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

ANNUAL REPORT

1990-91



INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
(I.C.A.R.)

LIBRARY AVENUE, NEW DELHI-110 012

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PREFACE

The present compendium gives the panorama of activities and achievements of the Institute during 1990-91. Mission-mode projects undertaken by various divisions of the Institute are reflected in this compendium. Areas of research in the field of computer application, leading to Statistical Package for Agricultural Research Data Analysis 'SPAR 1' are also highlighted.

Efforts have been made to cover all the functions and the research activities of the Institute during the year. I hope that the information furnished in this report will be of considerable interest to scientific fraternity. Comments and suggestions offered for improvement in the presentation of subsequent volumes of the annual reports of the Institute would be welcome and appreciated.

I am thankful to the Officers and Staff of the Institute who extended full cooperation in supplying the material required for this report.

Co-ordination Cell has done indeed a commendable job of editing the voluminous material of the report and deserves appreciation for its timely publication. Thanks are also due to Sh OP Singh, Technical Assistant and Sh RS Chauhan, Assistant for their help in preparation of the report and Mrs Rajni Gupta, Sh Mahesh Chand and Sh Ishwar Datt for efficiently typing the manuscript.

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 MSc and PhD degrees in agricultural statistics and MSc 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 application; and
- To provide consultancy service in data processing.

Origin and Growth

The Institute made a modest beginning in 1930 as a small Statistical Section in the then Imperial Council of Agricultural Research to assist the State Department of Agriculture and Animal Husbandry in planning their experiments, analysis of experimental data, interpretation of results as also advise on the formulation of the technical programmes and examine the progress reports of the schemes funded by the Council. The activities of the Section increased rapidly with the appointment of Dr PV Sukhatme as Statistician to the Council in 1940 and researches were initiated for developing objective and reliable methods for collecting yield statistics of principal food crops. The efficiency and practicability of these methods were demonstrated in different states for estimating yield by crop cutting experiments. 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. Research in sampling theory and training of field staff and statisticians were the activities initiated in this period resulting in the re-organization of the Statistical Section into a Statistical Branch with permanent footing in 1945

with appropriate expansion in its strength. The designation of Statistician was changed to Statistical Adviser. The Statistical Branch soon acquired international recognition as a centre for research and training in the field of Agricultural Statistics. During 1952, on the recommendations of two FAO experts Dr Frank Yates, and Dr DJ Finney who visited this Institute on the invitation of the Government of India, activities of the Statistical Branch were further expanded and diversified. In August, 1955, it moved to its present campus and was named as Statistical Wing of the ICAR. Subsequently, in recognition of its important role as a training and research institution, the Statistical Wing was re-designated as the Institute of Agricultural Research Statistics (IARS) on 2nd of July, 1959. An important landmark was the installation of an IBM 1620 Model-II Electronic Computer in 1964. New courses leading to MSc and PhD degrees in Agricultural Statistics were started in collaboration with the Indian Agricultural Research Institute (IARI), New Delhi in October, 1964. In April, 1970, the Institute was declared as a full-fledged Institute in the ICAR system and is since then headed by a Director.

Since the activities of the Institute expanded manifold, 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. A large number of general purpose appli-

cation software have been developed and are available on library tape. Currently, steps are afoot for installation of a powerful computer system comprising PC/AT 486, a number of PC/AT 386, PC/XT and terminals to be set up in a Local Area Network (LAN). Since 1st January, 1978 the name of the Institute was changed to Indian Agricultural Statistics Research Institute (IASRI) emphasizing the role of 'Agricultural Statistics' as a discipline by itself.

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 liaison 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 numbers of inputs added to the System every month. The Institute provides selective information services to scientists in the ICAR Institutes and Agricultural Universities 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 programme, several distinguished statisticians and computer experts from abroad have visited the Institute for a period of four to eight weeks with a view to interacting with the scientists of the Institute, give seminars/lectures and look into the research programmes of the Institute. A number of scientists from this Institute have received training in different areas of research extending over periods of 5-6 months each. In addition, a new course leading to MSc degree in Computer Application in Agriculture has been initiated.

The Institute has achieved international recognition for its high quality research and teaching 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.

The multistoreyed Training-cum-Administrative Block of the Institute, the foundation stone of which was laid

by the Hon'ble Union Minister of Agriculture Dr GS Dhillon on November 19, 1987 is almost nearing completion.

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,
- UNDP,
- Coordination, and
- Monitoring

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 the Council) by providing a broad-based platform for decision making

process, by examining the progress of the Institute periodically and by recommending suitable remedial measures for bottlenecks, if any. The Management Committee of this Institute was reconstituted for a period of 3 years with effect from Jan 3, 1991 to Jan 2, 1994. The meeting of the Management Committee was held on March 19, 1991.

Staff Research Council

The Staff Research Council (SRC) is the most important forum in the Institute to plan, monitor and evaluate research projects. The final review of the Institute research programmes is also undertaken by the SRC. The meetings of SRC are held under the Chairmanship of Director. As per the decision taken earlier, a Peer Group from outside the Institute is associated in the discussion during the

process of formulation of new project proposals.

During the period under report the meeting of SRC was held on 7th, 8th, 15th, and 16th May, 1990 and 20th February, 1991 to discuss the new project proposals to be taken up in the 8th Five Year Plan. Prof J Roy, Indian Statistical Institute, Calcutta, Prof. PV Sukhatme, distinguished scientist, Sh JS Sarma, Emeritus Research Fellow, IFPRI, Washington (USA), attended as special invitees. In all 22 new project proposals were presented at the meetings for their approval, and 19 proposals were approved.

Meetings of SRC were held on July 9, 1990 and February 20, 1991 to review the progress of research projects. The number of projects reviewed were 77 and 44 respectively.



Management Committee of the Institute in session



Staff Research Council in session with Prof J Roy, ISI, Calcutta as special invitee

Research Collaboration

The Collaborative projects which remained in operation during 1990-91 are as follows :

Sl. No.	Title	Collaborating Agency	Start	Completion
1.	Pilot studies for developing statistical methodology for estimating the losses due to diseases and pests in bovines	HAU, Hissar	Jan, 85	Oct, 90
2.	Planning, designing and statistical analysis of experiments planned under All India Coordinated Agromomic Research Project at cropping systems research centres and on cultivators' fields	(i) Deptt. of Agronomy, Agricultural Universities (ii) State Deptt. of Agriculture, Manipur	Mar, 86	Continuing
3.	Planning, designing and statistical analysis of 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 Agricultural Universities	Jul, 85	Continuing
4.	A within-year growth model for pre-harvest forecasting of crop yields	IARI, New Delhi	Oct, 87	Mar, 91
5.	Statistical aspects of physiological kinetics in animal nutrition	(i) IVRI, Izatnagar (ii) NDRI, Karnal (iii) CSWRI, Avikanagar	Aug, 87	Mar, 91
6.	Pilot studies on pre-harvest forecasting of yield of stick lac	Indian Lac Research Institute, Ranchi	Oct, 87	Dec, 91

Finance

Budget statement for the financial year 1990-91

Head	Non-Plan		Plan	
	Funds (Rs) in Lakhs	Expenditure (Rs)	Funds (Rs) in Lakhs	Expenditure (Rs)
Pay and Allowances	255.00	2,48,89,048.75	1.00	30,738.00
Travelling Allowance	2.50	2,32,799.60	1.00	52,753.00
Recurring contingency	—	57,92,754.16	—	4,09,845.00
Total	257.50	3,09,14,602.51	2.00	4,93,336.00
Non-recurring contingency	112.50*	2,44,224.00	98.00*	3,70,852.00
(a) Works	—	32,15,868.00	—	7,73,600.00
(b) Equipments	—	9,804.00	—	—
(c) Library books and journals	—	11,44,998.00	—	1,169.00
(d) Vehicles	—	1,744.00	—	—
(e) Coordinated project on data collection	—	—	—	—
(f) Electronic Computer	—	—	—	—
(g) Others	—	8,16,317.00	—	—
Total	—	54,32,955.00	—	11,45,621.00
Grand Total	370.00	3,63,47,557.51	100.00	16,38,957.00

	Abstract (1990-91)	
	Funds (Rs) in Lakhs	Expenditure (Rs)
Non-Plan	370.00	3,63,47,557.51
Plan	100.00	16,38,957.00
Total	470.00	3,79,86,514.51

Leave salary and Pension contribution

Non-Plan	Rs 7855.00	(included in Pay and Allowances)
Plan	—	

* Total contingency including recurring and non recurring.

