutting experiments.

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			(iii) G.A.U., Anand	The recommendation was noted for future guidance.
			(iv) Dte. of Agri., Bangalore.	As such this recommendation will be brought to the notice of the Bureau so that it can take action as per this recommendation. In the meanwhile necessary co-operation to the Bureau will be extended, in this behalf.
			(v) S.B.R.I., (ICAR), Tamil Nadu	The matured sugarcane leaves tops and sheath are being utilised as cattle feed in certain parts of India. In certain cases the molasses are also found useful for the same purpose. The commercial exploitation of molasses in combination with baggasse is also being done.
			(vi) U.A.S., Bangalore	Statistical Officer in AICRP on Agronomic schemes, has evinced interest to explore the possibility of evolving a suitable project involving data, already available.
			(vii) Dte. of Agri., Maharashtra	Such studies have been initiated in respect of a few crops and varieties on which the F.V.T. trials are in progress.
			(viii) M.P.K.V. Ahmednagar, Maharashtra	The work has been initiated in this University.
			(ix) AICRIP, Hyderabad	Action is being taken to estimate the straw to grain ratio for the dwarf and conventional varieties.

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			(x) P.K.V.,Akola, Maharashtra	The action will be taken by the Deptt of Animal Husbandry and Dairy and Deptt. of Animal Nutrition will collaborate.
			(xi) J.N.K.V.V., Jabalpur	The information on straw to grain ratio are available from various experiments conducted by the department of Agronomy and Plant Breeding. Post-graduate students invariably record plot-wise grain and straw yield. The various scientists of J.N.K.V.V. have been requested through Dean, Agriculture College to maintain record of plot-wise grain and straw.
			(xii) G.B Pant Univ., Pantnagar	These require research/technical/administrative personnel Appropriate action can be taken on the availability of such staff.
			(xiii) Dte. of Agri., Pondicherry	Study for the estimation in question is to be attempted during 1980-81 in respect of paddy crop to start with.
			(xiv) IARI (ICAR), New Delhi	Some scientists have already published material on this aspect.
			(xv) Dte. of Agri., Punjab	Provision will be made in the crop cutting experiments' farms (I & II) from 1980-81.
			(xvi) Dte. of Agri., M. P.	The information is being collected from the Dy. Directors of Agriculture of the districts where adaptive research

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				trials, minikits and demonstrations on major food crops are laid out.
			(xvii) Dte. of Agri., Nagaland, Kohima,	This will be taken up in colloboration with the ICAR Complex of Nagaland.
			(xviii)JARI, Barrackpore (W.B.)	Like straw to grain ratio, efforts have already been made to find out stick to fibre ratio for different conventional varieties of Jute.
			(vix) Dte, of Agri., Lucknow	Action is already being taken in Uttar Pradesh in respect of yield of straw.
11. In order to protect the interests of the procedures and for the purpose of price fixations it was recommended that the cost of production data should be collected on a wider scale.	4th, 1979		(i) IASRI (ICAR), New Delhi.	This is being looked into by Sen's Committee on cost of cultivation of crops.
			(i i) I.I.H.R, (ICAR), Bangalore	All experiments and studies conducted by the Institute take this aspect into consideration.
			(iii) Dte. of Agri., Trivandrum	Elaborate proforma has been prepared and the details are being collected from the field units every year.
(Action : IASRI, Agricultural Universities and State Department of Agriculture)			(iv) Dept of Agri., H. P.	Due to lack of adequate staff it is not possible to take up cost of production studies in this Deptt. However, the Agro-economic Research Centre, H.P.U. is conducting such studies in various zones of H.P. Scheme for cost of

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				major cereals and cash crops is being introduced during the 6th Plan.
			(v) H A.U., Hissar	The Dept. of Agril. Eco. H.A.U. has been involved for quite sometime in a Govt. of India Schems on cost of cultivation.
			(vi) G.A.U., Anand	In the initial stages cost of production data will be collected from University Farms.
			(vii) Dte. of Agri., Karnataka	The Department is collecting the data on cost of cultivation production for various crops. This is being collected bv the Farm Management wing of the Department on scientific lines, in all the districts covering important crops grown in the respective district. This fact was explained by the Deputy Director of Statistics (Agriculture) who attainded the above conference.
			(viii) M.P.N.V., Ahmednagar, Maharashtra	The collection of data in respect of cost of cultivation for different crops is collected in this University.
			(ix) P.K.V , Akola, Maharashtra	The work has been initiated on cotton, jowar. wheat, bajra, Groundnut and paddy by the Deptt. of Economics and Statistics.
			(x) K.A.U.,	Based on this recommendation a project, "Establishment of Agroeconomic observations" has started. This study

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			Trichur	will give information on :— (a) Trend in prices of inputs like fertiliser, irrigations, human labour, bullock labour, plant protection chemicals etc. (b) Trend on prices of produce. (c) Trend in cost benefit ratio. (d) Trend in socio-economic status of the cultivators. (e) Changes in cropping pattern. (f) Changes in the pattern of employment of persons.
		(xi)	J.N.K.V.V., Jabalpur	Already cost of cultivation scheme is in operation in the University, in the department of Agril. Economics. The Officer Incharge has been requested to collect the information on a wider scale.
		(xii)	G.B. Pant Univ., Pantnagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
		(xiii)	Dte. of Agri., Pondicherry.	IASRI is being approached for methodology in this direction.
		(xiv)	Dte. of Agri., Ahmedabad.	A scheme for estimation of requirement of man days and cost of cultivation of different crops in different crop

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				zones in Gujarat State has been submitted to the Government for approval. The scheme is proposed for a period of five years i.e. from 1980-1981 to 1984-85. It will cover all the major crops grown in the Gujrat State. At present Gujarat Agricultural University at Junagarh campus is estimating cost of production of major crops in Gujarat State on the basis of data obtained from seed farm.
			(xv) Dte. of Agri., M.P.	It is requested that copies of reports on studies undertaken on the subject may be sent to this Directorate for information and to serve as guidance for undertaking studies on similar lines, since a note for fixation of support price is required to be submitted from time to time by the Govt. to Agricultural Prices Commission.
			(xvi) Dte. of Agri., Nagaland, Kohima	A study to find out the cost of production of rice under terraced cultivation has been undertaken during the current year. Report is expected to be completed by the end of Dec. 80. Similar study on the other crops will also be taken up in near future.
			(xvii) N.D.R.I. Karnal	The recommendation has been incorporated at our Institute.
12. It was recommended that prices of inputs like ferti-	4th, 1979		(i) IASRI, (ICAR),	This is being looked into by Sen's Committe on cost of cultivation of crops.

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	lizers, irrigation, human labour, bullock labour etc. many be collected from and a fixed set of villages on a priority basis in order to study trend in prices. (Action : Ministry of Agriculture/NSSO).		New Delhi.	
		(ii)	I.I.H.R. (ICAR), Bangalore	Collection of these figures have been made from Karnataka State and are being analysed.
		(iii)	K.A.U., Trichur.	Based on this recommendation a project, "Establishment of Agro-economic observatories has started. This study will give information on :- (a) trend in prices of inputs like fertiliser, irrigation human labour, bullock labour, plant protection chemicals etc. (b) trend on prices of produce, (c) trend in cost benefit radio, (d) trend in the socio-economic status of the cultivators, (e) changes in cropping pattern. (f) changes in the pattern of employment of persons.
		iv)	N.S.S.O., Ministry of Planning, New Delhi.	A plan of scheme 'collection of data from a sample of villages for studies requiring repeated visits' is under consideration. The collection of prices of inputs will be considered when the scheme is implemented.

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13. For improving the quality of statistics of area production of crops it was recommended that steps may be taken to ensure that the schemes of timely reporting and improvement of crop statistics in all states and establishment of a field agency in the States of Kerala, Orissa West Bengal are uniformly implemented (Action : Ministry of Agriculture, NSSO, State Departments Concerned).		4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	These are being brought to the attention of Directorate of Economics and Statistics for necessary action.
			(ii) Dte. of E&S, Min. of Agri. New Delhi.	Both Timely Reporting Scheme (TRS) and scheme for crop statistics are at present in operation in almost all the states which have a regular reporting agency for collection of Agricultural Statistics. Efforts are being made to extend these schemes to other states and Union Territories also in a phased manner. Under the scheme for establishment of agency for collection of agricultural statistics on complete enumeration basis, 20% of villages in Kerala and 15% of villages in Orissa have already been covered by such agencies. The West Bengal Govt. have not been able to implement this scheme so far due to certain administrative and technical difficulties.
			(iii) Deptt. of Agriculture, H.P.	The schemes of Timely Reporting and Improvement of Crop Statistics are already in progress in H.P.
			(iv) Dte. of Agri., Ahmedabad.	T.R.S. is already being implement in Gujarat state from the year 1972-73 (from November 1972).
			(v) Dte. of Agri., Nagaland.	Efforts are being made to establish a statistical wing in this Deptt. and the improvements of crop statistics

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			Kohima	by timely reporting etc. from the Block level is expected when the wing will start functioning.
			(vi) N.S.S.O. Min. of Planing, New Delhi.	The Timely Reporting Scheme (TRS) and the scheme for Improvement of Crop Statistics (ICS) are being implemented in all major Land Records States, in Kerala and Orissa, the scheme for Establishment of an Agency for Reporting Agricultural Statistics, on the lines of TRS is already under implementation and a similar scheme sanctioned for West Bengal is under consideration of the States. Sample checks under ICS are also being undertaken in these three states. In addition, the scheme has been extended to the Union Territory of Delhi and its extension to Pondicherry is under consideration.
			(vii) Dte. of Agri., Punjab.	The schemes have been initiated in the state since 197 .
14. It was recommended that 4th taking into account the 1979 commercial aspects of plantation crops particuarly tea, coffee and rubber urgent steps may be taken to improve the			(i) I.A.S.R.I. (ICAR) New Delhi.	These are being brought to the attention of Directorate of Economics and Statistics for necessary action.
			(ii) Dte. of Agri., H.P.	The area under plantation crops like Tea in Himachal Pradesh is not substantial. Coffee and Rubber are not grown in the State. The research work on tea crop is with the Agricultural University Palampur. However

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	quality of statistics of area and production of these crops.			the department of Agriculture would like to associate with IASRI with the study of area and production of Tea crop in H.P.
	(Action : IASRI and State Departments of Agriculture)		(iii) Dte. of Agri., Maharashtra.	The area under these crops is negligible in the state.
			(iv) Dte. of Agri., Pondicherry.	Area under plantation crop in this territory is negligible and as such the recommendation is not applicable to this state.
			(v) Dte. of Agri., Ahmedabad.	The plantation crops like tea, coffee and rubber are not grown in Gujarat State. It may however, be brought out here that like all other crops, area of other plantation crops is also recorded in village form (7-12) and village form (13) which gets aggregated in taluka form (20) which ultimately gets published in State annual season and crop report.
			(vi) Dte. of Agri., Nagaland, Kohima.	Plantation crops particularly Coffee is a recent introduction in this state. As such, the statistics on area is being maintained but not production. Plants are yet to attain the bearing age.
15.	Regarding other plantation crops, it was recommended that IASRI may	4th, 1979	I.A.S.R.I. (ICAR), New Delhi.	These are being brought to the attention of Directorate of Economics and Statistics for necessary action.

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	examine whether the sampling methodology already developed on the basis of pilot surveys during the 2nd and 3rd Plans for estimating the area and production of plantation crops like coconut, arecanut, pepper etc., need any modification in view of the changes in cultivation practices, etc. (Action : IASRI).			
16.	For improving the data base for agricultural planning in India, it was recommended that the coverage of land use and crop statistics may be extended to the entire country. (Action : Ministry of Agriculture and State Departments).	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	These are being brought to the attention of Directorate of Economics and Statistics for necessary action.
			(ii) Dte. of E&S, Min. of Agriculture & Irrig., New Delhi	This is already being pursued by us as a part of the implementation of N.C.A. recommendations to begin with Arunachal Pradesh Admn. and Nagaland Govt. were requested to explore the feasibility of aerial Photographs available with survey of India office furnishing the information on land under cultivation and area under crops and to see how far the aerial photographs available with them could meet the require-

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				ments of data collection in the field of agriculture. Both Arunachal Pradesh and Nagaland have initiated action in the matter.
		(iii)	Deptt. of Agri., H.P.	Land use of crop statistics are already fully available in the State.
		(iv)	Dte. of Agri., Pondicherry.	Coverage as far as this territory is concerned is complete. The Department of Economics and Statistics of this state is in-charge of this programme.
		(v)	Dte. of Agri., Ahmedabad.	As regerds, land utilisation, the coverage in the state is already 100% as entire area of the state has been surveyed by now. While in respect of coverage under crop estimation survey, it may be mentioned here that all major crops and even minor important crops have been covered. The coverage however, is about 84 percent in respect of crop estimation surveys (C.E.S.) so far has been extended to as many as 22 crops.
		(vi)	Dte. of Agri , Nagaland, Kohima.	In absence of Cadastral survey, Land Records etc. and maximum practice of shifting cultivation in this state, the collection of information on land use is difficult.

