annual report

1987

INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
(I. C. A. R)
LIBRARY AVENUE, NEW DELHI-110 012

With best compliments from :

Prof. Prem Narain, Director
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ANNUAL REPORT
1987

INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
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LIBRARY AVENUE, NEW DELHI-110 012

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PREFACE

This year (1987) fell the 40th Anniversary of our Country's Independence which was suitably celebrated all over the country. We in our own humble way commemorated this august occasion by organising four National Symposia and bringing out a SOUVENIR highlighting the entire gamut of our research activities through popular articles. The Annual Report presents the panorama of various activities and achievements of this Institute during 1987 and also gives the major recommendations of the four National Symposia.

Coordination Cell has done a commendable job of editing the voluminous material and deserves appreciation. Thanks are due to Shri OP Singh, Technical Assistant and Shri RS Chauhan, Assistant in the preparation of the report and to Shri Mahesh Chand, Smt Rajni Gupta and Smt Harsh Kapoor for efficiently typing the manuscript.

Prem Narain
Director, IASRI

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INTRODUCTION

Aims and Functions

The Indian Agricultural Statistics Research Institute (IASRI) is a premier institute for promoting and conducting research and training in Agricultural Statistics in the country for improving planning and evaluation of agricultural research and development. To achieve these objectives, the IASRI has the following functions:

—To conduct research in experimental designs, sampling methods, statistical genetics, bio-statistics and statistical economics,

—To conduct post-graduate courses leading to M Sc and Ph D degrees in agricultural statistics and M Sc in computer application in agriculture,

—To provide advisory service to agricultural scientists/workers from various agricultural organisations in India and abroad,

—To develop computer software for agricultural research,

—To conduct in-service training courses in agricultural statistics and computer applications and

—To provide consultancy service in data processing.

Origin and Growth

The Institute on the recommendations of the Royal Commission on Agriculture made a modest beginning in 1930 as a STATISTICAL SECTION of the Indian Council of Agricultural Research (ICAR), the then Imperial Council of Agricultural Research. It was then manned by only one statistician with a limited staff. His main responsibility was to assist the agricultural officers in the various provinces of the country in planning of experiments, analysis of data and interpretation of results. In 1933, he was also made responsible for scrutiny of the technical programmes and progress reports of the research schemes of the Council.

The activities of the Statistical Section entered a new phase towards the end of 1943 when following the Bengal famine, the Government of India directed it to undertake research in the methods of collecting crop yield statistics by conducting objective surveys based on the methods of random sampling. This

assignment resulted in the development of the use of random sampling method for estimating yield by crop cutting surveys whose efficiency and practicability was demonstrated in different states. The recognition which this method attained was such that in the course of a few years the method was extended practically to the entire country to cover all principal food crops.

In 1944 the Statistical Section undertook statistical analysis of the 10 years data on goat breeding project at Etah in UP which led, for the first time, to the recognition of the need for application of statistical techniques to animal sciences. As a result several investigations both of methodological and basic nature followed and statistical techniques became integral part of research and development in animal sciences.

The Statistical Section was reorganised with a new name STATISTICAL BRANCH in 1945 into two separate units, each under the charge of a Statistician dealing with statistical application of research in agriculture and in animal husbandry and was headed by Statistical Adviser to the Council (ICAR). The Council also instituted regular post-graduate training courses for professional statisticians and for research workers in the field of agriculture and animal husbandry. Although research and teaching was integrated, a small training unit consisting of whole time professor, assistant professors and demonstrators, was eventually constituted for organising the various courses of study. The Statistical Branch soon acquired international recognition as a training and research institution in the field of agricultural statistics and was made responsible for training foreign students and organising international seminars for the Food and Agriculture Organisation of United Nations.

Valuable contributions were made by the Statistical Branch to the problem of improvement of crop acreage and production statistics. Sampling techniques were developed for securing objective and reliable estimates of marine fish catch and of livestock numbers. By the end of 1952, the crop cutting surveys for the estimation of production of the principal food crops were extended to almost whole of the country. In January, 1953 according to a decision of the Government of India, the work of large scale sample surveys on food crops and a few other surveys was transferred from the ICAR to National Sample Survey Organisation.

In September, 1952 the services of two FAO experts, Dr. Frank Yates, Chief Statistician, Rothamsted Experimental Station, Harpenden (UK) and Prof DJ Finney of Oxford University (UK) were assigned to the Government of India to advise and assist the ICAR in reviewing its research and training activities. As a result of their recommendations the activities of the Statistical Branch expanded in many directions and in August, 1955, it moved to its present campus at Pusa as a STATISTICAL

WING of the ICAR. The campus provided adequate space not only for office accommodation for the technical and the ministerial staff but also for facilities of a library, reading room, class room for the training classes, an auditorium and a hostel with the usual amenities for the students, admitted to the various courses of study.

In recognition of its significant role as a premier institution of training and research it was rechristened as the INSTITUTE OF AGRICULTURAL RESEARCH STATISTICS (IARS) in July, 1959. A mechanical data processing unit was also then added to the Institute.

On the completion of construction of a new four-storeyed building in the campus of Institute in 1964, the mechanical data processing unit was shifted to its ground floor and was expanded with the installation of an IBM 1620 Model-II Electronic Computer and other related equipments, while the first, second and the third floors of the new building provided additional office for expanding technical and ministerial staff of the institute and better accommodation for the Cooperative Canteen and Recreation and Welfare Club. All these facilities enabled the Institute to discharge its functions more efficiently. In October, 1964, new courses leading to M Sc and Ph D degrees in Agricultural Statistics were started in collaboration with the Indian Agricultural Research Institute (IARI), New Delhi which is a deemed university. In April, 1970 the Institute was accorded the status of a full-fledged institute under the ICAR set-up and is since then headed by a Director.

Since the activities of the Institute expanded manifold, a new three-storeyed Computer Centre building was constructed in the campus of the Institute in 1976. A third generation computer B-4700 system was installed in March, 1977 which was inaugurated by Shri BD Jatti, the then acting President of India. A large number of general purpose application software have been developed and are available on library tape. In view of Institute's mandate for research in agricultural statistics rather than in agriculture its name was changed to INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE (IASRI) in January, 1978.

In order to cover the deficiencies in the existing documentation services dealing with agriculture, the Food and Agriculture Organisation of the United Nations initiated a series of studies, in 1971, to establish the Information System for Agricultural Sciences and Technology (AGRIS). After preliminary trials the system started functioning in 1975. As on 1st November, 1977 there were 82 input centres and 77 liason offices all over the world, which contribute to the system. Our country is the third largest (next to USA and Japan) among the national input centres, from the point of number of inputs added to the system every month. The Institute provides selective information service to Scientists in the ICAR institutes and agricultural univer-

sities on references to documents relating to areas of their specific interest.

From October 1, 1983 the Institute is also functioning as a Centre of Advanced Studies in Agricultural Statistics and Computer Application under the aegis of the United Nations Development Programme (UNDP) for a period of 7 years. This aims at developing a centre of excellence with adequate infrastructure and facilities to undertake advanced training programmes and to carry out research in various aspects of agricultural statistics and computer application. Under this project a new course leading to M Sc degree in Computer application in agriculture has also heen initiated.

The Institute has achieved international recognition for its high quality of research and teaching work in the field of agricultural statistics. A number of research workers from the Institute have served as consultants and advisors in Asian, African and Latin American countries. Also, a number of statisticians and students of the Institute are at present occupying high positions in universities and other academic and research institutions of USA, Canada and other countries.

On Nov. 19, 1987 the foundation stone of the multistorey Training-cum-Administrative block of the Institute was laid by the Hon'ble Union Minister of Agriculture Dr GS Dhillon.

Functional Set-up

The Institute has the following six Divisions and four Cells to undertake research, training, consultancy, documentation and dissemination of scientific output.

Divisions :

—Design of Experiments and Analysis of Experimental Data;

—Sample Survey Methodology and Analysis of Survey Data ;

—Forecasting Techniques for Crops, Diseases and Pests ;

—Bio-statistics and Statistical Genetics ;

—Statistical Economics, and

—Computing Science.

Cells :

—Training Administration Cell ;

—UNDP Cell ;

—Coordination Cell ; and

—Monitoring Cell

Management Committee

The Director of the Institute, who is incharge of the overall management of the Institute is assisted in the discharge of his functions by the Management Committee of the Institute (constituted by and under administrative control of the Council) by providing a broadbased platform for the decision making process, by examining the progress of the Institute periodically and by recommending suitable remedial measures for bottlenecks, if any. The Management

Commiitee of this Institute was reconstituted for a period of 3 years on Oct 2, 1986.

Meetings of the management committee were held on July 22 and December 10, 1987.

Research Collaboration

The collaborative projects which remained in operation during 1987 are as follows :—

Sl No.	Title	Collaborating Agency	Start	Completion
1	2	3	4	5
1	Sample survey for cost of cultivation, agronomic practices, area and yield rates of potatoes	CPRI, Shimla	Nov, 83	Dec, 87
2	Pilot studies for developing statistical methodology for estimating the losses due to diseases and pests in bovines	HAU, Hissar	Jan, 85	Apr, 88
3	Planning, designing and statistical analysis of experiments planned under All India Coordinated Agronomic Research Project at cropping systems research centres and on cultivators' fields	(i) Deptt of Agronomy, Agricultural Universities (ii) State Department of Agriculture, Manipur	Mar, 86	Sep, 88
4	Planning, designing and statistical analysis of the data relating to experiments conducted under the All India Coordinated Research Project on Long Term Fertilizer Experiments	(i) Deptt of Soils, ICAR Institutes (ii) Deptt of soils, State Agri. Universities	Jul, 85	Continuing

1	2	3	4	5
5	A within year growth model for pre-harvest forecasting of crop yields	IARI, New Delhi	Sep, 87	Aug, 89
6	Statistical aspects of physiological kinetics in animal nutrition	(i) IVRI, Izatnagar (ii) NDRI, Karnal (iii) CSWRI, Avikanagar	Aug, 87	Jan, 91
7	Pilot studies on pre-harvest forecasting of yield of stick-lac in Bihar	Indian Lac Res. Institute, Ranchi	1988	Continuing

Finance

Budget statement for the financial year 1987-88

Head	Non-Plan		Plan	
	Funds (Rs)	Expenditure (Rs)	Funds (Rs)	Expenditure (Rs)
Pay and allowance	—	1,86,17,270	—	95,420
Travelling allowances	—	3,01,063	—	1,72,487
Recurring contingency	—	39,90,232	—	12,73,321
Total		2,29,08,565	—	15,41,228
Non recurring contingency				
(a) Works	—	—	—	57,12,358
(b) Equipments	—	—	—	5,25,221
(c) Library books and Journals	—	—	—	4,49,170
(d) Vehicles	—	—	—	—
(e) Coordinated project on data collection	—	—	—	—
(f) Electronic Computer	—	—	—	1,329
(g) Others	—	—	—	—
Total		—		66,88,078
Grand Total :	212 Lakhs	2,29,08,565	85 Lakhs	82,29,306

Abstract (1987-88)

	Funds (Rs.)	Expenditure (Rs)
Non-Plan	2,12,00,000	2,29,08,565
Plan	85,00,000	82,29,306
Total	2,97,00,000	3,11,37,871

Leave Salary and Pension contribution

Non-Plan	5,823
Plan	8,012

PROGRESS OF PROJECTS

DIVISION OF DESIGN OF EXPERIMENTS AND ANALYSIS OF EXPERIMENTAL DATA

Mandate :

To develop statistical designs and methodologies for analysis of data relating to field and laboratory experimentation in agriculture and animal sciences

Thrust Areas :

- Cropping system research
- Crop strategies for dryland agriculture
- Agriculture information system
- Yardsticks of additional production
- Designs for animal experiments

Projects in operation thrust areawise :

No.	Project title	Project leader and associates	Duration
1	2	3	4
	Cropping System Research		
1	Statistical assessment of cropping sequences in different agro-climatic regions of the country	KC Bhatnagar GL Khurana CR Leelavathi	Jul 85-Dec 87
2	Planning, designing and analysis of experiments planned under All India Coordinated Agronomic Research Project at cropping system research centres	PN Soni Rajinder Kaur Ajit Kaur Madan Mohan	Continuing nature
3	Planning, designing and analysis of experiments planned under AICARP on cultivators' fields	PN Bhargava HC Jain PP Rao Mahesh Kumar	Continuing nature

1	2	3	4
4	Analysis of data for study of inter-cropping experiments using bivariate analysis techniques	Basant Lal PN Bhargava Aloke Lahiri	Jan 85-Dec 87
5	A study of factors favourable for homogeneity of variances of groups of experiments on sugarcane crop	PP Rao RK Ghai MP Saxena PR Yeri	Jan 85-Dec 87
6	Methodological studies and critical analysis of data relating to repeated experiments with some common treatments	JK Kapoor VK Gupta	Nov 85-Dec 89
7	Statistical studies on nitrogen economy through organic sources	Rajinder Kaur Ajit Kaur Madan Mohan PN Soni	Jul 85-Dec 87
8	Planning, designing and statistical analysis of the data relating to experiments conducted under AICARP on Long Term Fertilizer Experiments	PN Soni MR Vats DK Sehgal DK Mehta	Continuing nature
9	A study of interactions with reference to resource constraints of agronomic factors	GL Khurana KC Bhatnagar	Aug 87-Dec 88
	Crop Strategies for Dryland Agriculture		
10	A statistical study for characterization of drought in relation to a crop	Asha Saxena PN Bhargava SC Mehta	Jul 84-Dec 87
	Agriculture Information System		
11	Agricultural field experiments information system	RK Ghai PN Bhargava PK Batra MP Saxena PR Yeri	Continuing nature
12	Agricultural experiments information system for animal sciences	GC Chawla A Dey	Continuing nature

1	2	3	4
	Yardsticks of Additional Production		
13	Development of suitable statistical methodology for construction of yardstick for milk production through feed intake	SN Bajpai	Aug 87-Dec 88
14	Yardstick of additional production from the use of crop improvement measures	VN Iyer Onkar Swarup	Mar 77-Mar 87
	Designs for Animal Experiments		
15	Studies on designs for animal experiments	A Dey VK Gupta	Oct 85-Sep 88
16	Change-over designs—their construction and cataloguing useful for animal experiments	GC Chawla A Dey VK Gupta	Nov 85-Dec 87
17	Studies on Robust designs	R Srivastava A Dey VK Gupta	Aug 87-Dec 88

1 **Statistical assessment of cropping sequences in different agroclimatic zones of various states in the country**

Data of cropping sequence experiments conducted in nine agro-climatic zones of various states in the country under the auspices of AICARP (ICAR) during the years 1979-85 were statistically assessed to compare the performance of cropping sequences with respect to agronomic productivity, monetary returns energy equivalents (Proteins, carbohydrates and calories). Six to eight cropping sequences were compared in each agroclimatic zone. These sequences were also assessed on the basis of per day availability of cereals, pulses and oilseeds and through them per day availability of proteins and energy to a household growing these sequences on one hectare of land under the assumption that the average family size of the household is five. The salient results obtained are summarized below ;

Sub-tropical zone of J & K

The most promising sequence was rice-wheat-fallow yielding total grain of 8603 kg/ha, Rs. 10976/ha of monetary returns, 735 kg/ha of proteins, 6517 kg/ha of carbohydrates and 29.71 kg x 10^6 calories/ha.

Northern dry zone of Karnataka

In terms of grain productivity the

most suitable sequences were jowar-wheat-jowar (9055 kg/ha) and jowar-grain-jowar (8672 kg/ha). In terms of energy these sequences were at per providing an average of 1000 kg/ha of proteins, 6310 kg/ha of carbohydrates and 30.96 K x 10^6 calories/ha. Highest returns (Rs. 14906/ha) were provided by blackgram-cotton sunflower.

Southern zone of Kerala

The most promising sequence was observed to be rice-rice-groundnut yielding 7662 kg/ha of total grains, Rs. 13000/ha of monetary returns, 963 kg/ha of proteins, 6327 kg/ha of carbohydrates and 35.52 K x 10^6 calories/ha.

North Konkan central zone of Maharashtra

In terms of grain productivity and energy equivalents the most preferable sequence was rice-jowar-greengram (7246 kg/ha) of grains, 712 kg/ha of proteins, 5357 kg/ha of carbohydrates and 25.06 K x 10^6 calories/ha. Rice-groundnut provided the highest returns (Rs. 8645/ha).

Scarcity zone of Maharashtra

Higher grain productivity was obtained from jowar-grain-bajra (F) (7837 kg/ha) and jowar-wheat-groundnut (7755 kg/ha) sequences in addition to the yields of summer crops. In terms of gross returns these sequences were at per (an average of Rs. 16165/ha). In terms of proteins and calories the suitable sequences were jowar-wheat-groundnut and maize-wheat-groundnut.

The sequences jowar-grain-bajra (F) were consistent in terms of gross returns where as jowar-wheat-groundnut and maize-wheat-groundnut were consistant in terms of energy equivalents.

Southern humid plain zone of Rajasthan

Rice-wheat-greengram yielded more grown than maize-wheat-greengram (7387 kg/ha as against 6147 kg/ha) whereas in terms of monetary returns both sequences performed equally well. In terms of energy equivalents rice-wheat-greengram performed better and was seen consistent in its performance over the years.

Irrigated Northern Western plains zone of Rajasthan

The most promising sequence in terms of grain productivity or carbohydrates was bajra-wheat-greengram (8603 kg/ha of grains and 4317 kg/ha of carbohydrates). Groundnut wheat showed an edge over other sequences with regard to monetary returns (Rs. 14027/ha), proteins (1270 kg/ha) and calories (30.12 K x 10^6 units/ha) and was also seen consistent in its performance over the years.

South Western Semi-Arid zone of Uttar Pradesh

Higher grain productivity were obtained from maize-wheat-greengram (7486 kg/ha) and bajra-wheat-greengram

(7387 kg/ha). In terms of monetary returns and energy equivalents, maize-wheat-greengram performed better than other sequences. Maize-mustard-greengram was another sequence containing not only cereals, pulses and oilseeds but gave higher returns (Rs. 10190/ha). Maize-wheat-greengram was consistent in its all round performance over the years.

New alluvial zone of West Bengal

The promising sequence in terms of grain productivity (9463 kg/ha) and proteins (932 kg/ha) was rice-wheat-maize. Rice-potato-jute was the most profitable sequence with regard to monetary returns (Rs. 28680/ha), Carbohydrates (7656 kg/ha) and calories (33.22 K x 10^6 units/ha). Rice-potato-jute and rice-wheat-maize were generally consistent in terms of monetary returns, carbohydrates and calories whereas in terms of proteins, rice-linseed-maize or rice-linseed-jute were consistent.

2 **Planning, designing and analysis of experiments planned under AICARP at cropping system research centres**

Critical statistical analysis of the data for the year 1985-86 in respect of 600 complex experiments conducted at 42 cropping system research centres was carried out. These include some newly introduced experiments for which appropriate statistical methodology was developed. These experiments related to developing suitable planting pattern, fertilizer schedules for different inter-cropping systems, identifying crop sequences under adequate input conditions and resource constraints. In addition to this the experiments involved testing of new fertilizer material. Most of these expts. are being conducted on the same site for 4-5 years in order to obtain dependable recommendations based on the data gathered. The types of designs adopted for the conduct of these experiments are RBD, split-plot, split-split-plot, confounded factorial, compact family block design etc. A comprehensive report bringing out the salient results based on the experimental data for the year 1985-86 was brought out in collaboration with Project Coordinator (AICARP). The results which are of immense agronomic interest and extension value would be utilised for formulating results for practical utility.

Layout plans for a number of experiments conducted during 1986-87 were prepared and sent to the cooperating centres. Trainings were arranged at a number of locations to acquaint the scientists and research workers in the conduct of the experiments.

3 **Planning, designing and statistical analysis of experiments planned under All India Coordinated Agronomic Research Project on cultivators' fields.**

The data for about 8,000 experiments conducted during 1985-86 spread over 43 districts in the country were available

for statistical analysis. The data was analysed suitably by taking into consideration the sampling design as well as the design adopted for the layout of the experiments. The sampling design adopted for the selection of experimental site was stratified multi-stage. The zones were the strata and blocks were the first stage of sampling unit and within blocks, villages were the second stage and the cultivator was the ultimate unit of selection for the identification of the site. Based on the results obtained from these experiments, a report of the project has been prepared which is to be presented in the annual workshop of the project to be held in March, 1988. The data for the experiments planned in kharif and rabi during 1986-87 is under processing.

About 14 types of experiments were identified during 1985-86 and 1986-87. The principal emphasis on the experimental programme during this period was on identification of the suitable cropping systems as well as their fertilizer management practices. In the rice growing areas, the experiments were planned to examine the reduction of fertilizer requirement for rice-wheat sequence by about 25-50%. It was observed that there is a feasibility of reducing the fertilizer requirement for rice but for wheat the fertilizer requirement have to be at recommended level. Similar type of experiments were also planned in dryland areas and it was confirmed in dryland areas that there is a feasibility of having two crops in a region where the annual rainfall is in the range of 750 to 1000 mm. The experiments planned to study the response on pulses and oilseeds revealed that for pulses the application of balanced dose of fertilizer namely at $N_{20}P_{40}K_{20}$ provides a good response and the costbenefit ratio for most of the regions, was in the range of 2-3. For oilseeds, the balanced dose of fertilizer was found to be quite beneficial and provided a good cost-benefit ratio.

An agronomic survey was initiated in the ECF districts to identify the different crop sequences adopted in the district and their agronomic practices, the constraints for non-adoption of recommended cropping pattern as well as the recommended practices and to develop the information on the labour potentials under different cropping patterns presently adopted in the district. The sampling plan for the enquiry was stratified multi-stage which was more or less the same as that obtained for the conduct of expts. on cultivators' fields. The survey was however completed in about 10 districts during the year.

4 Analysis of inter-cropped data through bivariate technique

Bivariate method of analysis was adopted to analyse the data on intercropping experiments conducted under AICARP to identify the suitable crop continuations and suitable methods of sowing the main crop and level of fertility to the intercrop It was observed that growing main crop with skip row method and application of 25% of the recom-

mended dose to the intercrop give higher return.

5 A study of factors favourable for homogeneity of variances of groups of experiments on sugarcane crop

The objective of the project is to find out the optimum conditions under which an experiment on sugarcane may be carried out for a set of years so that the experiments of error variances may become homogeneous.

Secondary data of 430 groups were collected from the volumes of National Index of Agricultural Field Experiments of the Institute. The data was subjected to χ^2—tests of significance of studying the association of various factors like soil type, block size, plot-size etc. with homogeneity of error variances.

The study revealed that in case of manurial type of experiments, if the block size is less than or equal to 700 sq. metre there are greater chances of error variances being homogeneous whereas for experiments carried out on clay loam or clayey type of soil the block area adopts should be less than 600 square metre. It was observed that plot size adopted in the experiments is favourable for homogeneity of error variances if it is less than or equal to 60 square metre.

6 Methodological studies and critical analysis of data relating to repeated experiments with some common treatments

The objectives of the project are : (i) to examine the applicability of the available methods of combined analysis of experiments when at least some treatments, not necessarily all the treatments are common to all the experiments. (ii) To examine the applicability of available methods in the literature for combined analysis of experiments when some treatments are common to some experiments and not necessarily to all the experi ment. (iii) To develop some new method of analysis of series of expts, covering the situation (i) and (ii) above.

The applicability of methodology developed for analysing a group of experiments conducted in R.B.D. with varying parameters has been examined for some groups of experiments conducted on wheat crop having the error variances of the same order chomogeneous). The analysis of a group of two experiments conducted on potato crop and also conducted in factorial in R.B.D. with two factors at different levels, having some treatments common has been carried out through fitting of orthogonal polynomials for the levels of factors occuring at unequal frequencies in the combined set up. The design metrix X is formed from the co-efficients corresponding to linear, quadratic and cubic components etc and the estimates of various effects were obtained from $(X^1 X)^{-1} X^1 Y$.

7 Statistical studies on nitrogen economy through organic sources

The project was initiated with the

objectives (i) to study the direct and residual effects of nitrogeneous fertilizers applied alone or in combination with organic sources like FYM and Azolla in crop sequences and to determine the extent to which nitrogen could be substituted through these sources and (ii) to study the comparative performance of slow release nitrogeneous fertilizers and urea in rice based cropping systems. The study is based on the relevent data gathered under AICARP. To meet the objectives the data were subjected to critical statistical analysis. Stability of treatments was assessed through regression technique. Non-parametric methods based on ranks were used to cover various situations. The study has brought out very useful results of agronomic interest and extension value. It has identified the sources and their proportions which could substitute for chemical nitrogen without any reduction in yields of crops taken in sequence.

8 **Planning, designing and statistical analysis of data relating to experiments conducted under the All India Coordinated Research Project on Long Term Fertilizer Expts. (LTFE).**

Based on the statistical analysis of the data for the year 1984-85, a national report of the project was prepared in collaboration with the Project Coordinater, Long Term Fertilizer Experiment and presented in the annual workshop held during May, 1987. Some of the salient results obtained are :

—Balanced fertilization of NPK has shown to maintain the yield stability of crops. Based on appropriate response function fitted to the data, the response maximising dose for most of the crops in the sequence varied from 120-150 percent of the optimum level. Profit maximising doses for the crops were very much close to 100 percent of the optimum NPK levels justifying the application of fertilizer at this level to obtain economic yield for the crops in the long run.

—The linear component of the year treatment interaction was more or less pronounced for different crops at Ludhiana, Palampur, Barrackpore and Pantnagar centres.

—Application of 100 percent NPK applied in conjunction with FYM indicated highest rate of appreciation or minimum deterioration for different crops.

—The long term fertilizer experiment have run for more than 16 years at 11 cooperating centres and have shown a sizeable built-up of phosphorus or serious depletion of some other nutrients in the soil indicating an urgent need to examine whether there could be any reduction or even temporary stoppage in the application of P or addition of other nutrient level. This is to be examined by spliting the treated plots into sub-plots. The manner this is to be done and the

methodology which should be adopted for the analysis of the resulting data were examined.

9 A study of interactions with reference to resource constraints of agronomic factors

The present agricultural technology emphasizes the need for developing a suitable package of practices for different cropping sequences. In view of the limited resources such as irrigation, fertilizer, weed control and plant population, the cultivators are reluctant to use the recommended practices for different cropping systems. It is essential to identify the hierachy of limiting factors to evaluate their importance including all possible interactions and to estimate the effect of progressive removal of these constraints on crop production. It would be possible to develop suitable package of practices by rationalising input use towards higher production. Accordingly, the project was initiated in September, 1987 with the objectives :

—To identify the interactions which could be exploited to obtain high crop production in respect of different crops at reduced levels of certain agronomic factors.

—to study the optimum number of replications, locations and years required to test the performance of such interactions.

To meet the first objective, multiple regression technique as given in (Draper and Smith 1966, Curnow and Mead, 1983) would be considered for fitting different suitable regression models for obtaining an important interaction variable.

The information obtained in the form of r.s.s. and or pure errorss would be used for comparing different regression models to obtain important interaction variable. After obtaining the important interaction variable, its mean yields would be noted and with the help of least significant difference test, the interaction at reduced levels of agronomic factors could be identified.

To meet the second objective, information on the importance of an interaction (a package of practice) with location, with year and with year location would be obtained by using the techniques adopted by Anderson and Bancroft, 1952 and Rasonusson and Lambert, 1961.

Scrutiny and compilation of data were in progress.

10 A statistical study for characterization of drought in relation to a crop

The project was initiated with an objective to quantify drought threshold value for a crop and to obtain the chances of occurrence of drought. A method developed by Barger and Jhon was modified to obtain threshold values for groundnut, bajra and cotton for Ahmednagar and Bijapur. The chances of occurrence of drought were obtained by fitting

gamma distribution to rainfall. It was found that though the threshold values were lower for Ahmednagar than Bijapur for groundnut crop the chances of occurrence of drought of all the duration starting 13 weeks after sowing were higher for Ahmednagar than Bijapur.