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
- Information system for agricultural and animal experiments
- Yardsticks of additional production
- Experimental designs for agricultural, animal and fisheries research

Projects in operation thrust-area wise :

No	Project title	Project leader and associates
1	2	3
Cropping System Research		
1.	Planning, designing and analysis of experiments planned under All India Coordinated Agronomic Research Project on cultivators' fields	PN Bhargava KC Bhatnagar Mahesh Kumar
2.	Planning, designing and analysis of experiments planned under AICARP at Cropping System Research Centres	PN Soni Rajinder Kaur Ajit Kaur
3.	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
4.	A study of interactions with reference to resource constraints of agronomic factors	GL Khurana KC Bhatnagar

1	2	3
5.	Methodological investigations in predicting fertilizer responses using soil test values and other site variables	Aloke Lahiri DK Mehta NK Sharma
Crop Strategies for Dryland Agriculture		
6.	A statistical model to assess the effect of moisture stress on yield	Asha Saksena PN Bhargava
Information System for Agricultural and Animal Experiments		
7.	Agricultural field experiments information system	RK Ghai PN Bhargava PR Yeri
8.	Agricultural experiments information system for animal sciences	GC Chawla PR Sreenath
Yardsticks of Additional Production		
9.	Yardstick of additional production from the use of crop improvement measures	KC Bhatnagar Onkar Swarup CH Rao
Experimental Designs for Agricultural, Animal and Fisheries Research		
10.	Studies on designs for animal experiments	A Dey VK Gupta
11.	Studies on robust designs	R Srivastava A Dey VK Gupta
12.	Construction of balanced incomplete block designs with nested rows and columns	PR Sreenath
13.	Study on optimality of designs for one-way and two-way elimination of heterogeneity	VK Gupta

1. Planning, designing and analysis of experiments planned under All India Co-ordinated Agronomic Research Project on cultivators' fields

The experiments on cultivators' fields are planned principally to test the performance of crop production technologies

identified at cropping systems research centres and to obtain the magnitude of responses under varying management conditions with adequate degree of precision. The objectives of the project are (i) to provide suitable sampling plan and designs for the lay-out of experi-

ments on cultivators' fields during 1989-90 under AICARP, (ii) to identify the appropriate statistical methodology for the analysis of data collected under the programme of E.C.F.; and undertake the analysis of the data of experiments conducted during 1988-89 and summarize the results for inclusion in the Annual Report of the Project.

A three stage random sampling design was adopted for the selection of site and mostly R.B.D. and split-plot designs were used for the lay-out of the experiments. Twelve different types of experiments with different objectives were laid out. In a district, about 96 experiments are planned in each season with a restriction of minimum of 16 experiments for a single type, thus accommodating around 5-6 types of experiments in a season in a district.

During the period under report the results of about 5,800 experiments conducted during 1988-89 at 41 E.C.F. districts were summarized and summary tables sent to the Project Director of Cropping Systems Research at Modipuram. In addition, the data of about 6,000 experiments conducted during 1989-90 in 41 districts were received, scrutinized and the analysis was in progress. The Annual Report for the year 1988-89 was being prepared for presentation and discussion at the group meetings under AICARP.

The salient results obtained are as below :

Studies on crop response to fertilization indicate that the increase in yield with the recommended fertilization compared to farmer's level was significantly higher under irrigated conditions in all the crops than under rainfed conditions. The magnitude of increase depended on the gap between the recommended level and farmer's level of fertilization. In kharif rice the increase in yield generally ranged from 3-12 q/ha whereas in rabi wheat it ranged from 3-22 q/ha under recommended fertilizer doses over farmer's level of fertilization. In other crops the increase in yield ranged from 1-4 q/ha.

In case of fertilizer requirements of legumes under irrigated or rainfed conditions it is observed that yield of pulse crops could be increased by fertilizing with suitable dose of NPK. The response was generally found to be significant upto $N_{40}P_{80}$ in most of the districts. The response of K over N and P was generally low except in Ratlam, Shivpuri and Mandla districts of Madhya Pradesh, Pitoragarh and Pratapgarh districts of U.P. and Puddokotai district of Tamil Nadu.

Studies on relative efficiency and economics of selected double crop sequences comprising of cereal-cereal, cereal-pulse, cereal-oilseed (pulse) or oilseed-pulse under irrigated conditions reveal that blackgram-mustard at Kanpur-Dehat (U.P.), greengram-mustard at Sabarkantha (Gujarat), greengram wheat at Panchmahal (Gujarat) and sesamum-

gram at Ghazipur (U.P.) were the most promising crop sequences. The results indicate that the inclusion of either a pulse or an oilseed crop in the system increased the returns substantially as compared to cereal crop.

Experiments were conducted on rationalization in crop production under irrigated or assured rainfall conditions at a number of districts. The results indicate the need of application of fertilizer at recommended level. The reduction in its application has resulted in significant reduction in yield of cereals, pulses, oilseeds or cotton crop.

2. Planning, designing and analysis of experiments planned under AICARP at Cropping System Research Centres.

Data for about 320 complex experiments conducted during 1988-89 at 40 Cropping System Research Centres were subjected to critical analysis. Final summary tables were prepared for inclusion in the National Report which is under preparation. Appropriate methodology for data analysis in respect of the newly introduced experiments during 1989-90 was developed and the statistical analysis of data relating to about 300 complex experiments was accordingly taken up. Layout plans for a number of complex experiments and related instructions for the conduct of experiments taken up during 1990-91 at various cooperating centres were prepared and communicated to concern centres. Trainings were engaged at a number of locations to acquaint the concerned scientists

and research workers on various statistical aspects connected with the conduct of experiments and other related aspects. Salient results based on the experiments conducted during 1988-89 are as below :

- Studies on production potential of promising crop sequences under optimum input conditions identified rice-wheat as the intensity crop sequence for different agro-climatic regions based on economic considerations.
- The effect of fertilizer reduction under normal and delayed sowing was examined under varying components of other input factors for rice-wheat sequence. The yields were significantly reduced (18-87%) with the reduction of fertilizers and delayed sowing in respect of both the crops at all the centres excepting Jabalpur for rice. The reduction in yield was more for the crops sown at normal dates with optimum plant population and irrigation for rice and wheat respectively. In case of other input factors, the trend was observed to be erratic.
- A number of slow release fertilizers were tried to study their efficiency in comparison to urea. To study the extent to which the superiority of different fertilizer sources varied from year to year, stability indices were worked out. It was observed that at a number of locations, the crop yields with application of slow release fertilizers to rice were higher as compared to ordinary urea both in rice-rice and

rice-wheat sequences. The new fertilizer materials especially urea, super granules happened to be more stable under varying environments as compared to prilled urea.

- Long term studies on relative efficiency of legume-cereal or cereal-legume rotations over cereal-cereal rotations have shown that sequences with leguminous crops were more remunerative over cereal-cereal sequence at most of the cropping system research centres.

3. Planning, designing and statistical analysis of data relating to experiments conducted under the All India Coordinated Agronomic Research Project on Long Term Fertilizer Experiments

The objectives of the project are to plan and design long term fertilizer experiments, to try alternative approaches for statistical analysis of data on long term fertilizer experiments and to coordinate the work of the project on national level and also to provide necessary information to Project Coordinator.

During the period under report, the project data for 1988-89 in respect of yield, plant uptake and soil characters were received from all the cooperating centres. These data were scrutinized, coded and statistically analysed. The results were made available to the cooperating research centres and to the project co-

ordinator. The results (1987-88 & 88-89) were being tabulated in the form of summary tables to be included in the overall Annual Report of the project. In addition to this, three types of investigations were undertaken with the data viz economics of long term fertilizer use in crop sequences, yield trends from continuous application of fertilizers and factors affecting yield sustainability. Some of the salient results are mentioned below :

- Response to N and P was conspicuous at all the centres except at Pantnagar. However, application of K did not show beneficial effect even after 15 years of continuous cropping at Coimbatore, Jabalpur, Hyderabad and Pantnagar because of high availability of the nutrients in these soils. The results indicate the use of balanced application of NPK for increased productivity and higher return.
- Sustainable and increasing yield trends over the years due to balanced application of fertilizers could be achieved for rabi crops.
- At most of the centres, a declining trend in yield of kharif crops was obtained at recommended doses.

4. A study of interactions with reference to resource constraints of agronomic factors

The project aimed : (i) 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, and (ii) to study the optimum number of replications, locations and years required to test the performance of such interaction.

By utilising the data of production potential experiments for the period 1982-85 under resource constraints conducted under AICARP (ICAR), an appropriate methodology was developed. The salient results achieved were as follows :

The data of these experiments were utilised to identify the important interactions between the different agronomic factors viz. D(date of sowing), F (fertilizer application), P (Plant population), I (Irrigation) and W (Weed control) that could possibly be exploited at reduced levels to obtain higher productivity of different crop sequences. The data were subjected to appropriate analysis applying multiple regression technique and analysis of means for arriving at meaningful conclusions.

For rice-rice sequence, the important interactions identified were $D \times P$, $D \times P \times W$ for kharif and $D \times W$, $D \times W \times I$ for rabi for Maruteru. $F \times P \times W$ for kharif and $I \times P$, $F \times I$ for rabi were found important at Thanjavur. $D \times F$ and $F \times P \times W$ were found important for kharif and rabi respectively at Bhubneshwar.

In case of rice-wheat sequence, for kharif season, different interactions viz.

$D_1 \times F_1 \times P_2 \times W_2$ for Raipur (M.P.) and Kalyani (W.B.), $D_1 \times F_2 \times P_1 \times W_1$ for Kathulia Farm (M.P.) $D_2 \times F_1 \times P_2 \times W_2$ for Masodah (U.P.) and $D_1 \times F_2 \times W_2$ for Rudrur (A.P.) were identified as important. For rabi, all the above districts, except Rudrur, $D_1 \times F_1 \times I_2 \times W_2$ was important. For Rudrur, $D_1 \times I_2 \times W_2$ was found important.

In case of jowar-wheat-sequence for kharif Sehore $D_1 \times F_2 \times P_2 \times W_2$ and for rabi $D_2 \times F_1 \times I_1 \times W_2$ were found important. For Kharif Akola, $D_2 \times F_2 \times W_2 \times P_1$ (P_2) and for rabi $D_2 \times F_1 \times I_1 \times W_1$ (W_2) were important interaction.

In case of bajra-wheat sequence, for kharif bajra at Bichpuri & Hissar, $D_1 \times F_2 \times P_2 \times W_2$ was important interaction and $D_1 \times F_2 \times I_1 \times W_1$ for rabi.