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17.	Realising the need for data of 4th, crop-cutting experiments for irrigated / unirrigated areas and also for indigenous/high yielding varieties, it was recommended that the sampling design of the surveys conducted may be under the state series modified to introduce stratification on these parameters. This will greatly improve the precision of estimates of crop yields in differnt categories. (Action ; NSSO)	1979	(i) I.A.S.R.I. (ICAR), New Delhi. (ii) N.S.S.O., Min. of Planning, New Delhi.	These are being brought to the attention of Directorate of Economics and Statistics for necessary action. The matter relating to stratification in CES as per input factors is receiving the attention of NSSO. Guide-lines on such methodological aspects as (a) type of stratification, (b) crops on which stratification is to be effected and (c) determination of sample size and allocation of the samples among districts/tehsils were drawn up and discussed with state authorities in the Zonal Meetings convened by NSSO during 1979. It appears that stratification according to irrigation alone can be considered as feasible for the present. Further, stratification may be advisable only in respect of crops which have a reasonable percentage of area under both irrigated and unirrigated categories
	B. FORESTRY			
18.	It was observed that even 3rd, the bare statistics of forest resources like different types of wood and other forestry products were not available with any degree of reliability. Some data in this regard were	1978	(i) I.A.S.R.I (ICAR), New Delhi. (i i) Chief Conservator of Forests, H.P.	A letter has been addressed by the Director, IASRI to the President, Forest Research Institute, Dehradun to explore the possibility of taking up a suitable project. Response is awaited and a reminder has been sent. Efforts are being made to improve reliability of statistics for our resources by adopting modified methods of determining basel area and volumes of trees as suggested.

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	being collected by Forestry Department. These data however, need to be put on sound statistical basis by developing appropriate sampling techniques. (Action : IASRI and States) The need for initiating appropriate surveys and other studies for bringing about improvement in Forestry Statistics was reiterated. It was felt that not much headway has been made in this regard though a similar recommendation was made at the last Conference. It was suggested that the Director, IASRI and the President, Forest Research Institute may jointly examine the problems as early as possible with a view to remove the impediments for the follow-	(iii) The Conservator of Forests, Lucknow,U.P.	A scheme has now been prepared to develop an adequate statistical organisation for the State Forest Deptt. This recommendation will be implemented after getting the sanction of this scheme.
		(iv) Chief Conservator of Forests, Haryana, Chandigarh.	The additional C.C.F. Haryana has been directed to collect the statistics of Forest resources of different types of wood and other Forestry Products. The figures when compiled will be made available in due course of time.
		(v) Chief Conservator of Forests, Trivandrum.	A Statistics Cell is functioning since last year with staff drawn from the State Bureau of Economics and Statistics for the timely availability of reliable statistics on various aspects of forestry. Ad-hoc studies on employment in forestry schemes and yield from plantations are also taken up.
		(vi) Addl.Chief Conservator of Forests, Maharashtra State, Pune.	We are gradually building up adequate statistical organisation and Forest Resources Surveys (F.R.&S.) are being conducted for last 15 years and substantial data is compiled and analysed. Attempts for improving Forest Statistics are being made as a continuous process and will be continued through surveys and studies.
		(vii) Chief Conservator of Forests, Madras.	The Forest Department has initiated surveys for estimation of yield of Bamboo adopting sampling techniques. Further action will be taken to impliment any suggestion to improve forest statistics after concrete proposals are received.

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	up action expeditiously. (Action : IASRI and F.R.I., Dehradun).	(viii)	Chief Conservator of Forests, Gujarat State.	For collection of basic statistics on forestry resources & allied matters, a special statistical branch headed by Dy. Director of Statistics has been opened in the office of the Chief Conservator of Forests. Similarly statistical cells are also opened at every territorial circle level. Slowly the states intend to go a step further and to create a small cell at the division level. Thus this state has already recognised the importance of collection of basic data and action in this direction is already afoot.
		(ix)	Chief Conservator of Forests, Andaman Nicobar Island, Port Blair.	Detailed surveys in respect of forest resources in these islands are being undertaken by the Pre-Investment Survey (F.R. Eastern Zone) of the Government of India and this work is going on and it is hoped that on completion of the entire survey more reliable data will be available in respect of the forest resources like different types of wood and other forestry products. As regards the need for initiating appropriate surveys and other studies for bringing about improvement in Forestry Statistics necessary guidelines when communicated by the F.R.I., Dehradun will be followed.
		(x)	Govt. of Arunachal	Though data regarding different types of woods and other forestry products were colleted in the past with some degree

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			Pradesh, Office of the Chief Conservator of Forests, Itanagar.	of reliability these informations are being put on a sound statistical foundation by creating a separate statistical cell at the state level. The field data is being reinforced by creating new Resources Survey Division.
		(xi)	Office of the Div. Forest office State, Div. Srinagar.	The point sampling method is more scientific, economical and based on sound statistics principles. So for this method has successfully been employed for the assessment of growing stock during the revision of Data Kishtwar, Pripanjal and Langet working plans. The method has also been continued for the revision of Reasi, Kamraj and Jhelam Valley working plans, which at present are under revision. This principle on which this method is based is that all the trees at a point when measured at a constant angle give a constant factor of calculation. The number of trees that can be compared can increase/decrease only when angle changes by increasing or decreasing the width of the angle guage or prism used for the purpose.
		(xii)	Chief Conservator of Forest, Bangalore.	As regards Karnataka State, accurate statistics relating to all major forest produce and few items of minor forest produce are being collected and maintained. The data relating to other minor forest produces are not collected systematically

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				because these produces are being sold in auction sales once in two years, where the produces collects the purchases from the Forests. However, efforts are being made to collect both major and minor forest produce and other forestry statistics systematically on a sound statistical basis. Regarding developing appropriate sampling techniques for taking up sample surveys, this aspect may be considered at the National level, and the nature of survey, design of survey and schedules etc., are to be determined and communicated to State for implementation.
		(xiii)	Office of the Forest Research Officer, Bihar, Ranchi.	It is expected that soon, the Bihar Forest Department will name its full fledged statistical unit and then all sorts of forest statistics will be made upto date together with development of sampling and experimental techniques applicable to Bihar forests.
19. A useful modification to Bitterlick's method for determining basal area of trees and from it the volume of the useable timber in a forest has been developed by	4th, 1979	(i)	I.A.S.R.I. (ICAR), New Delhi.	The Statistician, Forest Research Institute, Dehradun was contacted in this connection. Methodology suggested in this paper is being examined.
		(i i)	The Conservator of Fo-	The modified basal area method is being used in Forest Resources Surveys where necessary.

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	the Forest Research Institute, Dehradun. The modified method may be tried in different topographical forest areas and in various regions of the country. Its applicability for enumerating crop areas may also be tested on a pilot scale. (Action : F.R.I., Dehradun, State Departments of Agriculture and IASRI)	rests, Lucknow, U.P.		
		(iii) Addl. Chief Conservator of Forests, Maharashtra State, Pune.	This recommendation is being considered and will be applied to the extent possible while carrying out enumerations at the time of preparation and revision of working plans.	
		(iv) K.A.U., Trichur	Based on this recommendation a project, "Study of the method of estimation of area under tree crops" is started.	
		(v) Chief Conservator of Forests, Madras.	The officer-in-charge of Statistical Branch Forest Research Institute, Dehradun is being contacted. On hearing from him further action on the new method suggested will be taken.	
		(vi) Chief Conservator of Forests, Gujarat State.	The usefulness of bitterlick's method for determining basal area of trees is being tested in different topographical forest areas and various regions of this state.	
		(vii) Govt, of Arunachal Pradesh, Office of the	The state's Silviculturist is being advised to carry out pilot trials with the help of the modified Bitterlick's method in different topographical zones for estimating basal area of trees as also for calculating crop areas. The results will be	

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			Chief Conservator of Forests, Itanagar.	communicated by the Silviculturist directly to IASRI.

C. ANIMAL SCIENCES

20.	The performance of half-bred animals under field conditions in some areas is found to be much lower than the corresponding animals under well managed farm conditions. Such differences in the performance could be referred to as resources-cum-extension-cum-management-gap in regard to the cross-breeding programme. A constraints analysis may be made in such areas to isolate the management and other factors which are coming in the way of	3rd, 1978	(i) I.A.S.R.I. (ICAR), New Delhi.	A project has been formulated for collection and recording of data on performance of cross-bred and local animals in an area. A letter is being addressed to the Director of Animal Husbandry, Punjab and other state departments of animal husbandry for carrying out studies on the subject.
			(ii) Dte. of A.H., Punjab	A study has been taken up in the area covered under Indo-Swiss Project to isolate the management and other factors which are coming in the way of realising the genetic potential of cross-bred animals under field conditions
			(iii) Deptt. of A.H.,Madras	The officials of this Department are suitably advised to maintain records for the comparison of performance of half-bred animals under field conditions with that of corresponding animals under well managed farm conditions.
			(iv) Central Institute for Research on	A project entitled "A study of socio-cultural constraints in modernising sheep and goat Bessantries" is already designed at this centre/Institute (1978). The data so collected

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realising the genetic potential of cross-bred animals under field conditions. (Action : Department of A. H., Punjab). Since this is a research scheme, it may be carried out at some research farms. (Action: Research Institutes and Agricultural Universities.		4th, 1979		Goats (ICAR), will be analysed in relation to the Dorset half-bred sheep Makhdoom, P.O. in the O.R.P. villages near Makhdoom. Farah, Mathura (U.P.)
			(v) H.A.U., Hissar.	HAU has adopted the villages Kirtan & Rewelvas & experiments are conducted in the field condition there on half-bred animals. The effect of resources, Extension-cum-management gap on performance of these half-bred animals will be studied. Howewer, it is felt that there are several lacunae in such experiments which are mainly used for comparison.
			(vi) Dte. of A.H., Madras.	Further the officials of this Department are suitably advised to maintain records for the comparison of performance of half-bred animals under field conditions with that of corresponding animals under well managed farm conditions.
			(vii) G.A.U., Anand.	The recommendation was noted for future guidance.
			(viii) P.K.V.,Akola, Maharashtra	A scheme for the purpose is being prepared by the Deptt. of Animal Genetics and breeding.
			(ix) G.B. Pant Univ., Pantnagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.

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21.	Bench-mark survey under the guidance of IASRI should be carried out in areas where special livestock development programmes involving small and marginal farmers have been initiated recently or proposed to be initiated soon so that objective assessment of such development measure may be possible. (Action : A.H. Division of Ministry of Agriculture & Irrigation and State Department of A.H.)	3rd, 1978	(i) IASRI (ICAR), New Delhi.	The Ministry of Agriculture and Irrigation (A.H.Division) as well as state departments of animal husbandry are being informed to provide adequate facilities for undertaking assessment survey for the purpose and also to provide necessary funds. In addition, the Division is preparing some guidelines and formulating necessary schedules and plan of work for the guidance of the organisatians who will be taking up the assessment surveys.
			(ii) Dte. of A.H., Simla, H.P.	Bench mark survey in the Intensive Cattle Development Project have been carried out under the guidance of Govt. of India, Ministry of Agriculture and Irrigation and report submitted to the Institute as well.
			(iii) Dte. of A.H., Punjab.	For creation of assessment unit a proposal has been submitted to the Govt. under 6th Five Year Plan. If this scheme is sanctioned, such studies will be taken up.
	All State Governments should create adequate facilities and allot some funds for undertaking such studies as the part of projects. (Action : State Departments	4th. 1979	(iv) Central Institute for Research on Goats (ICAR), Makhdoom, P.O. Farah,	The bench mark surveys of villages selected to be covered under lab. to land programme initiated by the Council, 1979 is being carried out in proforma I and II, as prescribed by special task force recently. As the programme of the Council is specially designed for the socio-economic welfare of 50,000 village families who represent the weaker section of Indian social system the

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	of A.H.)		Mathura (U.P.)	data colleted in proforma I will service the planners at macro level (village level) where as the data collected in proforma II is going to be utilised for plant at micro family levels.
		(v)	Dte. of A.H., Trivandrum	A scheme has been drawn up for the conduct of a Bench Mark Survey in the newly sanctioned I.C.D.P. area at Kozhikode. In this area under the project special livestock development programmes involving small and marginal farmers have been proposed to be initiated soon.
		(vi)	A.H. Department, Madras.	It is agreed to undertake Bench Mark Surveys where special Livestock development programmes are initiated.
		(viii)	Dte. of A.H., Pune.	A scheme for taking Benchmark/Assessment Survey in the areas where S.L.P.P. and D.P.A.P. Programme are going on, was proposed to the Department as suggested in the conference. However, due to financial restric-

N.B.—S.L.P.P. stands for Special Livestock Production Programme
D.P.A.P. stands for Drought Prone Areas Programme.