11 Agricultural field experiments information system

The details of all the experiments collected under the project were brought out in the form of compendia volumes, but now the work has been re-organised into Agricultural field experiments information system and made computer based. This system would be based on the development of data bank which would store on magnetic tapes for future retrieval for experimental data in respect of field experiments conducted during 1978 and onwards at different research stations in the country. From the data collected under the project, an Annual Index giving brief details on the object, site and year of conduct of experiment is prepared for each experiment reported during a particular year.

During the year an Annual Index, Vol. XI giving the details of experiments reported by the regional staff during 1982-83 was printed. The preparation of crop wise reports in respect of experiments conducted in the country during 1966-77 giving results in summarised form alongwith details of treatments and other ancillary information were taken up. Reports on oilseeds and sugarcane experiments were under preparation. In addition, for the period 1978 onwards, the regional staff reported during the year, experimental data in respect of about 3800 experiments on the coding schedules of agricultural field experiments information system while about 675 experiments were reported on the prescribed proformas. Inclusive of these, about 8000 experiments on the coding sheets reported so far for the system and processing of data was in progress for storage on magnetic tapes.

12 Agricultural experiments information system (Animal sciences)

The objectives of the project are to collect data on a large number of experiments in the various disciplines of animal sciences carried out by various institutes/ Agril. universities in the country, to prepare instruction manual for data preparation; to put the data in an approved format and prepare the coding sheets and to get retrieve information according to the querries made etc.

During the year under report, one instruction manual for the animal nutrition expts was prepared. Data pertaining to animal and/poultry nutrition expts conducted at OUAT, Bhubaneswar (Orissa) were put in an approved format and the coding sheets were filled up for storing the data in magnetic tapes. The work of preparation of annual index, and data structure methodology were in progress.

13 **Development of suitable statistical methodology for construction of yard-sticks for milk production through feed intake**

Data from 111 experiments conducted on milk production at 13 important research stations during past 3 decades was collected from the project 'National Index of Animal Experiments'. These experiments provide information on milk production for 4 indigenous breed of buffaloe, cows and 8 indigenous breed of cattle cows alongwith information 12 crossbred cows. Statistical procedures were being applied for construction of yardsticks of milk production through animal feeds consisting of various combinations of concentrates, dry fodder and greens available in different seasons of the year for the entire country.

14 **Yardsticks of additional production from the use of crop improvement measures**

The aim of the project is to prepare single and composite yard-sticks of additional production and work out benefit cost ratios using different response functions for crops from the use of fertilizers. The project was taken up based on the recommendations of the National Commission on Agriculture and ICAR Quinquennial Review Team for the period 1971-81 as also to meet the requirements of planning commission and Ministry of Agriculture (Deptt. of Fertilizer).

Single and composite sticks of additional production and benefit cost ratios for rice, wheat, maize, jowar and bajra using quadratic function were completed. Similar work using Mitcherlich's function is nearing completion.

15 **Studies on designs for animal experiments**

The objectives of the project are :

—to review the existing literature and examine the feasibility of existing designs for animal nutrition/ physiology expts ;

—to identify situations where existing designs are in adequate and to construct new designs ;

—to suggest optimal designs for small number of units ;

—to prepare a catalogue of designs suitable for animal experiments.

Studies on optimal designs according to various optimality criteria were made and in some cases, new optimal designs were discovered theoretically as well as through a computer algorithm. It was proposed to initiate work on the preparation of the catalogue of designs in the period January-March, 1988.

16 **Change-over designs—their construction and cataloguing useful for animal experimentation**

This project was initiated to examine the feasibility of adopting the existing designs with their optimal properties and

to prepare a catalogue of change-over designs useful in animal experiments. Keeping this in view the literature on change-over designs and other related designs has been reviewed in the context of their applicability in animal science research. The situations existing in experiments on animal sciences were also reviewed from experiments collected under the project 'National index of animal expts'. For tne purpose of adopting the existing designs, various lists of series of change-over design, outline of construction, steps of analysis have been prepared.

A methodology of two factor study was evolved in which the levels of one factor are nested within that of the other factor by adopting williams squares and mutually orthogonal latin squares (MOLS).

17 Studies on Robust designs

This project was launched in July, 1987 with a view to study the designs which are robust against disturbances like outliers, missing observations, presence of systematic trend and inadequacy of assumed model.

The work on robustness of orthogonal main effect plans, balanced incomplete block designs against missing observation(s) was in progress.

SAMPLE SURVEY METHODOLOGY AND ANALYSIS OF SURVEY DATA

Mandate :

To evolve sample survey techniques for estimation of various parameters of interst relating to crops, livestock, fishery, forestry and allied fields and to develop techniques for analysis of survey data

Thrust Areas :

—Cost of production studies
—Cost of cultivation of horticulture crops
—Statistical modelling for production and growth
—Inland fish catch estimation
—Crops and livestock productivity studies
—Demographic parameter estimation
—Assessment and evaluation studies
—Operational feasibility studies
—Imperfect frames

Projects in operation thrust areawise :

No.	Project title	Project leader and associates	Duration
1	2	3	4
	Cost of Production Studies		
1	Pilot sample survey for estimation of cost of cultivation of oilseeds and pulses	AK Banerjee DL Ahuja OP Kathuria SK Raheja	Sep 84-Mar 89
2	A study of variability of various components of cost of cultivation of vegetable crops at different stages of sampling and determination of sampling sizes at given level of precision	Satya Pal AK Srivastava	May 83-Dec 86

1	2	3	4
3	Statistical summarisation of results on yield rates, areas, and extent of adoption of improved practices for HYV of millets (maize, jowar, bajra) during IV and V Five Year Plan periods	GS Bassi PC Mehrotra SK Raheja	Jan 84-Sep 87
4	Sample survey for cost of cultivation, agronomic practices, area and yield rates of potatoes	SS Gupta SK Raheja AK Srivastava PS Dahiya * VP Malhotra*	Nov 83-Dec 87
5	A study of yield trends of wheat in India during last three decades	DL Ahuja A Dey AK Banerjee SK Raheja	Jan 84-Mar 87
6	Pilot sample survey for estimation of area of grazing land and its utilisation, Tamil Nadu	Anand Prakash JS Maini BC Saxena	Dec 84-Dec 88
7	Pilot sample survey for estimation of losses, price spread at various stages and cost of cultivation of vegetable crops, Pune	AK Srivastava SK Raheja DC Mathur Satya Pal	Feb 85-Mar 89
	Cost of Cultivation of Horticulture Crops		
8	Pilot sample survey for study of cost of production of chikoo and its marketing practices in Valsad distt. (Gujarat)	MS Batra OP Kathuria	Jan 82-Dec 87
9	Pilot sample survey for determining the cost of production and to study the marketing practices of orange in Nagpur and Amrawati distt. of Maharashtra state.	OP Kathuria BL Kaul MS Batra	Apr 78-Mar 87

* of CPRI, Shimla

1	2	3	4
	Statistical Modelling for Production and Growth		
10	Pilot survey to develop statistical models for production and culling pattern in poultry	KPS Nirman JP Jain Balbir Singh	Jan 86-Feb 89
	Inland Fish Catch Estimation		
11	Pilot survey to evolve a sampling methodology for estimating the resources and total catch of inland fish in a region of Orissa	OP Kathuria HVL Bathla	Dec 84-Dec 88
	Crops and Livestock Productivity Studies		
12	Pilot sample survey to evolve an appropriate methodology for estimation of lac production	DC Mathur OP Kathuria AK Srivastava SC Sethi	Feb 84-Mar 92
13	Pilot sample survey for estimation of production of hides and skins in Chingleput and North Arcot districts of Tamil Nadu and Surat District of Gujarat	JP Goyal KB Singh RS Khatri	Dec 84-Dec 87
14	Statistical investigations on economics of pig production	TB Jain UG Nadkarni	Feb 84-Sep 87
	Demographic Parameter Estimation		
15	Pilot studies for estimation of birth and death rates in ovines	UG Nadkarni SN Arya Balbir Singh	Feb 84-Mar 88
16	A comparative study of some methods for estimating mortality rates in bovines	SN Arya UG Nadkarni	Sep 81-Aug 87
17	Study of distribution of age specific mortality and fertility rates in bovines	LBS Somayazulu SN Arya SC Aggarwal	Mar 83-Sep 87

1	2	3	4
18	Pilot studies for developing statistical methodology for assessing the losses due to diseases and pests in bovines	HP Singh JP Jain BC Saxena	Jan 85-Apr 88
	Assessment and Evaluation Studies		
19	Studies on comparative performance of mixed farming involving crops, live-stock, poultry and fish	Shivtar Singh RL Rustogi HO Aggarwal	Sep 84-Sep 87
20	Pilot sample survey to study the impact of flood on agricultural production in a region of UP	OP Kathuria AK Srivastava Jagmohan Singh	Oct 81-Sep 87
21	Pilot sample survey for estimation of post-harvest foodgrain losses	RK Khosla Prem Narain Rajinder Singh HC Gupta	Apr 85-Mar 89
22	Pilot sample survey for developing sampling methodology for assessment of impact of National Demonstration Trial on crop yield	MG Mittal	Oct 81-Sep 87
23	A study of employment and income of small farmers and landless labourers	Randhir Singh AK Srivastava	Mar 83-Dec 87
24	Sample survey for study of constraints in transfer of new agricultural techno-logy under field conditions	SK Raheja PC Mehrotra VS Rustogi SS Gupta SS Shastri NK Ohri GS Bassi RC Gola MS Narang	Jan 84-Dec 90
25	Pilot sample survey for estimating the energy utilisation for different levels of adoption of modern technology in agriculture	KK Tyagi PC Mehrotra SK Raheja Satya Pal	Jul 83-Sep 87

1	2	3	4
26	Pilot sample survey to develop sampling methodology to study impact of integrated rural development programme on employment potential and income generated by the programme for beneficiaries	MG Mittal	Jul 87-Jun 91
	Operational Feasibility Studies		
27	Pilot sample survey for developing a sampling methodology for estimation of livestock products on the basis of data collected as a part of the normal work of field agency of animal husbandary department	RS Khatri JP Goyal KB Singh	Nov 84-Feb 88
28	Pilot sample survey for relative merits of the data obtained by actual weighment and those through enquiry for estimation of milk production	KB Singh JP Goyal RS Khatri	Feb 85-Apr 88
29	Development of a suitable statistical methodology for estimating extent of labour utilisation in livestock and poultry keeping in rural areas, Meerut (UP)	SP Verma JP Jain	Jan 85-Oct 87
30	Development of a suitable methodology to study the effects of housing condition and other related factors on milk production under village conditions	VT Prabhakaran Bhagwan Das	May 83-Oct 87
	Imperfect Frames		
31	Use of imperfect frames in census and surveys	Randhir Singh	Sep 83-Dec 87

1 Pilot sample surveys for estimation of cost of cultivation of oilseeds and pulses

Presently no reliable data are available for cost of cultivation of important oilseed and pulse crops. Accordinly study on this aspect was taken up with the aim to evolve suitable sampling procedure for estimation of various components of cost of production of oilseed and pulse crops and to work out an index of cost of cultivation of these crops from year to year taking into account the price fluctuation. The project is in operation at two centres viz Bharatpur (Rajasthan) and Vidisha (Madhya Pradesh). At Bharatpur centre the crops covered are groundnut, sesamum (kharif) and mustard and Vidisha centre moong urad (kharif) and gram (rabi). The data collection work was continued and the processing of data was in progress.

2 A Study of variability of various components of cost of cultivation of vegetable crops at different stages of sampling and determination of sample sizes for given levels of precision

This study is based on the secondary data collected for estimation of cost of cultivation of vegetable crops in rural area of Delhi by ASIRI during 1978-81. The statistical analysis of the data was completed. On the basis of this study it is proposed that in surveys on cost of cultivation of crops involving multiple pickings, large sample for second stage of sampling and stratification according to holding sizes of the cultivators are more appropriate for getting a clear picture about cost components and their variability at each stage of sampling.

3 Statistical summarisation of results on yield rates, area and extent of adoption of improved practices for HYV of millets (bajra, jowar, maize) during IV and V five year plan periods

The project aims to highlight the performance of hybrids of bajra, jowar and maize over space and time by utilizing the secondary data collected on 'Sampling investigations into high yielding varieties programme conducted during the 4th and 5th five year Plan periods in selected districts of the country'.

The study revealed that the average yield of hybrid varieties of bajra, jowar and maize was highly variable over the period 1970-71 to 1979-80 in all the districts.

The average yield performance of hybrid varieties of all the three millet crops under study namely bajra, jowar and maize over the two plan periods was highly significant. Average rates of consumption of fertilizer also registered a decline during the 5th Plan period to 4th Plan period for hybrid varieties of bajra, jowar and maize respectively.

The main factors limiting the large scale adoption of HYV seeds were lack of water, lack of funds, non-availability

HYV seeds (adequate quantity/specific varieties/quality), susceptability to pests and disease attack, poor quality and taste of produce.

4 Sample survey for cost of cultivation, agronomic practices, area and yield rates of potatoes

The survey was taken up in Farrukhabad during rabi 1983-84 with the aims to estimate the cost of cultivation, area and yield rates of important varieties of potatoes and to study the extent of adoption of improved agricultural practices. The sampling design for cost of cultivation and agronomic enquiry was one of stratified two stage random sampling, the villages and cultivators growing potato being the primary and second stage units of sampling. For yield estimation two more stages of sampling viz fields and plots were involved.

The analysis on area and agronomic enquiry was completed during the year. Kufri Bahave was most popular high yielding variety and gave an average yield of 294.69 q/ha. The other important varieties grown were Kufri, Sindhwi, Military and Kufri Chandramukhi which gave yield rates of 296.77, 280.21 and 299.86 q/ha respectively. Pooled over different HYV the average yield was around 293 q/ha which was about 10 per cent more than corresponding yield of local varieties.

The project report was under finalisation.

5 A study of yield trends of wheat in India during last three decades

The aims of the project are (i) to study the trends of yield rates and area under wheat during last three decades, and (ii) to build up forecasting models for area under wheat and its projection.

From the analysis of the time series data, it is found that the Box-Jenkins methodology has produced forecasts which are quite accurate in the sense that the forecasts compare favourably with the actual figures, wherever available. However, the technique should be used only for taking short term forecasts to get reliable fore cast-estimates and number of observations used for building up forecasting model should be sufficiently. large. The project report was finalised.

6 Pilot sample survey for evolving a sampling technique for estimation of area of grazing land and its utilisation —Tamil Nadu

The aims of the project are (i) to evolve a sampling technique to estimate area of grazing land, (ii) to estimate average yield per unit grazing area in different seasons, and (iii) chemical analysis and botanical classification of herbage beside some general information relating to the livestock grazing. Stratified multistage sampling design was adopted with villages and grazing areas as the ultimate units for area and yield studies respectively.

The field work was completed and the statistical analysis of the data was in progress.

7 Pilot sample survey for estimation of losses, price spread at various stages and cost of culivation of vegetable crops

The aims of the project are (i) to evolve a suitable sampling methodology for estimating the losses taking place in marketing of vegetables, (ii) to study the price spread of vegetables at various stages of marketing, (iii) to study the various marketing practices prevalent in the vegetable marketing trade and (iv) to evolve a suitable sampling methodology for estimating the cost of cultivation per unit area and production of important vegetables.

The field work of the project was continued under the administrative control of Director of Horticulture, Maharashtra State, Pune. The project has two important aspects (i) cost of cultivation and (ii) marketing of vegetables. The data collection work of rabi (1986-87), zaid (1987) and kharif (1987) had been completed. The data collection regarding marketing part of the project was started in March, 1987. Data collection and tabulation work remained in progress.

8 Pilot sample survey on cost of production of chikoo and its marketing practices in Valsad district (Gujarat)

The work of analysis of data with regard to cost of production of the fruit-crop has been completed while analysis of data for the marketing aspect of the survey was in progress.

9 Pilot sample survey for determining the cost of production and to study the marketing practices of organge in Nagpur and Amravati districts of Maharashtra state

The aims of the survey were to obtain reliable estimates of cost of production of orange and to study the prevailing marketing practices of the fruit.

Drafting of the report was in progress.

10 Pilot survey to develop statistical models for production and culling pattern in popultry

The aims of the project are (i) to estimate monthwise/seasonwise age specific vital characteristics affecting the growth and structure of popultry production, (ii) to estimate production of broilers in form of number and weights and culling of layers by size of farm at regular intervals of time and (iii) to develop appropriate models characterising the production and culling pattern in poultry farm utilizing the estimated vital characteristics. Attempts will also be made to explore the possibilities of constructing suitable objective function to determine size of the farm and culling pattern of birds in different age groups.

The existing deterministic growth models will be modified for charactering

the production of broilers and culling of layers. Some variation in the existing models will include multiple births, immigration of young chicks from hatcharies unequal age step grouping etc.

The data collection work in the project was completed and the analysis of data was in progress.

11 Pilot survey to evolve a sampling methodology for estimating the resources and total catch of inland fish in a region of Orissa

The objectives of the project are (i) to evolve a suitable sampling methodology for estimation of inland fishery resources and catch from them, and (ii) to study the prevailing pisiculture practices.

The fresh water ponds and tanks were taken up in the first round of the survey and brackishwater units taken up in the second round. The field work of the project was completed and the statistical analysis of the data was in progress.

12 Pilot sample survey to evolve an appropriate methodology for estimation of lac production

The objective of the project is to evolve a suitable sampling methodology for providing reliable estimates on (i) number of lac host trees, (ii) number of cultivated lac host trees, (iii) average yield per cultivated host tree, and (iv) total production of stick lac with a reasonable degree of precision.

The estimates for Dudhi centre were revised in the light of the comments received from the Directorate of lac development. The estimates of Bhandra district centre were prepared and the regression analysis of this data was in progress. For Ranchi centre the technical programme was modified and the collection of data for Katki season 1987 has been completed.

13 Pilot sample survey for estimation of production of hides and skins in Chingleput and North Arcot districts of Tamil Nadu and Surat district of Gujarat state

The objectives of the project are (i) to evolve a suitable sampling technique for estimation of production of hides and skins, (ii) to study the practices like flaying on slaughtered and fallen animals, curing of hides and skins and their disposal, and (iii) to study the socio-economic status of the householders handling hides and skins.

The work of analysis of the data remained in progress.

14 Statistical investigations on economics of pig production

The aims of the project are (i) to evolve a suitable methodology for evaluating the commercial aspects of rearing pigs to an assigned stage of growth under field conditions, and (ii) to estimate componentwise costs of rearing of pigs.

The report on the project was under finalisation.

15 **Pilot studies for estimation of birth and death rates in ovines**

The aims of the project is to develop suitable methodology for estimating specific fertility and mortality rates in stationary flocks of sheep and goats with respect to breed, sex and age.

The data were processed to obtain village-wise results on group-specific births, deaths and exposures corresponding to the latter adopting the method of 'fractional exposures'. Procedures for obtaining weighted ratio estimates of specific vital rates were being developed. Further analysis work was in progress.

16 **A comparative study of some methods for estimating mortality rates in bovines**

The project envisaged a comparative study of four methods for estimating specific mortality rate to examine whether less cumbersome and less expensive methods could lead to reasonably accurate estimates of the demographic parameter for dynamic populations of cattle and buffaloes in village environments. The comparison was made with empirical results based on data from a mortality survey conducted earlier. The results were summarised in final tables. The draft report on the project was being prepared and it was found that the adjusted average population method which is quite simple yields satisfactory results.

The report would be reviewed and finalised.

17 **Study of distribution of age specific mortality and fertility rates in bovines**

Data from 75 villages from ICD area of Gujarat was utilised for estimation of birth and death rates of bovines. This data considered as the population, 820 samples of 50 villages were taken at random and the birth and death rates were calculated. Distributions were formulated with 205, 410, 615 and 820 samples after dividing the samples into four groups of 205 each. The formulated distributions were tested for their stability in increasing sample sizes through Kolmogorov—Smirnov 2-sample test. It was observed that the distributions of birth rates were stable with 410 samples while those of mortality rates were stable with 615 and over samples. In a few categories the distributions persistently showed clustering in a single interval showing that deterministic models would suffice for prediction in that category.

Efforts were underway to processed with more theoretical as well as practical considerations.

18 **Pilot studies for developing statistical methodology for estimating the losses due to diseases and pests in bovines**

The present investigation would involve estimation of (i) incidence of diseases and occurence of deaths due to them (ii) losses in production due to

disability and death and (iii) extent of losses in production and reproduction which could be avoided through protection measures.

The data collected under preliminary enquiry showed that the occurrence of five diseases namely; Phneumonia, parasites of gastro intestinal tract, repeat breeder, Anoroxia and Anoestrons was predominant in the area under study. Under the assumption of constant contact rate (.001) for all the five diseases the average time taken for a susceptible individual to get infected was calculated. It was minimum (5.60 rounds) for disease—Anoestrons and maximum (14.65 rounds) for disease—Anoraxia. Again the member of individuals which will be removed at infinity was maximum (495) for the disease—Anoestrons. It can be concluded that the disease Aneostrons spreads more rapidly than any of the other four diseases under study. In that cattle population under study, Phneumonia was also showing similar picture but severity was less. On the other hand, the three diseases were not serious on the bias of the findings of the study and they may not take the form of an epedemic in the area in near future. Further Statistical analysis was in progress.

19 **Studies on comparative performance of mixed farming involving crops, livestock, poultry and fish**

The aims of the project are (i) to determine design and response parameters for studying the comparative performance in terms of production, investment, return etc of different systems of farming, singly or in combination, and (ii) to compare the different systems of farming in respect of labour intensification.

The estimates of production per household from crop, Brestock, poultry and fish over all the combinations of mixed farming were obtained. Similar estimates of input cost per household were also obtained. Studies on labour utilisation in each farming occupation were completed. The drafting of the report remained in progress.

20 **Pilot sample survey to study the impact of flood on agricultural production in a region of UP**

The aims of the project are (i) to investigate a sampling procedure for assessing the losses caused by floods in agriculture production including livestock, and (ii) to study the impact of floods in corps and livestock in the subsequent season.

While analysing the data various estimators were tried both at the village level as well as at the cultivator level. However, none of these estimators worked well in the sense that either the estimators gave an over-estimate of the affected area or the precision was low. The intensity of flood classification was then subjected to analysis of variance and the same was seen to be not significant. As such the classification of villages into

various intensities was ignored and the data analysed. Apart from frequency tables both at the village and cultivator's level the estimate of loss was obtained using unistage cluster sampling approach. The same was improved by using an auxiliary variate approach. To meet the second objective of the project various comparisons of yield rates of flood affected and non-affected areas and normal yield were utilised. Comparison of input in flood affected and normal input was also made. The draft report was under finalisation.

21 Pilot sample survey for estimation of post-harvest foodgrain losses

The objective of the project is to develop a statistical methodology for the estimation of foodgrain losses at different post-harvest stages. The formulae for estimating the loss at harvest and threshing stage were modified and the percentage loss alongwith S.E. were estimated at harvest as well as threshing stage from the data collected during the year 1985-86. The preliminary study showed that the losses of wheat grain in Bulandshahr district during 1985-86 ranged from $0.24\% \pm 0.02$ (Zone-I) to $1.06\% \pm 0.13$ (Zone-III) at harvesting stage and at threshing (including cleaning/sieving) stage. When the wheat grain was stored for 3 months in the gunny bags, the percentage loss to the total wheat stored ranged from nil (Zone V) to $1.36\% \pm 0.82$ (Zone-VI). Further processing of the data was in progress.

22 Pilot sample survey for developing sampling methodology for assessment of impact of National Demonstration Trial on crop yield

The report on the project was prepared and being finalised.

23 A study of employment and income of small farmers and landless labourers

In the present investigation we study for the development of suitable sampling methodology the main aspects studied were (i) choice of sampling design, (ii) choice of auxiliary information (assets expenditure investment etc.) for estimation of income, (iii) choice of sampling intervals (weekly, monthly, quarterly etc.) for various items, (iv) seasonal fluctuations in employment and (v) eagerness and efforts with part of the people to improve their conditions. For (i) and (ii) the use of multivariate ratio and regression estimators having incomplete information for some units on some of the items and also the use of some qualitative and quantitative variables together were examined. For (iii) and (iv) the use of interpretating sub-sampling techniques treating different sampling intervals as independent subsamples was made to test the difference between different sampling intervals.

The analysis and tabulation of the data remained in progress.

24 **Sample survey for study of constraints in transfer of new agricultural technology under field conditions**

The objectives of the project are (i) to develop suitable sampling methodology for studying the effect of new agricultural technology high yielding/improved varieties, fertilizers, plant protection chemicals and cultural and management practices for increasing productivity of land (ii) to determine the extent to which the potential of high yielding/improved varieties has been achieved under field conditions and (iii) to identify and investigate constraints and limiting factors in the transfer of new agricultural technology to cultivator's field.

The field data collection work of the project was in operation in 16 selected districts spread over 9 states : Dibrugarh (Assam), Rajbet & Sabarkantha (Gujarat), Ernakulam (Kerala), Bhir & Nasik (Maharashtra), Cuttack & Puri (Orissa), Hoshiarpur (Punjab), Pali & Swaimadhopur (Rajasthan), Tiruchirapalli & North Arcot (Tamil Nadu) and Meerut, Rae-Bareli & Gorakhpur (Uttar Pradesh). Coded filled in data schedules for 1985-86 and 1986-87 (Partial) were received from the different centres. Field data collection work for the year 1987-88 was in progress. Development of procedure for analysis of data was in progress.

25 **Pilot sample survey for estimating the energy utilization for different levels adoption of modern technology in agriculture**

The main aim of the project is to develop suitable sampling methodology for estimating the energy utilization for different levels of adoption of modern technology in terms of labour and inputs like irrigation, fertilizers etc.

The statistical analysis of the collected data remained in progress.

26 **Pilot sample survey to develop sampling methodology to study impact of Integrated Rural Development Programme on employment potential and income generated by the programme for beneficiaries**

Integrated Rural Development Programme is to uplift the masses by giving financial help in the ferm of loan and subsidy to set up separate establisment. The main objective of the study is to examine a suitable reference period and periodicity of enquiry for estimation of employment and income generated per beneficiary family.

The project was started in district Alwar (Rajasthan) In the district the identification of beneficiaries was done at village Panchyat (consisting of 5 to 10 nearby villages) level. For selecting the beneficiaris a two stage sampling was adopted with village panchayats as primary sampling units and beneficiaries as second stage sampling unit. From each village panchayat30 beneficiaries were selected as second stage sampling units.

Field work remained in progress.

27 **Pilot sample survey for developing a sampling methodology for estimation of livestock products on the basis of data collected as a part of the normal work of field agency of animal husbandry departments in the states**

The aims of the projets are (i) to evolve a suitable sampling techniques for estimation of livestock products of utilizing the normal field agency of stockmen stock assistants of animal husbandry department in the states and (ii) to obtain estimates of annual products of major livestock products for the districts to be covered with a remarkable precision.

The field work was confined to the district of Hoshangabad (MP) during 1981-82 and Trichur (Kerala) during 1984-86. The data were collected from a representative sample selected by adopting a stratified multi-stage random sampling design. The statistical analysis of data remained in progress.

28 **Pilot sample survey for studying the relative merits of the data obtained by actual weighment and those through enquiry for estimation of milk production**

The aims of the project are (i) to study the relative merits of the data obtained by actual weighment and those through enquiry for estimation of milk production, and (ii) to obtain the estimates of annual milk production at district level with a reasobable precision.

The analysis of the data collected from the district Pulwama of Jammu and Kashmir was in progress.