To meet the second objective, a study on requirements of number of plots allocated into replicates, years and locations revealed that for rice-wheat sequence, the increase in the number of replications or locations or both resulted in substantial reduction of standard error of the interaction or package mean whereas for other crop sequence the associated standard error could be minimised with the increase in the number of replications alone.

5. Methodological investigations in predicting fertilizer responses using soil test values and other site variables.

The objectives of the study are (i) to identify a suitable statistical model based

on soil test values for estimating the optimal fertilizer response, and (ii) to evaluate the economic gain in adopting fertilizer recommendation involving soil test values Vs general recommendations. The experiments conducted at cultivators' field under AICARP from 1977 to 1981 were retrieved from the tape and information regarding these experiments like yield data, treatment details and soil test values were collected. The analysis of data was in progress.

6. A statistical model to assess the effect of moisture stress on yield.

This project was initiated with the objectives to develop moisture stress index for rainfed crops, to examine the effect of various degrees of stress on yield, and to obtain the chances of occurrence of stress of various degrees. Daily rainfall, pan-evaporation and crop yield data for the period 1972-1989 was collected from IARI, centres. Necessary information such as water holding capacity of the IARI soils, water requirement of pearl millet crop, critical stages of crop growth etc. were obtained through enquiry and from literature. Preliminary analysis like mean, variance etc. of meteorological variables was carried out. Preparation of moisture stress index was in progress.

7. Agricultural field experiments information system

The objectives of the project are to maintain at a central place the results and other ancillary information in respect of

all the agricultural field experiments except purely varietal trials conducted at different research stations spread all over the country. This would avoid duplication of research and assist a research scientist to utilise the information on the extent of work done in the past, the approaches followed and the results obtained by other scientists in the same line. The data under the project is collected by personal visits of the regional staff posted at different regional centres under senior officers of Agriculture Departments/Universities. Till recently, 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 reorganised into agricultural field experiments information system and made computer based. The system is based on development of data bank which would store on magnetic tapes for future retrieval data in respect of field experiments planned and conducted since 1978 and onward at different research stations in the country. Necessary software for storage and retrieval has been developed. A directory of experiments available with the system giving brief details viz. objective of experiment, type, year of start and termination, research station etc was under preparation.

The preparation of crop-wise reports of experiments conducted in the country during 1966-77 giving results in summarised form along with details of treatments and other availing information have been taken up. One such report "Results of Cotten Experiments in India

(1966-77)" Vol. II covering the experiments planned and conducted in Maharashtra, Punjab, Tamil Nadu and U.P. have been brought out. Similar reports on oilseeds (sunflower), sugarcane and paddy were under preparation. In addition, for the period 1978 onwards the regional staff reported during the year, experimental data in respect of about 2950 experiments on prescribed Index cards/Coding sheets. While about 880 experiments were reported on the prescribed proformae. Inclusive of these about 16,000 experiments on coding schedules have so far been reported for the system. Processing and validation of data and their storage on magnetic tapes was in progress.

8. Agricultural experiments information system for 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/agricultural 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 retrieve information according to the queries made etc.

During the period under report, Instruction Manual was modified. The format of presentation of results was completed for 104 experiments pertaining to various zones and data of nearly 300 experiments were loaded on magnetic tape for the Index of Animal Experiments.

9. Yardstick of additional production from the use of crop improvement measures

The objectives of the project were to prepare yardsticks of additional production and to work out the benefit cost rates using different response functions for crop from the use of fertilizers. Yardsticks of additional production rice, wheat, maize and jowar were worked out district wise, state-wise, region-wise, and soil group-wise. The project report was finalized. The feasibility of developing composite yardsticks was being investigated using the methodology given by Narain and Leelavathi in their report "Yardsticks of additional production from the use of irrigation (1989)".

10. Studies on designs for animal experiments

The project aims at suggesting efficient designs for animal experiments and to prepare a catalogue of efficient designs which can be used by experimenters. The work relating to the project was completed. Afterwards it was felt that some efficient block designs may also be obtained for least number of observations. Some E-optimal designs were obtained with least number of experimental units. The report on the project was being finalised.

11. Studies on robust designs

The project was started with a view to study designs which are robust against disturbances like missing observations.

Work on robustness of designs against loss of disjoint blocks was completed. Other results include robustness of augmented BIB design against loss of one block. Criterion used for robustness was efficiency of resulting design with that of original design. An attempt was also made to study robustness of designs against presence of more than one outlier. Further study was in progress.

12. Construction of balanced incomplete block designs with nested rows and columns

The BIBRC designs are useful for the elimination of more sources of variation than can be eliminated with the use of BIB Designs. Here equisized blocks are used with nested classifications of rows and columns which are orthogonal in each block. Developing further methods of construction of these designs with smaller number of replications, tabulation of these designs for $v \leq 30$ treatments in blocks of p rows and q columns with $k = pq \leq 10$ and $k \leq v$ and study of efficiency balancing in these designs form the objectives of the project.

Several new methods of construction of these designs have been developed alongwith trial and error solutions in few of the cases. The fundamental theorems for the construction of BIBD have been extended to this case. Their construction through EG (n,s) has been studied. Deve-

loping new designs with the help of known BIBRC and BIB designs has been attempted. Several new series of designs with smaller number of replications have thus become available through these efforts.

13. Study on optimality of designs for one-way and two-way elimination of heterogeneity

The broad objectives of the project are (i) to characterize and construct optimal block designs under homoscedastic and heteroscedastic models, (ii) to characterize and construct optimal row-column designs, and (iii) to prepare a catalogue of optimal designs.

The available literature on the optimality of block designs and row-column designs was critically reviewed and a catalogue of optimal designs was prepared. Some results concerning universal optimality of block designs were obtained which indicated that a binary balanced block design, whenever existent, is universally optimal in a global class $D(u, b, n)$, where $D(u, b, n)$ is the class of all competing designs with u treatments, b blocks and n experimental units. The replication numbers of treatments and the block sizes were arbitrary. Some characterizations of E-optimal block designs were also obtained. These designs were also with unequal block sizes and varying replication numbers.

**DIVISION OF SAMPLE SURVEY METHODOLOGY AND ANALYSIS
OF SURVEY DATA**

Mandate :

To evolve sample survey techniques for estimation of various parameters of interest 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 parameters estimation
- Assessment and evaluation studies
- Operational feasibility studies
- Remote sensing technology applications

Projects in operation thrust-area-wise :

No	Project title	Project leader and associates
1	2	3
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 VK Jain
2.	Pilot sample survey for estimation of area of grazing land and its utilization	Anand Prakash BC Saxena

1	2	3
3.	Pilot sample survey for estimation of losses, price spread at various stages of marketing and cost of cultivation of vegetable crops	AK Srivastava SK Raheja DC Mathur Satya Pal
4.	Study for estimation of area and production of important vegetable crops on the basis of partial harvest	AK Srivastava DL Ahuja DC Mathur K Chugh
5.	Pilot sample survey for estimation of yield of pepper and study of cultivation practices using successive sampling	SS Shastri SK Raheja VK Jain
Cost of Cultivation of Horticulture Crops		
6.	Pilot sample survey for study of cost of production of chikoo and its marketing practices in Valsad district (Gujarat)	MS Batra OP Kathuria
Statistical Modelling for Production and Growth		
7.	Pilot sample survey to develop statistical models for production and culling pattern in poultry	KPS Nirman JP Jain Balbir Singh
8.	Statistical modelling for projection of bovine populations and prediction of milk availability	SN Arya SC Agrawal HP Singh
Inland Fish Catch Estimation		
9.	Pilot sample survey to evolve a sampling methodology for estimation of inland fishery resources and catch in a region of Orissa	OP Kathuria HVL Bathla KK Kher
Crops and Livestock Productivity Studies		
10.	Pilot sample survey to evolve an appropriate methodology for estimation of lac production	DC Mathur OP Kathuria AK Srivastava SC Sethi
11.	Pilot sample survey for estimation of production of hides and skins in Chingleput and North Arcot districts (Tamil Nadu) and Surat district (Gujarat)	JS Maini JP Goel KB Singh RS Khatri

1	2	3
Demographic Parameters Estimation		
12.	Pilot studies for estimation of birth and death rates in ovines	SN Arya Balbir Singh AS Gupta
13.	Pilot studies for developing statistical methodology for assessing the losses due to diseases and pests in bovines	HP Singh JP Jain BC Saxena
Assessment and Evaluation Studies		
14.	Pilot sample survey for estimation of post-harvest foodgrain losses (wheat)	AK Srivastava HC Gupta Prem Narain
15.	Sample survey for study of constraints in transfer of new agricultural technology under field conditions	SK Raheja PC Mehrotra VS Rustogi SS Gupta SS Shastri NK Ohri GS Bassi RC Gola
16.	Pilot sample survey for estimating the energy utilization for different levels of adoption of modern technology in agriculture	KK Tyagi PC Mehrotra SK Raheja Satya Pal
17.	A sampling study on utilization of crossbred working animals vis-a-vis non-descripts	KB Singh JP Goel RS Khatri
18.	Investigations in sampling methods for multiple frames in two stage sampling	BC Saxena AK Srivastava
19.	Small area estimation of milk production	Shivtar Singh JP Jain DK Bhatia
20.	A study of variability of different components of cost of production of fruits at different stages of sampling and estimation of sample sizes at given levels of precision	MS Batra Satya Pal OP Kathuria

1	2	3
21.	Development of survey methodology for estimation of production of agricultural by-products	NK Ohri PC Mehrotra RC Gola
22.	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.	MG Mittal
Operational Feasibility Studies		
23.	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 the field agency of animal husbandry department	RS Khatri KB Singh JP Goel
Remote Sensing Technology Applications		
24.	Use of remote sensing technology in crop yield estimation surveys	Randhir Singh RC Goel BH Singh SK Saha

1. **Pilot sample survey 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. Accordingly study on this aspect was taken up with the objectives (i) to evolve suitable sampling procedure for estimation of various components of cost of production of oilseed and pulse crops, and (ii) to work out an index of cost of cultivation of these crops from year to year taking into account the price fluctuation. The project was in operation at two centres

viz Rajasthan (Bharatpur) and MP (Vidisha).