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				tions, this scheme cannot be taken up in the next financial year. Efforts will be made to push-up the scheme sometime in the next year.
		(viii)	Dte. of A.H., Karnataka.	This recommendation is under consideration.
		(ix)	P.K.V. Akola, Maharashtra.	A special cell for taking up evaluation studies is being proposed. The Cell when established could take up such studies also.
		(x)	Dte. of A.H., Ahmedabad.	No facilities have been provided under the special live-stock programme and hence it is not possible to carry out Bench-Mark Surveys in the areas.
		(xi)	Dte. of A.H. & Vety. Services, Bangalore.	It is under consideration.
		(xii)	Dte. of A.H., U.P., Lucknow.	No such facilities are in existance in this state. Also there is no hope of having them in the near future as there is no proposal in this connection under consideration as yet.
		(xiii)	Dte. of A.H., Haryana,	To make objective assessment of each development programme, surveys on Sheep Production Programme

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			Chandigarh.	have already been conducted. Steps are being taken to carry out other surveys.
		(xiv)	Dte. of A.H., Pondicherry.	It is informed that in the Union Territory of Pondicherry Special Livestock Development Programme i.e, Calf rearing Scheme (Centrally Sponsored Scheme) have been implemented since 1978-79. Under this scheme the Small/Marginal farmers have been provided feed at the subsidised rate for the rearing of cross-bred heifers. Since the scheme is being implemented for the past one year the Bench Mark Surveys for the Special Livestock Development Programmes have not been carried out in the Union Territory of Pondicherry.
		(xv)	C.S.W.R.I., Malpura (Rajasthan).	Bench Mark Survey is already being conducted and a copy of the report is sent to Dr.S.S. Pillai, Jt. Director, IASRI, New Delhi.
		(xvi)	Dte. of A.H. & Vety. Services, Orissa.	At present Bench Mark and Assessment Surveys are being carried out in I.C.D. Projects of the State where Statistical Units are functioning. Out of 4 I.C.D. Projects in the State only two I.C.D. Projects i.e. Cuttack and Berhampur have statistical cell and they are doing bench mark surveys. But other two I.C.D projects have no statistical staff to take up such survey. State

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				Govt. may be requested to create equal number of staff and officers for each I.C.D. Project.
			(xvii) Dte. of Vety. Services, M.P., Bhopal.	There are twenty districts in the State where small farmers Animal Husbandry Projects are functioning. In order to initiate objective assessment of these projects and other such projects a skeleon staff viz. two progress assistants, and five Enumerators (Contingency paid) for each district have been proposed under the state plan during the year 80-81.
22. It was pointed out that 4th, based on the scientific 1979 investigations in the field of animal sciences certain statistical methodologies have been evolved but these need to be adopted more widely by the organisations concerned. It was, therefore, recommended that IASRI may prepare a list of all such studies			(i) IASRI (ICAR), New Delhi.	Required information has been asked for from various institutions and organisations and these would be compiled after receipt of the replies.
			(ii) Dte. of A.H., Punjab.	The results of investigation made by this deptt. will be communicated to IASRI.
			(iii) H.A.U., Hissar.	On the request of Joint Director, IASRI, the Deptt. of Animal Breeding has passed on the recommendations of the researchers.
			(iv) P.K.V., Akola, Maharashtra.	Deptt. of Economics and Statistics will obtain the list of such studies.
			(v) JNKVV,	Extract of these items have been sent to Dean, Faculty

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	made at various Institutes and Agricultural Universities and circulate to various organisations for their adoption. (Action : IASRI, other Institutes, Agricultural Universities, State Departments of A.H. and Ministry of Agriculture).		Jabalpur	of Veterinary Science & A.H. with the request to circulate to concerned departments and implement the recommendations.
		(vi)	G.B. Pant University Pantnagar.	The detailed list can be had from the Head, Deptt of Animal sciences.
		(vii)	Dte. of A.H., H.P.	The iist is to be prepared by IASRI. However the methodology evolved by the Institute has been utilised in conducting the surveys. (i) Milk recording in key village block. (ii) Bench Mark and assessment survey under ICDP. (iii) Integrated Sample Survey for the estimates of Animal products. (iv) Economics of raising and maintaining cattle and Buffaloes. (v) Cost of production of milk.
		(viii)	Dte. of A.H. & Vety. Services, Orrissa.	The methodology evolved for estimation of production of major livestock products like egg, milk and meat by IASRI are adopted. After receiving the other methodo logy for scientific investigations on animal science,

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				it will be considered if the studies are practicable with the existing resources available.
			(ix) I.V.R.I., Izatnagar	The list of Research Projects under taken by this Institute for the year 1980 has been sent to IASRI.
23. It was felt that these may be a number of constraints for adopting the techniques already evolved. it was therefore, recommended that these constraints may be examined in details and necessary modifications made in the methodology, IASRI may initiate action in this regard. (Action : IASRI, State Departments and Ministry of Agriculture).		4th, 1979	(i) IASRI (ICAR), New Delhi.	Detailed study on small and marginal farmers in this project on constraints is being taken up by the Division of Econometrics Analysis, IASRI.
			(ii) Deptt. of A.H., Madras.	The Sample survey methodology developed by IASRI is being utilized by this directorate and no constraints/ difficulties are experienced while implementing it.
			(iii) Dte. of A.H., H.P.	The department feels that the designs suggested under Integrated Sample Survey for estimation of Animal products needs modification for estimation of number of Animal Slaughtered in private household and utilisation of animal products.
			(iv) C.S.W R.I. Malpura, (Rajasthan)	An assessment survey study is being conducted recently in the ORP area of the Institute.
			(v) Dte. of A.H. & Vety. Services, Orissa.	The constrains evelved by IASRI for estimation of production of major livestock products are being used, it has been proposed to take up other problems

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				like eost of production of livestock products, fortility and mortality rate of animals under village conditions etc. in which the methodologies evolved and examined by IASRI will be utilised for the above studies.
24.	For a proper dissemination of various results obtained in statistical research as applied to animals sciences and for wider application of methodologies, it was recommended that a Workshop/ Summer Institute might be organised at the IASRI. This will also provide desired forum for mutal discussion and formulation of appropriate programmes for adoption. (Action : IASRI)	4th, 1979	(i) IASRI (ICAR) New Delhi.	The summer Institute was organised in May, 1980.

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25.	While adopting the methodology on the integrated plan for estimating the annual output of principal livestock products, some States expressed certain difficulties, both in respect of sampling designs as well as in its implementation. It was recommended that these aspects might be discussed by the concerned agencies with recommendation that these aspects might be the coordinating agency and the IASRI to arrive at a suitable plan of work. (Action : Division of Animal Husbandry, Department of Agriculture, Ministry of Agriculture).	4th, 1979	(i) IASRI (ICAR) New Delhi.	The workshop has been convened in which the representatives come from State Departments of Animal Husbandry, IASRI, and Ministry of Agriculture participated.
			(ii) Dte. of A H.,H.P. Simla.	The matter has already been taken up with the Ministry of Agriculture and Irrigation (Deptt. of Agriculture) in the Statistics Division of Animal Husbandry.
			(iii) Deptt. of A.H. Madras.	In case any such difficulties are encountered the matter will be consulted with the Technical Committee of direction Min. of Agriculture, Govt. of India.
			(iv) Dte. of A.H. Trivandrum.	An integrated sample survey for the estimation of the production of major livestock products such as milk, meat and egg has already been started in this state as early as 1977 and the same is being continued. As regards state no specific difficulties have been experienced so far either in sampling design or in its implementation.

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			(v) Dte. of Vety. & A.H. Services, Manipur.	It is felt that there is room for obtaining guidance in adopting the methodology on the integrated plan for estimating the annual output of principle livestock products. This has been brought to the notice of the Planning Commission at the time of annual plan discussion. It was suggested that experts on this line may be deputed to the states for giving on the spot guidance to arrive at suitable plan work at the field level in the state.
			(vi) Animal Husbandry Department Andhra Pradesh, Hyderabad.	Regarding estimation of major livestock products, viz., milk, egg, wool & meat, an Integrated Sample Survey as per survey design provided by Government of India has been taken up since November 1977 and seasonal reports on estimation of production of major livestock products are being submitted to Government of India.
			(vii) Dte. of A.H. & Vety. Services, Orissa.	Integrated Sample survey for estimation of major livestock products is in operation in the State. Difficulties experienced in different stages of surveys have been communi-

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				cated to Govt. of India, Ministry of Agriculture, Deptt. of Agriculture and Cooperation for discussion in the direction of the Technical Committee. A meeting to this effect was scheduled to be held on 18.8.80. to 20.8.80. at Gandhinagar and the points might have been discussed and necessary instructions, modification and guide-lines are awaited.
26.	As there is a need for working out projection of milk production and other livestock products in the near and distant future, it was recommended that suitable methodologies may be evolved for such projections, as also the demand projections. (Action : IASRI)	4th, 1979	(i) IASRI (ICAR), New Delhi	Scientists in the Division have been requested to propare a project for working out the projection of milk production in the first instance. Afterwards similar studies will be taken up on other livestock products.
			(ii) P.K.V., Akola, Maharashtra.	A project for studying projection of milk and other livestock products is being prepared by the Department of Animal Husbandry and dairy in collaboration with the Department of Agricultural Economics and Statistics.

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			(iii) Dte. of A.H., Pondicherry.	The sample surveys on estimation of major livestock products like milk, egg and meat have started from July 80 in the Union Territory of Pondicherry. If any difficulty arises for the conducting of the sample survey the valuable suggestions may be sought from the IASRI.
27.	Although data collected in livestock farms are analysed to study the performance of a herd, it was felt that more efforts may be made to collect data on animals maintained under village conditions to judge their performance. (Action : IASRI, State Departments of A.H. Agricultural Universities and other Institutes).	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	Studies have been carried out utilising secondary data from some of the surveys carried out in three different areas. Similar work is in progress utilising other available data.
			(ii) Dte. of A.H., H.P. Simla	The action is being taken with the collaboration of IASRI, New Delhi in Kangra District of Himachal Pradesh.
			(iii) Dte. of A.H., Punjab.	The data of the performance of cross-bred cows in the field is being analysed by the statistical section of the deptt.
			(iv) Deptt. of A.H., Madras	The Dy. Director I/C Intensive Cattle Development had been informed to collect data on animals maintained under village conditions to judge their performance.

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			(v) Central Institute of Res. and Costs (ICAR), Makhdoom, Mathura.	The productivity recoiding of small animals like goats and sheeps is being done by the extension scientists of the Institute since May, 1979 in CRP/Lab, to land village, both at individual family level and at herd level.
			(vi) Dte. of A.H. & Vety, Services, Nagaland	As the data on livestock performance at Govt. farms are collected but could not be analysed through application of various statistical methods due to dearth of statistical staff in this Deptt.
			(vii) Dte. of A.H., Pune.	Information regarding performane of cross-bred cows under field conditions is being collected as recomended.
			(viii) G.A.U., Anad.	The recommendation was noted for future guidance.
			(ix) Dte. of A.H., Karnataka.	The data is being collected in selected villages in the Extension programme of Red-dane project.
			(x) Dte. of A.H., Trivandrum.	At present data collected from departmental livestock farms are analysed and utilised

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				for studying the performance of a particular herd. But in obediance to the above recommendation we are trying to collect similar data on animals maintained under village conditions to study their performance.
			(xi) P.K.V., Akola, Maharashtra.	The Deptt. of Economics and Statistics will undertake this project in collaboration with the Deptt. of A.H. & Dairy.
			(xii) Dte. of Vety. & A.H. Services, Manipur.	Work has been taken up with our departmental personnel with the available expertise.
			(xiii) J.N.K.V.V., Jabalpur	Extract of these items have been sent to Dean, Faculty of Vaterinary Science & A.H. with the request to circulate to concerned departments and implement the recommendations.
			(xiv) G.B. Pant Univ., Pantnagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
			(xv) Dte. of A.H., Ahmedabad	Assessment surveys are carried out every year in the Intensive Cattle Development

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				Programmes. They supply the necessary data on animals maintained under viilage conditions to judge their performance.
			(xvi) Dte. of A.H., U.P.,Lucknow,	At present analysis of breeding data at state Livestock-cum-Agriculture farms pertaining to cows & buffaloes only is being done in a limited scale as only one officer & five Assistants are available for this work. Efforts have been made to enlarge its scope as well as to cover sheep, Goat & Poultry Farms. The collection of such data and its analysis under the village conditions is not possible due to lack of financial resources.
			(xvii) N.D.R.I., Karnal.	The recommendation has been incorporated at our Institute.
			(xviii) Dte. of A.H. & Vety. Services, Orissa.	Action has already been taken to collect data on animals under village conditions in respect of production of major livestock products under Integrated Sample Survey Scheme.