29 **Development of a suitable statistical methodology for estimating extent of labour utilisation in livestock and poultry keeping in rural areas, Meerut (UP)**

The aims of the project are (i) to compare two estimates of labour utilisation obtained by different procedures, (ii) to study gain due to post stratification (iii) to study relative efficiency of three different types of primary stage units, (iv) to efficacy of the nearest neighbour' imputation procedure for figuring out non-observations, and (v) to determine norms for efficient utilisation of labour for different species.

Two estimators of labour inputs and labour coefficients alongwith their estimated variances were developed. In the case of cattle and buffalo species, the two estimators provide more or less estimates of the same precision as such one which gives an unbiased estimate was preferred. Between cluster variation is roughly 99% of the total variability and have within cluster variation may be ignored for estimating standard error. It was also found that gain due to post stratification is quite effective ranging between 20-25 percent.

Analysis of data in respect of goats, pigs and poultry species was in progress.

30 **Development of a suitable methodology to study the effects of housing condition and other related factors on milk production under village conditions**

Management factors together contributed only 10% towards milk production of the non-descript animals the remaining Milk being from feeding and genetic traits.

(Management Index) $I_M = A + B$

where A : annual score for animal care

B : ,, ,, housing conditions.

From the range of values of I_M it was observed that only 32% of the households had their scores above 100, but were very much below the maximum values of 200. The report on the project was under finalisation.

31 **Use of imperfect frames in census and surveys**

The aims of the project are (i) to study the problem of sampling from incomplete frames, mathematical formulation of the predecessor-successor method has been developed to estimate, (ii) total number of units of the target Population missing from the frame, and (iii) the total of the character under study in the target population. The estimation procedure has been developed for the two possible situations, namely; (a) when the units missing from the frame are random and (b) when the units from the missing frame are not random.

In case of incorrect auxiliary information contained in the frame used for selecting the sample with probabilities proportional to size some alternative estimators have been examined.

BIO-STATISTICS AND STATISTICAL GENETICS

Mandate :

To conduct statistical research in the areas of plant and animal pharmacological kinetics in animal research, ecology, pest control management and crop insurance

Thrust Areas :

—Optimum designs in plant and animal breeding
—Statistical methodology in crop insurance
—Statistical study of non-linear dynamical models for fishery harvesting
—Statistical studies in animal epidemiology
—Statistical investigation in sensory evaluation of agricultural products
—Statistical aspects of physiological and pharmacological kinetics in animal research.

Projects in operation thrust areawise :

No	Project title	Project leader and associates	Duration
1	2	3	4
	Optimum Designs in Plant and Animal Breeding		
1	Statistical analysis of crossbreeding data at military dairy farms	BS Sharma Prem Narain	May 84 Nov 87
2	Direct and maternal additive and heterotic effects in crossbred dairy cattle	RK Jain LK Garg SD Wahi	Dec 84 Jun 87
3	Investigations on appropriate statistical methods for comparing genetic groups based on multiple traits in dairy animals	Lal Chand Prem Narain	Jun 85 Jun 88
4	Studies on spatial patterns and its role in analysis of agricultural field experiments	VK Bhatia Prem Narain JS Samra	Aug 87 Jul 92

1	2	3	4
	Statistical Methodology in Crop Insurance		
5	Statistical studies in relation to crop Insurance	JN Garg Prem Narain Shivtar Singh Mahesh Kumar	Oct 85 Dec 89
	Statistical Study of Non-linear Dynamical Models for Fishery Harvesting		
6	Statistical study of dynamical models for fishery growth and harvesting	Prajneshu	Oct 85 Sep 88
	Statistical Studies in Animal Epidemiology		
7	Statistical studies in animal epidemiology	VK Bhatia PK Malhotra	Mar 86 Feb 89
	Statistical Investigation in Sensory Evaluation of Agricultural Products		
8	Statistical investigations in sensory evaluation of agricultural products	SC Rai VK Bhatia	Jul 85 Dec 87
	Statistical Aspects of Physiological and Pharmacological Kinetics in Animal Research		
9	Statistical aspects of physiological kinetics in animal nutrition	PS Rana Prem Narain	Aug 87 Jan 91
10	Estimation of repeatability of fruit yield in presence of biennial rhythm	SD Wahi PK Malhotra	Aug 87 Jan 90

1 Statistical analysis of crossbreeding data at military dairy farms

To study the problems associated with the adjustment of data, the least squares analysis of data with unequal subclass numbers was performed for each of the characters as per Harvey (1966) taking the fixed effects of farm, period and season in the model. The least squares analysis was also performed taking significant effects only in the model, Subtracting the sum of the appropriate least squares constants from the individual records the data were adjusted separately all the non-genetic effects in the model and only for significant non-genetic effects. The adjusted data were re-analysed with grade and error only in the model to find the error mean squares in

each case so that the suitability of the methods can be judged. The error mean squares for each of the five life-time traits considered was found to be minimum in case of data adjusted for all the non-genetic effects in the model. On the basis of these results it can be inferred that it would be better to adjust the data for all non-genic effects included in the model. The genetic divergence was studied by forming the clusters of the homogeneous grades using canonical root method and Tocher method. Considering simultaneously four life time traits such as total life, total productive life, total milk yield in first three lactations and total milk yield in all available lactations the thirty one genetic groups were arranged into eleven homogeneous clusters by Tocher method and canonical root method.

2 Direct and maternal additive and heterotic effects in crossbred dairy cattle

The project aims at the estimation of direct and maternal additive breed effects and heterotic effects in dairy cattle and comparing the estimates of heterotic effects obtained by the approach of multiple regression technique with that of the fitting of biometrical genetic models to the means of different grades in dairy cattle. Breeding data in respect of 32 exact genetic groups of Friesion x Sahiwal crosses obtained from 14 military dairy farms for the period from 1955 to 1978 were analysed. It was observed that there was a highly significant effect of genetic inheritence of sire on almost all important economic and livestock traits whereas there was negligible influence of genetic inheritence of dam on these traits except weight of animal at calving and total milk yield at first three lactations. The heterotic effects observed indicated that the interaction with exotic breed effects significantly the main economic and livestock traits.

3 Investigations on appropriate statistical methods for comparing genetic groups based on multiple traits in dairy animals

The project aims (i) to investigate into the statistical techniques for developing lactation performance indices applicable to cross-brad cattle and graded buffaloes based on multiple traits utilizing repeated lactation records of animals; (ii) to estimate genetic parameters such as heritability, genetic correlation etc of individual character as well as of the lactation performance indices for pure bred cattle and buffaloes, (iii) to develop statistical techniques for comparing genetic groups based on multiple traits and to examine the feasibility of adopting lactation performance indices for determining optimum level of exotic inheritance in crossbred cattle, and (iv) to develop methodology for estimating generalised heritability.

Breeding data of graded buffaloes maintained at 10 military farms were converted to the first lactation basis by using Sanders correction factors and these adjusted records were utilised to develop

lactation performance indices for various combinations of characters at each farms. Breeding data of crossbred animals pertaining to first lactation records were corrected for non-genetic effects and corrected data were used to carry out discriminatory analysis based on lactation yield, age at first calving, lactation length and dry period. Clusters were formed by Tocher's method.

4 Studies on spatial patterns and its role in analysis of agricultural field experiments

The project aims (i) to examine the spatial variability present in soil characteristics and its influence on plant growth traits, and (ii) to examine suitable statistical models for treatment comparison in the presence of spatial dependence among observations. Collection and compilation of the data relating to growth traits of *Melia azederch* species were carried out. The growth traits considered were height, diameter at breast height and diameter at stump height at planting 12 months, 24 months and at 36 months. In addition to growth traits information on soil characteristics were also collected at different depths of soil. Computer software were developed for estimating semi-variogram and auto correlations.

5 Statistical studies in relation to crop insurance

The objectives of the project are (i) to critically examine and analyse premium and indemnity tables for different crops under Comprehensive Crop Insurance Programme as modified from time to time, (ii) to develop suitable statistical methodology for estimating premium and indemnity rates based on appropriate distribution of crop yields over time and space, and (iii) to investigate into modifications needed to take into account of technological changes in yield over time as noticed through trend in crop yields.

Time series yield data received through Comprehensive Crop Insurance Scheme for the year 1986-87 for different defined areas and crops were analysed and premium and indemnity tables prepared and supplied to GIC. Normal Curve Technique was used for determining premium rates. Frequency distribution of crop strata according to premium rates and coefficient of variation of crop was studied at different level of coverage in respect of all crops for different states.

6 Statistical study of dynamical models for fishery growth and harvesting

The environmental stochasticity of some single and multispecies fish population growth models was investigated. The species interactions are taken to be prey-predator type. The effects of various harvesting policies viz constant effort, constant of yield, and constant escapement were also studied with a view to providing a firm theoretical basis for sustained yield.

7 Statistical studies in animal epidemiology

The project has two components viz

(i) studying the culling process in dairy cattle and (ii) modelling the epidemiology of diseases in animals. Computer software was developed for studying the culling process in dairy cattle. For relationship studies, variables were indentified through fitting of a particular parameter survival distribution—Weibull and culling probability estimates were obtained for different values of regressor variables. For identification of important concomitant variables affecting the time of survival of an animal in the herd, a distribution free technique i.e. the Cox Proportional Hazard model was also used. The work of compilation of the results was in progress.

8 Statistical investigations in sensory evaluation of agricultural products

The project aims to develop methodologies for analysis of sensory data obtained in different situations and to compare the efficiencies of these methodologies relative to the existing parametric and non-parametric procedures. The observations in sensory evaluation are mostly in Ordinal Scale, hence the non-parametric method is used in this study. A model for tied observations in triple comparisons was developed and recommended for sensory evaluation. A procedure was also finalised for combining of results of sensory trials conducted at various locations or different years. Sensory trials were conducted for testing different methodologies developed. The draft report on the project was prepared.

9 Statistical aspects of physiological kinetics in animal nutrition

The objectives of the project are to examine critically the existing compartment models in physiological kinetics in animal nutrition for their adequacy in describing the passage of nutrients through the gut of ruminants and to develop suitable stochastic model to quantify the rate of passage of undigested nutrients. The literature dose not show any current research in India concerning the application of compartmental modelling in animal nutrition problems, therefore, the research has a potential of a large impact on animal nutrition research and is a promising way to strengthen the interdisciplinary effort at IASRI. The work of reviewing of the literature was in progress.

10 Estimation of repeatability of fruit yield in presence of biennial rhythm

The objectives of the project are (i) to test for the biennial bearing tendency in orange and guava and to correct the data for this effect, (ii) to estimate the usual repeatability index by traditional methods and through principal component analysis, and (iii) to compare the efficiency and stability of different methods with the help of simulated data with known repeatability. The data already collected for 10 years' yield of orange and 5 years' yield of guava were used in the present study. The bienniality of yield in both the crops was tested and further analysis work was in progress.

FORECASTING TECHNIQUES FOR CROPS, DISEASES AND PESTS

Mandate :

To develop statistical models for obtaining advance estimates of crop production on the basis of bio-metrical measurement and weather parameters and also to develop forecast models for the incidence and intensity of pests and diseases

Thrust Areas :

—Crop yield forecast models
—Forecast models for occurrence of crop pests and diseases

Projects in operation thrust area-wise :

No.	Project title	Project leader and associates	Duration
1	2	3	4
	Crop Yield Forecast Models		
1	Pilot studies on pre-harvest forecasting of yield of groundnut crop on the basis of data on biometrical characters, weather variables and agricultural inputs, Rajkot distt. (Gujarat)	SR Bapat BH Singh RC Jain	Mar 84 Dec 88
2	Pilot studies on pre-harvest forecasting of apple yield on the basis of data on biometrical characters, weather variables and crop inputs, Simla distt. (HP)	Chandrahas KG Aneja Prem Narain	Mar 83 Dec 88
3	A within year growth models for pre-harvest forecasting of crop yields	RC Jain Ranjana Agrawal KN Singh	Oct 87 Mar 90
4	Probability model for crop yield forecasting	RC Jain Ranjana Agrawal	Sep 87 Aug 89

1	2	3	4
5	Yield forecast based on weather variables and agricultural inputs on agro-climatic zone basis	Ranjana Agrawal RC Jain	Oct 87 Sep 91
	Forecasting Models for Occurrance of Crop Pests and Diseases		
6	Pilot sample survey to estimate the incidence of pests and diseases and consequent loss in crop yield on high yielding varieties of paddy in South Arcot distt. (Tamil Nadu)	KG Aneja GN Bahuguna VK Mahajan	Jul 76 Dec 87
7	Models for forecasting aphid-pests of mustard crop	KG Aneja GN Bahuguna	Jan 87 Jan 89

1 Pilot studies on pre-harvest forecasting of yield of groundnut crop on the basis of data on biometrical characters, weather variables and agricultural inputs

The data collected during (kharif) 1984-85 were analysed taking three linear multiple regression models with biometrical characters, weather variables and agricultural inputs as regressors. The project report for first round of survey was completed. The results revealed that among biometrical characters plant population and length of main axis showed high correlation with yield in all periods of crop growth in which they were recorded. Rainfall recorded in pod development stage (81-90 days) showed high correlation with yield contributing about 50%. Forecast equations were fitted at flowering stage, peg formation stage, pod development stage. It was observed that 54% variation in yield could be explained due to biometrical characters, rainfall and crop inputs at the peg formation stage. Analysis work for the data collected during kharif 1985-86 and 1986-87 was in progress.

2 Pilot studies on pre-harvest forecasting of apple yield on the basis of data on biometrical characters, weather variables and crop inputs in Simla district (H.P.)

The data collected during the apple crop seasons 1985 and 1986 were analysed for obtaining total correlation coefficients with apple yield. Regression analysis was carried out for 1984 and 1985 season's data. The results of regression analysis for 1984 data using weight of apple yield/tree as regress and tree characters viz height, girth, canopy spread and intensity of flowering along

with amount of organic manure as regressors showed that these data explained about 59%, 65% and 40% variation in apple yield of Royal Delicious (R.D.) variety for the respective three age groups of trees i.e. 6-10 years, 11-15 years and above 15 years old. In case of yield of Golden Delicious trees the amount of variation explained by similar regressors was found to be 61%, 28% and 35% for the three respective age groups. in the case of regression analysis for 1985-86 data, these regressor variables could explains a relatively low variation in apple yield.

During the next quarter analysis will be continued for developing composite forecast models based on weather, biometric and input data.

3 A within year growth model for preharvest forecasting of crop yields

The objective of the project is to develop model for making early forecasts of yield based on current season data.

So far attempts have been made in India to obtain objective yield forecasts by substituting current year plant data into a model developed from previous years. An assumption was made that the present year is a part of the composite population of these base period (previous) years. These between year models' while performing satisfactorily in typical years often falter in a typical year. Within year growth modelling may be beneficial in improving forecasts during a year with a typical growing conditions besides providing good yield forecasts in typical years.

A project has been initiated with the objective to develop model for making early forecasts of yield based on current season data on wheat crop during the Rabi season.

Data would be collected during Jan to March, 1988 from research farm of IARI.

4 Probability model for crop yield forecasting

The project has been taken up with the objective to develop crop yield forecast using Markov Chain Theory. In earlier studies, models were developed by fitting of regression using least squares technique for estimating the parameters. The optimality properties of these estimates are described in an ideal setting which is not often realised in practice. Markow Chain Method overcomes some of the drawbacks of regression model. It has the advantage of providing non-parametric interval estimates and is robust against outliers/extreme values.

In this method, growth process of the crop is divided in phenological stages. A Markov Chain Model is to be construct or by defining a set of states or components, which describe the condition of an individual plant (or average condition of a group of plants) at specified times within the phenological stages. Individual

states can be defined on the basis of available qualitative and quantitative information to describe plant condition.

The project has just been initiated. Preliminary study has been carried out on sugarcane crop.

5 Yield forecast based on weather variables and agricultural inputs on agro-climatic zone basis

The objective of the project is to develop suitable model based on weather variables and agricultural inputs for forecasting crop yield of agro-climatic zone.

Earlier studies, were carried out on district level. Generally, such studies require long series of data on different weather variables and crop yield which are not available for most of the districts. The data of various districts within an agroclimatic zone may be pooled so that a long series could be obtained in a relatively short period, in order to obtain forecast of crop yield on a wider area.

The study would be carried out for major cereal crops i.e. rice and wheat. Weekly data on weather variables alongwith yield and agricultural inputs for the districts under the zone were selected. Forecast model for agro-climatic zone would be developed using suitable methodology. During the period January to March, 1988, attempts would be made to procure the data for the project.

6 Pilot sample survey to estimate the incidence of pests and diseases and their consequent crop loss in high yielding varieties of paddy in South Arcot district of Tamil Nadu

The study was taken up with the object of developing the methodology for obtaining objective estimates of the incidence of pests and diseases, their consequent crop loss and the loss in crop yield avoidable through adoption of plant protection measures in high yielding varieties of paddy grown in cultivators fields in South Arcot district of Tamil Nadu.

The mean incidence of pests and diseases was obtained by averaging the incidence levels recorded at different stages of sampling. For abtaining the crop loss due to pests and diseases two methods were used. One of them, developed earlier at I.A.S.R.I., involved the use of incidences at the stage of their maximum occurrence as regressor variables in the multiple regression of crop yield on incidences. Another method, developed under this study, involved the use of 'principal components' of the incidences at all the successive stages as explanatory variables in the multiple regression model The new methodology for estimating the crop loss due to pests/diseases has been found to be better than the earlier one as it uses the entire data on pest-disease incidences as regressors compared to partial data under the earlier technique, it provides a better fit to data in terms of R^2, it provides a proper esti-

mate of crop loss as against the under estimation by earlier technique and it provides the estimate of loss with better precision as well. The avoidable loss due to adoption of suitable plant protection measures was worked out on the basis of averaging the paired differences of crop yields of protected and control plots.

The project report was prepared on the basis of results of all the six seasons data. It was observed that crop loss due to pests and diseases ranged between 4.65 to 9.61 percent in *Samba* season (July to December) during 1976, 1977 and 1978; and in *Navarai* season (January to June) the loss ranged between 3.34 to 5.40 percent during 1977, 1978 and 1979.

7 Models for forecasting aphid-pests of mustard crop

The project was initiated in January 1987 with the objectives of identifying the meteorological factors influencing growth of aphid-pests population of mustard crop and for developing the methodology for forecasting the intensity of mustard aphid-pests at different stages of crop growth. The study has been taken up on data previously collected by the Entomology Division of Indian Agricultural Research Institute and these pertain to four mustard crop seasons (Nov. to March, 1977-78 to 1980-81). These data relate to weekly counts of aphid-population infestation (for two varieties of mustard viz. brown and yellow) during the mustard crop season and their corresponding weekly records of meteorological variables. The variables influencing aphid population on brown mustard variety have been identified on the basis of spectral analysis of relevant time series data. The log variables to be included in the forecast model have been identified on the basis of high values of auto-correlations of aphid-population for different time logs and cross correlations of aphid population with the meteorological variables.

During ensuing quarter similar analysis for yellow mustard variety would be taken up and also analysis procedure for developing process equations for forecasting aphid population at weekly intervals would be finalised.

DIVISION OF STATISTICAL ECONOMICS

Mandate :

To develop appropriate stochastic models and methods for quantification of economic phenomena related to agriculture.

Thrust Areas :

—Models for foodgrains economy
—Yield gap analysis
—Acreage response models
—Resource use in agriculture

Projects in operation thrust areawise :

No	Project titlle	Project leader and associates	Duration
1	2	3	4
	Models for Foodgrains Economy		
1	Economic study of imbalances in rice and wheat production in India	RK Pandey Shanti Sarup	Oct 82 Dec 87
	Yield Gap Analysis		
2	Economic study of new farm technology with special reference to yield gap and associated factors	RK Pandey Shanti Sarup HB Choudhary Bhagat Singh BL Kaul	Jul 84 Dec 88
	Acreage Response Models		
3	Statistical estimation of multiequation acreage response models under crop substitution	VK Sharma Ashok Kumar	Aug 87 Jul 89
	Resource Use in Agriculture		
4	A study on institutional credit in agriculture	Ashok Kumar RK Pandey S Kaul	Oct 85 Dec 87

1	2	3	4
5	Study of cost functions for milk production in rural areas	S Kaul RK Pandey Ashok Kumar	Oct 85 Dec 87
6	Level of employment in modern farm technology	Bhagat Singh RK Pandey PC Mehrotra UN Dixit	Apr 86 Jun 89
7	Study of fertilizer use and effect of subsidy on its consumption	UN Dixit SP Bhardwaj Ant Ram	Sep 87 Apr 89

1 Economic study of imbalances in rice and wheat production in India

The analysis and the draft report of the project were completed. The study revealed that growth of production of wheat as compared to that of rice was higher in pregreen revolution period. In this period, contribution of area under cultivation was relatively higher in the growth of wheat output whereas in case of rice productivity was a dominating factor in the growth of total rice output. During the post green revolution period, wheat output grew at a faster rate. The relative contribution of area to total output was higher in the case of wheat. But the role of productivity was relatively more in case of rice production.

Study of production functions for different states indicates that during the pregreen revolution period, the role of fertilizer in raising rice productivity was, somewhat, more visible as compared to that of irrigation. In the aggregate analysis for the country as a whole irrigation as well as fertilizer variables were significant in increasing rice yields. In the post green revolution period, role of improved seeds and fertilizers in raising wheat productivity was relatively significant. During the pregreen revolution wheat productivity equations indicates that with the exception of one or two states, the impact of irrigation on productivity was not significant. The relation between fertilizer use and wheat yield was positive in several states.

The study further revealed that there is still a great scope for improving productivity of rice and wheat and in no state of the Country the average productivity of these crops have exceeded 65 per cent of what it could be obtained with adoption of modern cultivation practices on farmers' fields.

2 **Economic study of new farm technology with special reference of yield gap and associated factors in selected operational research project areas**

The objectives of the project are (i) to examine the new technology and its yield potential for different crops, (ii) to examine the extent of gap and yields under farmers environment and (iii) to identify the socio-economic and other constraints responsible of gap between the potential yield and actual yield.

The project is based on primary data collected from the Operational Research Project areas on pulse production in Mohindergarh district, with Haryana Agricultural University, Hissar on Dry-Land Agriculture in Ranchi, with BAU Ranchi, Bhilwara with Sukhadia University in Udaipur and Indore with Jawaharlal Nehru Krishi Vishwa Vidyalaya, Jabalpur.

Data collection work was over for Ranchi and Bhilwara centres. Computerisation of data was in progress.

3 **Statistical estimation of multi-equation acreage response models under crop substitution**

The problem of acreage allocation under crop substitution can be solved in a more realistic manner through seemingly unrelated regression equations approach due to Zellner (962), J. Amer. Statist. Assoc., 57, 348-368). But literature in the field of seemingly unrelated regression equations ignores peculiarities usually encountered in the analysis of agricultural data. For example, macro level data on variables cropped area, yield, gross irrigated area, etc. to be used in the analysis are subject to errors. Therefore, estimation methods that take care of the errors in the variables need to be developed. Another situation usually encountered relates to the unequal numbers of time series observations for various crops. Introduction of new crops in different years in a region as a result of creation of irrigation facilities and/or biological innovation makes the time series observations on all crops grown in the region unequal. In this project attempt would be made to develop suitable estimation methods which could deal with these problems.With the help of these investigations multi-equation acreage response models for various competing crops in the selected regions could be developed. To this end, acreage under crops would be taken as the dependent variables and the explanatory variables would be gross irrigated area under competing crops, prices and yields of competing crops, risk variables, etc. Data from published sources on the relevent variables would be utilized for the study. Finally, an attempt would be made to examine the role of supply prices for bringing about a change in the acreages of competing crops, with the help of the models developed in this study.

Developed estimation procedure for two-equation models when numbers of

observations are unequal. Further investigations were in progress.

4 A study on institutional credit in agriculture

This study based on secondary data covered Commercial Banks and Co-operative Agencies providing agricultural credit for the period 1969 to 1982. The salient results of the project indicated that Commercial Banks have performed better in expanding their banking facilities as well as amount of credit in comparision to co-operative institutions. A wide gap in flow of credit on per unit of gross cropped area among the states was observed, however, it has reduced over the period. Among the various variables studied for determining the flow of credit, it was found that fertilizer consumption has dominated the other variables in majority of the states. Impact of agricultural credit on foodgrain productivity was not uniform in all the states.

5 Study of cost functions for milk production in rural areas

The study was based or primary data collected under a survey conducted by IASRI. The objectives of the project were to examine the suitability of different types of functions and various problems involved in their estimation, to examine cost functions and to derive supply functions for milk in rural area.

Using the data on milk-yield, feed cost, labour cost and other costs incurred in the production of milk, production functions of several forms were estimated using the usual regression analysis techniques.

Milk production functions of linear, quadratic and log-linear types were estimated for different seasons utilising data for two groups of animals, cross-bred and non-descript. It was found that nearly 40% of the variation was explained by feed cost alone. It was observed, in general, that the seasonal effect on milk yield in cross-bred animals is less as compared to non-descript animals.

6 Level of employment in modern farm technology

The objectives of the project are (i) to estimate overall employment generated on holdings of different sizes and various levels of technology, (ii) to examine employment pattern during lean periods, (iii) to estimate labour productivity in different crops, and (iv) to examine the suitability of observation-interview method of data collection to measure farm employment.

Data for kharif and rabi crops from 216 sampled cultivators from 18 villages of district Muzzafernagar (UP) were collected for 1986-87. Analysis of data was in progress.

7 A study of fertilizer use and effect of subsidy on its consumption

To study the temporal and spatial

distribution of fertilizer subsidy, secondary data on fertilizer consumption and amount of subsidy would be collected for different states. In order to examine the spatial and temporal distribution of fertilizer subsidy, a comparative study of different states over the time would be conducted on the basis of per hectare consumption of subsidized fertilizer in terms of trends in consumption of subsidized fertilizer rate of growth of fertilizer subsidy and variation in the consumption of fertilizer by using secondary data. Data collection for selection of sample villages was in progress. To examine the spatial and temporal distribution of fertilizer subsidy, data pertaining to different states over years would be collected.

COMPUTING SCIENCE

Mandate :

To develop appropriate software based on modern statistical methods for the analysis of agricultural and animal sciences research data and as also to modify the available programmes to users' friendly software. In addition, this division is also responsible for undertaking studies on file organisation techniques in relation to information management.

Thrust Area :

—Development of computer software for research data analysis in agriculture

Project in operation thrust areawise :

No	Project title	Project leader and associates	Duration
	Development of Computer Software for Research Data Analysis in Agriculture		
	Development of software for construction of selection-index as applicable to animal breeding data	OP Dutta	Dec 85-Dec 87

Development of Software for Construction of Selection-index as applicable to Animal Breeding Data

General purpose software for the construction of selection-index including restricted selection index was developed

NATIONAL SYMPOSIA ORGANISED

As part of the celebration of the 40th Anniversary of India's Independence, a series of national symposia were organised by the Institute. The first in the series was a three-day National Symposium on GROWTH AND INSTABILITY IN AGRICULTURE from August 19-21, 1987. The major issues discussed related to the factors affecting growth and instability and the measures for achieving higher growth with stability. The symposium was inaugurated by Dr GS Dhillon, Union Minister for Agriculture and the key-note address was delivered by Dr SR Sen, Member, Commission in Centre-State Relation, Govt of India. The second National Symposium was on SAMPLE SURVEYS IN INDIAN AGRICULTURE—PROBLEMS AND PROSPECTS organised jointly with the Directorate of Economics & Statistics, Ministry of Agriculture from September 17-19, 1987. The main theme of the Symposium was : Current Status and Future Scope of Sample Survey Techniques in Indian Agriculture. The symposium was inaugurated by Shri Yogendra Makwana, Hon'ble Union Minister of State for Agriculture and Rural Development. Prof PV Sukhatme, former Director of Statistics Division, FAO, Rome and now Honorary Professor, Department of Biometry, Maharashtra Association for Cultivation of Science, Pune delivered the key-note address. The third National Symposium in the series was on a newly emerging multi-disciplinary area STATISTICAL ECOLOGY from November 19-21, 1987 involving interaction and collaboration of statisticians with biologists and ecologists. The symposium was inaugurated by the Hon'ble Union Minister of Agriculture Dr GS Dhillon. Hon'ble Minister also laid the foundation stone of the multistorey Training-cum-Administrative block of the Institute. Prof JN Kapoor, Sr Scientist, Indian National Science Academy delivered the key-note address.