The crops covered in the study are : Rajasthan centre-Groundnut, Sesamum (Kharif) and Mustard (rabi); MP Centre-Moong, Urad (Kharif) and Gram (rabi). The analysis was completed and report on the project was being finalised.

2. **Pilot sample survey for estimation of area of grazing land and its utilization**

The objectives of the project were to evolve a suitable sampling technique for estimating (i) the area of grazing land, (ii) average yield per unit grazing area in different seasons, and (iii) chemical and

botanical composition of the grass land produce. The project report was finalised and the salient results are as follows :

The estimates of grazing areas for rainy, winter and summer seasons were 25.2, 30.48 and 40.94 thousand hectares respectively for the region with the respective percentage standard errors 9.94, 7.74 and 13.53. The estimates of yield per square metre before grazing turned out to be 45.6 gms and 40.0 gms for the winter and rainy seasons respectively with the respective percentage standard errors 4.41 and 8.83.

An important study aiming at researching the growth of herbage over a period of 30 days under restriction of the herbage being not grazed during that period, was also undertaken. The estimates of yield of herbage per square metre was 59.7 gms for winter season and 68.4 gms for rainy season.

The data on feeding and health of animals from some households were collected in each selected village. The male-cattle were in general heavier than their female counterparts while the female-buffaloes were more in weight than their male counterpart by about 40 kg. In general the quantity of feed given to animals was below the standard level of feeding.

The species of herbage in the grazing areas were leguminous, weeds etc in both the seasons. The identifiable herbage, namely, *Cynodon dactylon*, *Panicum*, *Aristida* and *Evolvulus* together contribut-

ed more than 40 percent to the total. As per the chemical analysis of the herbage samples, the nitrogen-free-extract, a digestible and valuable carbohydrate such as starch and sugar, accounted for about 48% of the totality of the investigated compounds. The calcium constituted only 0.6 percent of the total.

Except for grazing areas of size less than or equal to 1 hectare which constituted about 20 to 25 percent of the total in each of the seasons, the grazing areas of other sizes in classified groups varied more widely from season to season. The location of about 75% of the grazing areas was well within a distance of 1 kilometer and were also reported to be grazed by the animals belonging to neighbouring villages. The period of stay of livestock on the grazing areas normally depend on the climatic factors.

3. Pilot sample survey for estimation of losses, price spread at various stages of marketing and cost of cultivation of vegetable crops

The project aims (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 of area and production of important vegetables.

The field work of the project was undertaken under the administrative control of Director of Horticulture, Maharashtra state, Pune. The project has two important objectives (i) cost of cultivation, and (ii) marketing of vegetables. The cost of cultivation data was collected for 2½ years while for marketing 1½ years. The report on the project was being finalised.

4. Study for estimation of area and production of important vegetable crops on the basis of partial harvest

The objectives of the study are (i) to develop a suitable theoretical frame work for sampling from two dimensional populations spread over space and time with particular reference to vegetable crops, (ii) to apply and test the theory on secondary data collected under earlier vegetable surveys at IASRI in order to develop a suitable methodology for estimating the production of vegetable crops based on partial harvests, and (iii) to estimate the total production of important vegetable crops and their yield rates on the basis of partial harvest.

The existing literature available on sampling from two dimensional populations spread in space and time were reviewed.

5. Pilot sample survey for estimation of yield of pepper and study of cultivation practices using successive sampling

The objectives of this project are (i) to develop suitable sampling technique

for estimation of yield and study of cultivation practices of pepper, (ii) to estimate the changes in yield estimation, and (iii) to study the relative efficiency of yield estimates generated through different patterns of successive sampling.

The survey will be conducted in one district each of Tamil Nadu (Salem), Karnataka (Kodagu) and Maharashtra (Sindhudurg). The design of the survey is two-stage stratified random sampling using successive sampling at psu. Taluk will form as strata and 10 villages will be selected from each Taluk/Tehsil, of which 8 will be retained and 2 will be taken a fresh in subsequent years. From each selected village, 6 survey number will be considered for studying cultivation practices. For crop cutting experiments, two (from 6 already selected,) will be considered. Further for these experiments a cluster of 4 pepper growing standards will be selected.

On the spot study of the situation and the feasibility of survey was made by visiting the concerned districts. Action was being taken to initiate the field work.

6. Pilot sample survey for study of cost of production of chikoo and its marketing practices in valsad district (Gujarat)

This study was taken up with the objectives (i) to obtain reliable estimates of cost of production of chikoo based on a suitable sampling design, and (ii) to study the prevailing marketing practices of the fruit in the region of study. The report on the project was being finalised.

7. Pilot sample survey to develop statistical models for production and culling pattern in poultry

The objectives of the project are (i) to estimate month wise/season wise age specific vital characteristics affecting the growth and structure of poultry population, (ii) to estimate production of broilers in terms of number and weight and culling of layers by size of farm at regular interval of time (fortnightly/monthly), and (iii) to develop appropriate models characterising the production and culling pattern in poultry farms utilizing the estimated vital characteristics.

The vital statistics in respect of broiler were estimated and the modified Leslie's equal age group model for broiler stock was tested. The analysis of data to work out specific rate of mortality, culling and replacement was completed and summary tables prepared. Drafting of the report was in progress.

8. Statistical modelling for projection of bovine populations and prediction of milk availability

Future estimates of bovine population/milk production, which are often needed by planners, administrators and researchers, have been worked out from time to time in different contexts. However, no concerted effort seems to have been made on developing methodology for the purpose. This project was initiated with the objectives (i) to identify (and develop, where necessary) suitable models for projection of bovine popula-

tion in various categories on the basis of empirical studies, (ii) to conduct a comparative study of different models so as to recommend appropriate models for use in varying situations, and (iii) to arrive at a suitable method for prediction of milk availability in future.

Literature relevant to the project was reviewed. Requisite data were being scrutinised for compilation.

9. Pilot sample survey to evolve a sampling methodology for estimation of inland fishery resources and catch in a region of Orissa

The study was undertaken in the districts of Cuttack, Sambalpur and Bolangir for freshwater ponds and Puri, Ganjam, Balasore and Cuttack districts for brackishwater units.

The report on estimation of resources and catch from freshwater ponds was prepared and analysis of data and writing of report was in progress in case of brackishwater units.

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

The objective of the project was 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 reasonable degree of precision. The consoli-

dated report of all the three centres was prepared and being finalised.

11. Pilot sample survey for estimation of production of hides and skins

(a) *Chingleput and North Arcot districts (Tamil Nadu)*

The project report was under finalisation.

(b) *Surat district (Gujarat)*

The analysis work was completed and draft report on the project was prepared.

12. Pilot studies for estimation of birth and death rates in ovines.

The project was taken up with a view to developing suitable methodology for estimation of specific fertility and mortality rates in stationary flocks of sheep and goats with respect to breed, sex and age. A sample survey was conducted in Tiruchirappalli district of Tamil Nadu adopting stratified two stage simple random sampling without replacement. The sampling units at the two stages were village and household having ovines. Requisite data were collected by trained field investigators in two phases : a census of households in the selected villages and collection of detailed data from the selected households through successive periodical visits.

The processing and analysis of detailed data were continued to obtain group-specific mortality and fertility rates. Data relating to ovine diseases were

compiled to estimate the duration of sickness due to each major disease. Results obtained were tabulated and report writing was in progress.

13. Pilot studies for developing statistical methodology for assessing the losses due to diseases and pests in bovines.

The study aimed to evolve a suitable methodology for estimation of losses in productivity of animals due to some of the diseases and pests commonly occurring in the area. It involves estimation of incidence of diseases, and extent of losses in production.

It was observed that bovines mainly suffered with Pneumonia, Rheumatic Syndrome, Foot & Mouth Mastitis as also repeat breeding and anoestrous conditions. The effect of disease on productivity of bovines was examined and it was observed that on an average the loss in milk production in pregnant bovines was lower than that in milk open bovines. Cattle suffered highest loss (875 gm per day) due to repeat breeding condition followed this with anoestrous which resulted in loss of 660 gm per day. Buffaloes suffered highest order loss (1 kg per day) in productivity due to mainly Rheumatic Syndrome.

Nearly 62% of the bovines suffered with anoestrous condition, about 5% with repeat breeding, 3% with Rheumatic Syndrome, 1% with Pneumonia and the rest with other diseases. Of the major diseases in cattle, anoestrous recorded

the highest (30 per thousand) disease prevalence rate. Repeat breeding condition was comparatively less prone to cattle. About 15 in one-thousand cattle were victims of repeat breeding. The other diseases ranked slightly on lower side. Among buffaloes the prevalence rate of anoestrous and repeat breeding condition was almost double than that of cattle. As regards Rheumatic Syndrome, buffaloes were more affected as compared to cattle. Buffaloes were mainly victims of Mastitis which affected milk yield of the animal. The project report was being finalised.

14. Pilot sample survey for estimation of post-harvest foodgrain losses (wheat)

The project aimed to develop a statistical methodology for estimation of foodgrain losses at different post harvest stages. Estimates of losses at different post-harvest stages such as harvesting, threshing and transporting were obtained at the district levels. Further, estimates of percentage loss due to different reasons on the basis of laboratory analysis and observed by cultivators for different storage types at farm and market levels were obtained at the district level. The standard errors for these estimates were also obtained. Drafting of the project report remained in progress.