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28.	A large body of data are collected during surveys and experimental investigations in animal husbandry and dairy fields with some specific objectives. It was recommended that these secondary data may be critically examined for making further useful studies. (Action : IASRI, Other Institutes, State Departments of A.H., Agricultural Universities and Ministry of Agriculture).	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	A number of projects have been formulated in the Division utilising secondary data. The results on some of the studies have also been completed.
			(ii) Dte. of A.H., Simla (H.P.)	The critical examination of the data collected through Integrated Sample for estimation of animal products, Benchmark and assesment survey and economics of raising Cattle and Buffaloes etc. is being done.
			(iii) Dte. of A.H., Punjab Chandigarh.	Secondary data collected during course of survey is already being analysed.
			(iv) Deptt. of A.H., Madras.	It is further agreed to fully utilise the data collected during surveys and carry out experimental investigations in Animal Husbandry and dairy fields.
			(v) Central Instt. for Res. on Goats (ICAR), Makhdoom, Mathura.	The secondary data on all India Co-ordinated Research project on sheeps and goats are being analysed in collaboration with IASRI, New Delhi.

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			(vi) Dte. of A.H., Trivandrum.	Steps are in progress.
			(vii) Dte. of A.H., Pune.	The point is noted.
			(viii) U.A.S., Bangalore	An attempt is being made to see if a P.G. student in Agril. Statistics may take up a problem for his thesis topic.
			(ix) P.K.V. Akola, Maharashtra	A project will be undertaken by the deptt. of A.H. & Dairy in collaboration with Operational Research Project.
			(x) J.N.K.V.V., Jabalpur.	Extract of these items have been sent to Dean, Faculty of Veterinary Sciences & A.H. with the request to circulate to concerned departments and implement the recommendations.
			(vi) Dte. of A.H., Ahmedabad.	Specific studies are not being undertaken but whenever a particular type of data is required for particular need. The Survey data are being utilised by utilisation of secondary data.
			(xii) Dte. of A.H., Haryana, Chandigarh.	It is a good suggestion. Data collected will also be used as per recommendation.

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			(xiii) Dte. of A.H., U.P., Lucknow	Detailed reports on the surveys conducted by the department including secondary data are regularly brought out. These reports can be seen in the Departmental Library for any critical review.
			(xiv) I.V.R.I. Izatnagar (U.P.)	A projection, in collaboration with IASRI, based on the breeding data accumulated over years in the All India Co-ordinated Project on Cattle, is being initiated.
			(xv) N.D.R.I., Karnal	The recommendation has been incorporated at our Institue.
			(xvi) Dte. of A.H., & Vety. Services, Orissa.	The secondary data of integrated sample survey for estimation of major livestock products are analysed and used for the purpose.
29.	The possibility of using discriminant function approach and other multivariate techniques for improvement in analysis of breeding data on cattle may be explored.	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	Discriminant function and multivariate techniques are already being used in the analysis of breeding data on sheep. The approach of multivariate techniques to problems in cattle breeding will be taken

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	(Action ; IASRI, other Institutes and Agricultural Universities).			up in due course.
			(ii) H.A.U., Hissar.	The techniques are under use for quite sometime by the P.G student of Plant Breeding & Animal Breeding in this University. Proper guidance is provided by the Deptt. of Maths. & Statistics.
			(iii) G.A.U., Anand.	The recommendation is being explored.
			(iv) P.K.V., Akola Maharashtra.	The Deptt. of Animal Genetics and Breeding will study this aspect as and when required.
			(v) J.N.K.V.V., Jabalpur.	Extracts of these items have been sent to Dean, Faculty of Veterinary Science & A.H. with the request to circulate to concerned departments and implement the recommendations,
			(vi) G.B. Pant Univ., Pant nagar.	Action is being done at this University.
			(vii) Dte. of A.H. Ahmedabad	With the present staffing pattern of the Statistical work this is not possible.

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			(viii) Dte. of A.H. Haryana, Chandigarh	Efforts will be made as per recommendation.
			(ix) N.D.R.I., Karnal.	The recommendation has been incorporated at our Institute.
			(x) I.V.R.I., Izatngar.	The multi-variate technique has been used for comparison of half-breds.
30.	Studies may be made to examine the various methods evolved so far for working out sire indices in respect of their efficiency, stability, etc. (Action : IASRI, other Institutes, Agricultural Universities and State Departments of A.H.).	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	The study on comparative performance of different sire indices evolved so far will be taken up as soon as the work in respect of some projects is completed.
			(ii) Dte. of A.H., H.P. Simla.	No staff is available for undertaking such studies.
			(iii) Dte. of A.H., Punjab	A scheme for the evaluation of Buffalo/C.B. Bulls in the field condition has been proposed during 6th Plan period. On the sanctioning of this scheme the efficiency of various methods for working out sire indices will be studied.
			(iv) Central Instt., for Res. on Goats, Makhdoom, Mathura.	Action is proposed to be taken in future.

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			(v) H.A.U., Hissar.	This problem in part is being studied under AICRP (Animal Breeding).
			(vi) Dte. of A.H., Trivandrum.	At present progeny testing is being carried out at Mavelikara under the auspices of the Kerala Livestock Development and Milk Marketing Board.
			(vii) G.A.U., Anand.	The recommendation was noted for future guidance.
			(viii) Dte. of A.H., Pune.	The sire evaluation work has been started in the State, from 1977-78. The evaluation of bulls maintained at Pune and Nagpur District, Artificial Insemination Centres, was taken up during 1977-78. During the year 1978-79, sire Indices of exotic breeding bulls located in the areas of Miraj, Chiplan, Dhule and Jalna Intensive Cattle Development Projects have been worked out on the data collected of Progeny Performance. During the year 1979-80, it is proposed to evaluate breeding bulls located at Pune, Nagpur, Ahmednagar, Satara, Osmanabad, Akola and Buldhana District Artificial Insemination Centres.

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			(ix) P.K.V., Akola, Maharashtra	The Deptt. of Animal Genetics and Breeding will study these aspects as and when required.
			(x) Dte. of Vety. & A.H. Services, Manipur.	As indicated studies will be made under various methods available so far for working out sire indices after obtaining the various methods from IASRI etc.
			(xi) J.N.K.V.V., Jabalpur.	Extract of these items have been sent to Dean, Faculty of Veterinary Science & A.H. with the request to circulate to concerned departments and implement the recommendations.
			(xii) G.B. Pant Univ., Pantnagar.	These required research/technical/administrative personnel appropriate action can be taken on the availability of such staff.
			(xiii) Dte. of A.H.. Ahmedabad.	State Department of Animal Husbandry in consultation with the Agricultural Universities, has taken up the work of progeny testing and working out the sire indices.
			(xiv) Dte. of A.H., Chandigarh, Haryana.	Steps will be taken for working our Sire indices in respect of efficiency and stability etc.

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			(xv) Dte. of A.H., U.P., Lucknow.	A study to examine the efficiency of different methods of sire evaluation has been carried out by the Department for Sahiwal herd maintained at State Livestock Farm, Chak Ganjaria, Lucknow.
			(xvi) Dte. of A.H., & Vety. Services, Orissa.	Action has been taken and concerned officers of livestock breeding farms of the State have been requested to study the efficiency and stability of Sire maintained in the departmental farms.
31. There is an urgent need for knowing the number of cattle and buffaloes under different breeds as well as crossbred ones in the country. It was recommended that in the first instance the number of crossbred animals may be obtained during quinquennial livestock census. (Action: Ministry of Agriculture and State Deptt. of (A.H.).		4th, 1979	(i) I.A.S.R.I. (ICAR) New Delhi.	The Ministry of Agriculture & Irrigation as well as State Departments of Animal Husbandry are being addressed emphasising the need for obtaining the required data during livestock census and suggesting to take necessary steps for collection of such data.
			(ii) Dte. of A.H., Punjab.	In Punjab the livestock census is being conducted by Director, Land Records. He has been requested to collect the information about the number of C.B. animals in the State during next census.

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			(iii) Deptt. of A.H., Madras.	In Tamil Nadu, in the year 1977 it was recommended to include the various cross-breeds to be enumerated in livestock census conducted by the Directorate of Statistics, Govt. of Tamil Nadu.
			(iv) Dte. of A.H., H P. Simla	The next livestock Census will be conducted in 1982 by the Directorate of Land Records, H.P. The Ministry of Agri. & Irrigation, Govt. of India, to include such column in the schedules may initiate recording of cross-bred cattle.
			(v) Central Instt, for Res. on Goats, Makhdoom, Mathura.	The data will be gathered as desired, during the quinquennial livestock Census.
			(vi) Dte. of A.H. & Vety. Services, Nagaland.	The livestock Census was completed in the state during 1978. The data on performance of the livestock in field conditions are being collected for analysis.

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			(vii) Dte. of A.H., Trivandrum.	In this State during the 12th quinquinnial livestock census (1977) number of cross-bred and Desi cattle were taken separately. But the number of cross-bred buffaloes were not taken separately. This may be done during the next census.
			(viii) Dte. of A.H., Pune.	The action suggested has already been taken while conducting the 12th quinquennial livestock census-1978. The form for collection of data on cross-bred animals in the state has already been introduced in this census. Village-wise information about cross-bred animals would, thus be available for the state after completion of the census.
			(ix) Dte. of A.H. Karnataka.	This will be considered in the next livestock and farm equipment census provided the Ministry of Agriculture (A.H) approve.
			(x) Dte. of Vety. & A.H., Services Manipur.	Livestock census in the state is in progress. After completion of the same the exact position of different animals will be known.

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			(xi) Dte. of A.H., U P., Lucknow.	In order to get the desired information in the quinquennial Livestock Census, the census proformae will have to be first ammended by making provision of columns for noting such information, the Economics & Statistics Directorate of Ministry of Agriculture, Government of India. Which designs the proformae to co-ordinate this work throughout the country may be asked to make necessary arrangements.
			(xii) Dte. of A.H., & Vety. Services, Orissa.	Steps will be taken in the next census to collect data bredwise in respect of cattle and buffaloes. In this connection, the Ministry of Agriculture, Deptt. of Agriculture and Co-operation, Govt. of India may also be requested to include the breedwise information in the proforma before forwarding to States so that uniformity for all States can be maintained.
			(xiii) Dte. of Vety. Services, M.P., Bhopal.	The proposal for collecting the number of Cattle, Buffaloes and improved Sheep, Goats, during the next quinquennial livestock Censns going to be held in 1982, were submitted to the State Government which has kindly been agreed upon.

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			D. FISHERIES	
32.	To assess the potential of inland fisheries, it is necessary to have reliable data for area under water. For this purpose, it was recommended that a census of of fisheries may be conducted at two points of time, viz., monsoon and lean seasons. (Action : Fisheries Division of Ministry of Agriculture and Irrigation).	3rd, 1978	(i) I.A.S.R.I. (ICAR), New Delhi.	C.I.F.R.I. Barrackpore/Fisheries Section of the Deptt. of Agriculture, Govt. of India has been addressed in this connection.
			(ii) Dte. of Fisheries, Manipur.	Potential of Inland Fisheries in this state had already been assessed. There are about 50,000 hectares derelict water available at present of which 19,000 hectares are cultivable water. Further survey in this regard is in progress
	In the absence of representative from Fisheries Department, this matter may be taken up with the Fisheries Department. (Action: Fisheries Division of Ministry of Agriculture & Irrigation).	4th, 1979	(iii) Dte. of Fisheries, H.P.	Noted Please.
			(iv) Deptt. of Agri., Min. of Agri. & Irrig., New Delhi.	State Govts. have been supplied with a methodology for assessing the potential of inland fisheries as well as estimation of annual production through sample surveys. State Govts. have been luke-warm to the proposal sent by the Centre mainly because of the non-availability of financial resources for undertaking the work.
			(v) Dte. of Fisheries, Trivandrum.	As per N.C.A. recommendations it has been decided to undertake a census of inland water resources. An Asstt. Director of Fisheries has been appointed for the conduct of the survey. The preliminary works have been completed.