In addition to the foregoing three symposia, the Institute also organised a two-day National Symposium on ELECTRONIC DATA PROCESSING AND COMPUTERISED INFORMATION from May 25-26, 1987, with a view to convey to other Universities and Institutes the state-of-the-art in the specific and related field of Electronic Data Processing and Computerised Information System. Prof Prem Narain Director of the Institute inaugurated the symposium and Dr N Seshagiri, Director General, National Information Centre delivered the key-note address.

Each of the four Symposia was attended by eminent scientists, economists and statisticians drawn from ICAR Institutes, Agricultural Universities and Traditional Universities. As a result of delibrations in these Symposia valuable recommendations of far-reaching importance emerged which are briefly as under :

Growth and Instability in Agriculture

—To measure the growth and instability—the data should be disaggregated to the region/district level to analyse the effect or socio-economic and agro-climatic factors ; while dis-aggregating the data, care should be taken for their reliability.

—The yardsticks developed at IASRI are being used for estimating the potential yields of various crops. Since the yardsticks are mainly available for fertilizer, the studies should be directed to develop similar yardsticks for irrigation and other input resources.

—Statistical techniques should be developed to study the difference in the magnitude of variability/instability between crops and regions over time.

—Sophisticated models based on theoretical or most probable postulates responsible for growth and instability needs to be developed for understanding the processes of growth and instability in agricultural production.

—Use of complementary inputs like fertilizer, irrigation, rainfall, together with HYV has increased instability in agriculture. Further studies should be focussed for examining the role of management and other non-monetary factors alongwith the monetary inputs in the production and their impact on growth and instability.

—Instability in the farm-income is the major determinent of input use in agriculture particularly in sensitive crop like pulses and oilseeds. The generation and adoption of suitable location specific technologies and integration of research and extension activities would help to improve and stabilise the production of these crops.

—There is a need for more elaborate and refined data for estimating the role of weather variables for which data from Indian Meteorological Department may be made available and research on weather-production relationship should be encouraged.

—Since irrigation has shown stabilising effect on production, the exploitation of the ground-water and surface water potential by developing infrastructure and water management practices would help in solving the problem of instability in agriculture. This aspect need be studied in detail.

—Apart from immediate problems of surpluses and deficits, medium and

long term issues of macro-economic nature such as price stability, income and employment generation should also be studied at macro as well as micro level.

—Cost-benefit analysis of the impact of investment in infrastructure development on income and employment generation should be undertaken.

—Crop insurance is an important preventive measure for instability in agricultural income. Rationality of crop insurance schemes and premium structures specific to different farming systems and agro-climatic regions should be studied.

—Ex-post, concurrent and ex-ante evaluation of the foodgrain buffer stock programme should be done to evaluate its usefulness in the growth and instability context.

Sample Surveys in Indian Agriculture

—Almost every year drought and flood occur in parts of the country causing economic and physical losses. A quick and objective assessment of such losses is essential for taking preventive and ameliorative measures. Suitable sample survey techniques should be developed for making quick assessment of such losses. In this context the application of remote sensing technique could be explored.

—In some States the system of collection of agricultural statistics is proposed to be remodelled and a new agency for their recording and reporting has been set up. This deviation needs to be considered carefully after taking into account the experience of the work done so far in the last four decades and the cost of field operations involved.

—The current system of reporting crop statistics consists of area statistics by revenue agencies and yield statistics through field investigators of the concerned State departments. However, due to the need of yield statistics for small area the number of crop cutting experiments is likely to increase enormously which may be difficult to manage through existing agency. Whether the work of crop cutting experiments may be entrusted to single agency or to different departments needs to be examined. Simultaneously, efforts should also be made to develop survey designs for estimating parameters for small domains with reasonable degrees of precision within the constraints of available resources. Quantal method/procedures based on double sampling may be found useful in this respect.

—In some cases data on area or yield are required even at a level lower than block or taluk or for different geographical entities such as command area of an irrigation project. For instance in the case of command area development programmes in which water for irriga-

tion is supplied through distributaries/outlets, sometimes even a village is only partly irrigated and thus reporting of irrigated and unirrigated area with corresponding yield rates even at the block level is not much meaningful. Suitable survey design therefore, needs to be developed for such a situation.

—With computer facilities increasingly becoming available for analysis of survey data, efforts should be made to apply more complex survey designs which may provide better results in terms of smaller sample size or even at lower cost.

—A number of surveys have been conducted in the past for estimating the incidence of pests and diseases and consequent crop losses. The methodology needs to be standardised for use in different states.

—Estimation of post-harvest foodgrain losses is another important area where the available survey methodology needs to be standardised.

—The cropping systems in the hilly areas of the states in north-eastern region are quite distinct from those in other states of the country. Suitable sample survey methodology may be developed for estimation of acreage and yield of crops in hilly areas.

—Some of the gaps in basic statistics in the livestock sector requiring immediate attention are :

(i) Livestock population at shorter intervals for wider breed—sex-age combinations ; (ii) Bristle production ; (iii) Rates of production of meat per slaughtered animals ; (iv) Production of cattle feeds ; (v) Production of dung and its proportion utilized as fuel and (vi) Updating of time series data on livestock production and their storage at central place.

Suitable steps need to be taken to fill these gaps.

—Some areas of research in the livestock sector requiring attention are :

(i) Epidemiology and disease surveillance

(ii) Post-production losses in livestock products

(iii) Surveys of animal draught power

(iv) Effectiveness of AI under field conditions.

Suitable sample survey techniques need to be developed in these areas.

—Some methodological studies are required in developing overall index of impact of new technology by following a some multivariate

approach akin to descriminant function.

—The primary reporting worker is generally over loaded with the collection of data on multifarious activities besides his normal duties which adversely affects the quality of data collected by him. The collection of data on miscellaneous activities should be assigned to adhoc staff.

—In addition to listing down the various sources of errors and the possible remedial measures to be adopted for reducing the same, it would be desirable to quantify the effect of different types of errors, with a view to providing information on the extent of their influence on the final product.

—The schemes of rationalised supervision and post-enumeration checks should form an integral part of all surveys and should not be directed solely at fault finding but also in educating the field staff.

—The collection of data in the livestock surveys currently in operation is done by adhoc field staff. A permanent field agency in the animal husbandry sector may need to be created.

—In survey data analysis more emphasis should be laid on problems, like regression analysis etc. rather than simply estimating the mean and related parameters. Regression analysis in complex sample surveys is one area which requires more attention.

—Variance estimation is an important aspect in presentation of results. In the context of complex survey data analysis, variance estimation is somewhat difficult. Techniques like Balanced Repeated Replications (BRR), Jackknife and Linearisation methods based on Taylor series are some handy tools for this purpose. More emphasis on research aspects as well as their applications should be laid on these topics.

—Use of auxillary characters and multi-subject surveys are still rather under-developed areas, Optimisation problems in this field are complex and need to be looked into.

—In most of the recent development in the survey data analysis, the role of computer is pivotal. Although various software packages are now available for complex data analysis, most of them are to some extent, design specific. Development of software packages in the context of agricultural survey data analysis is needed.

—Micro-computers may be preferred for data preparation on magnetic media and main-frame computers or super-micro-computers for tabulation and analysis. These may be suitably interfaced.

—Data collected by various agencies should be made available to research workers in other organisations for carrying out further indepth analysis.

Statistical Ecology

—To facilitate two-day interaction between biologists/ecologists/agricultural scientists on one side and the statistician/mathematicians on the other, it was desirable that the former group should identify problems and circulate among the latter group for possible collaboration. Statistical ecology being a newly developing multi-disciplinary area requiring close collaboration among various groups of scientists, therefore, calls for holding more frequently such types of symposia/ meetings for better understanding of problems.

—Though several mathematical models, both deterministic and stochastic have been studied, many of these cannot be appropriately tested in Indian conditions for want of adequate data. Attempts have therefore to be made to collect data for a variety of problems to test the validity of the models leading to their improvements. To this end, effective collaboration is necessary between ecologists working in the field and the mathematicians/statisticians. For more realistic modelling it is imperative that the latter group should visit the former and talk to them at their level in a non-mathematical way to learn the real live situation.

—In view of the importance of statistical ecology as an interdisciplinary field, efforts may be made to introduce suitable courses on statistical ecology with emphasis on modelling in fisheries, pest control, animal nutrition and epidemiology, in the universities and other teaching institutions. In addition short term courses in modelling should be organised by the species specific institutes in collaboration with statisticians/mathematicians drawn from the other institutes.

—Quite often when the models are not analytically tractable, computers are required to be used for getting some insigh. into the underlying mechanism. This type of usagse of computers should be encouraged.

Electronic Data Processing and Computerised Information Systems in Agricultural Research

—An inventory of hardware and software available with all the Agricultural Research Organisations may be prepared and published. Hardware and software additions in different organisations may be incorporated in subsequent editions.

—Programs for latest and more sophisticated techniques of analysis using

improved algorithms may be got prepared.

—Programmers may develop programs for use at various installations.

—Precision aspects in computing may be taken care of.

—Centres may utilise existing and develop new appropriate software for undertaking computer simulated studies.

—Adequate staff may be provided in all computer centres.

—Computer Centres may develop Computerised Information Systems,

—Data may be recorded in auxiliary storage media and selectively disseminated to all users.

—The existing teaching/training courses at IASRI and NAARM may be got strengthened. All other Centres may also explore the possibilities of initiating user oriented courses.

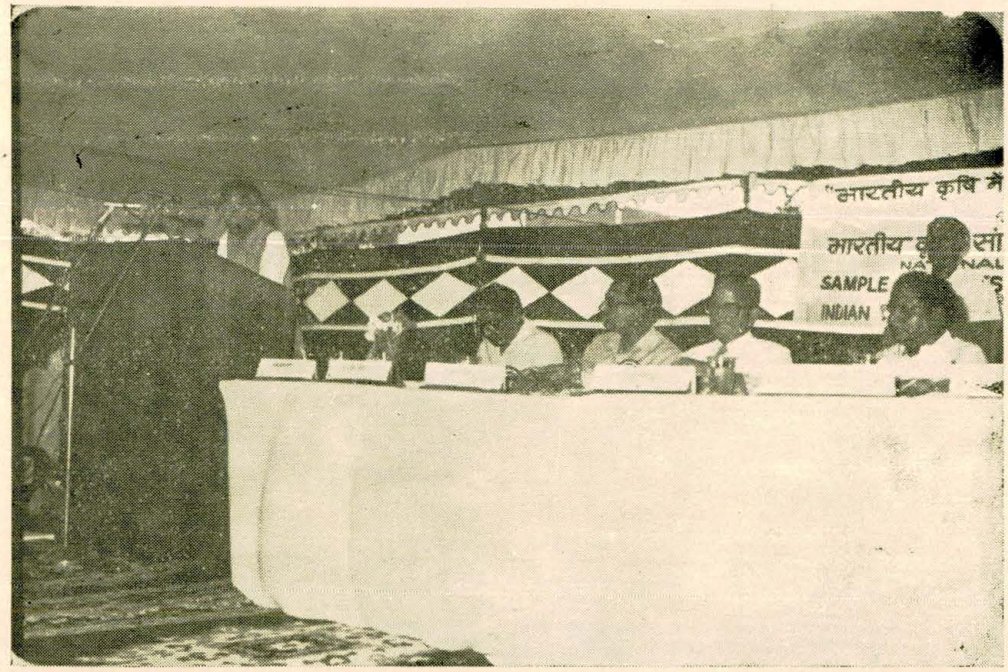
—Computer Centres may procure/enhance their hardware and software capabilities by acquiring machines and packages which are compatible with systems available in sister organisations.

—Attempts may be made to develop user friendly programs for use on interactive terminals.

—Similar symposia may be organised at periodic intervals.

Dr GS Dhillon, Hon'ble Union Minister for Agriculture inaugurating the National Symposium on "Growth and Instability in Agriculture"

Dr NS Randhawa, Director General, ICAR delivering the Presidential Address



Prof PV Sukhatme delivering the Keynote Address at the National Symposium on "Sample Surveys in Indian Agriculture —Problems and Prospects"

Prof Prem Narain, Director Chairing the Plenary Session of the National Symposium on "Statistical Ecology"

UNDP CENTRE OF ADVANCED STUDIES IN AGRICULTURAL STATISTICS & COMPUTER APPLICATIONS

This Institute has been recognised as a 'Centre of Advanced Studies in Agricultural Statistics and Computer Applications' by United Nations/FAO under their development programmes from the Oct 1, 1983. The main objective is to develop a Centre of Excellence with adequate infrastucture facilities to undertake advanced training programmes and carry out research in various aspects of Agricultural Statistics and Computer Applications.

UNDP Consultants

	Consultants	Field of Consultancy	Period of Visit
1	Prof Jagdish S Rustagi The Ohio State University, Columbus, Ohio, USA	Simulation and Optimisation	Jun 6 to Jul 28, 1987
2	Dr DS Tracy University of Windser, Ontario, Canada	Multivariate Analysis and Statistical Inference	Jul 9 to Sep 6, 1987
3	Dr RN Curnow University of Reading, UK	Curriculum Development and Training Methods	Aug 1-31, 1987
4	Prof P Holgate Department of Statistics, Birbeck College, University of London, London, UK	Statistical Ecology	Dec 22, 1987 to Jan 20, 1988

The reports of Prof Jagdish S Rustagi, Dr DS Tracy and Dr RN Curnow had been received and the necessary action was being taken as per their recommendations. In addition, they delivered Seminar talks :

Consultants	Seminar Topic
Dr Jagdish S Rustagi	1 Bias reduction in kernel density and hazard function estimates
	2 Introduction to optimization techniques with applications in statistics
Dr DS Tracy	Matrise derivative and statistical applications
Dr RN Curnow	1 Optimal programmes for varietal selection
	2 Optimal diets for poultry flocks when individual requirement vary

Deputation for Training Abroad

Name of Scientist	Field of Training	Training Centre	Period
1 Sh OP Dutta, Scientist S-2	Computer Applications	1 IMSL Houston 2 Texas A and M University, College Station	5¾ Months
2 Dr VK Gupta, Scientist S-2	Curriculum Developments and Training Methods	University of Reading, Reading, UK	4 Months

Meetings

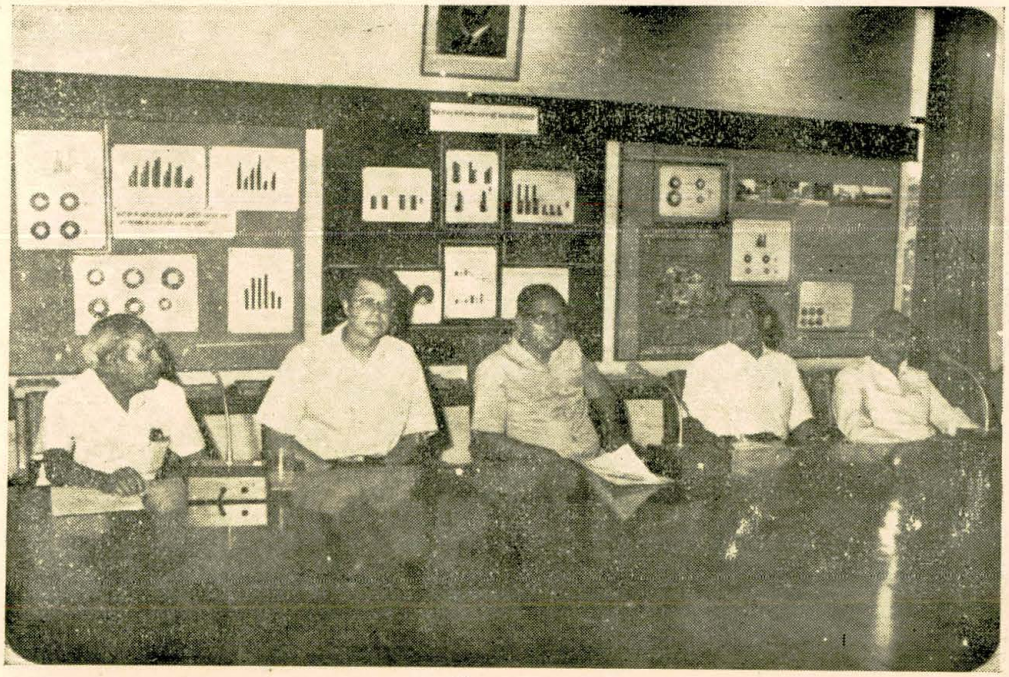
A meeting was organised to acquaint Mr N Van Leeuwen, Country Project Officer for India and Bhutan, FAO, Rome and Mr HKF Hoffmann, Senior Officer (Agricultural Education), Agricultural Education Group, FAO, Rome about the working and achievement of the UNDP Project at this Centre on Mar 13, 1987 The following were present :

1 Prof Prem Narain, Director, IASRI.

2 Mr N Van Leeuwen, Country Project Officer for India and Bhutan, FAO, Rome.

3 Mr HKF Hoffmann, Senior Officer (Agricultural Education) Agricultural Education Group, FAO, Rome.

4 Mrs AC Karna, Assistant, FAO



Dr Wayne L Myers, Co-Director, Office for Remote Sensing of Earth Resources, Pennsylvania State University, USA (2nd from L) & Dr Jagdish S Rustagi, Chairman, Deptt of Statistics, The Ohio State University, Columbus, USA, UNDP Consultant (4th from L) in discussion with the Senior Scientists

Representative in India and Bhutan, FAO, New Delhi.

5 Mr V Kumar, Administrative Officer, FAO, New Delhi.

6 Sh SC Rai, Head, UNDP Cell, IASRI, New Delhi.

A meeting was held at IASRI, New Delhi for discussing the progress of the UNDP Project on Jun 25, 1987 under the Chairmanship of Prof Prem Narain. Sh V Kumar, FAO, New Delhi, Sh Alok Sinha, UNDP, New Delhi, Sh V Radhakrishnan, UNDP, New Delhi and Sh SC Rai, New Delhi participated in the meeting. Prof Prem Narain presented the progress in respect of consultancy appointments, fellowship training and supply of equipments. Members also made visit to the Computer Centre.

Seminar

A seminar on the system of budgeting, consultancies, purchase of equipments, fellowship, study tour and reporting of progress on UNDP Project was organised by FAO from Apr 8-10, 1987 at FAO Office, New Delhi. Mr IC Eokorny, Chief Management Support Service, Agricultural Operations Division, FAO Rome was the main speaker, Prof Prem Narain, Director and Sh SC Rai, Senior Scientist of the Institute participated.

Visitors

Dr Raj S Chhikara,
Prof Mathematical Sciences,
University of Houston, USA

Ms Ilona De Borhegyi,
Visual Media Officer, FAO, Rome

Dr Wayne L Myers,
Co-Director, Office for Remote Sensing of Earth Resources, Pennsylvania State University, USA

Mr N Van Leeuwen,
Country Project Officer,
Asia and the Partific Service,
Agricultural Operation Division,
FAO, Rome

Mr V Kumar,
FAO, New Delhi

Ms Nicola Senecal, Director-General,
Multilateral Technical Co-operation,
CIDA, Ottawa, Canada

They acquainted with the progress made in the UNDP Project.

POST GRADUATE TRAINING AND EXTENSION

Regular Courses

The four regular post-graduate training courses : Professional Statisticians' Certificate Course, Diploma in Agricultural and Animal Husbandry Statistics Course, Senier Certificate Course and Course in Advanced Computer Programming which were being conducted at the Institute (the first two courses since 1945) were discontinued in 1985 and a new set of short term refresher courses namely Refresher Course in Agricultural Statistics, Senior Level Refresher Course for statisticians and Agricultural Scientists and also a short term course on the Use of Computer in Agricultural Research have been started from 1986 Apart from this, the Institute continued to conduct, in collaboration with IARI, two degree courses leading to MSc and PhD degrees in Agricultural Statistics and MSc degree course in Computer Application in Agriculture. During 1987, 19 students were admitted to various courses : 8 PhD, 7 MSc in (Ag stat) and 4 MSc (Computer Application in Agriculture). 26 students : 8 PhD and 14 MSc of Agricultural Statistics and 4 Diploma in Advanced Computer Programming successfully completed their degree courses.

Ad-hoc Training Courses

The second short-term course on use of computer in agricultural research was organised by this Institute from Jan 5-30, 1987 and was attended by the scientists of ICAR Institutes and Agricultural Universities. The certificates were distributed by Prof Prem Narain, Director, IASRI, New Delhi to 27 participants on Jan 31, 1987.

The 3rd short-term course on use of Computer in agricultural research was organised by this Institute from Sep 1-28, 1987. Prof Prem Narain, Director of the Institute inaugurated the course on Sep 1, 1987. The course was attended by the participants of ICAR Institutes and Agricultural Universities.

Ad-hoc Training Programme

A training programme was organised by the Institute on "Weather and crop forecasting and supply projections for agricultural commodities" from Jun 22 to Aug 28, 1987 under the USAID assisted Development and Management Training Project for the Directorate of Economics and Statistics, Ministry of Agricul-

ture and Cooperation. Dr OP Kathuria, Sr Scientist was the Course Coordinator for this programme.

The following scientists of the Institute delivered lectures to the participants :

Dr JP Jain, Sh PN Bhargava, Sh SC Rai, Dr AK Banerjee, Dr PC Mehrotra, Sh SR Bapat, Dr (Mrs) Ranjana Agrawal, Dr RC Jain, Sh GN Bahuguna, Dr KK Tyagi, Sh Ram Kumar, Dr VK Bhatia and Sh BH Singh.

Prof Prem Narain, Director of the Institute delivered valedictory Address and distributed certificates to the participants on Aug 28, 1987.

Research Fellowships

During 1987, 22 MSc and 24 PhD students received research fellowships. MSc students received fellowship at the rate of Rs. 800/- per month each besides Rs 2,000/- per annum as contingent grant. Of the 24 PhD students 15 received fellowship at the rate of Rs 1,000/- per month each in the I and II year and 9 students received fellowship at the rate of Rs 1,200/- per month in the III year in addition to Rs 5,000/- per annum as contingent grant.

Hostels

The Institute maintains two well furnished hostels : Panse Hostel and Sukhatme Hostel within its premises to cater residential requirements of the students. Ample facilities also exist for cultural activities and sports. All the students are supposed compulsorily to stay in the Hostel. Hostel mess is run by the students on cooperative basis. The general management of hostels is vested in the Warden, who is assisted by Prefect and the students Executive Committee. During 1987 the main activities included :

—New Year's Day and Holi festival were celebrated with great pump and show.

—Sarasvati Puja was celebrated on Feb 2, 1987

—All the students residing in the hostels organised their sports activities for the year 1987 and the certificates were distributed amongst winners of different events.

—A Cricket Match between students and faculty members of the Institute was played on Nov 14, 1987.

Seminars/Workshops/Lectures
Seminars

The results of the research projects and field trials undertaken in different aspects of Agricultural Statistics and Computer Applications were presented in the seminars organised regularly in the Institute. During the period under report 108 talks were delivered by the scientists, research scholars and various experts; the ones delivered by the eminent scientists are :

Sl. No.	Speaker	Topic
1	Dr BD Tikkiwal, Ex-Sr Prof of Statistics and Dean, Faculty of Science University of Rajasthan	New approach to teaching of courses in sample surveys
2	Dr KL Mehra, Prof of Mathematical Statistics, University of Alberta, Canada	"Non-parametric inference-where and why"
3	Dr Wayne Myers	"Remote Sensing and Spatial Data Analysis for Environmental Assessment"
4	Dr Hardev Sahai, Prof. Deptt. of Bio-Statistics and Epidemeology, Graduate School of Public Health, Medical Science Campus Univ, of Puerts Rico.	Variance component analysis
5	Dr RE Waggoner, Ex-Director, Connec Agri Expt Stat New Havan, USA	"Epidemiology and work for Statistician"
6	Dr CG Khatri, Prof and Head, Deptt. of Statistics Gujarat University, Ahmedabad	"Linear models and elliptical distributions"
7	Mr Francisco J Mata, Computer Centre, Costa Rica	CATINET : "Agricultural Computer Network"
8	Dr (Miss) Isha Bagai, Lecturer, Deptt of Statistics, Punjab University, Chandigarh	"Some tests underlying competing Risk Models"

WORKSHOPS

8th Annual Workshop of the AICRP on Weed Control

The 8th Annual Workshop of the All India Coordinated Research Programme on Weed Control was held at IASRI from Feb 25-27, 1987. It was attended by about 100 delegates. Prof Prem Narain, Director, IASRI welcomed the delegates and Dr IP Abrol, DDG (SAE), ICAR gave the inaugural address. Some Senior Scientists of the Institute participated in the workshop deliberations and gave useful suggestions in designing of experi-

mental programmes on weed control and on improving survey technique for estimating weed flora. Shri PN Bhargava, Head, Division of Design of Experiments and Analysis of Experimental Data proposed 'vote of thanks'.

Mini Workshop on Data Processing and Application in Coordinated Projects

The IASRI organised a Mini Workshop on Data Processing and Application in Coordinated Projects in collaboration with ICAR and IRRI from Dec 14-16, 1987. From the Institute 6 Sr Scientists participated in the workshop. Prof Prem Narain chaired one of the technical sessions and presented a paper on Data Interpretation of All India Coordinated Research Project Systems. The mini workshop was attended by 55 participants consisting of Project Directors/Project Coordinators in various crop improvement projects and scientists from ICAR and International Rice Research Institute, Manila, Philippines. An important recommendation of the workshop related to development of appropriate linkages among the various crop improvement projects and IASRI and involvement of IASRI in the training on field trials and data collection and management to scientists of various crop improvement projects.

LECTURE

Dr VG Panse Memorial Lecture

Prof Jagdish S Rustagi, Department of Statistics, The Ohio State University, Columbus, Ohio, USA delivered Dr VG Panse Memorial Lecture on "Teaching of Statistics and Statistical Consulting", at the Institute Auditorium an Jul 24, 1987. The lecture was presided by Prof PV Sukhatme, Maharashtra Association for Cultivation of Science. Prof Prem Narain, Director and other scientists of the Institute attended the lecture.

Advisory Service

The Institute continued to play its important role of giving technical advice and guidance in regard to problems in agricultural statistics and sampling techniques particularly in the statistical aspects of the projects financed by the ICAR.

Technical advice and guidance were also rendered to research workers and students of the various research Institutes, universities and other research organisations in planning of their experimental investigations and in processing and analysis of data on the computer. Division-wise brief resume of such assistance rendered during the year is as follows :

Design of Experiments and Analysis of Experimental Data

—Dr Manekar, Director, Cotton Research Institute, Nagpur regarding choice of treatments, layout plan and analysis of long term experiments.

Sample Survey Methodology and Analysis of Survey Data

—Central Silk Board, Bangalore,

Ministry of Textiles, Govt. of India, for tabulation of data and organisation of field survey work for estimating the production of sericultural products.

—Mack Svendron, Scientist, IFPRI, Washington D.C. on planning of survey for performance monitoring of irrigation system.

—Deputy Director (Statistics), Directorate of Animal Husbandry Gujarat on the procedures for estimation of production of milk and eggs and their variances.

—Deputy Director (Statistics), Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi on the statewise estimates of milk production for the period 1977-85.

—Assistant Soil and Conservation officer and Deputy Commissioner (SWC) of the Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi for organising a transfer programme for a base line survey under the world bank aided.