15. 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 including high yielding/improved varieties/fertilisers, 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 cultivators fields.

The project was in operation in 16 selected districts spread over 9 states : Dibrugarh (Assam), Rajkot and Sabarkantha (Gujarat), Ernakulam (Kerala), Bhir and Nasik (Maharashtra), Cuttack and Puri (Orissa), Hoshiarpur (Punjab), Pali and Swai-Madhapur (Rajasthan), Tiruchirapalli and North Arcot (Tamil Nadu) and Meerut, Rae-Bareilly and Gorakhpur (Uttar Pradesh).

The field data for the last year (1988-89) of the survey was received and were taken up for scrutiny before being transferred to magnetic tape for analysis. Data for the year 1987-88 were being transferred on magnetic tapes/floppies. In the taped data for 1985-86 and 1986-87, corrections were being incorporated after subjecting the same to scrutiny programmes.

Two computer scrutiny programmes were prepared. Likewise, while nine such programmes had already been prepared in addition to the five computer programmes for analysis of data which were

prepared earlier, another four computer programmes were prepared while two more programmes were in hand. The checked and cleaned data in respect of three computer programmes were under analysis. The formats of summary tables for inclusion in the report were discussed and are now being finalised.

✓ **16. Pilot sample survey for estimating the energy utilisation for different levels of adoption of modern technology in agriculture**

Part of the data analysed by working out energy output-input ratio for various crops/crop-rotations. For a particular stratum estimates of energy utilisation for various crops/crop-rotations involving ratio and regression methods of estimation at different stages of sampling were worked out alongwith their standard errors. Further analysis work was in progress.

✕ **17. A sampling study on utilisation of crossbred working animals vis-a-vis non-descripts**

The objectives of the study are (i) to compare the utilisation pattern of the two types of working animals, (ii) to estimate the extent of utilisation of working animals, and (iii) to study the factors influencing varying levels of utilisation of working animals.

The data collection work remained in progress.

✓ **18. Investigations in sampling methods for multiple frames in two stage sampling**

The objectives of the study are (i) to investigate the estimation of population parameters like mean, total, ratio etc in multiple frame situation for multi-stage sampling, and (ii) to examine simultaneous estimation of various characters in multiple frame surveys.

Some theoretical development was made for building up the estimates in two frame situations. Further work was in progress.

✓ **19. Small area estimation of milk production**

The emphasis so far had been towards developing State level estimates of milk production. The growing awareness for microlevel planning has necessitated the development of reliable estimates of milk production at district level. With the existing methodology, the usual survey estimates based only on the data from a given area (domain) are likely to yield large standard errors due to smallness of sample size in the domain. Secondly, the usual survey methodology for estimating milk production at district level is also cost prohibitive. Hence the need for the present investigation. Although alternative techniques have been proposed in the literature for obtaining reliable estimates for small areas but these were used mainly for estimation of demographic parameters.

The suitability of using the existing techniques for developing small area estimates was examined after making a detailed review of the literature. As all these techniques utilise auxiliary information in readily available variables, the choice of a particular method depends upon the availability and kind of auxiliary information as well as on the knowledge of the relationship between the alternative sources of data. Under the circumstances synthetic estimation method was found suitable for developing district wise estimates of milk production. In this method the estimates developed for the larger areas are scaled down to the smaller area on the basis of certain model assumptions. Generally, it is assumed that relations for the study variable as well as for the auxiliary character between the larger area and the smaller area remain the same.

The data collected for estimating milk production at State level in a survey conducted by the Directorate of Animal Husbandry, Himachal Pradesh during 1989-90 were obtained for building up the districtwise estimates. In addition, data for the latest available livestock census were also obtained. The auxiliary variable for grouping the sampling units (milk cows) was identified. Data on livestock numbers was transferred to floppies. Districtwise estimates of milch/in milk cows were obtained alongwith standard errors. Further analysis of data was in progress.

20. A study of variability of different components of cost of production of fruits at different stages of sampling and estimation of sample sizes at given levels of precision

The present study is based on secondary data drawn from some pilot surveys conducted by IASRI to estimate cost of production of some important fruit crops on the basis of fixed sample sizes in Gujarat state. Scrutiny of data and tabulation work were in progress.

21. Development of survey methodology for estimation of production of agricultural by-products

The study aims to develop appropriate procedures for estimation of production of important agricultural by-products, (ii) to develop estimation procedure for straw to grain ratio for a region for maximising the precision of the estimate and to study the extent to which it is affected by different agronomic and management practices, and (iii) to work out the optimum fraction of crop cutting experiments on which the straw yield should be recorded for estimating straw to grain ratio.

The work of scrutiny and tabulation of secondary data was in progress.

22. 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

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.

Secondary objectives to be studied are : (i) the association between employment generated and amount of loan, (ii) income generated and amount of loan, and (iii) comparison of different trades on the basis of employment and income generation.

The project was started in district Alwar (Rajasthan). In the district the identification of beneficiaries was done at village panchayat (consisting of 5 to 10 nearby villages) levels. For selecting the beneficiaries a two stage sampling was adopted with village Panchayats as primary sampling units and beneficiaries as second stage sampling unit. From each village panchayat 30 beneficiaries were selected as second stage sampling units.

The analysis of the data was in progress.

23. 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 department

The objectives of the project are (i) to evolve a suitable sampling technique for estimation of livestock products utilizing the normal field agency of stock men/stock assistants in Animal Husbandry Department of states, and (ii) to obtain

estimates of annual production of major livestock products. The analysis work was completed and the report writing remained in progress.

24. Use of remote sensing technology in crop yield estimation surveys

With the advent of remote sensing technology the availability of satellite gathered spectral data provides extensive data base to examine the crop vigour and crop conditions at various points of time of the crop calendar. This satellite gathered spectral reflectance will vary according to the condition of the crop and thus can be effectively utilized to stratify/post stratify the crop area according to homogeneous crop growth conditions, say (i) very good crop, (ii) good crop, (iii) poor crop, (iv) very poor crop, and (v) uneconomical to harvest.

Therefore, to make use of the spectral data in crop yield estimation surveys for improving the efficiency of the crop yield estimators, the project was taken up with the following objectives (i) to investigate the usefulness of satellite gathered spectral data for stratification according to crop vigour and growth conditions for wheat crop in major wheat growing regions, and (ii) to obtain improved estimator for crop yield from crop yield estimation surveys using post-stratification based on spectral data.

The villages selected for crop cutting experiments were located on the False Colour Composite and the Coordinates

of each unit were recorded and were used to obtain gray level values for a window of size 3×3 pixels from each sampled unit.

The average spectral response obtained from the window was treated as

the spectral response of vegetation vigour of the sampled units.

The relationship between yield of wheat and various vegetation indices based on spectral data obtained from the satellite borne sensor was examined

DIVISION OF BIO-STATISTICS AND STATISTICAL GENETICS

Mandate :

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

Thrust Areas :

- Statistical modelling in plant and animal breeding
- Modelling in animal nutrition and epidemiology

Projects in operation thrust-area wise :

No	Project title	Project leader and associates
Statistical Modelling in Plant and Animal Breeding		
1.	Statistical analysis of cross-breeding data at military dairy farms	BS Sharma Prem Narain
2.	Direct and maternal additive and heterotic effects in crossbred dairy cattle	RK Jain LK Garg SD Wahi
3.	Investigations on appropriate statistical methods for comparing genetic groups based on multiple traits in dairy animals	Lal Chand Prem Narain
4.	Studies on spatial patterns and its role in analysis of agricultural field experiments	VK Bhatia Prem Narain JS Samra
5.	Estimation of repeatability of fruit yield in presence of biennial rhythm	SD Wahi LK Garg PK Malhotra
Modelling in Animal Nutrition and Epidemiology		
6.	Statistical studies in animal epidemiology	VK Bhatia PK Malhotra
7.	Statistical aspects of physiological kinetics in animal nutrition	PS Rana Prem Narain

1. Statistical analysis of cross breeding data at military dairy farms

The objectives of the project are to study the problems associated with adjustment of data by the least squares techniques; genetic divergence among different grades of crossbred cows and GE interactions. The data pertaining to Holstein Friesian-Sahiwal crossbred grades of cows for 1955-1978 were adjusted for non-genetic factors like farm, period and season by the least squares techniques. Using these adjusted data the thirty one genetic grades of cows were grouped into relatively homogeneous clusters by Tocher method on the basis of the following eleven characters: First lactation yield, age at first calving, first lactation length, first calving interval, weight at first calving, total productive life, total milk yield in first three lactations, total milk yield in all available lactations, milk yield per lactation in whole life of the animal, milk yield per day of total productive life and milk yield per day of total life.

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.

The report on the findings in the project was being finalised.

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

Breeding data of Friesian × Sahiwal cross-bred cows on lactation yield, age at first calving, dry period and breeding efficiency from six military dairy farms were corrected for farm, season and period effects. These corrected records were utilised for arriving at an appropriate level of exotic inheritance in crossbred cows through linear discriminant function approach. For studying the relationship among different genetic groups, clusters were formed by Tocher's method.

The report on the research project was finalised.

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

The objectives of the project are (i) to examine the spatial variability present in soil characteristic 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.

For studying the nature of spatial patterns, the estimated semi-variograms for different growth traits were subjected to fitting of different models. It is observed that spherical model is the best choice of explain the nature of spatial patterns

present in the field. The same exercise is also carried out for soil characteristics as well. It is seen from the results that there is something other than random component which is classified as spatial dependence among observations and can be structured by suitable modelling technique. Further analysis was in progress.