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33.	A Workshop on "Fisheries Statistics" may be convened to discuss problems which are of interest in both marine and inland fisheries. (Action : IASRI)	3rd, 1978	(i) I.A.S.R.I. (ICAR), New Delhi.	C.I.F.R.I. Barrackpore/Fisheries Section of the Deptt. of Agriculture, Govt. of India has been addressed in this connection.
			(ii) Dte. of Fisheries, Manipur.	Candidates will be deputed when such an arrangement is made.
	Directorate of Economics & Statistics/ Fishery Division, Deptt. of Agriculture irrigation should arrange for a Workshop/Symposium exclusively for 'Fisheries Statistics'. (Action : Dte. of E & S/Fishery Division, deptt. of Agri. &. Irrig.).	4th, 1979	(iii) Deptt. of Agri., Min. of Agri. & Irrig., New Delhi.	The proposal is acceptable. The Govts., CMFRI and other Institutions make the estimates of fish production independently and wide divergence has been observed in these estimates. Deptts. of Agri. for sometime has been considering a proposal to convene a meeting of all the organisations engaged in the estimation of fisheries statistics to thrash out the problems.
			(iv) Dte. of E&S, New Delhi.	Regarding Fisheries statistics concern n ainly the fisheries division of our Ministry and action will have to be initiated by them.
34.	The joint research project of CIFRI and IASRI for development of methodology for estimation of inland fishery resources and catches there from is operating in a comparatively small	4th, 1979	(i) I.A.S.R.I., (ICAR),	The possibility of enlarging the scope of the existing project to develop the methodology for estimation of inland fishery resources will be explored. Correspondence is on with the Bihar State Govt.

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	area in West Bengal. In order to provide an enlarged scope to the project, the Conference recommends that the Fishery Directorates/Agricultural Universities/State Departments may provide necessary qualified manpower support to enlarge the scope of the survey to different states so that an objective method is evolved quickly. (Action : CIFRI/IASRI/Dte. of Fisheries (All States)/BCKVV, West Bengal/ OUAT, Orissa/GBPAU, U.P./R.A.U., Bihar/TNAU).	(ii)	Fisheries Deptt., Pondicherry.	As and when the joint Research project is taken up in the Union Territory of Pondicherry, necessary assistance will be rendered by the Dte. of Fisheries, Govt. of Pondicherry to conduct the survey successfully.
		(iii)	Dte. of Fisheries, Lucknow.	The State Fisheries Department is ready to co-operate with CIFRI and IASRI for development of Methodology for estimation of Inland Fishery resources and catches.
		(iv)	Dte. of Fisheries, H.P., Bilaspur.	This will be considered & work initiated after obtaining necessary information from the concerned sources
		(v)	Commissioner of Fisheries, Gujarat State, Ahmedabad.	This point needs to be further clarified as to the specific action expected from the State Fisheries Deptt. in making provision of necessary qualified manpower support for the Central Project.
		(vi)	Dte. of Fisheries, Orissa.	Strengthening the statistical organisation/ unit with suitable staff for undertaking summary of fishery resources are being

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				considered for implementation considering the availability of funds in State sector budget.
			(vii) Dte. of Fishersies, Panaji-Goa.	Noted the recommendation please. It is under active consideration of this Dte. to depute some of the staff members for training to have qualified manpower in this respect.
			(viii) I te. of. Fisheries, Srinagar.	Approved cold water fisheries unit of CIFRI is already functioning in J&K State for the last decade.
			(ix) Dte. of Fisheries, A.P., Hydera-bad.	Proposals for strengthening the statistical cell of this Deptt. are being processed for submission to Govt. of Andhra Pradesh.
			(x) Dte. of Fisheries, Haryana, Chandigarh.	Due to shortfall of qualified manpower this Department is not in a position to develop methodology for this kind of survey.
			(xi) Dte. of Fisheries, Madras.	It has been recommended that in order to provide an enlarged scope to the project for development of methodology for estim-

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				ation of inland fishery resources and catches, the State Fisheries Department may be provided necessary qualified menpower support to enlarge the scope of the survey. The proposals for the creation of one Assistant Director of Fisheries (Statistics) under Part II scheme 1980-81 have been referred by the State Government.
			(xii) Dte. of Fisheries, Assam, Gauhati.	Qualified Manpower Support has been given to the ICAR project at Gauhati. More qualified manpower will be supplied when necessary.
			(xiii) Dte. of Fisheries, Trivandrum.	As per N.C.A. recommendation, this Department has contacted (CIFRI), Barrackpore (W.B.) and the Central Ministry of Agriculture and Irrigation, New Delhi. The Central Ministry has forwarded a methodology for estimation of inland fish landings adopted by NSSO. It is being studied and necssary steps will be taken.
35.	Considering the fact that inland fish seed production and fish production from larger water bodies is largely a	4th, 1979	(i) IASRI (ICAR), New Delhi.	Fisheries Section of the Deptt. of Agriculture, Govt. of India has been addressed in this connection.

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	state activity in public sector, the conference recognises that the available data at various state level organisations can be properly processed and made available for the benefit of various users. In order to achieve this objective it recommends that a small group of 3 or 4, consisting of experienced inland fisheries statisticians be constituted to design standard proformae, for collection of data at state level, for the entire country. The State Fisheries Directorates may be required to file the same to identify gaps and availabilities of inland fisheries data. This may be completed by Nov., 1979, so that a background is available for the symposium of inland statistics, where background papers of each State may be invited. (Action : IASRI).		(ii) Dte. of Fisheires, Manipur. (iii) Dte. of Fisheries, Madras. (iv) Dte. of Fisheries, Trivandrum.	Standard proformae may be prepared and sent to this Dte. for further action. The fisheries Statisticians of the State may also be consulted while designing standard proformae for collection of the data. The Department has not been informed of any such proformae. However, seed production particulars have been regularly collected by the Department.
36,	It was recommended that Shri K.K. Ghosh might prepare a note for onward transmission to Dte. of E&S	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	The matter was discussed with Dr. K.K. Ghosh during one of his visits to this Institute and he had agreed to submit the note.

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	regarding inclusion of items, i.e., area under water with sub-heads to identify ponds, tanks, reservoirs, rivers, seasonal, perennial, stocked with fish seed, not stocked under their land utilisation schedule for taking necessary action.		(ii) Dte. of E&S, Min. of Agri. & Irrig, New Delhi.	For including the area under water spread as one of the items in 9 fold land use classification, we have set up a working group under the chairmanship of ESA to examine the feasibility of this item.
			(iii) Dte. of Fisheries, Lucknow.	This work has to be done by Sh. K.K. Ghosh and if any data regarding U.P. is wanted by him, the same will be made available to him as and when required.
37.	In order to obtain a basic data base at district level, required by the new planning process recommended by NCA, and village/panchyat level, required by institutional financers and banks on items such as water areas, classified as perennial/seasonal under stockings/nonstockings, commercial/ noncommercial exploitation, active fishermen/their operation zones, crafts and implementation etc., it is necessary to have a Quinquennial Fisheries Census. It has been recognised as a	4th, 1979	(i) IASRI (ICAR), New Delhi.	Fisheries section, Deptt. of Agriculture, Govt. of India has been addressed in this connection.
			(ii) Dte. of E&S, New Delhi.	Regarding fisheries statistics concern mainly the fisheries division of our Ministry and action will have to be initiated by them.

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	basic need for and recommended by NCA for implementation. The Conference recommended that this be done urgently for which a working group be constituted to perpare the schedules and suggest an operative mechanism for the census. Action : Deptt. of Agriculture/Dte. of E&S)			
38.	The Statistics and resources Division 4th, of CIFRI being experienced and well 1979 equipped to analyse the inland fisheries data, the Conference recommended that this expertise may be used by the States for collection and interpretation of inland fisheries data. (Action : State Directorates of Fisheries/CIFRI).	(i) I.A.S.R.I. (ICAR), New Delhi,	This has been brought to the notice of Ministry of Agriculture, Govt. of India. Their response is still awaited.	
		(ii) Fisheries Department, Pondicherry.	The expertise of statistics and Resources Division of CIFRI will be utilised by the department as and when required.	
		(iii) Dte. of Fisheries, H.P., Bilaspur.	Noted for guidance.	
		(iv) Dte. of Fisheries, Lucknow.	The Statistics & Resources Division of CIFRI will be approached to provide necessary literature to SFD which may be helpful in analysing the inland fisheries data	

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				available with the U.P. State Fisheries Deptt.
		(v)	Dte. of Fisheries, Orissa.	The Statistics and Research Division of CIFRI is being requested to apprise this department about the expertise of inland Fisheries data analysis in order to examine its application by this department as recommended.
		(vi)	Dte. of Fisheries, Goa.	Noted please. The Statistical staff is already trained in this aspect.
		(vii)	Dte. of Fisheries, Srinagar.	The recommendation was approved.
		(viii)	Dte. of Fisheries, A.P., Hyderabad.	This Department will definitely seek the expertise assistance of the Statistics and Resources Division of CIFRI as and when required.
		(ix)	Dte. of Fisheries, Haryana, Chandigarh.	The Department is shortly making a reference to the Statistics and Research Division of CIFRI seeking their advice to analyse the inland fisheries data of the State.
		(x)	Dte. of Fisheries, Madras.	Further action will be taken in consultation with the Central Inland Fisheries Research Institute.

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			(xi) Dte. of Fisheries, Assam, Gauhati.	Action will be taken.
			(xii) Dte. of Fisheries, Trivandrum.	Central Inland Fisheries Research Institute has been addressed in this matter.
39. The State Fisheries Directorates, which are the organisations now involved in fisheries data collection and dissemination, need to have well organised statistics section headed by a senior level statistician with experience in fishery statistics. The conference recommended that this be done expeditiously. (Action : State Fishery Departments).		4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	This has been brought to the notice of Ministry of Agriculture, Govt. of India. Their response is still awaited.
			(ii) Dte. of Fisheries, Manipur.	The Fisheries Directorate had already established a statistical cell and imparting training to a senior level officer is being taken up.
			(iii) Dte. of Fisheries, Andaman and Nicobar, Admn. Port Blair.	It is informed that there is a lack of qualified and experienced hands in Fishery Statistics in this department and action is being taken to sponsor one of the officials of this department to undergo the training in Fisheries Statistics which is being conducted by CMFRI, Cochin in Nov., 1979.
			(iv) Dte. of Fisheries, H.P., Bilaspur.	The recommendation is commendable and the matter shall be taken up with the Govt. on the basis of above.

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			(v) Commissioner of Fisheries, Gujarat, Ahmedabad.	We already have a well organised statistical cell. The statistical structure requires reorganisation in order to meet the challenge of the planned development achieved in the field of Fisheries. This is being done by S.F.D.
			(vi) Dte. of Fisheries, Orissa.	Strengthening the statistical Organisation/ Unit with suitable staff for undertaking survey of fisheries resources are being considered for implementation are being considering the availability of funds in State Sector budget.
			(vii) Dte. of Fisheries, Bangalore.	A statistical cell is already established in this directorate.
			(viii) Dte. of Fisheries, Goa.	A separate statistical cell headed by Research Assistant is already functioning. However, since he is not trained in Fisheries Statistics, attempts will be made as suggested in the recommendations.
			(ix) Dte. of Fisheries, Srinagar.	The recommendation was approved.

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			(x) Dte. of Fisheries, U.P., Lucknow.	With the availability of necessary staff, the recommendations contained on this point will be compiled with.
			(xi) Dte. of Fisheries, A.P., Hyderabad.	Proposals for strengthening the statistical cell of this Department are being processed for submission to Govt. of Andhra Pradesh.
			(xii) Dte. of Fisheries, Haryana, Chandigarh.	The Statistical Assistant in position is meanwhile collecting data and consolidating it for dissemination of the information on fisheries development in the field. The provison for creation of a well defined statistical section headed by a senior level statistician shall be provided during VIth plan.
			(xiii) Dte. of Fisheries, Madras.	Action is being persued separately. However if matching grant is made available from Govt. of India, the State Government may be approached for creating a well organised statisticals section.