—Department of Animal Husbandry, Punjab on estimation procedure for working out cost of production of milk.

—To Shri AS Chopra, Jt. Director (Stat.), Ministry of Agriculture, Department of Animal Husbandry on the estimation of livestock numbers on sampling basis.

—To Dr DS Balame, Director, NBPGR and NIAG, Karnal in formulating a sampling plan for development of data base on breed characteristics of economically important domestic livestock.

—Dr M Rajashekhar, Bio-statistician, All India Coordinated Research Project on Development of a system for surveillance, monitoring and forecasting of animal diseases of economic importance, Institute of Animal Health and Veterinary Biologicals, Bangalore in the formulation of technical programme and questionnaire for the project.

—Shri AS Sanghi, Agril. Economist, Department of Irrigation, Haryana on "Sampling Design".

—Jt. Director (AHS), Department of Agriculture and Cooperation, Ministry of Agriculture, New Delhi on estimates of milk production for the year 1983-84 and 1984-85.

—Shri Sudershan Kumar, Dy. Director (Statistics), Department of Animal Husbandry, Punjab, regarding initiation of a 'Sample survey for cost of production of milk' by the state Govt.

—Dy. Director (Stat), Directorate of Animal Husbandry, Haryana in planning of sample surveys on

livestock products under centrally sponsored scheme.

—Central Silk Board, Bangalore, Ministry of Textiles, Govt. of India for coding of schedules in the 'Survey for estimating the production of sericultural products'.

—Agricultural Economist and Ex-officio Additional Director of Agriculture, West Bengal on planning of survey on estimation area and production of fruits and vegetables in the state.

—Agricultural Economist, Monitoring and Evaluation Cell, Deptt. of Irrigation, Haryana on survey design for evaluation of canal irrigation in selected districts in the state.

Bio-statistics and Statistical Genetics

—Officers from GIC and State Govts. on statistical matters relating to crop insurance.

—Dr SS Negi, Emeritus Scientist, IVRI (Regional Station) Palampur (H.P.) on analysis of data regarding the summer degraduation of dry matter or nitrogen.

—Shri RK Kamra, ISS Probationer; CSO on statistical analysis of animal breeding data.

—Dr. TVRS Sharma, Scientist (S-2), Plant Breeding of CARI, Port Blair on analysing the data of 150 strains of rice collected under varietal evaluation programmes.

Forecasting Techniques for Crops, Diseases and Pests

—To Shri S Mukherjee, ISS Probationer on forecasting of jute yield using time series models.

—Head, Division of Extension, ILRI, Ranchi, in formulating the project (pre-harvesting forecasting of stick lac' at ILRI, Ranchi.

Computing Science

—Dr. AG Khan, Prof and Head, Department of poultry science, College of Veterinary Science and Animal Husbandry, Jabalpur for the analysis of control line data of ICAR Project on poultry.

Computing Services

Burroughs B—4700 Computer System alongwith the 16 interactive terminals and the ET-2000 Graphics terminals were run from 8 AM to 8 PM on all working days. The mainframe system provides data processing and computer programming facilities to the Research workers and Seientists of this Institute and other organizations engaged in Agri. Research and Developmental activities.

An IBM compatible PC (SHYAM) with one Hard Disk (2MB) and one floppy drive was installed. ET 2000 Graphics terminal, PC and interactive terminals are extensively used by staff and

students for development of computer software and learning purposes.

Programming and data processing assistance was provided to 190 Research students from various ICAR Institutes and Agril. Universities.

The Institute continued to provide selective information service based on International Information System for Agricultural Science and Technology (AGRIS).

Mechanical Tabulation Unit under took jobs of punching data on cards. About 8 lakhs cards were punched and verified.

LIBRARY AND DOCUMENTATION SERVICES

Resource Building

As a part of its important activities, library continued its resource collection programme as under :

i Total number of publications as on 1.1.87 : 25918
- a Books : 19632
- b Journals : 882
- c Reports, etc : 5404

ii Number of publications added during 1987 : 1,192
- a Books : 421
- b Journals : 444
- c Reports, etc : 327

iii Journals subscribed : 180
- a Indian : 50
- b Foreign : 130

iv Bulletins/Newsletters received on exchange : 80

v Number of reprints procured during 1987 : 39
- a For exchange : 14
- b For users : 25

Maintenance

i) Publications bound : 810

ii) Publication mended: (in house) 450

Library usage

i Working hours : 09.30 AM to 04.30 PM.

ii Numbers of readers who consulted the library : 19,000

iii Number of publications issued from the library : 18,900

Library Services

i Number of documents borrowed or lent out on inter-library loan : 119

ii Number of pages of scientific and technical nature reprographed : 48,132

iii Number of issues of 'Current Content Mirror' brought out : 16

iv Number of electronic stencils and transparencies made : 480

Advisory Services

Provided guidance to the ICAR Institute's and CSIR Librarians/ Documentation Officer with regard to technical and organisation part.

Library Committee

The library committee consists of :

1.	Prof Prem Narain	*Director*
2.	Dr SS Pillai	*Chairman*
3.	Dr OP Kathuria	*Member*
4.	Dr VK Sharma	,,
5.	Sh SR Bapat	,,
6.	Sh AC Kaistha	,,
7.	Sh PN Soni	,,
8.	Sh SS Srivastava	*Convenor*

Art and Photography Unit

Art : Art Unit assisted the scientists in preparing diagrams, charts, histograms and maps for research publications and as also visual display of research findings in the exhibition room. It also assisted in transcribing the lectures write-ups on transparencies.

Photography : Photographic jobs including exposing, processing and printing of about 600 photos taken on various important occasions and of important research and extension activities of the Institute were executed. In addition enlargement of good number of photographs were also done.

Visual Display of Research Findings : The charts and graphs were updated in the light of recent research findings for display in the exhibition room. A number of new charts were also added to the existing ones depicting current research findings. Photos taken at the time of National Symposia held at the Institute were displayed. Latest publications were also added.

PUBLICATIONS

Research Papers

The major publications of the Institute comprised over 65 papers and popular articles the details of which are given in Appendices V and VI.

Research reports/Monographs/Compendia

Bapat, SR ; BH Singh and RC Jain. Annual report of pilot studies on pre-harvest forecasting of yield of (Kharif) Groundnut in Rajkot Distt (Gujarat) 1984-85.

Batra, MS and OP Kathuria. Pilot sample survey on cost of production of Banana/Mango and its marketing practices in Surat and Bulsar districts of Gujarat State.

Bassi, GS ; PC Mehrotra and SK Raheja. Statistical summarisation of results on yield rates, area and extent of adoption of improved practices for HYV of millets (maize, jowar, bajra) during 4th and 5th five year plan periods.

Bhatia, VK ; Prem Narain and PK Malhotra. Some aspects of yield-survival relationship in dairy cattle.

Ghai, RK ; PN Bhargava ; MP Saksena and PR Yeri. Annual Index of Agricultural Field Experiments, Vol. XI (List of experiments conducted during 1972-77 and reported during 1982-83 under the scheme of National Index of Agricultural Field Experiments).

Lal, Basant ; PN Bhargava and Aloke Lahiri. A report on statistical study of intercropping experiments.

Malhotra, PC ; VS Rustogi, SK Raheja and Satya Pal. A study of variability and trends of yield rates of high yielding varieties of rice during the fourth and fifth five year plan period (1987).

Nadkarni, UG ; LBS Somayazulu and SC Agarwal. Optimum ration for animal production through linear programming technique.

Raheja, SK ; AK Srivastava ; SS Gupta ; VP Malhotra and PS Dahiya. Sample survey for cost of cultivation, agronomic enquiry, area and yield rates of potatoes.

Singh, Jagmohan and SD Bokil. A study on costs and returns from inter crops in apple cultivation.

Wahi, SD ; Prem Narain and LK Garg. Use of discriminant function for comparing different grades in crossbreeding programme with sheep.

AWARDS/HONOURS/SPECIAL RECOGNITION

Prof Prem Narain

—Was elected

* Member, Executive Committee (1987-89) of the Indian Association of Social Science Institutions (IASSI), New Delhi.

* President of the Physical Sciences Section of the 57th Session of the National Academy of Sciences, India, Allahabad.

—Was selected for "Dr GP Chatterjee Memorial Lecture Award (1987)" of the Indian National Science Academy for his contribution in the field of Agricultural Statistics.

Dr OP Kathuria

—Was nominated Chairman of Subcommittee constituted by the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics constituted by Ministry of Agriculture, Govt of India, New Delhi.

SEMINARS/WORKSHOPS/SYMPOSIA AND CONFERENCES ATTENDED BY THE SCIENTISTS

S. No.	Name of the Scientist	Programme title	Venue	Period
1	2	3	4	5
1	Shri SR Bapat	Workshop of All-India Coordinated Project on Weedicide	IASRI, New Delhi	Jan
2	Prof Prem Narain, Dr JP Jain and Shri SP Doshi	Workshop on Statistical Methods in Genetics and Medicines, sponsored by UGC and AP State council of science and technology	Deptt. of Genetics, Osmania University, Hyderabad (AP)	Jan 5-10
3	Shri Kharag Bahadur Singh and Dr KK Tyagi	Tenth Annual Workshop on the All India Coordinated Research Project on Energy Requirements in Agricultural Sector	The Cenetral Research Institute of Dryland Agriculture, Hyderabad	Jan 8-10
4	Dr JP Jain*	The Second Workshop on All India Coordinated Research Project on the Development of a System for Monitoring Surveillance and Forecasting of important Animal Diseases	The Institute of Animal Health and Veterinary Biologicals, Habbal, Bangalore	Jan 23-25
5	Shri KB Singh	The National Seminar on Status of Animal Energy Utilization	Central Institute of Agricultural Engineering, Bhopal	Jan 24-25

* Also chaired the meeting of the Working Group on 'Data Processing and computer application.

1	2	3	4	5
6	Dr JP Jain	The National Workshopcum-Seminar on 'Meat and Meat Products'	Pragati Maidan, New Delhi	Feb 2
7	Prof Prem Narain	International Symposium on climate Variability & Food Security, oganised jointly by Indian National Science Academy, American Association for Advancement of Science and IRRI	New Delhi	Feb 6
8	Shri PN Bhargava	Eleventh Workshop on All India Coordinated Project for Research and Water Management	Udaipur	Feb 9-13
9	Dr VK Bhatia	International Symposium on Afforestation of Salt Affected Soils	CSSRI, Karnal	Feb 16-20
10	Shri PN Soni Shri PN Bhargava Shri MR Vats	National Symposium on Alternate Farming System	IARI, New Delhi	Feb 21-23
11	Shri OP Dutta Dr KK Tyagi Shri SL Garg Dr VT Prabhakaran	Symposium on Operations Research and Statistical Analysis in the Nineties organised by Institute of System-Studies and Analysis of Defence Research and Development Organisation	New Delhi	Feb 26-27
12	Shri PK Malhotra Shri SD Wahi	National Symposium on Plant Genetic Resources	NBPGR, New Delhi	Mar 3-6
13	Dr OP Kathuria	Indian Water Congress organised by Indian Centre for Public Health and Environment	Hotel Hayatt Regency, New Delhi	Mar 11-13

1	2	3	4	5
14	Shri OP Dutta	Conference on Cybernetics and Systems organised by the Society of Management Science and applied Cybernetics (CSIR). New Delhi	Hotel Samrat, New Delhi	Mar 18-20
15	Dr VK Sharma	International Symposium on Science, Technology and Development sponsored by World Federation of Scientific Workers with the assistance of the Govt. of India	Vigyan Bhawan, New Delhi	Mar 20-25
16	Dr Randhir Singh	Annual Convention of American Society of Photogrammetry and Remote Sensing	Baltimore, USA	Mar 28 to Apr 3
17	Dr OP Kathuria Dr HVL Bathla	Symposium on Impact of Current Land Use Pattern and Water Resources Development on Riverine Fisheries	CICFRI, Barrackpore, Calcutta (W.B.)	Apr 25-27
18	Dr SS Pillai and 30 other scientists of the Institute	National Symposium on Electronic Data Processing and Computerised Information System in Agriculture Research	IASRI, New Delhi	May 25-26
19	Shri PN Soni Shri MR Vats Shri DK Sehgal Shri DK Metha	The XIII Annual Workshop of AICRP on Long Term Fertilizer Experiments	GB Pant University of Agriculture and Technology, Pantnagar, (UP)	May 27-29
20	Shri Mahesh Kumar	Seminar on Unix and Unix Like System	CSI, Delhi Chapter	May 23-24
21	Shri PN Bhargava	The III Workshop on all India Diara Land Crop Improvement	Banaras	Jun 8-10

1	2	3	4	5
22	Shri SP Doshi	National Seminar on "Distributional Data Bases"	Mysore	Jun- 29 Jul 1
23	Dr PC Mehrotra	Seed and Fertilizer Zonal Conference for Rabi, 1987 season organised by National Cooperative Development Corporation	Bangalore	Aug 18
24	Prof Prem Narain Dr VK Sharma* and 20 other Scientists of the Institute	The National Symposium on Growth and Instability in Agriculture	IASRI, New Delhi	Aug 19-21
25	Dr Bhagat Singh Shri MS Narang	All India Seminar on Mandal System and Rural Development in Andhra Pradesh organised by Prakasham Institute for Development Studies, Hyderabad	Ambedkar Auditorium, AP Bhawan, New Delhi	Aug 22-24
26	Shri R Gopalan	Workshop on Expert Systems-Concepts and Implementation	New Delhi	Sep 2
27	Dr SK Raheja	Workshop on "Farming Systems Research Programme in Eastern India" organised by NDUAT, Faizabad and Ford Foundation	Faizabad	Sep 7-9
28	Dr SK Raheja	Workshop on "Women Work and Child Survival" Organized by Ford Foundation	New Delhi	Sep 14-15
29	Prof Prem Narain Dr OP Kathuria* and 40 other Scientists of the Institute	National Symposium on "Sample Survey in Indian Agriculture-Problems and Prospects"	IASRI, New Delhi	Sep 17-19

* As Convenor.

1	2	3	4	5
30	Shri PN Bhargava	The Workshop on "Water Management in Rural Areas" organized by the Instt. of Public Health Engineers	New Delhi	Sep 19
31	Prof Prem Narain, Dr OP Kathuria, and 20 other Scientists of the Institute	Workshop on Estimation Procedure and Tabulation Programme Relating to Production Surveys on Milk, Eggs, Wool and Meat and Cost of Production Studies on Milk and Eggs	IASRI, New Delhi	Sep 22-26
32	Dr RK Pandey Shri PN Bhargava Dr VK Sharma Mrs Asha Saksena Shri SC Mehta	Group discussion on "Agricultural Drought" organised by Federation of Indian Societies of Agricultural Sciences and Technology	IASRI, New Delhi	Sep 28
33	Prof Prem Narain	i) The 57th Annual Session of the National Academy of Sciences, India	Bharathidasan University, Tirichirapalli (TN)	Oct 7-9
		ii) Directors' Conference of ICAR Research Instutes	Pragati Maidan, New Delhi	Oct 14 & 15
		iii) The 53rd Session of the Indian Academy of Sciences	Regional Res. Laboratory, Hyderabad	Nov 7
		**iv) The 9th Annual Conference of the Indian Society of Probability and Statistics	Deptt. of Mathematical Stat., Delhi Univ., New Delhi	Nov 10-13

* Convenor.

** Also a member of reception Committee.

1	2	3	4	5
34	Prof Prem Narain, Dr Prajneshu* and 32 other scientists of the Institute	National Symposium on Statistical Ecology	IASRI, New Delhi	Nov 19-21
35	Dr SK Raheja Shri PN Bhargava	FAI Seminar on "Fertilizer Industry—Challenges and Strategies"	New Delhi	Dec 3-5
36	Shri SC Rai	Worhshop of Statistical Quality Control organized by Bureau of Indian Standards	Jaipur	Dec 9
37	Shri SC Rai*	Symposium on 'Statistical Aspects of Crops Yields'	CTRI, Rajahmundry	Dec 18
38	Prof Prem Narain** Dr SS Pillai Dr A Dey Sh PN Bhargava Sh PN Soni Dr VK Bhatia	The ICAR/IRRI Mini Workshop on "Data Processing and Application in Coordinated Research Projects"	Hotel Ashok, New Delhi	Dec 14-16
39	Prof Prem Narain Dr OP Kathuria+ Sh SC Rai Dr Shivtar Singh Dr SS Shastri Dr VK Bhatia	The 41st Annual Conference of the Indian Society of Agricultural Statistics	CTRI, Rajahmundry (AP)	Dec 17-19

* As Convenor.

** Organised and attended as local coordinator and also Chaired Session IV of the Workshop on Dec 15, 1987.

\+ Convenor of the Symposium on Small Area Statistics Organised during Conference.

PAPERS PRESENTED AT WORKSHOPS/SYMPOSIA/CONFERENCES

S. No.	Authors	Paper title	Programme title	Venue	Period
1	2	3	4	5	6
1	Shamra, JS Bhatia, VK Gill, HS	Analysis of variability in afforestation studies in sodic soils	International Symposium on Afforestation of Salt Affected Soils	CSSRI, Karnal	Feb 12-20
2	Soni, PN Vats, MR	Cropping system in relation to irrigation and fertiliser constraints	National Symposium on Alternate Farming System	IARI, New Delhi	Feb 21-23
3	Narain, P	Documentation of genetic resources in the national context	National symposium on Plant Genetic Resources	New Delhi	March 3
4	Dutta, OP	An overview of energy crises in perspective	Congress of Cybernetics and Systems organised by the Society of Management Science and Applied Cybernetics	CSSRI, Karnal	Mar 20

1	2	3	4	5	6
5	Bhargava PN Ghai RK	Agricultual field experiment information system	National Symposium on Electronic Data Processing and Computer Information System	IASRI, New Delhi	May 25 & 26
6	Bhatia, VK	Some aspects of statistical Computing	,,	,,	,,
7	Bhatia, VK	Simulation of statistical biological models which are of interest in animal breeding	,,	,,	,,
8	Bhatia, VK Malhotra, PK Kumar, Mahesh	Adoption of computer programes relevant to agricultual and animal science research	,, ,,	,, ,,	,, ,,
9	Doshi, SP	Computer software development for cluster analysis	,,	,,	,,
10	Jain, RC	What I look for in a Computer center	National Symposium on Electronic Data Processing and Computer Information System	IASRI New Delhi	May 25 & 26
11	Kumar, Mahesh	Conversion of programme LSML 76	,,	,,	,,

1	2	3	4	5	6
		(Mixed Model least square and maximum likelihood computer programme) for B-4700 medium system			
12	Raheja, SK Mehrotra, PC	Role of computer in plaanning of sample surveys and analysis of survey data	,,	,,	,,
13	Pandey, RK Sarup, Shanti	Planning for foodgrains production at the turn of the country	XII Indian Social Science Congress	Mysore	Jul 14-17
14	Prajneshu	Stochastic population ecology models in random environment	International Conference of 'Combinatorics, Optimization and Statistics'	Srinagar	Aug 17-21
15	Kumar, Ashok Kaul, Sushila	Estimation of contribution of growth components and instability in agriculture	The National Symposium on 'Growth and Instability in Agriculture	IASRI, New Delhi	Aug 19-21
16	Bhardwaj, SP and Antram	Growth and instability in sugarcane crop and its impact on exportable surplus sugar in India	,,	,,	,,

1	2	3	4	5	6
17	Choudhary, HB	Output growth stability of tea in India	,,	,,	,,
18	Dixit, UN	Impact of production instability on input use and cropping pattern	,,	,,	,,
19	Raheja, SK Narain, P	Agricultural growth and development-regional strategies	The National Symposium on "Growth and Instability in Agriculture"	IASRI, New Delhi	Aug 19-21
20	Rai, SC Shanti Sarup	Some Methodological issues relating to measures of instability in crop production	,,	,,	,,
21	Singh, Jagmohan Kathuria, OP Singh, Joginder	Instability and imbalances in growth of fertilizer consumption in India-consequences and remedy	,,	,,	,,
22	Singh, Jagmohan Mehrotra, PC Rustogi, VS	Contribution of acreage, productivity and their interaction to growth in production of grain in important states	,,	,,	,,
23	Prajneshu	Non-linear stochastic population ecology models and their applications	International Conference on 'Non Linear Analysis and Applications to Biomathematic	Andhra University Visakhapatnam	Aug 24-28

1	2	3	4	5	6
24	Arya, SN	Demographic surveys for animal populations	The National Symposium on Sample Surveys in Agriculture-Problems and Prospects"	IASRI, New Delhi	Sep 17-19
25	Choudhry, HB	On estimation of crop production-an alternative approach	,,	,,	,,
26	Dixit, UN	Impact of production instability on input use and cropping pattern	,,	,,	,,
27	Kathuria. OP Srivastava, AK Singh, KB Khatri, RS	Factors affecting quality of data in agricultural sample survey	,,	,,	,,
28	Khosla, RK Narain, P Gupta, HC	Review-estimation of crop losses	The National Symposium on Sample Surveys in Agriculture-Probems and prospects"	IASRI, New Delhi	Sept 17-19
29	Raheja, SK Mehrotra, PC	Sample surveys on fleld crops—past, present and future	,,	,,	,,

1	2	3	4	5	6
30	Raheja, SK Mehrotra, PC Rustogi, VS	Quality of data in agricultural surveys	,,	,,	,,
31	Singh, Bhagat	Conducting agro-economic surveys in tribal areas-Some problems	,,	,,	,,
32	Singh, Randhir Singh, Nirmal	Imputation in longitudinal surveys	,,	,,	,,
33	Singh, Shivtar Jain, JP	Overview of sampling methodologies as applied to animal sciences	,,	,,	,,
34	Singh, Shivtar Narain, Prem Garg, JN	Data generation through crop estimation surveys for use in crop insurance	,,	,,	,,
35	Srivastava, AK Singh, SP	Small area estimation-a review	,,	,,	,,
36	Pandey, RK Sarup Shanti	Study of charges in farm tenancy structure emerging trends and its implication	The 47th Annual Conference of Indian Society of Agricultural Economics	Rammohanpur (WB)	Sep 24-26
37	Saksena, Asha	A method of determining drought threshold value for a crop	Group discussion on "Agricultural Drought"	IASRI, New Delhi	Sep 28

1	2	3	4	5	6
38	Narain, P	Role of Random process in genetics	The IX Annual Conference of the Indian Society of Probability and Statistics	University of Delhi, Delhi	Nov 11
39	Bhatia, VK	Modelling in animal epidemiology	The National Symposium on Statistical Ecology	IASRI, New Delhi	Nov 19-21
40	Kathuria, OP Bathla, HVL Gupta, VH	Study of growth rates in marine fisheries in India	,,	,,	,,
41	Narain, Prem Khosla, RK Gupta, HC	Statistical aspects in pests control management	,,	,,	,,
42	Prabhakaran, VT	Stochastic models for rumen fermentation studies on ruminants	,,	,,	,,
43	Prajneshu	Fish Population growth models and harvesting policies	,,	,,	,,
44	Shastri, SS	A study on model for zooplankton production in Arabian Sea	,,	,,	,,

1	2	3	4	5	6
45	Bhargava, PN Ghai, RK Saksena, MP	Agricultural field experiments information system	The ICAR/IRRI Mini Workshop on Data Processing and Application in Coordinated Research Projects	New Delhi	Dec 14-16
46	Narain, Prem Bhargava, PN Soni, PN	Data interpretation of All India Coordinated Research Project System	,,	,,	,,
47	Banerjee, AK Mehrotra, PC Rustogi, VS	Regression models and economic optima in fertilizer use.	41st Conference of Indian Socieity of Agricultural Statistics	CTRI, Rajahmundry	Dec 16-19
48	Banerjee, AK Singh,.Jagmohan Kathuria, OP	A study of losses in agricultural production due to floods	,,	,,	,,
49	Bhatia, VK Narain, Prem	Some statistical aspects of stability of crop yields	,,	,,	,,
50	Dey, A Banerjee, AK	On the estimation of coefficient of variation	,,	,,	,,
51	Jain, VK Banerjee, AK Kathuria, OP	On cost of cultivation of gram in Vidisha distt.	,,	,,	,,

1	2	3	4	5	6
52	Prakhakaran, VT Jain, JP	Distribution of the linear combination $\alpha X \beta y$ of two dependent F—variates	,,	,,	,,
53	Rustagi, RL Singh, Shivtar	Some studies in mixed farming	,,	,,	,,
54	Saxena, BC Srivastava, AK	Another estimation approach in multiple frame surveys in two stage sampling	,,	,,	,,
55	Sethi, SC Kathuria, OP Singh, Jagmohan Mathur, DC	Prospects of employment generation in lac cultivation in tribal areas	,,	,,	,,
56	Shastri, SS	Use of sample surveys in biological oceanography	,,	,,	,,
57	Shastri, SS	Some contribution to graphical presentation	,,	,,	,,
58	Shastri, SS Guglani, JD	A study of fluctuations in coarse grain production in Maharashtra	,,	,,	,,

1	2	3	4	5	6
59	Shastri, SS Raheja, SK	Some contribution to successive sampling-a case of dynamic population	41st Conference of Indian Society of Agricultural Statistics	CTRI, Rajahmundry	Dec 17-19
60	Singh, Jagmohan Kathuria, OP	Effect of flood parameters on yield of paddy crop	,,	,,	,,
61	Singh, KB Srivastava, AK Khatri, RS	A case study on collapsing of strata	,,	,,	,,
62	Kathuria, OP	On some methods of small area estimation	The symposium on small Area Statistics (during 41st Conference of ISAS)	,,	Dec 17
63	Narain, Prem Singh, Shivtar	Estimation for small areas under crop insurance	,,	,,	,,
64	Rai, SC Sarup, Shanti	Measures of Statbility for binary responses in crop yields	The symposium on "Statistical Aspects of Stability of Crop yield"	,,	,,
65	Singh, Jagmohan Mehrotra, PC Rai, SC	Stability of Productivity of HYV wheat	,,	,,	,,

1	2	3	4	5	6
66	Bhardwaj, SP Pandey, RK	Impact of external debt in agricultural development in India	Annual Conference of Indian Economic Association	Jaipur	Dec
67	Narain, P Kathuria, Op Srivastava, AK	Measuring change in agricultural surveys	Annual Conference of International Statistical Institute	Tokyo, Japan	Sep 19

OTHER INFORMATION ABOUT SCIENTISTS

Fellowship/Membership of Scientific Societies

Prof Prem Narain

—Royal Statistical Society of Britain

—Indian National Science Academy

—Indian Society of Genetics and Plant Breeding

—International Statistical Institute, Netherlands

—National Academy of Sciences, India

—Indian Academy of Sciences, Bangalore

—Secretary General, Federation of Indian Society for Agricultural Sciences of Technology

—Vice President, Indian Society of Agricultural Science, New Delhi

—Secretary, India Society of Agricultural Statistics, New Delhi

—Chairman, Editorial Board, Journal of the Indian Society of Agricultural Statistics, New Delhi

Dr SS Pillai

—Institute of Electronics and Telecommunication Engineers (IETE)

—Advisory Committee for the Council for Advancement of Rural Technology, New Delhi

—Group of Communication Net Work for AGROMENT set up by the Space Application Centre

—Society for Information Science

—Computer Society of India

—Chairman, Division II (software) of Computer Society of India

—Chairman Division VIII (Micro Computers) of Computer Society of India

Dr SK Raheja

—Indian Society of Agricultural Statistics, New Delhi

—Indian Society of Agricultural Sciences, New Delhi

Dr RK Pandey

—Indian Society of Agricultural Economics, Bombay

—Indian Economic Association Kanpur

—Indian Academy of Social Sciences, Allahabad

Dr OP Kathuria

—Indian Society of Agricultural Statistics, New Delhi

—International Association of Survey Statisticians, Paris, France

—Indian Society of Agricultural Science, New Delhi

Dr Aloke Dey

—Indian Society of Agricultural Statistics, New Delhi

—International Statistical Institute, Netherlands

—Biometric Society, Washington, USA

Dr JP Jain

—Indian Society of Agricultural Statistics, New Delhi

—Indian Society of Agricultural Science, New Delhi

Dr Prajneshu

—Indian Society for Probability and Statistics

—Biometric Society, Washington, USA

—Gujarat Statistical Review

Sh RK Khosla

—Indian Society of Agricultural Statistic, New Delhi

—International Association of Survey Statisticians, Paris, France

Dr KG Aneja

—Indian Society of Agricultural Statistics, New Delhi

—Biometric Society, Washington, USA

Dr PC Mehrotra

—Indian Society of Agricultural Statistics, New Delhi

—Indian Society of Agricultural Science, New Delhi

Sh SC Rai

—Joint Secretary, Indian Society of Agricultural Statistics, New Delhi

Dr VK Sharma

—Indian Econometric Society, Ahmedabad

Dr HVL Bathla

—Indian Society of Agricultural Statistics, New Delhi

—Biometric Society, Washington, USA

Sh TB Jain

—Indian Society of Agricultural Statistics, New Delhi

—Indian Society of Agricultural Economics, Bombay

Sh Shanti Sarup

—Indian Academy of Social Sciences, Allahabad

Sh OP Dutta

—Computer Society of India

Dr VK Bhatia

—Indian Society of Agricultural Statistics, New Delhi

—Indian Society of Agricultural Science, New Delhi

Dr VK Gupta

—Indian Society of Agricultural Statistics, New Delhi

—International Association of Survey Statisticians (ISI)

Sh PK Malhotra

—Indian Society of Animal Genetics and Breeding, New Delhi

—Indian Society of Agricultural Statistics, New Delhi

—Biometric Society, Washington, USA

Sh HB Choudhary

—Indian Society of Agricultural Statistics, New Delhi

—Agricultural Research Communication Centre, Karnal

Sh SN Arya

—Indian Society of Agricultural Statistics, New Delhi

—Society for the Advancement of Research in Animal Sciences, Ludhiana

Dr Basant Lal

—Indian Society of Agricultural Statistics, New Delhi

—Indian Society of Agricultural Sciences, New Delhi

Dr Chandrahas

—Biometric Society, Washington, USA

Dr PS Rana

—Indian Society of Agricultural Statistics, New Delhi

—Indian Academy of Arithmetic, Indore

—Biometric Society, Washington, USA

Sh PN Bhargava, Sh SR Bapat, Dr HP Singh, Dr AK Banerjee, Dr. AK Srivastava, Dr VS Rustogi, Dr (Mrs) Ranjana Agrawal, Dr Shivtar Singh, Dr SS Shastri, Dr RC Jain, Dr GC Chawla, Sh PK Batra, Sh KB Singh, Sh MS Batra, Dr DL Ahuja, Dr LBS Somayazulu, Sh SP Verma, Sh AS Gupta, Sh MS Narang, Sh BH Singh, Sh MR Vats, Sh Balbir Singh, Sh HO Agrawal, Sh SC Sethi, Sh DC Mathur, Sh HC Gupta, Sh JP Goel, Sh Tribhavan Rai

—Indian Society of Agricultural Statistics, New Delhi

Membership of Committees/Panels/ Working Groups

Prof Prem Narain

—Indian Science Congress Association, Calcutta

—General Council of the University of Edinburgh (UK)

—Computer Society of India

—General Body of the Jan Timbergen Institute of Development Planning, Rohtak

—Bernoulli Society for Mathematical, Statistics and Probability, Netherlands

—New York Academy of Sciences, USA

—Indian Society of Human Genetics

—Editorial Board of the Journal of Energy from Biomass and Recycling, India House Development

—Chairman, the first and second meetings of Sub-Working Group for the discipline of Animal Husbandry Statistics for undertaking in depth studies for formulation of suitable proposals for the VII Five Year Plan of the Ministry of Agriculture, New Delhi.