5. 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 performance of different estimators like ANOVA, principal component analysis based on variance-covariance and correlation matrices, Abeywardona's estimator and the estimators obtained from the moving average of two consecutive years were compared with the help of simulation study. The moving average estimators were found to be more efficient than the others for estimation of repeatability in presence of biennial rhythm in data. The repeatability of both orange and guava crops are estimated and found to be lowly repeatable in both the crops.

The project report was being finalised.

6. Statistical studies in animal epidemiology

The project aims to study culling patterns of different categories of dairy animals as well as to model the epidemiology of diseases. Suitable epidemiological models were explored and computer software for epidemiological studies was developed. Different models such as transition probability approach for mastitis and model based on meteorological data for foot and mouth disease were discussed. The report on the project was being finalised.

7. Statistical aspects of physiological kinetics in animal nutrition

The objectives of the project are to examine the existing compartmental 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 models to quantify the rate of passage of undigested nutrients through the digestive tract with special reference to the seasonal and dietary patterns.

The level of voluntary intake and particle turn over rate within the rumen is related to communication via rumination. The fast ruminators appear to have greater out flow of digesta and consequently greater intake. Thus for giving mathematical shape to these observations, a stochastic model is developed where in flow rates from one compartment to another in a sequential two compartment model depend on the number of particles present in a compartment.

The draft report on the project was prepared,

**DIVISION OF FORECASTING TECHNIQUES FOR CROPS,
DISEASES AND PESTS**

Mandate :

To develop statistical models for obtaining pre-harvest forecast of crop production on the basis of biometrical characters, weather parameters and agricultural inputs and also to develop forecast models for incidence and intensity of pests and diseases.

Thrust Areas :

- Crop yield forecast models
- Forecasting models for occurrence of crop, pests and diseases

Projects in operation thrust-area wise :

No	Project title	Project leader and associates
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 District (Gujarat)	BH Singh RC Jain Madan Mohan
2.	Pilot studies on pre-harvest forecasting of apple yield on the basis of data on biometrical characters, weather variables and crop inputs, Shimla district (HP)	Chandahas Prem Narain
3.	A within-year growth model for pre-harvest forecasting of crop yields	RC Jain Ranjana Agrawal KN Singh (IARI)
4.	Probability model for crop yield forecasting	RC Jain Ranjana Agrawal
5.	Pilot studies on pre-harvest forecasting of yield of stick lac	SK Saha (ILRI) AK Jaiswal (ILRI) BH Singh
Forecasting Models for Occurrence of Crop, Pests and Diseases		
6.	Models for forecasting aphid-pests of mustard crop	GN Bahuguna Chandahas

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 in Rajkot district of Gujarat

The primary objective of the survey conducted during 1984 to 1986 (kharif) was to evolve a suitable methodology to forecast yield rate of groundnut on the basis of observations on biometrical characters such as number of plant per plot, number of branches, length of main branch (axis), number of flowers, number of pegs and number of pods per plant taken at various stages of crop growth, agricultural inputs such as manures and fertilizers applied and weather variables such as rainfall.

A stratified multi-stage random sampling design was adopted for the selection of villages and fields. A sample plot of size $5m \times 5$ rows (approx 25 sq.m.) was located randomly in each selected field for recording biometrical observation at ten days interval beginning from one month after sowing. Agricultural inputs were recorded from each selected field and daily rainfall data was recorded from working rain gauge stations. Plot yield was also recorded at harvest. The data were planned to be collected from 240 fields during 1984-85 and 180 fields during 1986. However, the data of only 184 fields were analysed for 1984 and 204 fields for 1985 and 151 fields for 1986 because of incomplete information in respect of yield/biometrical characters in some of the fields. The data collected were subjected to different types of analy-

sis for each periodical observation such as (i) obtaining estimates of various biometrical characters, agricultural inputs and weather variables, (ii) study of relationship between yield and biometrical characters, agricultural input and weather variables (a) correlation between yield and biometrical characters, agricultural inputs and weather variables, and (b) regression of yield on biometrical characters, agricultural inputs and weather variables alone, partial combination of them and all of them together.

The district estimates of biometrical characters in respect of different years were obtained. The results also revealed that yield of groundnut showed the positive and significant correlation with most of the biometrical characters observed till the crop attained the age of 60 days.

Forecast models were fitted at three main stages of crop growth namely flowering, peg formation and pod development. It was observed that 53%, 44% and 37% variation could be possible at flowering, pegging and pod development stage respectively taking biometrical characters alone whereas taking crop inputs alongwith biometrical characters there was not much improvement in the value of R^2 . Rainfall alongwith above these two categories improved the value of R^2 from 3 to 9%.

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

The objective of the project was to

develop the methodology for obtaining pre-harvest estimate of apple yield on the basis of data on tree characters, weather variables and crop inputs as explanatory variables.

Apple yield forecast regression models developed earlier on the basis of data on tree characters (viz. age, height, girth and canopy spread of three, intensity of flowering and fruit crops) and manures for three years and two varieties were used to forecast apple yield rate for the district in a given year from the previous years equations. The first year regression equation was used to forecast the yield rate for the second and third years while the second year equation was used to forecast the third year yield. Yield forecast figures were obtained at two stages of fruiting season namely full blooming and fruit development stages. The forecast values and average estimated yield (kg/tree) at harvest for the district were compared. The forecasted average yield for 1986 season was found very close to the observed yield when obtained from 1984 model as compared to 1985 model. The draft final report of the project was prepared.

3. A within-year growth model for pre-harvest forecasting of crop yields

The project aims at developing model for making early forecasts of yield based on current season data.

Two years' data on wheat and rice collected during 1987-88 and 1988-89 from IARI research farm were analysed. Logistic growth models were fitted using

non-linear regression technique after removing outlier and extreme observations. Results revealed that logistic growth model can be used to forecast total dry matter at maturity about one month before harvest in wheat and rice whereas forecast of head-panicle weight can be made about 15 days advance of harvest. Total dry matter as well as head weight at maturity were over estimated in general when partial data were used in wheat (1987-88, 1988-89) and rice 1989. However, it was not so in rice during 1988. Modified growth model worked well to adjust for over estimation in total dry matter and head weight at maturity in wheat and rice (1989).

4. Probability model for crop yield forecasting

The present study applies Markov Chain approach to forecast sugarcane yield. Two years data (1977-78 and 1978-79) were taken from the pilot study on pre-harvest forecasting of sugarcane yield carried out by the IASRI. The observations on plant population, plant height, girth of cane and width of third leaf recorded at 3-4, 4-5, 5-6, 6-7, 7-8 months after planting and at harvest were used. Plant condition states were defined by quantiles of the selected variables in different stages of the crop growth. Transition matrices which give transition probabilities of a plant (or group of plants) moving from any possible state of a stage in the growth process to any state of the next stage were worked out.

Predicted yield distributions were

obtained by using transition matrices. Predicted yield distributions from 1977-78 data were used to forecast yield of 1978-79 at different stages of crop growth and vice versa. Standard errors of forecasts were also obtained.

Yield forecasts at 7-8 months after planting (about 2-3 months before harvest) were very close to the observed ones (per cent deviations being 4 in 1978-79 and 2 in 1977-78). Per cent standard error in yield forecast of 1978-79 was about 12 whereas it was about 7 in yield forecast of 1977-78.

5. Pilot studies on pre-harvest forecasting of yield of stick-lac

This project was formulated by the Indian Lac Research Institute in collaboration with this Institute with the objective to develop suitable model for obtaining pre-harvest estimates of yield of stick-lac on the basis of yield affecting characters such as crown of lac hosts, number of inoculable shoots, length of

inoculable shoot/tree, weight of bread lac, settlement of trees and number of pests.

The report on the project was being finalised in consultation with Dr SK Saha of ILRI, Ranchi.

6. Models for forecasting aphid-pests of mustard crop

Models for forecasting aphid-pest population were developed for both yellow seeded and brown seeded mustard varieties by using the Group Method of Data Handling (GMDH) originated by A.G. Ivakhnenko. Through these models it would be possible to forecast aphid-pest population on the basis of five week lag of average maximum temperature, four week lag of average minimum temperature and nine week lag of average relative humidity in the case of yellow seeded variety, and four week lag of both average maximum temperature and average minimum temperature, and nine week lag of average relative humidity in the case of brown seeded mustard. The final report on the project was drafted.

DIVISION OF STATISTICAL ECONOMICS

Mandate :

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

Thrust Areas :

- Yield gap analysis
- Acreage response models
- Resource use in agriculture
- Technology and its diffusion in agriculture

Projects in operation thrust-areawise :

No.	Project title	Project leader and associates
Yield Gap Analysis		
1.	Economic study of new farm technology with special reference to yield gap and associated factors in selected ORP areas	RK Pandey Shanti Sarup BL Kaul
Acreage Response Models		
2.	Statistical estimation of multi-equation acreage response models under crop substitution	VK Sharma Ashok Kumar
Response Use in Agriculture		
3.	Testing relative economic efficiency and determination of factor demand output supply function for wheat	SS Kutaula
Technology and its Diffusion in Agriculture		
4.	Non-linear statistical models for adoption of HYV's in India	VK Sharma Prajneshu Sushila Kaul

1. Economic study of new farm technology with special reference to yield gap and associated factors in selected ORP areas

The project was taken up (i) to examine new technology and its yield potential for different crops, (ii) to estimate the extent of untapped yield potential under farmers' environment, and (iii) to identify the socio-economic and other constraints responsible for the existing gap between potential yield and actual yield.