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			(xiv) Dte. of Fisheries, M.P. Bhopal	The Statistical Cell of the state Fisheries Deptt. is organised and working under the supervision of Deputy Director of Fisheries (Statistics) Class I and further strengthening will be done in due course by providing additional staff as per approved norms.
			(xv) Dte. of Fisheries, Assam, Gauhati.	Action is being taken in consultation with the Director of Economics and Statistics, Assam.
			(xvi) Fisheries Deptt., Pondicherry.	Necessary proposals will be submitted to Govt. for the strengthening of Statistical Wing headed by a Deputy Director of Fisheries (Statistics).
			(xvii) Dte. of Fisheries, Trivandrum.	A statistical section has been organised with an Asstt. Director (Statistics) as the Head.
			(xviii) Dte. of Fisheries, Patna, Bihar.	The present strength of the Statistical section of the Dte. is as follows :— 1. Asstt. Director of Statistics & Marketing —One 2. Statistical Officers —Two

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				3. Statistical asstt. —One 4. Computer Clerk —One Steps are being taken to create higher and lower level posts of statisticians under the World Bank Project.
40.	The Conference recommended that a Summer School or Seminar 2-3 weeks on "Quantitative methodology in inland fisheries research" be organised jointly by CIFRI and IASRI. (Action : CIFRI and IASRI).	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	This will be taken up with CIFRI after the result of project (pilot sample survey to estimate the inland fisheries resources & production of fishes in West Bengal) now in hand, become available. At present analysis is in progress.
			(ii) Dte. of Fisheries, Madras.	Further information on the organisation of a summer school or Seminar may be intimated.
41.	Multi-disciplinary studies may be taken up for detailed micro-level data analysis in integrated use of water, especially for multi-use water so that optimum water utility can be worked out. Such investigations may be taken in some selected reservoirs or tanks involving irrigation Agriculture/Fisheries/Power, Scientists representing different interests.	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	This is a complex problem which is being examined for bringing out its statistical aspects.
			(ii) Dte. of Fisheries, Manipur.	Action is being taken.
			(iii) AICPRF (CIFRI), Barrackpore, (W.B.).	The programme is being prepared to take up the micro level study at Bhakra reservoir.

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	(Action : CIFRI/IASRI/Project Co-ordinator (Reservoir Fisheries).			
42.	Considering the fact that data base for inland fisheries resources itself is highly unsatisfactory, the conference recommends that the census of water areas initiated in different states as a results of NSSO recommendations be completed urgently. (Action : Deptt. of Fishery, Ministry of Agri. & Irrig., and State Fisheries Deptt.).	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	Ministry of Agriculture, Govt. of India has been addressed to find out the present position of census of water areas. Response is awaited.
			(ii) Dte. of Fisheries, Bilaspur (H.P.).	This will be done after processing necessary guidelines from other States.
			(iii) Dte. of Fisheries, Lucknow.	If the requisite staff is provided the recommendations contained on this point will surely be carried out by SFD.
			(iv) Deptt. of Agri., Min. of Agri. & Irrig., New Delhi.	The methodology suggested by the Deptt. of Fisheries for the colllection of data on inland fisheries is in two stages. In the first stage the data is to be collected on water area and in the second-stage the data on inland fish production is to be obtained.
			(v) Dte. of Fisheries, J & K Srinagar.	In J & K State NSSO has recommended no such census of water areas. NSSO may please be directed to include J & K State as well in their programme.

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			(vi) Dte. of Fisheries, A.P., Hyderabad.	Action was initiated long back to list out the impounded water spreads village-wise. But due to lack of exclusive statistical field staff, progress could be achieved only to the extent of 60% till to date and the efforts are being geared up to complete the rest of work shortly.
			(vii) Dte. of Fisheries, Haryana, Chandigarh.	In view of a small Fisheries organisation in the state of Haryana and considering the sentiments of village folks against fisheries in first few years after the formation of the state, the NSSO recommendations are being called for the census of water resources.
			(viii) Dte. of Fisheries, Madras.	In view of the inadequate staff, the census of water areas could not be collected in the state.
			(ix) Dte. of Fisheries, (M.P.). Bhopal	Recommendation is already being implemented and proposal has already been submitted to the State Govt. for providing additional survey units for early completion of the census of water resources.

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			(x) Dte. of Fisheries, Assam, Gauhati.	Action is being taken.
			(xi) Fisheries Deptt., Pondicherry.	No census of water area is being taken as a result of NSSO recommendations. However the data on inland water areas collected by the staff of this department is readily available to meet the demands.
			(xii) Dte. of Fisheries, Trivandrum.	An Asstt. Director of Fisheries (Survey) has been posted and the preliminary works have been completed, steps have been taken for the immediate completion of the detailed survey.
			(xiii) Dte. of Fisheries, Patna, Bihar.	State Fisheries Department is willing to conduct a fish census of water resources.
			E. General	
43.	With the increased emphasis on newly emerging cropping systems like multiple cropping, multi-level cropping etc., research for developing appropriate designs for identifying judicious	3rd, 1978	(i) IASRI (ICAR), New Delhi.	The possibility for studying designs on multiple cropping, multilevel cropping, etc. are being explored. The action has been taken on the second part of the recommendation.

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	combinations of crops and their management is necessary. (Action : IASRI, other ICAR Institutes and Agricultural Universities)		(ii) G.A.U., Anand.	The recommendation was noted.
	The recommendations made in such conferences should continue for review till the action is completed mentioning the conference(s) in which those were recommended. (Action : IASRI)	4th, 1979	(iii) S.B.I., Tamil Nadu. Coinbatore.	This is under our active consideration. In the recent past, we had laid out several experiments on inter-cropping of sugar cane with wheat and moong. These experiments were laid out mostly in Randomized Block Designs, bearing in mind the input requirements of individual crops eg. manures. The suggestion will be implemented in future programmes.
			(iv) P.K.V. Akola, Maharashtra.	The work is already taken up and will be continued. In addition to this, a scheme is being separately prepared by the Dryland Agronomist and will be submitted to ICAR.
			(v) K.A.U., Trichur.	Based on this recommendation a project, "Methodological investigation for evolving suitable experimental design and sampling design for newly emerging cropping system like multiple cropping multi-level cropping etc." is started.

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			(vi) G.B. Pant University, Pantnagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
			(vii) I.A.R.I., New Delhi.	There are quite a good number of experiments conducted every year on cropping system, in the division of Agronomy of this institute. The appropriate designs developed for conducting field experiments on cropping systems, like multiple cropping, multi-level cropping etc., may kindly be supplied.
			(viii) J.A.R.I., Barrackpore.	Research project for developing appropriate designs for identifying, judicious combinations of crops has recently been approved by staff research council of the Institute.
44. It was felt that the studies on determination of the various constraints in the transmission of technology should be undertaken in diverse conditions including the tribal areas and also the small farmers. This may help to provide suggestions for remedial measure		3rd, 1978	(i) IASRI(ICAR), New Delhi.	The feasibility of studying the various constraints in the transmission of technology in any tribal areas in consultation with the ICAR is under examination.
			(ii) I.I.H.R, (ICAR), Bangalore.	The institute has opened two sub-stations in tribal areas, there this aspect would be taken care of.

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	to be taken in future. Such studies should be undertaken in collaboration with the extension agencies. (Action : IASRI, Extension Division of IARI and Extension Department of Agricultural Universities).	Agricultural Universities, concerned departments of other universities and other research institutes should also take up this work, at least at micro-level if not at macro level. (Action : Research Institutes, Agricultural Universities and Concerned Departments of other Universities).	4th, 1979	
			(iii) G.A.U., Anand.	Such studies have been already taken up by extension Deptt. of our University.
			(iv) S.B.I. (ICAR), Tamil Nadu.	This is also in our active consideration. We have adopted 4 villages and 100 marginal, small farmers and landless labourers under the Lab. to Land Programme.
			(v) P.K.V., Akola, Maharashtra.	This study will be taken up by the Deptt. of Extension. The data collection for this study will be done by Economists of Operational Research Project.
			(vi) J.N.K.V.V., Jabalpur.	Such studies on small scale are being undertaken by the post-graduate students of Extension Deptt.
			(vii) G.B. Pant University, Pantnagar.	Action is being done by the Deptts. Agri. Economics and Extension of the University.
			(viii) IARI (ICAR), New Delhi.	Besides some studies conducted by the Division of Agril. Extension, an All India Cordinated Research Project on the Farming Systems (constraints analysis) has already been conducted under the overall guidance of Jt. Director (extn.) in 8 states

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				representing various diverse conditions. Three of the Centres of this Research project were in 3 tribal districts.
			(ix) N.D.R.I., Karnal.	The recommendation has been incorporated at our Institute.
			(x) J.A.R.I. Barrackpore, (W.B.)	Studies on determination of various constraints in the transmission of technology has been taken up in diverse conditions under ORP and Lab. to Land Programme.
45.	The ICAR may be approached to appoint a committee to look into the need and requirement of statistical staff in different agricultural universities. The members of the committee may go round those universities and give recommendation regarding the creation/strengthening of the department of statistics as per their needs.	3rd, 1978	(i) ICAR., New Delhi.	ICAR informed that since the academic staff requirement of Agricultural Universities is looked after by the visiting team in every plan for Post-Graduate Departments special accredictation teams are set up, the recommendation to appoint a committee to look into the need and requirement of statistical staff in Agricultural Universities might not be accepted.
	(Action : ICAR). The IASRI should vigorously persue the matter for implementing to the	4th, 1979	(ii) M.P.K.V., Ahemdnagar, Maharashtra.	The University has been approached for formulation of a Department of Statistics.

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	recommendation. (Action : IASRI/ICAR)		(iii) P.K.V., Akola, Maharashtra.	A scheme for creation of Deptt. of Agril. Statistics has already been submitted to ICAR. It is necessary that a separate Deptt. of Statistics is established in the University.
46.	It was noted that the Govt. of India has given high priority to rural development programmes under the Sixth Five Year Plan. It is necessary to develop a proper statistical frame for monitoring the rural development projects, particularly those for the benefit of small farmers and land-less labourer. The conference stressed the need for the creation of a suitable and adequate machinery for proper assessment and evaluation of these programmes as was followed for Rinderpest Eradication, IADP and State part of I.C.D.P. (Action : IASRI, Ministry of Agriculture and Irrigation Concerned Departments of Agri-	4th, 1979	(i) IASRI (ICAR), New Deihi.	This is already being done by the state level, statistical Bureau, and Planning Organisation.
			(ii) H.A.U., Hissar.	One position has been provided in lab. to land programme with the Director of planning-cum-Project Formulation. The evaluation of these programmes will be taken up.
			(iii) P.K.V. Akola, Maharashtra.	There is no machinery for taking up evaluation studies. A project for creating such in cell in the University is being submitted to IASRI by the Deptt. of Economics and Statistics.
			(iv) K.A.U., Trichur.	Based on this recommendation a project, "Establishment of Agro-economic observatories" has started.
			(v) G.B. Pant University, Pantnagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.

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	cultural Universities).		(vi) Dte. of A.H., Ahmedabad.	The Department has proposed a scheme for monitoring of all the development animal husbandry programme in the state but unfortunately it is not included in the sixth plan.
			(vii) Dte. of A.H., Chandigarh, Haryana.	Govt. will be approached for a suitable and adequate machinery for the proper assessment and evaluation of these programmes.
			(viii) IARI (ICAR), New Delhi.	The integrated rural development programme of the Govt. of India is carried out by State Govt. Agencies and not by us. However, we agree with the recommendations of the conference i.e. the creation of suitable and adequate machinery for proper assessment and evaluation of rural development programme.
			(ix) Dte. of Agriculture, M.P.	The State Govt. may kindly be requested to create a statistical unit for monitoring the working of Rural Development Programmes as well as to assess the impact on

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				small and landless labourers. A model-Scheme may be circulated to all State Govts. with its copy to Directors of Agriculture.
47.	In order to examine the operational feasibility and possibility of improving the sampling techniques and reduction in cost by collecting data by enquiry, it was recommended that data may be collected simultaneously by enquiry and observation while carrying out pilot investigations. (Action : IASRI and State Departments)	4th, 1979	(i) IASRI (ICAR), New Delhi.	This will be kept in view while planning pilot investigations in future.
			(ii) Commissioner of Fisheries, Gujarat, Ahmedabad.	This is noted.
			(iii) Dte. of A.H,. Punjab.	Recommendation made about the enquiry method will be adopted in the next sample surveys.
			(iv) Dte. of A.H., Pune.	The action is being taken.
			(v) Chief Conservator of Forest, Trivandrum.	The recommendations are noted for strict adherence when pilot investigations or surveys are taken up.
			(vi) Dte. of Agriculture, Maharashtra.	IASRI may prepare a detailed note on this subject, and circulate to different states for consideration and adoption for future pilot studies.