—Scientific Advisory Committee of the Institute for Research in Medical Statistics, New Delhi.

—Technical Evaluation Committee for evaluation of the design and methodology on collection of catch statistics of fish from different inland water resources, monitoring of progress of work and suggestions on improvement of sampling system for central sector scheme on Development of Inland Fisheries Statistics for implementation.

—ICAR Committee of direction to consider the methodology and detailed programme of work, relating to All India coordinated project on "Survey of animal draught power in various agroclimatic zones of the country—Socio-economic features and current husbandry practices".

—Committee of Direction for the National Bureau of Animal Genetic Resources and the National Institute of Animal Genetics for formulation of detailed programme.

—Direction Committee of Computer Science and Numerical Analysis IASRI, New Delhi.

—Chairman, Advisory Board on Training Courses, IASRI, New Delhi.

—Academic Council, IARI, New Delhi.

—Committee on Improvement of Agricultural Statistics, National Sample Survey Organisation, New Delhi.

—Sampling Methods Sectional Committee, TDC—33 for preparation of Standard of Statistical Quality Control of the Bureau of Indian Standards, New Delhi.

—Committee on Improvement of Agricultural Statistics, Directorate of Economics and Statistics, New Delhi.

—Faculty of Mathematics, University of Delhi

—Central Technical Committee on Agricultural Census (1980-81) of the Ministry of Agriculture, Govt of India, New Delhi.

—Committee of experts to evaluate the proposal submitted by Economics and Marketing Research Department of Projects and Development India Ltd.

—Chairman, AFDC—57 on behalf of the Sampling Methods for Food Production Agricultural Inputs, Sectional Committee of the Bureau of Indian Standards, New Delhi

—Chairman, Management Committee, IASRI, New Delhi.

—The group to undertaken in-depth and critical review of the functioning of the Comprehensive Crop Insurance Scheme constituted by Govt of India, Ministry of Agriculture, Deptt of Agri and Coopn, New Delhi.

—The reconstituted Technical Advisory Committee for Applied Statistics, Surveys and Computing Division of the Indian Statistical Institute, Calcutta wef Mar 4, 1987.

—The reconstituted Technical Advisory Committee for Biological Sciences Division of the Indian Statistical Institute, Calcutta wef Mar 4, 1987.

—The Board of Post-graduate Studies in Statistics, Deptt of Statistics, Punjab University. Chandigarh for the period 1.4.87 to 31.3.89.

—Chairman, Joint Staff Council on the Committee for issue of liveries for supporting staff.

—The Technical Committee set up by the Directorate of Economics and Statistics, Ministry of Agriculture to examine the feasibility of generating estimates of total food production on per hectare basis.

—The reconstituted National Advisory Board on Statistics of the Deptt of Statistics, Planning Commission, Govt of India, New Delhi.

—The ICAR Steering Committee to oversee the computerisation process and to identify priority areas for computerisation.

—The Working-Group of SAC-PM on "Strategies for efficient and optimum fertilizer use".

—The Committee constituted by DG, ICAR to go into the details for the development of a suitable proforma for the maintenance of Research Project Files by the scientists at ICAR headquarters and other Institutes.

—The Editorial Board of the Indian Journal of Pure and Applied Mathematics of the Indian National Science Academy for the year 1988.

—The ICAR Society under Rule 4 (xix) of the Society upto 12.6.1990 by the Union Minister of Agriculture and President, ICAR Society.

—The ICAR Governing Body under Rule 35 (xi) upto Jun 12, 1990 by

the Union Minister of Agriculture and President. ICAR Society.

Dr SS Pillai

—Consultative Group set up by the DG, ICAR for review of research design and planning for Conference on Role of Women in Agriculture.

—Task Force for identifying proper areas of research in bio-informatics by the Deptt of Bio-technology, Ministry of Science and Technology, New Delhi.

—Expert Group set up by the Director-General, Central Statistical Organisation for replacement of the B—3845 computer system installed at Rama Krishna Puram.

—Advisory Committee of the ICAR —NIC Centre for Bio-medical Information—National Informatic Centre, New Delhi.

—Action Group set up by the Deptt of Science and Technology for suggesting the configuration of PCs to be provided to the district Task Forces of selected backward districts.

—Technical Advisory Committee set up by the Institute for Research in Medical Statistics, New Delhi for installation of a new computer system in the IRMS.

—Ad-hoc Committee set up by the University of Agra to process the syallabi, scheme of course and examination for Diploma Course in Computer Programming in various colleges of the University.

—Technical Advisory Committee of the Council for People Section and Advancement of Rural Technology, New Mehrauli Road, New Delhi.

—Chairman of the Selection Committee set up by the PG School of the IARI for admission to M Sc students of the PG School of IARI.

—Selection Committee set up by the Department of Electronics for selection of system analysis and computer programmes.

Dr SK Raheja

—Secretary, Centre for Agricultural and Rural Development Studies, New Delhi.

—PG Faculty of PG School, IARI, New Delhi.

Dr OP Kathuria

—National Advisory Board on Statistics constituted by the Deptt of Statistics, Ministry of Agriculture, Govt. of India.

—Technical Advisory Committee on Training of Statistical personnel constituted by Deptt of Statistics, Ministry of Planning, Govt of India.

—Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics

constituted by ministry of Agriculture, Govt of India, New Delhi.

—Chairman of Sub-Committee constituted by the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics constituted by Ministry of Agriculture, Govt of India, New Delhi.

—Task Force on Land Use statistics constituted by Ministry of Agriculture, Govt of India, New Delhi.

—Technical Group for Reviewing Sampling Design and Estimation Procedure for Crop Estimation Surveys on Fruits, Vegetables and minor crops in different states, constituted by Ministry of Agriculture, New Delhi.

—Technical Working Group constituted by Central Statistical Organisation for Improvement of Data Base for State Income and Related Aggregates.

—Technical Evaluation Committee constituted by the Ministry of Agriculture, for the Central Sector Scheme for Development of Inland Fishery Statistics

—Working Group on Environment Statistics constituted by Deptt of Statistics, Ministry of Planning, Govt of India

—Committee of Experts on Crop Estimates in respect of Cotton Constituted by Ministry of Agriculture, Govt of India.

—Technical Group to Identify the causes on variation observed in Demand and Supply of Jute constituted by Ministry of Agriculture, Govt. of India.

—Working Group to Study the Consistency between the Estimates of Agriculture Census 1980-81 constituted by Ministry of Agriculture, Govt of India.

—Working Group on Economic Advice and Statistics, Planning Commission, New Delhi.

Dr RK Pandey

—Board of studies, IARI, New Delhi.

—Board of studies in Agricultural Economics Meerut University, Meerut.

—Board of studies in Agricultural Economics in the Faculty of Agriculture, BHU, Varanasi.

Sh PN Bhargava

—Selection Committe for foreign assignment of IASRI.

—Management Committee of IASRI.

Dr JP Jain

—Research and Studies Coordination Group constituted by the Ministry of Agriculture for initiation, Coordination and assessment of studies and research projects of the National Federation.

—PG Faculty of the PG School, IARI, New Delhi.

—Management Committee of IASRI.

—Liaison Officer of the Institute for looking after the interest of the SC/ ST employees.

—Committee for out-of-turn allotment of IASRI quarters.

—Department Promotion Committee for Administrative/Ministerial post and supporting staff at the Institute.

—Course-Progress Review Committee of the Institute.

—Official representative of Joint Staff Council.

—Video-Film Committee of IASRI.

—UNDP Recommendations Implementation Committee.

—Secretary, Staff Research Council of the Institute.

—Reception Committees of the three National Symposia organised by the Institute during the year.

Dr KG Aneja

—PG Faculty of PG School, IARI, New Delhi.

—Faculty, IASRI, New Delhi.

Sh VS Rustogi

—PG Faculty of the PG School, IARI, New Delhi.

Sh PN Soni

—PG Faculty of PG School, IARI, New Delhi.

—Board of Studies of PG School, IARI, New Delhi.

Sh SC Rai

—Food Sampling Committee AFDC-57 Bureau of Indian Standards, New Delhi.

—EC : 3 : 7 Statistical Quality Control and its various Sub-Committees of Indian Standards Institution, New Delhi.

—Sectional Committee on Sensory Evaluation of Bureau of Indian Standards (AFDC-38) and its sub-committees.

—PG Faculty of PG School, IARI, New Delhi.

- Management Committee of ICAR Inter-Institutional Students Sport Meet during 1987.

—SMDC-4 Method of Sampling Sectional Committee of Bureau of Indian Standards.

Dr Bhagat Singh

—Board of Studies, Division of Agricultural Economics, IARI, New Delhi.

—Faculty (Agricultural Economics), IARI, New Delhi.

Dr GS Bassi

—NAARM, Alumni, Hyderabad (AP).

Sh KB Singh

—NAARM, Alumni, Hyderabad (AP).

—Sub-Committee on National Income.

—Sub-Committee constituted by the technical committee of direction for improvement of animal husbandry and dairying statistics.

Dr VK Bhatia

—PG Faculty of PG School, IARI, New Delhi.

—Committee to watch and review the progress of MSc I and II year (CAA) Courses.

Dr Pranesh Kumar

—International Association of Survey Statisticians (Also regional monitor).

—International Association for Official Statistics (Also publication committee member for the years 1987-89).

—Editorial Board, PG School, Journal of Research.

—Abstracter, International Journal-Quality Control and Applied Statistics.

Sh Mahesh Kumar

—Convenor, Committee to watch and review the progress of MSc in CAA course.

—Convenor, Board of Studies, IARI, New Delhi.

Dr Randhir Singh

—Chairman Board of Studies, Agri Statistics, IASRI, New Delhi.

—Academic Council, PG School, IARI, New Delhi.

—PG Faculty, IARI, New Delhi.

—Convenor, Faculty IASRI, New Delhi.

—Sub-Committee to review syllabi for M Sc/PhD Courses in Agril Statistics.

Dr BC Saxena

—PG Faculty of PG School, IARI, New Delhi.

Sh TB Jain

—NAARM, Alumni, Hyderabad (AP).

—Agricultural Research Communication Centre, Karnal.

Sh SP Verma

—NAARM, Alumni, Hyderabad (AP).

Dr DL Ahuja

—NAARM, Alumni, Hyderabad (AP).

Sh RS Khatri

—Joint-Secretary, NAARM, Alumni, Hyderabad (AP).

Sh DC Mathur

—Agricultural Research Communication Centre, Karnal.

Sh BH Singh

—Agricultural Research Communication Centre, Karnal,

—NAARM, Alumni, Hyderabad (AP).

Sh SP Doshi

—Chairman, Advisory Committee for M Sc (CAA), Ph D Courses.

—Board of Studies (CAA).

SPECIAL LECTURES, TRAINING, STUDY TOUR AND MEETINGS

Prof Prem Narain

—attended

* The SICO sponsored N A Sc Awards ceremony organised by the National Academy of Sciences, India at New Delhi on Jan 13, 1987.

* Meeting with Dr GI Marchuk, President, USSR Academy of sciences at the House of Soviet Science, Culture and Art, New Delhi on Jan 13, 1987.

* Meeting of the Research Direction Committee for discussing the research guidlines for the National Bureau of Animal Genetic Resources and National Institute of Animal Genetics. at Krishi Bhavan on Jan 21, 1987.

* Meeting of the Crop Insurance in the chamber of Shri KN Ardhnareeswaran, Additional Secretary, Ministry of Agriculture, New Delhi to discuss the status report on Crop Insurance held at Krishi Bhavan on Jan 23, 1987.

* Academic Council meeting, participated in Full Dress Convocation Rehearsal and attended Lal Bahadur Shastri Memorial lecture on Feb 6, 1987 at IARI, New Delhi.

* Second Meeting of the Group set up to undertake an in-depth and critical review of the functioning of the comprehensive Crop Insurance Scheme of the Ministry of Agriculture held at Krishi Bhavan on Mar 20, 1 87.

* Meeting of the Committee of Experts on Crop Estimates in respect of Cotton on Mar 21, 1987 at Krishi Bhavan, New Delhi.

* Academic Council meeting of IARI on Mar 25, 1987.

* Meeting of the Sectional Committee-X of the Indian National Science Academy, New Delhi from Apr 27-29, 1987

* Meeting of ICAR Steering Committee on Computerization under the chairmanship of Director General, ICAR on May 4, 1987.

* Meeting of the Comprehensive Crop Insurance Scheme of the Govt of

India under the chairmanship of Sh KN Ardhanareeswaran, Addl Secretary, at Krishi Bhavan, New Delhi on May 6, 1987.

* First meeting of the Executive Committee (1987-89) of the Indian Association of Social Science Institutions at New Delhi on Jun 26, 1987.

* Joint meeting of the DCSW and Training Advisory Committee of the Biological Sciences Division of the Indian Statistical Institute, Calcutta on Jul 9, 1987.

* The ICAR Review Committee on Jul 21, 1987 at New Delhi.

* The IASRI Peer Review Group meeting on Oct 16-17, 1987.

* The first meeting of the SAC-PM Working Group on Strategies for efficient and optimum fertiliser use on Oct 26, 1987.

* Meeting of the proposed Indian Statistical Congress at Deptt of Mathematical Statistics, University of Delhi, Delhi on Nov 11, 1987.

* Meeting of ICAR Governing Body at Krishi Bhavan, New Delhi on Dec 29, 1987.

—chaired

* Meeting of AFDC-57—Sampling methods for Food Products and Agricultural Inputs Sectional Committee held on Jan 22, 1987 at Indian Standards Institution, New Delhi. The document "Methods of Sampling for Agricultural Machinery and Equipment, Part-I Hand Tools, Hand Operated/Animal-drawn equipment, DOC : STAT/ AFDC, 57(248) was finalised and recommended to be published as Indian Standard.

* Meeting of the Institute's Joint Staff Council on May 11, 1987.

* Meeing of IASRI Management Committee on Jul 22, 1987.

—delivered

* A lecture on "On some aspects of stochastic processes in genetics and medicine" on Jan 15, 1987 to the participants of the UGC Workshop 'Statistical Methods in Genetics and Medicine' at the Department of Genetics, Osmania University, Hyderabad.

* A lecture on 'Evolutionary dynamics of gene substitution in finite population' on Jan 16, 1987 at the above workshop.

* The Valedictory Address on "Statistical Science in Genetics" on Jan 17, 1987 at the Valedictory Function of the above UGC workshop.

* An Introductory Lecture regarding the various activities of IASRI to

the students of Deptt of Statistics, Punjab University, Chandigarh at IASRI on Feb 21, 1987.

* Valedictory Address to the participants of the Training Programme on "Weather and Crop Forecasting and Supply Projections for Agril Commodities" held at IASRI on Aug 28, 1987.

* A Seminar Talk on "Deliberations on the Invited Paper Session-Measuring Change from Surveys-46th Session of the International Statistical Institute at Tokyo" on Sep 19, 1987 at IASRI, New Delhi.

* Presidential Address entitled "Role of random process in genetics" in the Physical Sciences Section on Oct 8, 1987 at the 57th Annual Session of the National Academy of Sciences, India held at Bharathidasan University. Tiruchirapalli (TN).

* An invited talk entitled "Role of random process in genetics" on Nov 11, 1987 during the 9th Annual Conference of the Indian Society of Probability and Statistics at University of Delhi.

* Dr GP Chatterjee Memorial Lecture entitled "The evolutionary dynamics of quantitative characters" on Dec 2, 1987 at the Indian Institute of Chemical Biology, Calcutta under the auspices of the INSA Local Chapter.

Dr SS Pillai

—attended

* The meeting of the Consultative Group set up by the DG, ICAR for review of research design and planning for Conference on Role of Women in Agriculture, on Dec 7-8, 1987 at the Nuclear Research Laboratory Auditorium, New Delhi.

* Meetings of the Advisory Committee of the ICMR-NIC Centre for Bio-medical Information-National Informatic Centre, New Delhi during the year.

* Meetings of the Technical Advisory Committee set up by the Institute for Research in Medical Statistics, New Delhi for installation of a new computer system in the IRMS during the year.

—organised

* "National Symposium on Electronic Data Processing and Computerised Information System in Agricultural Research" on May 25-26, 1987 as a part of celebration of 40th Anniversary of Indias' Independence.

Dr SK Raheja

—Delivered a lecture on "Sampling technique in farming systems

research programme" to the participants of the workshop on 'Farming Systems Research Programme' at NDUAT, Faizabad on Sep 8, 1987.

Dr RK Pandey

—As chairman attended the panel for discussion on "Promotion of employment opportunity in agriculture" at Institute of Applied Manpower Research, New Delhi on Jun 9, 1987.

Dr Aloke Dey

—Delivered lecture on "Interpenetrating sub-sampling" at Institute of Applied Statistics and Development, Lucknow to Senior Officers of Indian Statistical Service.

Sh PN Bhargava

—Attended the zonal meeting of AICARP arranged at five Agricultural University namely University of Agricultural Sciences, Banglore from Apr 15-16, Assam Agricultural University, Jorhat on Apr 25, Mahatma Phule Agriculture University, Rahuri from Apr 29-30, HAU, Hissar from May 7-8 and CS Azad Agricultural University, Kanpur from May 19-20 to consider (i) the results of research of each concluded experiment under AICARP since 1976, (ii) to finalize the technical programmes for each centre and ECF districts for 1987-88 and (iii) to discuss the agronomic survey-the progress achieved in it and to impart training in the collection recording and coding of its data.

Dr JP Jain

—Lectures delivered on (i) 'Estimation of genetic components of variance using data derived from different mating designs', (ii) 'Estimation of genetic components of variance using data derived from descendants of single crosses, (iii) 'Path-coefficient Analysis', (iv) 'Selection methods for quantitative traits' at the Workshop on 'Statistical Methods in Genetics and Medicine' organised by the Department of Genetics, Osmania University, Hyderabad on Jan 5-6, 1987.

—attended

* Meeting of sub-committees (i) to decide the optimum size of the sample to be selected for the district level estimates, (ii) to finalize the format for the supply of half-yearly estimates on production of milk, egg and wool by the States/UTs on Feb 2, 1987 at IASRI, New Delhi.

* Meeting of the Coordination Committee on Census of Livestock and Farm Equipments, 1987 at Krishi Bhawan, New Delhi on Feb 10, 1987.

* Meeting of Direction Committee for National Bureau of Animal Genetic Resources, Karnal, at NDRI Campus, Karnal on Mar 28, 1987.

* Meeting of Departmental Sanctioning Committee regarding 14th Quinquennial Livestock Census taken by Secy (A and C) at Krishi Bhavan on Jun 9, 1987.

* Meeting of Management Committee of the Institute on Jul 22, 1987.

* Meeting of Management Committee of the Institute on Dec. 10, 1987.

* Chaired the meeting of the sub-committee on finalization of egg production estimates for the period 1980-81 to 1984-85 on Feb 3, 1987 at IASRI, New Delhi.

Dr OP Kathuria

—Attended meeting of the training advisory committee of the CSO, Department of Statistics, held at Sardar Patel Bhavan, Parliament Street, New Delhi on Jan 13, 1987.

Dr AK Banerjee

—Attended the training course on 'Human Resource Management' conducted by NAARM, Rajendra Nagar, Hyderabad from Oct 5-17, 1987.

—delivered

* A lecture on sampling, to participants from various countries of ESCAP region for training course on sampling on household survey methodology organised by CSO on Mar 6,9 and 10, 1987 at Vishwa Yauvak Kendra, New Delhi.

* A lecture on ratio, regression and product method of estimation to SCC students course conducted by CSO on Sep 9, 1987.

Sh PN Soni

—Attended the group meetings of AICARP at CS Azad Agricultural University, Kanpur from May 18-20, 1987 and at HAU, Hissar from May 6-8, 1987.

Dr PC Mehrotra

—Attended the meeting of the "Committee of Direction" for consideration and approval of the "Report on Marketable surplus and post harvest losses of maize in India" held at Krishi Bhavan, New Delhi on Jul 30, 1987.

Sh SC Rai

—Attended

* The meeting of AFDC—57 'Sampling Methods for Food Products and Agricultural Inputs Sectional Committee' at Indian Standards Institu-

tion, Manak Bhawan, New Delhi on Jan 22, 1987.

* The meeting of the Executive Council of Indian Society of Agricultural Statistics at IASRI, New Delhi on Feb 25, 1987.

* The meeting of Management Committee of ICAR Inter-Institutional Student Sports Meet at NDRI, Karnal on Mar 5, 1987.

* The meeting with Dr Raj S Chhikara at IASRI, New Delhi on Mar 17, 1987 for discussing the use of remote sensing techniques in Indian Agriculture.

* The meeting with Ms Ilona D Borhegyi, Visual Media Officer FAO Rome for discussing the progress of UNDP Project at IASRI, New Delhi on Mar 18, 1987. She was taken to the Computer Centre of the Institute for photographic coverage.

* Meeting of the executive council of the Indian Society of Agricultural Statistics, New Delhi on Jul 24 and Sep 17, 1987.

* The Executive Council Meeting of the ISAS held on Dec 17, 1987 at CTRI, Rajahmundry (AP).

* The Management Committee Meeting of IASRI on Dec 10, 1987.

* The Meeting of EC-3 and its various sub-committees on Dec 3, 1987 at Manak Bhavan, New Delhi.

—organised

* The meeting at IASRI, New Delhi on Mar 13, 1987 of (1) Mr N Van Leeuweh, Country Project Officer for India and Bhutan, FAO, Rome (2) Mr HKF Haffman, Senior Officer, Agricultural Education Group FAO, Rome (3) Ms AC Karma Assistant FAO Representative in India and Bhutan FAO, Rome, New Delhi, (4) Shri V Kumar, Administrative Officer, progress and plan of work for 1987 for the UNDP Project IND/83/020 Centre of Advanced Studies in Agricultural Statistics and Computer Applications.

—Delivered a lecture on the "Designs of industrial experimentation—theory and practice" in the workshop of Statistical Quality Control organised by Bureau of Indian Standards at Jaipur on the Dec 9, 1987.

Dr AK Srivastava

—Delivered lecture on Systematic sampling, cluster sampling and determination of sample size in an International training programme on sampling on household survey methodology organised by CSO on Mar 3, 4 and 11, 1987 at Vishwa Yauvak Kendra, New Delhi.

Dr VK Sharma

—delivered

* A lecture on "Problems in estimating production function" to the participants of the Summer Institute on "Quantitative Techniques to Evaluate Returns to Investment on Agril. Development Projects', organised at CSSRI, Karnal on Jun 11, 1987.

* Fourteen lectures on "Econometric theory" to ISS probationers batch-XVII at CSO, New Delhi from Jun 16-24, 1987.

* A lecture on "Application of statistical methodology in agricultural marketing" to the traineees of 7th senior level training programme on Agricultural Marketing, at Directorate of Marketing and Inspection, Faridabad on Sep 16, 1987.

Dr Prajneshu

—Attended the training course on 'Human Resource-Management held at National Academy of Agricultural Research Management Hyderabad from Apr 8-23, 1987.

Dr (Mrs) Ranjana Agrawal

—Delivered a lecture on forecasting techniques to the students of M Stat of ISI Calcutta/New Delhi/ Bangalore on Jun 10, 1987.

Dr Shivtar Singh

—delivered

* A lecture on method and technique of crop cutting experiments for estimation of crop yields to the participants of the training programme on crop insurance at Vaikunth Mehta National Institute of Co-operative Management, Poona on Feb 16, 1987.

* A lecture on 'Co-efficient of variation for fixing threshold yield and premium under crop insurance' to the participants of the crop insurance training programme for AAO's (Agriculture) at Oriental Insurance Company's training college, Faridabad on Mar 24, 1987.

* A lecture on 'Crop Insurance' to probationers of 18th batch of Indian Statistical Service at CSO, New Delhi on Oct 14, 1987.

Sh SP Doshi

—Attended an one month's evening training course on dBASE III and Lotus 1-2-3 from Mar 25 to Apr 24 1987 conducted by CSI, Delhi.