Project report has been prepared using the secondary as well as primary data collected through farm surveys at four ORP locations in Ranchi (Bihar), Indore (MP), Bhilwara (Rajasthan) and Mohindergarh (Haryana). Some of the salient results emerging from this study are presented below :

The analysis of the data from ORP, Indore revealed a significant yield gap of 2.82 q/ha in respect of soyabean crop and 6.80 q/ha for sorghum crop. The yield gap for wheat was 6.34 q/ha whereas for gram crop, it was 1.81 q/ha,

In different villages of ORP, Bhilwara, yield of wheat crop ranged from 17 q/ha to 26 q/ha as against the potential yield of 35 to 38 q/ha. For maize crop, the average yield varied from 7.24 q/ha on medium farms to 14.1 q/ha on large farms. The potential yield for the crop was observed to be 16 q/ha.

In ORP area of Ranchi, the potential

yield of rice was observed to be 19.7 q/ha. In case of ragi, another important kharif crop of the area, the potential yield was 19.8 q/ha. Based on demonstration trial data, wheat crop showed a maximum yield of 28 q/ha whereas for ragi, the same was 24 q/ha. The main constraints in raising farm yields as perceived by cultivators were also analysed. Unawareness of new technology was experienced by 85% of the cultivators. More than two-thirds of the farmers felt that the technology should be tailored to their requirements and should be simple and easy to adopt.

In ORP area of Mohindergarh, the potential yield of wheat was estimated as 41.2 q/ha against the estimated average yield of 31.8 q/ha of the area while in respect of barley, the potential yield was 33.0 q/ha against the average yield of 23 q/ha. In the area, gram crop showed a yield gap of 3.4 q/ha over the potential yield of 13.2 q/ha while mustard showed a gap of 3.2 q/ha over the potential yield of 12.9 q/ha. In order to examine the contribution of various agro-economic factors contributing to the existing yield gap, production function approach was utilized. The analysis revealed that low level of fertilizer application contributed significantly in all the above mentioned crops except gram and seed rate also contributed significantly to the yield gap in all crops except mustard. Non-adoption of plant protection measures was also observed to be important factor hindering in realizing the higher yields in respect of wheat and gram in the area.

2. Statistical estimation of multi-equation acreage response models under crop substitution

The project was initiated to evolve estimation procedures for multi-equation acreage response models under crop substitution, to develop multi-equation acreage response models for competing crops in the selected regions, and to examine the role of supply prices for bringing about a change in the acreages of various crops.

The estimation procedures for two-equation models were developed when the number of observations on the two equations are different. These were used to develop a two-equation acreage response model for competing maize and rice crops in Ferozepur district. The results revealed that expected relative gross returns, measured by one year lagged value of the gross returns, played a significant role in increasing acreage under the maize crop. The partial response of maize acreage to per unit increase in relative gross returns was observed to be positive with value as 4.27 thousand hectares while the total long-term response was 18.50 thousand hectares. Besides, rice acreage showed dependence on one year lagged acreage, anticipated relative price variability and a trend variable which could be considered proxy for technological improvement in rice production.

Instrumental variable technique was used to estimate the parameters of the

two-equation model when explanatory variables are subject to errors and the number of observations for both the equations are equal. An acreage response model was developed for competing crops of sugarcane and wheat in Bulandshahar district of Uttar Pradesh assuming explanatory variables viz. gross cropped area lagged by one year and relative gross returns. Ranks of lagged acreage of sugarcane and wheat were taken as the instruments for the respective variables in the estimation procedure. The partial response of sugarcane acreage to per unit increase in relative gross returns was 10.38 thousand hectares whereas the total response was 16.64 thousand hectares. In case of wheat the partial acreage response was seen to be 17.62 thousand hectares and total response to per unit increase in relative gross returns was 73.16 thousand hectares.

3. Testing relative economic efficiency and determination of factor demand output supply function for wheat

The project aims (i) to test the relative economic efficiency between large and small farms of wheat crops, (ii) to determine the demand for labour and fertilizer in the production, and (iii) to determine the output supply functions. The farm level data on wheat crop pertaining to the year 1985 were obtained from tabulation sheets of cost of cultivation scheme of Directorate of Economics and Statistics, Ministry of Agriculture, Govt. of India. Data of farmers belonging to various tehsils of Haryana and Punjab

states for the specified variables have been procured. Further data collection work was in progress.

4. Non-linear statistical models for adoption of HYV's in India

High yielding varieties for various foodgrain crops were introduced in mid-sixties. With this new technology, India has attained real self-sufficiency in the production of foodgrains. Since the adoption of this technology has not been uniform over different crops and regions, this project has been formulated with following objectives, (i) to develop non-linear statistical models for adoption of HYV's of various foodgrain crops at state level. Modifications of the existing statis-

tical theory for autocorrelated errors will also be undertaken whenever necessary, (ii) to attempt various theoretical generalizations of the adoption models, and (iii) to develop multi-equation statistical models for explaining the spatial differences in the values of the parameters of the adoption process.

Relevant secondary data on area under HYV's and acreage under wheat in different states were collected. The information on items like fertilizers, consumption and irrigated area pertaining to wheat crop was also collected to study the causal relationship. Attempts were made to develop statistical models to describe the adoption of HYV's of wheat in different states.

DIVISION OF COMPUTING SCIENCE

Mandate :

To develop appropriate software based on modern statistical methods for the analysis of agricultural and animal sciences research data.

Thrust Areas :

- Development of software for agricultural research data analysis
- Establishment of data bases and MIS
- Systems modelling
- Simulation

Software Development

—“SPAR 1” Statistical Package for Agricultural Research Data Analysis

As per the suggestion of Prof DJ Finney, Key Consultant UNDP, Software-package ‘SPAR 1’ was modified. The User’s Manual for ‘SPAR 1’ was released for public use on commercial basis.

“SPAR 1” a computer software package for statistical analysis of agricultural research data on Micro-Computers (PC XT, AT) was developed at Computer Centre, IASRI by experienced Programmers. ‘SPAR 1’ is, primarily, developed for statistical analysis of research data in Genetics and Plant Breeding and related disciplines. However, some of the programs can be used in other branches of research, where the data is in the required form. The software package is user-friendly and can be

used, without any difficulty. If desired, practical training would be imparted at IASRI, New Delhi. The research workers will find the package useful for research data analysis on PC’s.

Features of “SPAR 1”

‘SPAR 1’ is an user-friendly, interactive software package, which can be installed and used on IBM compatible PC’s with a Hard Disk and Floppy Drive (360 kb) and (640 kb) RAM.

Procedures for the following Biometrical methods are available with this package :

1. Analysis of Variance and Covariance in R.B.D.
2. Diallel analysis by various approaches like Hayman and Griffing

3. Heterosis and Inbreeding depression analysis
4. Divergence analysis (Mahalanobis D-Square)
5. Canonical analysis
6. Genotypic/phenotypic studies and Path analysis
7. Discriminant function analysis
8. Regression analysis
9. Non-Hierarchical Cluster analysis
10. Principal Components analysis
11. Line \times Tester analysis
12. Generation Means, Scaling tests and Joint scaling test
13. Triple Test Cross analysis
14. Stability analysis

—Seven new programs were developed and a number of existing programs were modified to meet the requirements of users.

—A few PC-system utilities for file transfers and transparency writer developed

—Software for prevention, detection and cure of computer viruses was installed on all PCs.

Computer Utilization

Details of computer utilization are as follows :

(a) B-4700 Mainframe :

1. No. of production jobs : 2616
2. No. of testing jobs : 1022
3. No. of listing jobs : 444
4. No. of Ph. D. Scholars : 26 helped
5. No. of M.Sc. scholars : 29 helped
6. No. of other research : 8 workers helped

(b) PC System

1. No. of Users : 804
2. No. of hours for PC Use : 9569

For all the regular and ad-hoc training programs for computer application conducted by IASRI, PCs were used for practical classes and demonstration purposes.

(c) Data Entry Unit :

1. No. of cards punched : 7400
2. No. of data records created : 9.60 lacs
3. No. of batches created : 796
4. No. of files transferred : 548 from tape to disk and vice-versa

UNDP CENTRE OF ADVANCED STUDIES IN AGRICULTURAL STATISTICS AND 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 October 1, 1983. The main objective is to develop a Centre of Excellence with adequate infrastructure facilities to under-

take advanced training programmes and carry out research in various aspects of agricultural statistics and computer applications. The project which was to terminate on March 31, 1991 has since been extended for a further period of 4 months i.e. upto July 31, 1991.

UNDP Consultants

The following foreign consultants visited the Institute during 1990-91 :

S. No.	Consultant	Field of Consultancy	Period of visit
1.	Prof DJ Finney, University of Edinburgh, Edinburgh, UK	Key Consultant	Oct 31- Nov 29
2.	Dr JS Rustagi, The Ohio State University, Columbus, USA	Simulation and Optimizations	Nov 24- Dec 06

Deputation for Training Abroad

Dr Prajneshu, Senior Scientist underwent five months training from April 17 to September 19, 1990 at Massey University, Palmerston North, Newzealand in the field of Epidemiological Statistics.

Meetings

—A meeting of the UNDP Recommendations Implementation Committee was held on Oct 29 under the Chairmanship of Prof Prem Narain for considering various recommendations



Prof DJ Finney, Key Consultant and Dr JS Rustagi, Consultant, UNDP in conference with Senior Scientists



UNDP Consultants with the members of the UNDP Recommendations Implementation Group

made by UNDP Experts who visited this Institute.

- A meeting of Heads of Divisions and Senior Scientists was held on Nov 28 with Prof DJ Finney, Key Consultant and Dr JS Rustagi, Consultant, UNDP Project to discuss their observations and recommenda-

tions of research and training activities of the Institute.