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			(vii) Dte. of A.H., Ahmedabad.	By inquiry method the data is being collected.
			(viii) Dte. of Fisheries, Assam, Gauhati.	This recommendation was noted for future census.
48.	All data should be subjected to appropriate quality checks before being released for general use. (Action : All concerned organisations)	4th, 1979	(i) IASRI (ICAR), New Delhi.	This recommendation has been brought to the notice of Directors of all ICAR Institutes.
			(ii) Commissioner of Fisheries, Gujarat, Ahmedabad.	This is being done.
			(iii) Dte. of A.H., Punjab.	This has been noted.
			(iv) Dte. of A.H., H.P.	The data is being checked for improving the quality of data.
			(v) Dte. of A.H., Pune.	The action is noted.
			(vi) U.A.S., Bangalore,	Action is being taken for implementation.

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			(vii) Dte. of Agriculture, Maharashtra.	This is accepted.
			(viii) P.K.V. Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(ix) G.B. Pant, University, Pantnagar.	Action is being done at this university.
			(x) Dte. of A.H., Ahmedabad.	This is being provided.
			(xi) Dte. of A.H., Haryana, Chandigarh.	Necessary checks are being made before releasing the reports.
			(xii) Dte. of Fisheries Gauhati.	Action will be taken accordingly.
			(xiii) N.D.R.I., Karnal.	The recommendation has been incorporated at our Institute.
			(xiv) C.I.F.T., Cochin.	We are incorporating this recommendation in our data collection system.

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49.	Keeping in view the importance of agricultural statatistics it was recommended that all efforts should be made to educate the officials and other workers engaged in data collection as well as the respondents. (Action : All Agencies Concerned).	4th, 1979	(i) IASRI (ICAR), New Delhi.	This recommendation has been brought to the notice of directors of all the ICAR Institutes.
			(ii) Dte. of E & S, Min. of Agri. and Irrigation New Delhi.	This is already being taken care of under the scheme for timely reporting and improvement of crops statistics being implemented by us.
			(iii) Dte. of A.H., Punjab.	The officials engaged for sample survey are imparted thorough training. The proformae used for the survey are also convassed in the villages before the start of the survey.
			(iv) H.A.U., Hissar.	This deptt. has been giving one week training to the Deptt. of Agril. Statisticians. These trainings are arranged twice in a year.
			(v) U.A.S., Bangalore.	Action is being taken for implementation.
			(vi) Dte. of Agriculture, Maharashtra.	This is already being implemented.
			(vii) P.K.V. Akola, Maharashtra.	This will be followed by all the concerned research workers.

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			(viii) G.B. Pant University, Pantnagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
			(ix) N.D.R.I., Karnal.	The recommendation has been incorporated at our institute.
			(x) Dte. of A.H., Ahmedabad.	In order to improve the quality of data the training to the field staff and the supervisory staff has been provided before inspection of the survey. During the course of field works the supervisory staff as well as the field Investigators are in close touch with the realistic conditions in the sample units. In order to do this general informations about the sample units are being collected in the listing round of the season and the vital factors of breeding, feeding and marketing and general management are being studied. Adequate number of supervisions are also been provided as per the need. Only factor deterioriting the quality of data and felt due to the reason of non-stability of the

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				basic field staff which are normally a regular establishment but is the meantime many of them leaving the job and are being replaced by the new in course of the field work of the survey. Also it is felt to provide a specific training to the supervisory and above staff working in the integrated sample survey in order to upgrade their performance and technique to provide adequate methodological checks. This may be provided at the IASRI level.
			(xi) Dte. of Fisheries, Assam, Gauhati.	Action is being taken accordingly.
			(xii) Dte. of A.H., Haryana, Chandigarh.	The primary agencies responsible for collection of data are fully trained before sending to the field.
			(xiii) Dte. of Agriculture, M.P.	Action is always taken keeping this recommendation in mind.
			(xiv) C.I.F.T., Cochin.	We are incorporating this recommendation in our data collection system.

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50.	In order to meet the data needs as also to fill in some of the important gaps, the conference reiterated the recommedation of the National Commission on Agriculture to devise an integrated system of agricultural surveys and periodic agriultural and livestock consus es. (Action : IASRI, Ministry of Agriculture and NSSO).	4th, 1979	(i) IASRI (ICAR), New Delhi. (ii) Dte. of Agriculture, M.P. (iii) N.S.S.O., Ministry of Planning, New Delhi.	Ministry of Agricultural, Govt. of India has been addressed in this connection. This is being done as far as possible. In the ten year programme of the NSSO Agricultural survey relating to land holding and livestock enterprises is to be carried out once in ten years.
51.	It was observed that one of the main reasons for non-response and incomplete sample was the administrative problems like transfer of field staff in the middle of data collection work, late appointment of field staff, or sometimes keeping the posts vacant, assignment of other duties, etc. It was, therefore, recommended that the field staff employed for a survey should be completely made available for the field work and their transfer	4th, 1979	(i) IASRI (ICAR), New Delhi. (ii) Commissioner of Fisheries, Gujarat, Ahmedabad. (iii) Dte. of A.H., Punjab. (iv) Deptt. of Agriculture, H.P.	The recommendation has been brought to the notice of state Govts. and various authorities concerned. The SFD is aware of this, and is trying its best to avoid transfer, etc. in the midst of a statistical field programme. It will be kept in view at the time of the transfer. Frequent transfers of the staff engaged in collection of data are not a practice in the Department of Agriculture.

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	avoided throughout the period of the survey. This will also ensure collection of data on a uniform basis. (Action : State Deparments Concerned).	(v)	Dte. of Agriculture, Maharashtra	Necessary steps are already being taken and the concerned agencies prevailed up on to avoid midterm transfers.
		(vi)	P.K.V., Akola, Maharashtra.	This will be followed by all the concerned research workers.
		(vii)	Dte. of A.H., Ahmedabad,	The field staff employed for a survey should be possessing adequate educational qualifications and provided with appropriate renumerations and which likely to remain with the organisation for longer period can only make this possible,
		(viii)	Dte. of Fisheries, Assam, Gauhati.	The recommendation was noted for future.
		(ix)	Dte. of A.H., Haryana, Chandigarh.	These suggestions will be kept in view for future work.
		(x)	Dte. of Agriculture Ahmedabad.	For all the Agricultural Census studies and surveys, V.L.Ws. and talaties mainly serve as field agency. Both these agencies

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				viz. V.L.Ws. and talaties are administratively under the Taluka Panchayats. It is therefore very difficult to implement this recommendation even though, it is importtant. All the Departments concerned however, will be informed of this recommendation.
			(xi) Dte. of A.H., Pune.	The field staff appointed for the survey is completely made available for the field work and their transfers are avoided during the survey period.
			(xii) Dte. of Agriculture, M.P.	The recommendation is taken into account for implementation.
			(xiii) Dte. of A.H., H.P.	In general the transfers are being done only once in a year so that uniformity in the collection of data is maintained.
52.	It was recommended that in addition to organising a detailed training programme for the field staff before commencement of data cellection, regular training of the field staff should be arranged at the beginning of each	4th, 1979	(i) IASRI (ICAR), New Delhi.	It is generally being done.
			(ii) I.I.H.R. (ICAR), Bangalore.	This aspect of the work is given utmost importance in the surveys conducted by the Institute.

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	season/round and the proforma and instructions explained in detail in the light of experience gained.		(iii) Dte. of A.H., Punjab.	It is already being done.
	(Action : IASRI, Agricultural Universities and State Departments).		(iv) Deptt. of Agri, H.P.	Regular training programme for Kangra Agricultural Inspectors/Patwaris are held every season.
			(v) H.A.U., Hissar.	A letter has been written to the Director of Statistics & Evaluation, Govt. of Haryana and Director of Agriculture, Haryana emphasising the need of regular training on data collection to be given to the field staff. It was also impressed that at the beginning of each reason/round of the data collection such training will be extremely useful and the Deptt. of Maths. & Stat. at this University will be extremely happy to participate in such programme. The replies are awaited & necessary action will be taken as & when required.
			(vi) G.A.U., Anand, Gujarat.	The recommendation has already been adopted.

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			(vii) Dte. of A.H., Pune.	As recommended, the field staff is given regular and refresh training every time at the beginning of each season and the perfo-rmae and instructions are explained in detail in the light of experience gained.
			(viii) Dte. of A.H., Karnataka.	This recommendation is being done.
			(ix) U.A.S. Bangalore.	Action is being taken for implementation.
			(x) Dte. of Agri., Maharashtra.	This is already being implemented.
			(xi) P.K.V. Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(xii) G.B. Pant Univensity, Pantnagar.	These require research/technical/administr-ative personnel. Appropriate action can be taken on the availability of such staff.
			(xiii) Dte. of A.H.. Ahmedabad.	This is being implemented.
			(xiv) Dte. of A.H., Haryana, Chandigarh.	Training programmes are organised at appropriate time.

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			(xv) Dte. of A.H. & Vety., Services, Bangalore.	This is being done.
			(xvi) Dte. of Agriculture, M.P.	Regular training of the field staff is arranged at division and district level at the beginning of each season/round for giving detailed instructions regarding filling up of the schedules and classification regarding discrepancies and mistakes noticed in data collection.
			(xvii) Dte. of A.H., H.P.	The training to the field staff is already being imparted every year before starting the survey for the next year.
			(xviii) N.D.R.I., Karnal.	The recommendation has been incorporated at our Institute.
53. It was recommended that intensive and frequent supervision of field work, both preplanned and surprise may be undertaken to solve the field problems and remove conceptual as operational difficulties in data collection. It will be useful to provide the field staff with		4th, 1979	(i) IASRI (ICAR), New Delhi.	It is generally being done.
			(ii) Dte. of E & S, Min. of Agri. & Irrigation, New Delhi.	This is being taken care of under the scheme for timely reporting and improvement of crop statistics being implemented by us.

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	a Handbook of Instruction giving details of sampling design, procedure of selection of units, proforma, Instructions for filling of proforma, time schedule of collection of different items of data, procedure of measurement and observation of units etc. (Action: All Agencies Concerned).		(iii) Commissioner of Fisheries, Gujarat, Ahmedabad.	The field staff are being provided with necessary literature. Exclusive supervisory units manned by suitable statistical personnel are being proposed for the next year (1980 81), for effective regular & surprise inspection over the field work.
			(iv) Dte. of A.H., Punjab.	A hand book for the guidance of the staff engaged for Integrated Sample Survey is being prepared.
			(v) Deptt. of Agri., H.P.	Statistical supervision over field agency is being strengthened.
			(vi) Dte. of A.H., Pune.	The recommedation is being followed.
			(vii) Dte. of A.H., Karnataka.	This recommendation is being done.
			(viii) Chief Conservator of Forests, Trivandrum.	The recommendations are noted for strict adherence when pilot investigations or surveys are taken up.
			(ix) Dte. of Agriculture, Maharashtra.	This is already being implemented.

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			(x) P.K.V., Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(xi) Dte. of A.H., Haryana, Chandigarh.	Action is already being taken.
			(xii) Dte. of. A.H., Ahmedabad.	Possible supervisions of the field work is being provided which could be more intensified after the availability of the team of trained personnels alongwith the facility of a vehicle.
			(xiii) Dte. of Fisheries, Assam, Gauhati.	Action is being taken.
			(xiv) Dte. of A.H. & Vety., Bangalore.	This is being done.
			(xv) Dte. of Agriculture, H.P.	Efforts are made to undertake intensive supervision of field work from the state Head Quarter to solve the problem and operational difficulties of field staff engaged in data collection. A hand book of inst-

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				ructions containing details of sampling design procedure of selecting of units, instructions for filling of proforma time schedule for collection of data on different items during survey rounds has been prepared and supplied to each and every field worker working in monitoring and evaluation cell under Intensive Extension and Research project assisted by World Bank.
			(xvi) N.D.R.I., Karnal.	The recommendation has been incorporated at our institute.
			(xvii) Director of A.H., Pondicherry.	Sample Survey is being done by the Field Staff of this Department regularly. Necessary instructions are given to the field staff for selection, Sampling design, procedures for the conducting of Sample Survey.
			(xviii) C.I.F.T., Conchin.	We are incorporating this recommendation in our data collection system.
54.	It was recommended tnat for an effective sample check on the quality of data collected, a sub-sample of the	1979 4th,	(i) IASRI (ICAR), New Delhi.	The recommendation was noted by the statistician concerned with the conduct of sample surveys.