—Delivered 4 lectures on 'Use of computer programmes for bio-metrical research in the workshop on "Statistical Methods in Genetics and Medicine" organised by Deptt. of Genetics, Osmania University, Hyderabad from Jan 5-8, 1987.

Sh TB Jain

—Attended a meeting of the 'Sub-committee of the technical committee of direction to examine state-wise egg production estimates' on Feb 3, 1987 organised by Department of Agriculture and Cooperation, Ministry of Agriculture, Govt of India.

—Delivered a lecture on 'Estimation of cost of production of poultry and eggs' to the trainees of Kerala and Tamil Nadu States in a programme organised by Animal Husbandry Department, Ministry of Agriculture, Govt of India on Jan 1, 1987.

Sh Mahesh Rumar

—Delivered a lecture on Computer usage in regression analysis to the participants at the Summer Institute on "Quantitative Techniques to Evaluate Returns to Investment on Agricultural Development Project" at CSSRI, Karnal on Jun 8, 1987.

Dr RC Jain

—Monitered training programme on 'Weather and Crop Forecasting and Supply Projections for Agricultural Commodities' held at IASRI, New Delhi from Jun 22 to Aug 28, 1987.

—Delivered a lecture on 'Crop forecasting and survey of crop losses' to JCC trainees of CSO at IASRI, New Delhi.

Sh Ram Kumar

—Delivered a lecture on 'Use of computer in linear programming' to the participants at the Summer Institute on "Quantitative Techniques to Evaluate Returns to Investment on Agricultural Development Project, at CSSRI, Karnal from Jun 4-23, 1987.

Dr NK Ohri

—Delivered 3 lectures on statistical methods in the 29th short (Refresher) course training in soil testing laboratories held at the division of Soil Science and Agricultural Chemistry, IARI on Oct 1, 3 and 4, 1987.

Dr JN Garg

—delivered

* A lecture on 'Premium structure relating to crop insurance' at Oriental staff college, Faridabad on Mar 24, 1987.

* A lecture on (i) premium structures relating to crop insurance methods of determinatics (ii) fixing of coefficient of variation for fixing yield under crop insurance to the Asstt Administrative Officers (Ag), GIC in the training programme in crop insurance held at Pune in Nov 1987.

Sh KB Singh

—attended

* The meeting of the technical Committee of Direction for the improvement of Animal Husbandry and Dairying Statistics on Feb 2 and 3, 1987.

* The sub-committee on National Income in a meeting held on Oct 13, 1987 at CSO, New Delhi.

Dr VK Bhatia

—attended

* The meeting of the committee to watch and review the progress of MSc in Computer Application in Agriculture on Jan 9, 1987.

* The meeting of the Library Committee on Mar 7, 1987.

* The meetings of organising committee of the symposium on Statistical Ecology on Feb 8, 1987 and Mar 10, 1987.

* Second meeting of the committee to watch and review the progress of MSc and Computer Application in Agriculture on Jun 27, 1987.

Dr PS Rana

* Attended the mini training course in stochastic modelling of natural phenomenon held at ISI, Delhi during Oct 5-9, 1987.

Sh PP Rao

—Attended the zonal Meetings of the AICARP (ICAR) at Bangalore from Apr 15-16, 1987 at Rahuri from Apr 29-30 and at Kanpur from May 19-20.

DEGREES RECEIVED

Shri SS Shastri

—Ph D Degree from Post Graduate School, IARI, New Delhi on 'Some contribution to successive sampling'.

Shri Ved Prakash

—Ph D degree in Economics from Meerut University, Meerut. Thesis title was "An economic analysis of consumption pattern of food in India".

MISCELLANOUS INFORMATION

Prof Prem Narain

—Attended XXVI Convocation of IARI on Feb 7, 1987.

—Inaugurated

* The 2nd Short-term Course on Use of Computer in Agricultural Research on Jan 5, 1987 held at IASRI from Jan 5-31, 1987.

* 3rd Short-term Course on Use of Computer in Agricultural Research on Sep 1, 1987 at IASRI.

—had discussion with

* Mr Mark Sevensen and Mr DK

Arora, USAID, New Delhi to discuss on the topics of mutual interest at IASRI on Jan 30, 1987.

* Dr GK Kanji, Head, Department of Applied Statistics and Operational Research, Sheffield City Polytechnic, Sheffield, UK on topics of mutual interest at IASRI on Sep 1, 1987,

* Dr Van Leeuwen, Country Project Officer, Asia and the Pacific Service, Agril Operations Division, Agriculture Department, FAO of the United Nations, Rome about the UNDP Project activities of IASRI on Sep 25, 1987 at IASRI.

—Appeared on television in Krishi Darshan Programme

* On Aug 10, 1987 and talked about National Symposium on "Growth and Instability in Agriculture".

* On Sep 22, 1987 and spoke about the National Symposium on "Sample Surveys in Indian Agriculture—Problems and Prospects".

* On Nov 24, 1987 and talked about the Institute's activities and other celebrations including four National Symposia on subjects of topical interest held at IASRI on the occasion of the 40th Anniversary of India's Independence. Also spoke about the release of Souvenir and Foundation Stone laying ceremony of Administrative and Training Block multistoreyed building by Hon'ble Union Minister for Agriculture. Dr GS Dhillon

Dr OP Kathuria

—Organised a training programme in Base Line Survey from Apr 20-24, 1987 under the World Bank Aided project for Water Shed Development in Rainfed areas at the instanee of the Division of Soil Conservation in the Ministry of Agriculture. Govt of India.

Shri SC Rai

—Visited CTRI, Rajahmundry (AP) from Nov 9 to 14, 1987 for supervising the arrangements for the 41st Annual Conference of ISAS and examining the possibility of collaborative projects.

—Organised and participated in the meeting of HDs/Sr Scientists of IASRI convened to acquaint the UNDP experts regarding research and training activities of the Institute.

—Inspected the progress of Hindi work at the Institute in various Divisions/Sections etc as Chairman of the Inspecting team on Aug 30-31, 1987.

—Attended 'PanseMemorial Lecture' delivered by Prof JS Rustagi at IASRI, New Delhi on Jul 24, 1987.

Dr PR Sreenth

—Attended Administrative Vigilance training course conducted by ICAR at IARI, New Delhi during Aug 10-18, 1987.

Shri PN Soni

—Attended a course of Agricultural Research Project Management at NAARM, Hyderabad from Oct 16-30, 1987.

Dr Randhir Singh

—Visited USA and Canada for six months from Oct 1986 to Mar 1987 under the UNDP Project for acquainting with the latest knowledge of Remote Sensing Technology applicable in the field of agriculture.

Dr HVL Bathla

—Accompanied the participants of the training programme on "Weather and Crop Forecasting and Supply Projections for Agricultural Commodities" on their study tour to Indian Meteorological Department, Pune and Space Applications Centre, Ahmedabad from Jul 24 to Aug 7, 1987.

Shri SR Bapat

—Attended a course on project management held at NAARM, Hyderabad from Mar 2-13, 1987.

Shri AC Kaistha

—Attended a course on project management held at NAARM, Hyderabad from Mar 2-13, 1987.

Dr KG Aneja

—Visited IARI, Entomology Division Experimental Farm to see recording of aphid pests of mustard crop.

Dr VK Bhatia

—Attended the VI ICAR Inter-institutional students sports meet held at NDRI. Karnal from Mar 29-31, 1987 as Manager of the IASRI students contingent.

Dr KK Tyagi

—Participated as a player of institute, 'table tennis team in the VI ICAR inter zonal sports meet organised by Sugarcane Breeding Institute, Coimbatore from Mar 16-20, 87 and won winners position for the Institute.

Shri TB Jain

—Visited CSWRI, Avikanagar to discuss the technical programme etc of a collaborative research project on "Epidemiology and disease surveillance in sheep" from Oct 12-14, 1987.

Dr PS Rana

—Visited NDRI, Karnal on Jan 7, 1987, CIRG, Makhdoom on Feb 2,

1987 and IVRI, Izatnagar on May 14-15, with a view to interact with the subject matter specialist of animal nutrition and physiology and discussed on various aspects of physiological kinetics of nutrients through the gart of ruminants.

Dr DL Ahuja

—Attended a training on rescue and resusitation organised by "Green Cross Society (India)" from Dec 20-22, 1987.

Shri HC Gupta

—Attended second short-term course on Use of Computer in Agricultural Research during Jan 5-30. 1987.

Shri DC Mathur

—Attended second short-term course on Use of Computer in Agricultural Research during Jan 5-30, 1987.

Shri SC Agrawal

—Attended third short-term course on Use of Computer in Agricultural Research during Sep 1-26, 1987.

Shri BH Singh

—Attended second short-term course on Use of Computer in Agricultural Research during Jan 5-30, 1987.

Shri MS Narang

—Attended second short-term course on Use of Computer in Agricultural Research during Jan 5-30, 1987.

Shri VK Jain

—Attended Third short-term course on Use of Computer in Agricultural Research during Sept 1-26, 1987.

COORDINATION AND MONITORING CELLS

COORDINATION CELL

This cell is responsible for documentation and dissemination of scientific output of the Institute through IASRI Newsletters, Quarterly Progress Reports, Annual Report, etc. It also organises National Conferences of Agricultural Research Statisticians and meetings of Senior Statisticians of ICAR Institutes and also conducts meetings of Staff Research Council and Senior Scientists and Head of Divisions of the Institute from time to time.

Report/Newsletters/Proceedings

Annual Report, 1986, 131 pp

IASRI Newsletter, Oct-Dec, 1986, 14 pp

IASRI Newsletter, Jan-Mar, 1987, 14 pp

IASRI Newsletter, Apr-Jun, 1987, 14 pp

IASRI Newsletter, Jul-Sep, 1987, 14 pp

Quarterly Progress Report, Jan-Mar, 1987, 12 pp

Quarterly Progress Report, Apr-Jun, 1987, 14 pp

Quarterly Progres Report, Jul-Sep, 1987, 13 pp

Contributed Papers and Proceedings of Eighth National Conference of Agricultural Research Statisticians, July 29-31, 1986, 161 pp

IASRI Souvenir 1987, 307 pp

Communication of Research Material

ICAR

—'For General Body Meeting of ICAR Society'

—Decadewise achievements of the Institute since Independence

—Views and Proposals of the Institute in connection with commemoration of 40th Anniversary of India's Independence

—For Publication of Research Highlights and Annual Report of ICAR for the year 1987

—Schedule of meetings/conferences/seminars during 1987

—For ICAR Review Committee

—For preparation of "Directory of Agriculture Research Workers" of ICAR

CSO

—For Publication of Statistical System in India, 1987

—For 38th Annual Report on Sample Survey of Current Interest in India and 24th Report of the ESCAP region 1986.

—For Statistical Newsletter

DS & T

—Schedule of meeting/conferences/ seminars, etc. for the year 1987

—For National Survey on collection of data on resources devoted to research and development activities of the country.

QRT

—Working papers to review the work done by the IASRI during the period during 1982-86

Staff Research Council

The Staff Research Council (SRC) is the most important forum in the Institute to plan, monitor and evaluate research projects. Hitherto, the review of the Institute's Research Programmes is restricted to the SRC under the Chairmanship of the Director, with little external input. As per the suggestion of the Director General, ICAR, it was decided to associate, henceforth, with this forum a Peer Group from outside the Institute while deliberating the new project proposals. This was also the recommendation of the Quinquennial Review Team of the Institute for the period 1971-81. The philosophy behind this is to avoid the ill effects of inbreeding and to broaden the base of Think Tank. Accordingly, a Peer Group from outside the Institute was associated with the SRC to draw upon its expertise while deliberating 13 new project proposals on Jul 20, 1987. Subsequently, all the on-going research projects were reviewed on October 16-17, 1987 by the Peer Review Team constituted by the Council.

MONITORING CELL

The Chief function of this Cell are to monitor the progress of on-going research projects as well as to process the Plan Schemes of the Institute. The items of work undertaken by the Cell during 1987 include :

—Information relating to mid-term appraisal of 7th Plan was compiled;

—Preparation of activity milestone for on-going research projects for 1987-88;

—Preparation of research programmes of the Institute during 1986-87;

—Preparation of material relating to the current research projects of the Institute and Director of Scientific

Personnel;

—Consolidation of the information relating to various items namely, mandate, national goal, mini-mission, thrust areas fund allocations, staff strength etc of the Institute;

—Preparation of material for slide projection to be presented by the Director;

—Coordination of Research Project Files;

—Preparation of summary progress reports of on-going research projects for the operative periods ending Sept 1986 and Mar 1987;

—Convening of a number of meetings for the preparation of various documents sent to the Council.

STAFF WELFARE ACTIVITIES

The Institute has manifold activities for the amenities and welfare for the staff. The major items are detailed below :

JOINT STAFF COUNCIL

The Institute has a Joint Staff Council (JSC) to promote harmonious relations and secure the best means of co-operation between the Council/IASRI as employer and the general body of its employees in matters of common concern for insuring a high degree of efficiency of the service.

Shri RB Kadam, Superintendent and Secretary (Staff side) expired in Jan, 1987 and Shri Pramod Kumar, Tech Asstt (Stat) went on long study leave. The JSC was thus reconstituted of the following ;

I Direcror — Chairman

II Representatives of the Official side :

1 Dr SS Pillai — Jt. Director
2 Dr JP Jain — Sr Scientist
3 Shri SR Bapat — Scientist S-3
4 Dr KK Tyagi — Scientist S-2
5 Capt RK Marwah — CAO
6 Shri RK Verma — Acctts Officer
7 Shri KC Bhatnagar — Scientist S-1 Secretary (Official side)

III Elected representatives of the Staff side :

1 Shri DN Bhatia, Asstt—Secretary (Staff side)
2 Shri Asha Ram Sharma, Tech Asstt (Stat)
3 Shri Mangal Singh, Card Librarian
4 Shri Hira Lal, Sr Clerk
5 Shri Dilbagh Rai, Field Investigator
6 Shri Purushottam Sharma, SS Grade-II
7 Shri Maqsood Khan, SS Grade-II

Two meetings were held on May 11 and Nov 27, 1987 under the chairmanship of the Director

GRIEVANCE CELL

The Grievance Cell of the Institute (Constituted as per ICAR rules) which

provides to the employees a forum to ventilate their grievances relating to official matters and their remedial measures.

BENEVOLENT FUND

The employees of the Institute have constituted a Benevolent Fund from their own contributions to provide relief in time to the families of the employees who die in harness and are self indigenent conditions. The collection of funds and the relief disbursement provided during the year are as follows :

An amout of Rs 890/- was collected on the occasion of Benevolent Fund Day, Jun 30, 1987.

An amount of Rs 21/- was received from the Collection for celebration of Krishna Janamashtmi on Aug 25, 1987.

A sum of Rs 500/- was given to the family of late Shri RB Kadam. Ex AAO who expired on Jan 26, 1987.

RECREATION AND WELFARE CLUB

The Institute has recreation and welfare club which provides facilities for indoor and outdoor games, promotes social and friendly relations among the member and look after the general welfare of the member. The club received the annual grant amounting to Rs 194/- from the Institute and members contribution of Rs 502/- during the year.

CO-OPERATIVE THRIFT AND CREDIT SOCIETY

The Society which is registered with the Registrar Cooperative Societies, Delhi Administration, Delhi, Regd No 495 (U) continued its activities in the same manner as during the past years. The society helped its members by advancing loans. The various sources of funds of the society are share money, compulsory deposits and fixed deposits from the members of the Society. The General Body Meeting was held on Dec 31, 1987 in which the accounts for the year 1986-87 were presented and passed. The Managing Committee elected in Nov 1986 was responsible for the working of the society during the entire year 1987.

During 1987, the main activities of the society were :

Amendments in the bye-laws of the society raising the (a) regular loan amount from Rs 5,000/- to Rs 10,000/-, (b) the emergent loan amount from Rs 300/- to Rs 600/- and (c) number of instalments for regular loans from 30 to 45 were approved by the Registrar, Cooperative Societies and were made effective from the month of April, 1987.

Society was provided accomodation (a room in Panse's Hostel) for its office for which the society is highly grateful to the Director of the Institute for his help in this regard.

Total membership of the society increased to 498 members on Dec 31, 1987.

Rs 12,04,840.00 were advanced as loan to the members.

Financial help was extended from the Member Welfare Fund to the tune of

Rs 1,000/- to the bereaved family of Shri TC Sachdeva and Rs 1,500/- to the family of Shri RB Kadam on their sudden and sad demise.

CO-OPERATIVE CANTEEN AND STORE

The Cooperative Store registered with the Registrar, Cooperative Societies, Delhi Administration, Delhi, continued to run for the benefit of the staff members of the Institute. Tea, Coffee, cold drinks, snacks, lunch provisions and general merchandise were made available at reasonable prices to the staff members of the Institute. The Annual General Meeting of the store was held on Aug 4, 1987 and election for the new Managing Committee was also conducted on the same date.

SPORTS

For the purpose of holding the VI ICAR Inter Institutional Tournaments for the year 1986-87, the various Research Institutes/Laboratories/National Centres and Headquarters of the ICAR were regrouped into six zones taking into consideration the location and staff strength of the Institutes in each zone. IASRI was grouped in Zone-III alongwith NDRI, Karnal, NBPGR, New Delhi ICAR Headquarters, New Delhi and CIRG, Makhdoom.

Zone-III Sports Meet

The Zone-III Sports Meet was organised by NDRI, Karnal from Jan 29-31, 1987. The IASRI Sports Contingent consisted of 46 members; Dr SK Raheja being Chief-de-mission, Capt RK Marwaha, Dy Chief-de-mission, 3 Managers and 41 Sportsmen. The following positions were won by the IASRI sportsmen.

Event	*Position*	*Captain*
Table Tennis (Team Event)	Winner	Capt RK Marwaha
Table Tennis (Open Singles)	Winner	Shri OP Khanduri
Kabaddi	Winner	Shri DPS Mann
Football	Winner	Shri AK Bhalla
Volleyball (Smashing)	Runner	Shri PS Rai

Inter-Zonal Sports Meet

The Inter-zonal Sports Meet was organised by Sugarcane Breeding Institute, Coimbatore from Mar 16-20, 1987 at the TNAU Campus. The IASRI Sports Contingent consisted of 27 members; Capt RK Marwaha being Chief-de-mission, 2 Managers and 24 sportsmen. The following positions were won by the IASRI sportsmen.

Event	*Position*	*Captain*
Table Tennis (Team Event)	Winner	Capt RK Marwaha
Table Tennis (Open Singles)	Winner	Shri OP Khanduri
Kabaddi	Runner	Shri DPS Mann

हिन्दी के प्रगामी प्रयोग में प्रगति

वर्ष 1987 के दौरान, निम्नलिखित मदों के अन्तर्गत राजभाषा के प्रयोग को गति प्रदान करने के लिए संस्थान में विभिन्न कार्यक्रम, आदि, आयोजन किये गये :

राजभाषा कार्यान्वयन समिति

निदेशक महोदय की अध्यक्षता में संस्थान की राजभाषा कार्यान्वयन समिति की तिमाही बैठकें दिनांक 23 मार्च, 20 जून और 30 अक्तूबर 1987 को सम्पन्न हुई, जिनमें जांच-बिन्दुओं के नियतन, हिन्दी पुस्तकों एवं टंकण-यन्त्रों की खरीद, अधिकारियों एवं कर्मचारियों के प्रशिक्षण की व्यवस्था, हिन्दी प्रकाशन, हिन्दी निरीक्षण, हिन्दी पखवाड़ा मनाने, हिन्दी दिवस आयोजित करने, आदि, माध्यमों से प्रचार-प्रसार सम्बन्धी निर्णय लिये गये तथा उन पर की गई कार्रवाई की समीक्षा की गई।

हिन्दी शिक्षण योजना

इस योजना के अन्तर्गत, संस्थान के कुल 22 आशुलिपिकों तथा 33 टंककों में से अब तक क्रमश: 10 आशुलिपिकों एवं 13 टंककों को हिंदी आशुलिपि तथा टंकण में प्रशिक्षित किया जा चुका है। इस वर्ष भी दो कर्मचारियों को हिन्दी आशुलिपि तथा 2 को हिन्दी टंकण में प्रशिक्षण दिलाने के लिए नामित किया गया।

हिन्दी प्रकाशन

संस्थान का हिन्दी अनुभाग "हिन्दी प्रसारिका" नामक हिन्दी प्रसार सम्बन्धी छ:माही पत्रिका का वर्ष 1982 से तथा 'कृषि सांख्यिकी समाचार' नामक तिमाही अंकों का वर्ष 1984 से प्रकाशन, अतिरिक्त तौर पर, करता चला आ रहा है। इसके अतिरिक्त, तीन वैज्ञानिक शोध प्रचारिकाएं भी प्रचालन के लिए प्रकाशित की जा चुकी हैं। इस वर्ष भी इन आवधिक प्रकाशनों का उत्तरदायित्व सम्भाला गया।

हिन्दी कार्यशालाएं

संस्थान में प्रशासनिक, वैज्ञानिक एवं तकनीकी अधिकारियों तथा कर्मचारियों को उनसे सम्बद्ध हिन्दी कार्य करने में उनकी झिझक दूर करने के लिए अब तक 7 विशेष और सामान्य कार्यशालाओं के माध्यम से प्रशिक्षित किया जा चुका है। इस वर्ष भी दिनांक 3 से 8 सितम्बर 1987 के दौरान, एक कार्यशाला का आयोजन किया गया जिसमें 32 प्रशासनिक कर्मचारियों को विभिन्न चौदह विषयों में प्रशिक्षित किया गया।

हिन्दी निरीक्षण

संस्थान की राजभाषा कार्यान्वयन समिति द्वारा श्री एस० सी० राय की अध्यक्षता में गठित एक निरीक्षण उपसमिति ने दिनांक 26,

27 एवं 28 अगस्त 1987 को संस्थान के विभिन्न प्रभागानुभागादि का निरीक्षण किया और उनमें किये गये हिन्दी कार्य की समीक्षा करते हुए हिन्दी प्रगति में उनके योगदान सम्बन्धी अपनी रिपोर्ट प्रस्तुत की जिसके आधार पर विशेष योगदान के लिए चलशील्ड तथा अन्य पुरस्कारों से उन्हें पुरस्कृत भी किया गया।

हिन्दी व्यवहार पखवाड़ा

संस्थान में दिनांक 16 अगस्त से 1 सितम्बर 1987 के दौरान की अवधि को हिन्दी व्यवहार पखवाड़ा के रूप में मनाये जाने का निर्णय लिया गया और इस अवधि के कार्य-दिवसों में संस्थान के सभी प्रभागानुभागादि में सम्बद्ध अधिकारियों एवं कर्मचारियों ने अपना अधिकाधिक कार्य हिन्दी में करने का सफल प्रयास किया।

हिन्दी प्रतियोगिताएं

इस वर्ष संस्थान में निम्नलिखित प्रतियोगिताओं का आयोजन उनके समक्ष उल्लिखित तिथियों में किया गया :

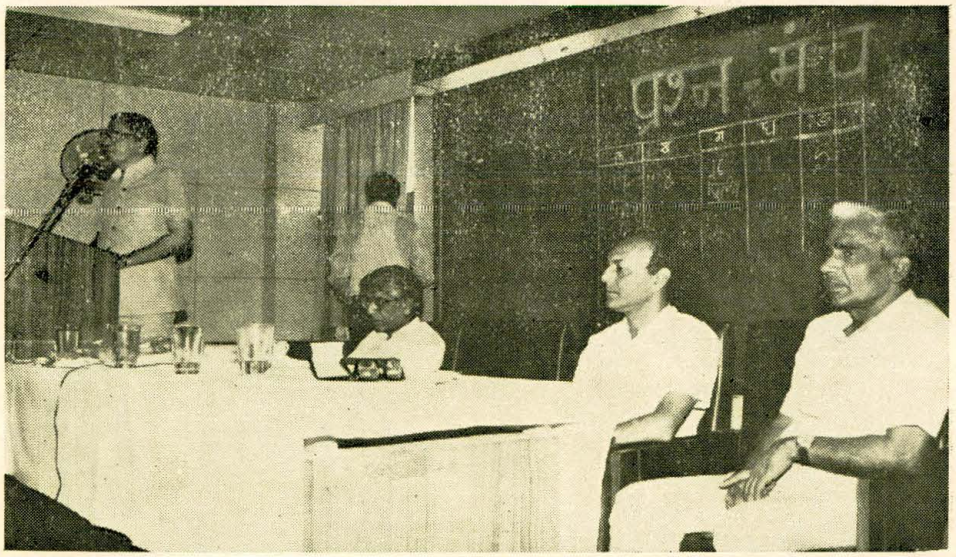
1.	हिन्दी टिप्पणी एवं प्रारूप लेखन प्रतियोगिता	25 अगस्त
2.	हिन्दी लेख प्रतियोगिता	26 अगस्त
3.	हिन्दी टंकण प्रतियोगिता	27 अगस्त
4.	हिन्दी आशुलिपि	28 अगस्त
5.	हिन्दी अनुवाद प्रतियोगिता	29 अगस्त
6.	हिन्दी व्यवहार प्रतियोगिता (वैज्ञानिक एवं तकनीकी प्रभाग चलशील्ड)	26, 27 एवं 28 अगस्त
7.	हिन्दी व्यवहार प्रतियोगिता (प्रशासनिक अनुभाग चलशील्ड)	26, 27 एवं 28 अगस्त
8.	हिन्दी व्यवहार प्रतियोगिता (व्यक्ति-विशेषार्थ)	26, 27 एवं 28 अगस्त
9.	हिन्दी वाद-विवाद प्रतियोगिता	29 अगस्त
10.	हिन्दी अन्ताक्षरी प्रतियोगिता	29 अगस्त
11.	हिन्दी प्रश्नमंच प्रतियोगिता	24 सितम्बर

केन्द्रीय सचिवालय हिन्दी परिषद् शाखा

शाखा प्रधान, डा० कथूरिया, की अध्यक्षता में संस्थान की शाखा की कार्यकारिणी की बैठकें दिनांक 23 फरवरी तथा 17 अगस्त 1987 को सम्पन्न हुई जिनमें हिन्दी प्रचार-प्रसार हेतु विभिन्न कार्यक्रमों की रूपरेखा तैयार करके उन पर अमल करने की समीक्षा भी की गई और विभिन्न प्रतियोगिताओं के आयोजन का उत्तरदायित्व विभिन्न पदाधिकारियों को सौंपा गया। इस वर्ष शाखा के 212 सदस्य बनाए गए।

हिन्दी दिवस/वार्षिकोत्सव

दिनांक 14 सितम्बर 1987 हेतु निर्णीत मुख्य अतिथियों की अनुपलब्धता के कारण, संस्थान में हिन्दी दिवस/वार्षिकोत्सव इस वर्ष 24 सितम्बर को सम्पन्न हुआ, जब अन्ततः मुख्य अतिथि के रूप में संस्थान के निदेशक महोदय, प्रो० प्रेम नारायण जी, ने लगभग 32 प्रतियोगियों को पुरस्कृत किया और संस्थान में और भी अधिक हिन्दी कार्य बढ़ाने की प्रेरणा देते हुए अपने सहयोग का आश्वासन दिया।



प्रो० प्रेम नारायण, संस्थान निदेशक एवं संरक्षक के.स.हि.प.शा. मुख्य अतिथि के रूप में
उद्घाटन भाषण देते हुए

लेखा परीक्षा अनुभाग के प्रभारी श्री शान्ति कुमार मैथानी को चल-शील्ड प्रदान करते हुए
मुख्य अतिथि के रूप में प्रो० प्रेम नारायण

IASRI PERSONNEL

Prof. Prem Narain, Director
Dr SS Pillai, Jt Director (CS)