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	ultimate sampling units may be canvassed by Supervisory officers and the data of supervised sample may be separately processed for judging and assessing the overall quality of data collected. (Action : All Agencies Concerned).		(ii) Dte. of E & S, Min. of Agri. & Irrigation, New Delhi.	This is already being taken care of under the scheme for timely reporting and improvement of crop statistics is being implemented by us.
			(iii) Commissioner of Fisheries, Gujarat. Ahmedabad.	Noted. This will be possible when supervisory units will come into operation in the state.
			(iv) Dte. of A.H., Punjab.	This has been accepted
			(v) Deptt. of Agri., H.P.	Under the scheme of Improvement of crop statistics, sample check data results are prepared independently to assess the quality of field data.
			(vi) Dte. of A.H., Pune.	The recommendation is under consideration.
			(vii) Dte. of Agri., Maharashtra.	This is already being implemented.
			(viii) P.K.V., Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(iv) G.B. Pant University Pantnagar.	These require reesarch/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.

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			(x) Dte. of A.H., Ahmedabad.	This is being done in some cases.
			(xi) Dte. of A.H., Haryana, Chandigarh.	Steps will be taken to do so.
			(xii) J.A.R.I., Barrackpore, (W.B.).	Statistics section scrutinise a part of data submitted for analysis by Scientists of other disceplines. Before analysis, if there is any discrepancy or inconsistency in presenting the data, the data has been usually referred back to the experimenter for proper correction.
			(xiii) C.I.F.T., Cochin.	We are incorporating this recommendation in our data collection system.
55. It was recommended that close scrutiny of schedules may be done and the gaps and discrepancies observed referred to the field agency involved in the data collection without much time lag to minimize errors on account of memory lapse and investigator's bias.		4th, 1979	(i) IASRI (ICAR), New Delhi.	The recommendation was noted by the Statisticians concerned with the conduct of sample surveys.
			(ii) Commissioner of Fisheries, Gujarat, Ahmedabad.	This is being done. The proposed reorganisation of statistical structure at the Head Office will make the job more effective.

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	(Action : IASRI, NSSO and State Departments)		(iii) Deptt. of Agri. H.P.	Steps are taken to correct recording errors by page totalling.
			(iv) Dte. of A.H., Pune.	The recommendation is being followed.
			(v) Chief Conservator of Forests, Trivandrum.	The recommendation are noted for strict adherence when pilot investigations or surveys are taken up.
			(vi) Dte. of Agri., Maharashtra.	This is already being implemented.
			(vii) P.K.V. Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(viii) Dte. of A.H., Ahmedabad.	This is being done.
			(ix) Dte. of A.H., Haryana, Chandigarh.	This is already being done by the department.
			(x) Dte. of Agri., Ahmedabad.	(a) Close scrutiny of schedules received under various surveys and census is being done.

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				(b) Training is being imparted to the field as well as supervisory staff before any survey or census is conducted.
			(xi) N.S.S.O., Ministry of Planning, New Delhi.	The schedules relating to sample checks are scrutinized at FOD Headquarters immediately on their receipt and the discrepancies observed are intimated to the field workers through scrutiny notes and clarifications are obtained. The schedules are rectified as per clarifications before tabulation. The findings of sample checks are brought to the notice of the state Agricultural Statistics Authorities through high level coordination Committee and States Reports. To expedite the work of communication of these findings, the states Reports are now prepared for each season for each State in place of the earlier practice of presenting the report for all the States annually.
56. Since data are generally processed on Electronic Computer, it was recommended that suitable scrutiny and error detection programmes may be prepared not only to eliminate errors		4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	This recommendation has been brought to the notice of Directors of all ICAR Institutes. Regarding the recommendation the following are some of the checks which

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	introduced due to computerisation of data analysis like coding, punching of cards, tabulation, etc. but also other errors and inconsistencies in the body of data. Other methods for detection of these errors like the use of statistical relationships between various factors range of parameter, observed trends etc., may also be employed to detect and eliminate errors. (Action : IASRI and Other Concerned Agencies)		may be implemented by the statisticians/ scientists. 1. Checking for outliers. An outlier is an observed value which is far away from the expected range of values of a variable. Before accepting such outliers proper enquiries should be made with the source from which data collected was made. This indirectly means that every value of the variable accepted for analysis must fall within the range of values which the variable is expected to take. 2. The statistical relationships between different variables should be checked. 3. Whenever data are coded checking should be done to ensure that the correct codes have been used. The codes also should be checked from point of its value being within the range which the codes can take. 4. If the processing is done using mechanical means including electronic computers

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				the data in numeric fields should not be entered with alphabatic data and vice-versa. 5. When coding designs are made it will be preferable to avoid using zero as a code. 6. Missing observations should also be coded so that separate analysis can be done with or without missing data.
			(ii) Commissioner of Fisheries, Gujarat, Ahmedabad.	The fisheries data are not processed on computer. However, at the time of scrutiny of the data, various steps are taken to detect & eliminate errors in the body of the data.
			(iii) U.A.S., Bangalore.	Action is being taken for implementation.
			(iv) P.K.V., Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(v) G.B. Pant Univ., Pant-nagar.	These require research/technical/administ-rative personnel. Appropriate action can be taken on the availability of such staff.
			(vi) Dte. of A.H., Ahmedabad.	State Department of Animal Husbandry has made a beginning to collect data on

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				computer and it is felt that this will serve the purpose.
			(vii) Dte. of Agri., Ahmedabad.	In Agricultural census, close scrutiny and error detection of filled in schedules is being carried out. After scrutiny, coding is being done. During scrutiny whatever discrepancies are observed are communicated to the field staff.
			(viii) Dte. of A.H., Pondicherry.	In the Union Territory of Pondicherry for the compilation of Statistical data the electronic computer has not been used.
57.	Realising the need for making available the data of agriculture field experiments conducted at different Research Stations to scientists and research workers all over the country, it was recommended that a standardised proformae may be developed for recording data of these experiments on a uniform basis. These data could be suitably stored in Agricultural Research Information System at the IASRI which will enable instant avail-	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	The action for developing a suitable proforma is being taken by concerned unit.
			(ii) I.I.H.R. (ICAR), Bangalore.	A memorandum of understanding with detailed code of conduct should be drawn up and circulated among all ICAR Institutes and Agricultural Universities so that this facility is not misused.
			(iii) G.A.U,, Anand	The recommendation was noted.
			(iv) S.B.I. (ICAR), Tamil Nadu.	A proforma was prepared by three of our scientists during 1975 and is being followed to record the data in every project.

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	ability of data of experiments to any user. (Action : Agricultural Universities/ ICAR Institutes).		(v) P.K.V., Akola, Maharashtra.	The Deptt. of Agronomy will take up this work in collaboration with the Deptt. of Agril. Economics and Statistics.
			(vi) J.N.K.V.V., Jabalpur.	The standardisation of proforma to be used uniformity in all the institutions has to be taken by one agency.
			(vii) G.B. Pant Univ., Pantnagar.	Action is being done as part of N.I.F.E. Scheme of IASRI.
			(viii) J.A.R.I. Barrackpore (W.B.).	A standard proforma for uniform recording of data has already been adopted only for the experiments under coordinated research project.
58.	It was observed that sometimes the 4th, administrators and planners wanted 1979 data which were either not readily available or incomplete or were not of good quality. Data from ancillary or other related sources were therefore used for the purpose. It was recommended		(i) I.A.S.R.I. (ICAR), New Delhi.	The recommendation was noted by the statisticians concerned with the conduct of sample surveys.
			(ii) Commissioner of Fisheries, Gujarat, Ahmedabad.	This is being done wherever necessary.

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	that limitations of data supplied may be clearly made known to planners and margins of errors specified. The methedology of teckling incomplete data may also be investigated.		(iii) Dte. of A.H. Punjab.	Limitations of the data supplied will be spelt out to the Administrations & Planners
			(iv) Dte. of A.H., Pune.	The recommendation is noted.
	(Action : IASRI and other Agencies Concerned).		(v) P.K.V., Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(vi) J.N.K.V.V., Jabalpur.	The extract of the recommendations has been sent to Dean of different colleges to bring it to the notice of research workers and taking necessary steps to improve the quality of the data.
			(vii) G.B. Pant Univ., Pantnagar.	Action is being done at this University.
			(viii) Dte. of A.H., Ahmedabad.	This recommendation was noted.
			(ix) Dte. of Fisheries, Assam, Gauhati.	Action will be taken.

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59.	It was recommended that robustness of various survey designs in use at present which were less prone to non-sampling errors should be investigated to determine the effect of deviations and disturbances on the estimates of parameters being studied. (Action : IASRI, Other ICAR Institutes and Agricultural Universities).	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	This recommendation was noted by the Statisticians concerned with the conduct of sample surveys.
			(ii) P.K.V., Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(iii) G.B. Pant Univ., Pantnagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
60.	It was recommended that efforts should be made to provide inbuilt system for quality check in each and every project to ensure constant assessment of quality of data collected. (Action : IASRI and Other Agencies Concerned).	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	The recommendation was noted by the statisticians concerned with the conduct of the sample surveys.
			(ii) Commissioner of Fisheries, Gujarat, Ahmedabad.	Noted, for guidance.
			(iii) P.K.V., Akola, Maharashtra.	This will be followed by all the concerned research workers.
			(iv) J.N.K.V.V., Jabalpur.	The extract of the recommendation has been sent to Deans of different colleges to bring it to the notice of research workers

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				and taking necessary steps to improve the quality of the data.
			(v) G.B. Pant Univ., Pantnagar.	These require research/technical/administrative personnel. Appropriate action can be taken on the availability of such staff.
			(vi) Dte. of A.H., Ahmedabad.	It is not provided and it is required.
			(vii) Dte. of Fisheries, Assam, Gauhati.	Action will be taken.
			(viii) Dte. of A.H., Haryana, Chandigarh.	Efforts will be made to collect the quality data.
			(ix) National Bureau of Plant Genetic Resources, (IARI Campus), New Delhi.	We have already started utilizing IBPGR descriptors wherever available and for other crops as soon as the internationally accepted descriptors will be available they would be utilized by this Bureau.

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			(x) C.I.F.R.I., Cochin.	We are incorporating the recommendation in our data collection system.
61.	It was recommended that once a technique has been developed with the help of pilot sample surveys undertaken by IASRI and passed on to the States for adoption on regular basis, the Institute should actively collaborate and co-operate with the concerned agencies in the States in proper implementation of designs as also in other technical aspects like training of field staff, supervision of field work, etc. This will not only ensure good quality of data but also serve as feed back for further rasearch to bring about improvements in the methodology already developed. (Action : IASRI)	4th, 1979	(i) I.A.S.R.I. (ICAR), New Delhi.	The recommendation was brought to the notice of leaders of projects for developing methodology of sample surveys.
62.	It was recommended that the Statistical Organisations engaged in data collection should establish a cell for cons-tant review and appraisal of data	4th, 1979	(i) Commissioner of Fisheries, Gujarat, Ahmedabad.	The experience of the proposed monitoring cell in the IASRI should go a long way in guiding the establishment of such cell in the states.

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	collection techniques. The cell should devise suitable checks, both internal and external, to ensure accuracy and quality of data. Preparation of suitable schedules for data collection should also be the responsibility of these organisations. As a first step in this direction a monitoring cell or unity may be established at IASRI to develop guidelines to assess and monitor quality of data. (Action : All Concerned Agencies).	(ii)	Dte. of A.H., Punjab.	On the receipt of the guidelines, necessary steps will be taken up.
		(iii)	Dte. of A.H., Ahmedabad.	The department has provided a scheme for monitoring of all the development animal husbandry programme in the State but unfortunately is not included in the Sixth Plan.
		(iv)	Dte. of Fisheries. Assam, Gauhati.	Action was taken.
		(v)	I.A.S.R.I. (ICAR), New Delhi.	A sub-committee has been framed at IASRI to develop guidelines to assess and monitor quality of data.

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The Annual Report issued by the Institute covers all the aspects of its functions and activities and provides useful infermation to research workers in the field of Agricultural Statistics.

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