Division of Design of Experiments and Analysis of Experimental Data

Shri P.N. Soni, Head and Scientist S-3
Shri PN Bhargava, Sr Scientist
Dr AK Nigam, Sr Scientist (Retired)
Dr Aloke Dey, Sr Scientist
Miss CR Leelavathi, Scientist S-3
Dr PR Sreenath, Scientist S-3
Shri VN Iyer, Scientist S-2
Shri PP Rao, Scientist S-2
Dr VK Gupta, Scientist S-2
Mrs Asha Saksena, Scientist S-2
Shri RK Ghai, Scientist S-2
Shri JK Kapoor, Scientist S-2
Shri HC Jain, Scientist S-2
Dr BL Choudhary, Scientist S-2
Dr GC Chawla, Scientist S-2
Shri PK Batra, Scientist S-2
Mrs Rajinder Kaur, Scientist S-1
Shri Onkar Sarup, Scientist S-1
Shri GL Khurana, Scientist S-1
Shri DK Mehta, Scientist S-1
Shri MR Vats, Scientist S-1
Shri DK Sehgal, Scientist S-1
Shri SC Mehta, Scientist S-1
Shri Ravinder Srivastava. Scientist S-2
Shri KC Bhatnagar, Scientist S-1
Shri Madan Mohan, Scientist S-1
Mrs Ajit Kaur Bhatia, Scientist S-1
Shri Aloke Lahiri, Scientist S-1
Shri NK Sharma, Scientist S-1

Division of Sample Survey Methodology and Analysis of Survey Data

Dr OP Kathuria, Head and Sr Scientist
Dr SK Raheja, Sr Scientist
Dr JP Jain, Sr Scientist
Dr HP Singh, Scientist S-3
Dr AK Banerjee, Scientist S-3
Dr PC Mehrotra, Scientist S-3
Dr JS Maini, Scientist S-3
(on deputation)
Dr A.K. Srivastava, Scientist S-3
Shri UG Nadkarni, Scientist S-3 (Retired)
Shri VS Rustogi, Scientist S-3
Dr Randhir Singh, Scientist S-3
Shri RK Khosla. Scientist S-3
Dr MG Mittal, Scientist S-3
Dr HVL Bathla, Scientist S-2
Dr Shivtar Singh, Scientist S-2
Shri TB Jain, Scientist S-2

Shri RL Rustogi, Scientist S-2
Dr Pranesh Kumar Scientist S-2
Dr SS Shastri, Scientist S-2
Shri KB Singh, Scientist S-2
Shri SS Gupta, Scientist S-2
Dr NK Ohri, Scientist S-2
Shri Anand Prakash, Scientist S-2
Dr KK Tyagi, Scientist S-2
Shri MS Batra, Scientist S-2
Shri GS Bassi, Scientist S-2
Shri Jagmohan Singh, Scientist S-2
Dr DL Ahuja, Scientist S-2
Dr BC Saxena, Scientist S-2
Dr LBS Somayazulu, Scientist S-2
Shri KPS Nirman, Scientist S-2
Shri SN Arya, Scientist S-2
Shri SP Verma, Scientist S-2
Shri KR Rajagopalachar, Scientist S-2
Shri Satya Pal, Scientist S-2
Dr VK Mahajan, Scientist S-2
Shri AS Gupta, Scientist S-2
Shri RS Khatri, Scientist S-1
Shri DC Mathur, Scientist S-1
Shri RC Gola, Scientist S-1
Shri Jagbir Singh, Scientist S-1
Dr VT Prabhakaran, Scientist S-1
Shri Balbir Singh, Scientist S-1
Shri SC Agarwal, Scientist S-1
Shri HO Aggrawal, Scientist S-1
Shri Satya Pal, Scientist S-1
Shri SC Sethi, Scientist S-1
Shri DK Bhatia, Scientist S-1
Shri Bhagwan Das, Scientist S-1
Shri MS Narang, Scientist S-1
Shri JP Goyal, Scientist S-1
Shri HC Gupta, Scientist S-1
Shri MS Kaushik, Scientist S-1
Shri SS Walia, Scientist S-1

Division of Statistical Economics

Dr VK Sharma, Head and Scientist S-3
Dr RK Pandey, Sr Scientist
Shri Shanti Sarup, Scientist S-2
Dr UN Dixit, Scientist S-2
Shri HB Choudhary, Scientist S-2
Dr Bhagat Singh, Scientist S-2
Shri BL Kaul, Scientist S-2
Shri Ashok Kumar, Scientist S-1
Shri Ant Ram, Scientist S-1
Shri SP Bhardwaj, Scientist S-1
Mrs Sushila Kaul, Scientist S-1

Division of Forecasting Techniques for Crops, Diseases and Pests

Shri SR Bapat, Head and Scientist S-3
Dr KG Aneja, Scientist S-3
Dr (Mrs) Ranjana Agrawal, Scientist S-3
Dr RC Jain, Scientist S-2
Shri GN Bahuguna, Scientist S-2
Dr Chandrahas, Scientist S-2
Shri BH Singh, Scientist S-1

Division of Bio-Statistics and Statistical Genetics

Prof Prem Narain, Director and Head
Dr Prajneshu, Scientist S-3
Shri SC Rai, Scientist S-3
Dr JC Malhotra, Scientist S-3 (Transferred to ICAR)
Dr BS Sharma, Scientist S-3
Shri LK Garg, Scientist S-3
Dr VK Bhatia, Scientist S-2
Shri Lal Chand, Scientist S-2
Shri PK Malhotra, Scientist S-2
Shri SD Wahi, Scientist S-2
Dr JN Garg, Scientist S-2

Dr PS Rana. Scientist S-1
Shri RK Jain, Scientist S-1

Division of Computing Science

Shri AC Kaistha, Head and Scientist S-3
Shri SN Mathur, Scientist S-3
Shri R Gopalan, Scientist S-3
Shri IC Sethi, Scientist S-2
Shri OP Dutta, Scientist S-2
Shri ML Sahni, Scientist S-2
Shri SP Doshi, Scientist S-2
Shri Mahesh Kumar, Scientist S-2
Shri Ram Kumar Scientist S-2
Shri ML Choudhary, Scientist S-2
Shri KC Gupta, Scientist S-2
Shri SL Garg, Scientist S-2
Shri KL Kaul, Scientist S-2
Shri RC Goyal, Scientist S-2

Coordination Cell

Dr JP Jain, Head and Sr Scientist
Shri DS Aneja, Scientist S-1

Monitoring Cell

Dr HP Singh, Head and Scientist S-3

UNDP Cell

Shri SC Rai, Head and Scientist S-3

Training Administration Cell

Shri SN Mathur, Sr Professor (CA in Ag.)
Dr Randhir Singh, Sr. Professor (Ag. St.)

Technical Officers

Shri Rajendra Singh, Field Officer (on deputation)
Shri SK Suri, Field Officer
Shri SD Sharma, Field Officer
Shri SS Srivastava, Librarian
Shri SK Sublania, MTO (on deputation)
Shri SK Mahajan, Jr Technical Officer
Shri DC Pant, Jr Technical Officer
Shri SN Bajpai, Jr Technical Officer
Shri Amar Ranjan Pal, Sr Artist

Administration

Capt RK Marwaha, CAO
Shri Anthony Tete, Sr AO

APPENDIX—II

SANCTIONED AND FILLED-UP POSTS

(As On 31-12-1987)

S No	Designation	Scale of Pay (Rs)	No of Posts		No of SC/ST employees	
			Sanctioned	Filled	SC	ST
1	2	3	4	5	6	7
1	Director	2000-2500*	1	1	—	—
2	Jt Director	1800-2250*	2	1	—	—
3	Sr Scientist	1800-2250*	21	29	—	—
4	Scientist S—3	1500-2000*				
5	Scientist S—2	1100-1600*	29	58	—	—
6	Scientist S—1	700-1300*	63	38	2	—
7	Scientist S—0	1640-2900	35	11	1	—
8	Chief Admn Officer	3000-5000	1	1	—	—
9	Sr Admn Officer	3000-4500	1	1	—	1
10	Accounts Officer	2200-4000	1	—	—	—
11	Field Officer	2200-4000	3	3	—	—
12	Mech Tabulation Officer	2200-4000	1	1	1	—
13	Librarian	2200-4000	2	1	—	—
14	Jr Tech Officer	2200-4000	3	2	—	—
15	Sr Artist	2200-4000	1	1	—	—

1	2	3	4	5	6	7
16	Asstt Field Officer	2000-3500	1	1	—	—
17	Asstt Engineer	2000-3500	1	—	—	—
18	Asstt Admn Officer	2000-3500	3	2	1	—
19	Hindi Officer	2000-3500	1	1	—	—
20	Security Officer	2000-3500	1	1	—	—
21	Electronic Computer Operator	1640-2900	8	3***	—	—
22	Artist	1640-2900	1	1	—	—
23	Superintendent	1640-2900	8	7	—	1
24	Sr Personal Asstt	1640-2900	1	1	—	—
25	Photographer	1400-2300	1	1	—	—
26	Tech Asstt (Stat)	1400-2300	155	112	15	—
27	Tech Asstt (Eco)	1400-2300	8	8	1	—
28	Tech Asstt (Lib)	1400-2300	2	2	—	—
29	Asstt EC Operator	1400-2300	5	4	1	—
30	Field Inspector	1400-2300	2	2	—	—
31	Hindi Translator	1640-2900	1	1	—	—
		1400-2300	1	1+	—	—
32	Assistant	1400-2300	25	20	5	1
33	Stenographer	1400-2300	11	8	—	—
34	Jr Stenographer	1200-2040	18	13**	1	—
35	Sr Clerk	1200-2040	20	20*	3	—
36	Field Supervisor	1200-2040	6	6	—	—
37	Punch Supervisor	1200-2040	3	3	1	—
38	Card Librarian	1200-2040	1	1	—	—
39	Receptionist	975-1540	1	—	—	—
40	Electrician	975-1540	1	1	—	—
41	Key Punch Operator	975-1540	45	44	4	1
42	Field Investigator	975-1540	30	30	5	—
43	Coders	975-1540.	10	2	—	—

1	2	3	4	5	5	6
44	Reference Assistant	975-1540	1	—	—	—
45	Counter Assistant	975-1540	1	—	—	—
46	Telephone Operator	975-1540	3	3	—	—
47	Tubewell Operator	975-1540	2	2	—	—
		950-1400	1	1+	1	—
48	Sr Gestetner Operator	950-1400	1	1+	—	—
49	Carpenter	975-1540	1	1	—	—
50	Driver	975-1540	3	3	3	—
		950-1400	2	1	—	—
51	Zerox Operator	950-1500	1	—	—	—
52	Jr Clerk	950-1500	38	36	5	1
53	Supp Staff-Grade I	750-940				
	Grade II	775-1025				
	Grade III	800-1150	103	95	39	2
	Grade IV	825-1200				

Notes : *Indicates old scale

**Two posts excess filled against Jr Steno

***Five Sr Tech Asstts are working against the vacant post of ECO

+Auxiliary Posts

DISSERTATIONS APPROVED

PhD Degree

1. SINGH, NIRMAL—Use of imputation in two dimensional sample survey

Imputing missing values (i.e. assigning a value to the missing value, assumed to be close to the true value) is commonly resorted to make the data set complete in both census and surveys. In longitudinal or two dimensional surveys, the structure of the sample at each time stage may vary. There are mainly three possibilities for obtaining samples over different time stages, namely (i) the same common sample may be used on all the time stages, (ii) a new independent sample may be observed on each time stage and (iii) a combination of the above two i.e. a common sub-sample is retained for all time stages and it is supplemented by independent sub samples at each time stage.

In any survey, the observed values (in case of response) are subjected to response errors and imputed values (in case of non-response) are subjected to imputation errors as compared with the true values.

Therefore, a total survey error model using the concept of response probabilities for developing general imputation methodology has been studied and various cross-sectional and cross wave imputation methods have been examined for the above three situations.

(Guide : Dr Randhir Singh)

2. SHASTRI, SURESH S—Some contribution to successive sampling

Change is the law of nature and its often the desire of the investigator to determine and estimate its nature and extent. To meet this requirement use of successive sampling, i.e. partial replacement of units from occasion to occasion, is an age old practice. Here is an attempt to suggest design of cyclic nature. The cyclic design of h^{th} order we mean the design having h sets of units such as, units

common on all the 'h' occasions, units common on h—1 of the h occasions etc. and the last ie h^{th} set is of fresh units.

As an illustration cyclic design of third order has been considered. In addition a few estimators for sampling on four occasions and one for general case have been considered. In the case of three occasions we get $\theta_j = \frac{m_j}{n}$ for j=1 to 4, and $\theta_{ui} = \frac{u_i}{n}$, i=1 to 3 where mj and ui are matched and unmatched units and n the sample size. Due to cyclic nature of the design, in addition to $\theta_j \geqslant 0$, $\theta ui \geqslant .0$ we get three more constraints viz $\theta_1+\theta_2+\theta_3+\theta_{u2}=1$, $\theta_1+\theta_2+\theta_4+\mu_{u1}=1$ and $\theta_1+\theta_3+\theta_4+\theta_{u3}=1$. Considering $\theta_i=0$ to 0.5 with an interval at 0.1, we have in all 726 combinations of θ_j satisfying the above constraints and each combination gives rise to 726 sampling plans. To study the efficiency of these plans some estimators along with their expression of variances has been suggested.

Firstly linear unbiased estimator based on weighted means of matched portions for three and four occasions have been suggested. By using these result an attempt has been made to generate 'h' equations in h unknowns, solution of which ultimately helps information of the estimator. Another linear estimator which is unbiased and having minimum variance has also been suggested. For the sake of comparisons the percentage gain in efficiency of these estimators over SRS for all the 726 plans for some values of correlation coefficients has been obtained.

The results revealed that the second estimator leads to higher precision, however, from the computational point of view the first estimator is preferable. Efficiency gains of all the plans (726) has been graphically represented.

Assuming the structural change in population two different linear unbiased estimators have been considered. Both the estimators involve 15 arbitrary constants. We can get these 15 constants involved in 15 equations, such that six constants can be obtained by solving three pairs of simultaneous equations, while rests of the nine can be obtained by solving remaining nine equations, using usual method.

Lastly, for cyclic design of third and fourth order, estimators of the current occasion by using double sampling technique have also been suggested, however, for more number of occasions these estimators become unmanageble/ combersome.

(Guide : Dr S.K. Raheja)

M. Sc Degree

1. RAO, JODH SINGH—Use of auxiliary variable in estimation under balanced random sampling.

Padam Singh and Garg JN (1979) discussed a sampling technique known

as 'Balanced Random Sampling'. The balanced random sampling technique has the advantage of both simple random sampling as well as the systematic sampling in the sense that a part of the sampling variance depends upon the arrangement of the units and other is independent of it. It provides an unbiased estimate of the variance of the estimate of population parameter and it is shown that Yates-Grundy estimate of the variance of the Horvitz-Thompson estimator is always positive This is the main advantage of the balanced random sampling technique over the other sampling techniques.

In most of the surveys information on an auxiliary variable is available alongwith the information on the characteristic under study. This information can be suitably used in estimation of mean or total of the population of the characteristic under study more efficiently. The auxiliary information can be utilized either in selection of the sample or at the estimation stage. The common estimators which utilize the information on auxiliary variable are ratio, product and regression estimators. The present investigation has done to develop the theory of the ratio, regression and product method of estimation under balanced random sampling technique. The extension to the multivariate case and double sampling situations for ratio, product and regression estimator has been studied under balanced random sampling technique.

An empirical study was conducted on eight natural populations of wide variety and wide range for the comparison of the efficiencies of the different estimators. In brief the results of the empirical study are as follows:

(i) The balanced random sampling is in general more efficient than the simple random sampling.

(ii) The ratio estimator ($\bar{Y}'R$) based on balanced random sampling (BRS) was always found superior to the simple mean estimator based on balanced random sampling ($\bar{y}_{brs}$). This establishes the fact of utilizing suitably the auxiliary information in estimation of parameter more efficiently.

(iii) On the basis of the results of the empirical study the ratio estimator ($\bar{y}'_r$.) based on balanced random sampling (BRS) is recommended for estimation of populat. on mean or total when the auxiliary information is available.

(Guide : Dr JN Garg)

2. TRIPATHI, ASHWANI KUMAR—A study of yardsticks of additional production from the use of crop inputs.

To prepare targets of additional production from the adoption of improved measures, a knowledge of input-output relationship of the various developmental measures is necessary. The yardstick is a measure of the average increase in production per unit of given improve-

ment measure singly or jointly that is expected under the typical agronomic and climatic conditions of the region. The input-output relationship is established by fitting a suitable mathematical function to the yield data. In the present investigation four types of response functions viz. quadratic, Square root, Cobb—Douglas and Mitscherlich's function, are considered. Yardsticks and their standard errors were obtained using all the four functions. The function which gave the lowest standard error was considered the most suitable function. The results have been illustrated with the help of data of fertilizer experiments conducted on representative cultivators' fields in five districts, viz. Belgaum, Amritsar, Kurnool, Purnea and Tirunelveli during the period 1977-78 to 1981-82 on rice crop, with the fertilizer treatments at graded levels of the primary nutrients. N, P and K Yardsticks were worked out for nitrogen alone, nitrogen and phosphorus together and for combination of all the three nutrients, nitrogen, phosphorus and potassium. Mitscherlich's function distinctly gave the estimates of yardsticks with lower standard errors as compared to other response functions tried. Next to this quadratic function has been found suitable in a majority of cases.

(Guide : Shri PN Soni)

4. BAGE, BASANT—Economic analysis of up land, rice and Kharif pulse production in Gumla district of Bihar"

The present study was conducted in Basia development block of Gumla district of Bihar. The objectives were to examine rice and pulse production and to study the cost and returns of these crops. The productivity of different farm resources as well as the constraints in getting high yield of up land rice and kharif pulse were examined.

The study is based on secondary as well as primary data. The crop covered in this study are rice, arhar, urd, moong, kulthi. The compound growth rate for area production and productivity of these crop have been computed. Log-linear production function have also been estimated to examine the productivity of resources used in the production of these crops.

(Guide : Dr RK Pandey)

6. AGGRAWAL, NEETA—Balanced random sampling on successive occasions

Padam Singh and JN Garg (1979) suggested a sampling procedure known as 'Balanced Random Sampling' which has the advantage of both simple random sampling as well as the systematic sampling. It provides an unbiased estimate of the variance of the estimate of population parameter and the estimate of the variance of the Horvitz-Thompson estimator is always positive.

The sample may be required to present the estimates of changes taking place in dynamic population from time to time

for various characteristics of interest. By keeping some of the units in the sample common on all occasions and selecting the remaining units afresh from the population it is possible to obtain improved estimators of population parameters on all occasions. Such surveys when repeated over time are called repeat surveys also known as sampling on successive occasions. The suitability of balanced randon sampling procedure in a situation involving the use of successive sampling technique has been investigated in the present thesis.

The improved estimates of the population mean, its variance and estimate of variance have been obtained for successive sampling on two occasions. The procedure has been extended to more than two occasions.

The estimate of change and total between two consecutive occasions and their variances have also been obtained under the same balanced random sampling scheme.

(Guide : Dr JN Garg)

7. KISAN, PRAGGYA—Optimal designs for comparing treatments with a control

It is often desired to compare simultaneously several test treatments with a control. This thesis deals with the study of some optimal designs for the problem. The E-optimality of designs within the class of standard reinforced designs has been studied. The A-efficiencies of some of these designs were found to be very high. A method of construction of BTIB designs using PBIB designs with two associate class is given. These designs were found to have high average-efficiencies in many cases.

(Guide : Dr RC Jain)

8. VOHRA, ALKA—The generalised inverted file system for information storage and retrieval

The thesis deals with preparation of inverted files on the common flat file for retrieval of information from records having values of given key attributes. The advantage of this system is that the files of the key attributes need not be entered in the records of the main file since they appear in the index. Even though considerable amount of computer time is required for creating the index and it is not very easy to update the indices, the method is quite useful in retrieving information from the data file at a very fast rate, The method is particularly suitable to data bases where changes in the information stored in the records take place rather at long intervals of time. The work done in the thesis was illustrated by the use of application of inverted file system for bio-data of scientists working in all Institutes of ICAR.

(Guide : Dr SS Pillai)

9. DEWAN, SANGEETA—Ring file structures for information storage and retrieval

One of the methods of quick retrieval of information from the flat file is to put ring file pointers, in each of the records. During this investigation generalised programme for putting ring file pointers on any file was prepared. The programme was used to illustrate the use of method on data collected by the IASRI on the bio-data of all the scientists working in the ICAR. The thesis contains the algorithms used for the preparation of entries in the pointer fields. Sample outputs from the retrieval of data using the method is also included in the appendix to the thesis.

(Guide : Dr SS Pillai)

10. SHARMA. ATUL KUMAR—"Bhashantaram", a preprocessor for converting fortran programmes into equivalent advanced basic

BASIC has become a popular language for writing programes on Micro computers. Practically all micros used for general purpose applications have got BASIC Compiler or BASIC interpreter. However many of them do not have FORTRAN compilers. In the scientific environment there is a wealth of FORTRAN programs which have been developed over last two decades for solving many problems in science, engineering and humanities.

When a micro computer does not possess the FORTRN compiler, all FORTRAN programs available to the user will be useless. To use these programs, a software which can automatically convert them to equivalent Advanced BASIC programms will be of great help. In the present work an attempt has been made to develop this software. Advanced BASIC is used for writing the software. Statement recognition, analysis of the statements and translation to Advanced BASIC are three major steps taken during the whole process. Each statement is translated one at a time.

The translator program produces a compilable BASIC source code which will be printed out when the last statement of FORTRAN source is typed in. There are certain limitations however. Provision has not been made to accommodate functions and subroutines, due to shortage of time for the development of the translator. There are also a few limitation in the translation of a few Input/Output statements which could have been completed, had more time been available for the preprocessor to be deve'oped.

(Guide : Dr SS Pillai)

Diploma in Advance Computer Programming

11. GUPTA, ASHA—Screen editor for microcomputers

The text editor is based on using the

principle of linked list structure. Only the forward pointers are used for record reference. There is other alternative, using both forward and backward pointers, which is quite flexible and also efficient in minimizing the number of comparisons for a record search. But this advantage is offset by increasing the number of replacements and resetting the values of backward pointers in case of insertions and deletions thereby increasing the execution time. Using backward and forward linkages require more memory compared to using only forward pointers due to additional memory requirement for storing backward pointers. The editor is developed mainly for the benefit of Micro Computer users and with the chief objective of editing programs written in BASIC language.

(Guide : Sh Mahesh Kumar)

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APPENDIX VI

APPOINTMENTS, PROMOTIONS, TRANSFERS, RETIREMENTS AND RESIGNATIONS

Appointments

	NAME	*GRADE*	*w.e.f.*
1	Shri A Tete	3000—4500	09.01.1987
2	Shri RK Verma	2200—4000	21.11.1987
3	Shri RK Saini	1400—2300	16.04.1987
4	Shri V Chakarborty	1400—2300	27.04.1987

Promotions

	NAME	*GRADE*	*w.e.f.*
1	Shri LK Garg	1500—2000*	01.01.1984
2	Dr MG Mittal	1500—2000*	01.01.1984
3	Shri Satya Pal	1100—1600*	01.01.1984
4	Shri AS Gupta	1100—1600*	01.01.1984
5	Dr VK Mahajan	1100—1600*	01.07.1984
6	Shri RC Goyal	1100—1600*	01.01.1984
7	Dr. Chandrahas	1100—1600*	01.01.1984
8	Shri SS Walia	700—1300*	01.01.1984
9	Shri Aloke Lahiri	700—1300*	01.01.1984
10	Mrs. Sushila Kaul	700—1300*	01,01.1984
11	Shri Mahender Singh	700—1300*	01.07.1981
12	Shri NK Sharma	700—1300*	01.07.1984
13	Shri SN Bajpai	2200—4000*	24.06.1987

Transfers

(a) On transfer from other Institutes

	NAME	*GRADE*	*FROM*	*DATE OF JOINING*
1	Dr PR Sreenath	1500—2000	IGFRI, Jhansi (UP)	23.04.1987

	NAME	*GRADE*	*PLACE OF JOINING*	*DATE OF RELIEVE*
1	Shri SL Dua	700—1300*	CIFE, Bombay	29.09.1987
2	Shri DK Sharma	1400—2300	DPR, Kanpur	19.10.1987

Deputation

	NAME	*GRADE*	*PLACE OF JOINING*	*DATE OF RELIEVE*
1	Shri Rajendra Singh	1300—1700	Royal Govt, Bhutan	31.08.1987
2	Shri SK Sublania	1100—1600	Royal Govt, Bhutan	09.10.1987

Retirements

	NAME	*GRADE*	*DATE OF RETIREMENT*
1	Dr AK Nigam	1500—2000	30.04.1987
2	Shri UG Nadkarni	1500—2000	01.06.1987

Resignations

	NAME	*GRADE*	*DATE OF RESIGNATION*
1	Shri Sabu Kurien John	1400—2300	25.03.1987
2	Shri Ram Bhujrat	1400—2300	31.08.1987

Induction into ARS

	NAME	*GRADE*	*DATE OF INDUCTION*
1	Shri MP Saxena	1640—2900	01.10.1975
2	Shri CH Rao	1640—2900	01.10.1975
3	Shri PM Rameshan	1640—2900	08.04.1984
4	Shri KK Chug	1640—2900	19.03.1983

*Pre-revised Scales

PRIMARY DATA COLLECTION

Projects for which primary data were collected either through Institute's own field staff or through ad-hoc staff of the collaborating agencies are as follows :

(a) Institute's own staff

—Pilot sample survey for estimation of post harvest foodgrain losses (wheat)-Bulandshahar (UP)

—Level of employment with modern farm technology-Muzaffarnagar (UP)

—Pilot survey to develop statistical models for production and culling pattern in poultry-Delhi

—Pilot sample survey to develop sampling methodology to study the impact of integrated rural development programme on employment potential and income generated by the programme for beneficiaries-Alwar

(b) Ad-hoc state staff

—Survey for area and production of fruits, vegetables and summer crops-Chandigarh (Punjab)

—Pilot studies for developing the statistical methodology for assessing the losses due to diseases and pests in bovines-Hissar

—Pilot sample survey to evolve a suitable methodology for the estimation of acreage under mulberry and production of mulberry leaves and reeling cocoons-Bangalore

—Agricultural Experiments Information System-Coimbatore

—Base line survey under the World Bank project for watershed development of rainfed areas-IASRI, New Delhi.

—Analysis of data for study of intercropping experiments using bivariate analysis techniques-Nagpur.

—Planning, designing and analysis of experiments planned under AICARP at cropping systems research centre-Hissar; Kanpur; Pantnagar; Hyderabad; Rahuri; Bangalore

—Planning, designing and statistical analysis of the data relating to experiments conducted under

AICARP on Long Term Fertilizer Experiments-Bhubeneswar, Barrackpore

—Sample survey for study of constraints in tranfer of new agricultural technology under field conditions-Bhubaneswar and Puri (Orissa), Ahmedabad (Gujarat), Lucknow and Meerut (UP), Guwahati (Assam), Madras (Tamil Nadu), Ernakulam (Kerala), Nasik and Pune (Maharashtra), Chandigarh (Punjab), Jaipur and Sawai Madhopur (Rajastha)

—Economic study of new farm technology with special reference to yield gap and associated factors in ORP-Bhilwara, Hissar, Indore

—Pilot sample survey for the estimation of losses, price spread at various stages and cost of cultivation of vegetable crop-Pune

—Pilot sample survey for estimation of cost of cultivation of oil seeds and pulses-Jabalpur (MP) and Bharatpur (Rajasth)

—Pilot sample survey to evolve an appropriate methodology for estimation of lac production-Ranchi, (Bihar)

—Pilot sample survey to evolve a suitable sampling methodology for estimation of inland fishery resources and catch in a region of Orissa, Orissa

—Pilot study for estimation of yield in Irrigated and unirrigated conditions in Lower Bhawani Project Command Area-Erode (TN)