- A meeting of all the Scientists who had undergone training abroad under the UNDP Project was held with Prof JS Rustagi, UNDP Consultant on Nov 29.

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, Senior 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 refresher courses namely 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 M.Sc. and Ph. D. degrees in Agricultural Statistics and M. Sc. degree course in Computer Application in Agriculture. During 1990-91, 12 students were admitted to various courses : 2 Ph. D., 6 M.Sc. in (Ag. Stat.) and 4 M.Sc. (Computer Application in Agriculture). Seventeen students : 8 Ph.D. and 5 M.Sc. (Agricultural Statistics) and 4 M.Sc. (Computer Application in Agriculture) successfully completed their degree programmes.

Ad-hoc Training Courses

The Ninth short-term course on

'Use of Computer in Agricultural Research' was organised by the Institute from Sep 3—Oct 1. The Course was inaugurated by Dr SK Raheja, Acting Director of the Institute on Sep 3. Prof Prem Narain, Director, IASRI delivered the Valedictory Address and distributed certificates to 23 participants from ICAR Institutes and Agricultural Universities on Oct 1.

The X and XI short-term training courses on 'Use of Computer in Agricultural Research' were organised during March 4-15, 1991 and March 18 to April 1, 1991 respectively. The X Course was for scientific/technical personnel from ICAR Institutions located at Delhi. This was attended by 8 scientists from different Divisions of IARI and 2 scientists and 6 technical personnel from IASRI. The XI Course was for participants from ICAR Institutes (outside Delhi) and State Agricultural Universities. This was attended by 15 participants of which 4 from Agricultural Universities and 11 from ICAR Institutes.

The main emphasis in the training was given on practical aspects of using micro-computers, features of MS-DOS, Editors, solving of simple problems using BASIC language and use of MICROSTAT, PC

CARP and dBASE III plus application packages. Adequate practice on work on PC's was provided to the trainees.

A valedictory function jointly for the two courses was held on April 1, 1991. Shri SN Mathur, Principal Scientist and Course Coordinator presented the report on the training courses. Prof Prem Narain Director, IASRI delivered the Valedictory Address and distributed certificates to 31 participants. In his address he informed about the future expansion plans of the computer equipment at this Institute which would be one of the largest set up with LAN facility.

Training Programme

A training programme on 'Modern methods of field experimentation, design and implementation of experiments, farm trials and carrying out of farm surveys' sponsored by the NARP of the Council for a period of two weeks for the junior and middle level scientists of the State Agricultural Universities engaged in the implementation of NARP programme was organised at the Institute from April 16-28, 1990. The programme of training included lectures, practicals/demonstrations and group discussions under the 4 major fields/subjects namely, Statistical Methods, Computer Applications, Sampling Techniques and Design of Experiments. Besides, the trainees were given orientation regarding the NARP—its objectives and achievements and the activities of the IASRI. The trainees were familiarised with some of the latest con-

cepts in design and analysis of experiments and were provided some basic knowledge on the use of computer in agricultural research. A field trip was also organised for practical training on the selection of random plots in the field for estimation of yield and other characteristics of the crop. The trainees were supplied with cyclostyled notes on various topics covered in the training programme besides providing them with suitable references.

Workshop-cum-Seminars

A Second Workshop-Cum-Seminar on 'Software Development for Agricultural Extension Personnel' was organised during April 30-May 5, 1990 at the instance of the Directorate of Extension, Ministry of Agriculture, Government of India. The programme of the workshop was designed to familiarise the officers of the Monitoring and Evaluation units under Training and Visit system in different states in the use of Personal Computer and relevant software. In all 19 participants from 8 different states participated in the workshop. Of these, 14 participants were from Agricultural Departments and 5 from Animal Husbandry Departments. Shri DC Misra, Joint Secretary-cum-Extension Commissioner, Ministry of Agriculture, Govt. of India was the Chief Guest at the Valedictory Function held on May 5, 1990. He also distributed certificates to the participants. In his valedictory address, he assured the participants that efforts were being made to

make available one or two PCs to each State and advised the participants to make the best use of the training by applying the newly gained knowledge for a variety of problems and bring about improvements in the quality of their work.

Third Workshop-cum-Seminar on 'Software Development for Agricultural Extension Personnel' sponsored by Ministry of Agriculture, Department of Agriculture and Co-operation, Directorate of Extension, New Delhi was organised at the Institute from Aug 20-25. At the Inaugural Function held on Aug 20, Dr SK Raheja, Acting Director, IASRI gave the orientation talk. He also delivered the Valedictory Address and distributed certificates to 16 participants of training course on Aug 25.

Refresher Course in Agricultural Statistics

The main objective of the refresher course was to impart basic knowledge of statistical techniques to persons who may not have formal training in statistics but who use the scientific statistical techniques in their research and other day to day activities.

The Course covered

- Statistical Methods
- Data Processing and Computer Programming
- Design of Experiments
- Survey Sampling
- Statistical Genetics
- Econometrics Theory

The Third Refresher Course in Statistics for Agricultural Scientists was organi-

sed in the Institute from Oct 3 to Dec 22, 1990 for the benefit of scientists and other personnel working in ICAR Institutes and Agricultural Universities. Dr SK Raheja, Joint Director welcomed the participants and Prof Prem Narain, Director inaugurated the Course. The valedictory function was held on Dec 21. Prof Narain delivered the Welcome Address and Shri JV Shah, Minister of State for Agriculture, Govt. of India delivered Valedictory Address and distributed the certificates to the 14 participants.

International Training Course

The Third International Training Course on 'Techniques of estimation of output of food crops' was organised at the Institute during February 18 to March 30, 1991. The course was jointly funded by the Ministry of External Affairs, Govt of India under its ITEC programme and Afro Asian Rural Reconstruction Organisation. Nine participants from 6 Afro Asian countries—two each from Egypt, Mauritius and Ghana and one each from Malaysia, Philipines and Ethiopia attended the training course. The training course was inaugurated by Shri BC Gangopadhyay, Secretary General, AARRO and the Valedictory Address was delivered by Dr GR Seth, Former Director, IASRI. The training programme comprised of lectures and practicals on sampling methods and applications, statistical methods, computer programming and use of application software and storage and marketing systems of food grains in India. Particular emphasis in the training



Shri DC Mishra, Joint Secretary-cum-Extension Commissioner, Ministry of Agriculture giving certificates to the participants of Workshop-cum-Seminar on 'Software Development for Agricultural Extension Personnel'



Shri JV Shah, Minister of State for Agriculture, Govt. of India delivering the Valedictory Address of Third Refresher Course in Statistics

programme was laid on methods of area and yield estimation followed in India for estimating the production of food grains. For this purpose besides giving lectures on the subject of area and yield estima-

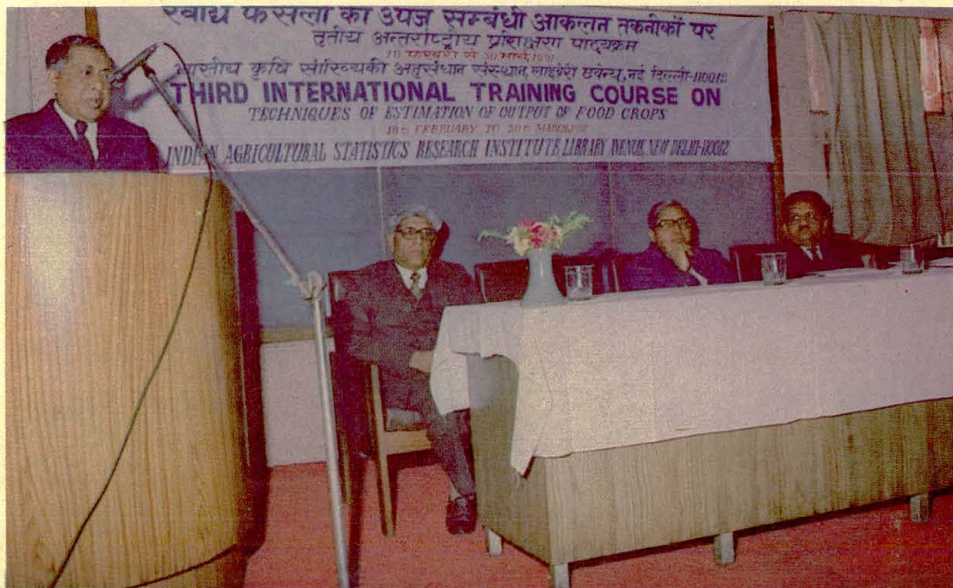
tion the participants were also taken to West Bengal and Madhya Pradesh states for practical demonstration of area and yield estimation in non-land record and land record states,

Training programmes organised for trainees from other organisations

Sl. No.	Name of programme	Dates	No. of trainees	Agency sponsoring the programme	Lectures delivered by
1	2	3	4	5	6
1.	Indo-Arab Republic of Egypt Protocol on Agriculture	Apr 19- May 02	1	Department of Agricultural Research and Education, Krishi Bhavan, New Delhi	Sh R Gopalan Dr HP Singh Sh PN Soni Dr BS Sharma Dr VK Sharma Dr (Mrs.) Ranjana Agrawal Dr PC Mehrotra
2.	National Household Survey	May 11	10	C.S.O., New Delhi	Dr HP Singh Dr PC Mehrotra Sh R Gopalan
3.	M. Stat. course of Indian Statistical Institute	Jun 06	22	C.S.O., New Delhi	Prof P Narain Sh R Gopalan Dr PC Mehrotra Sh PN Soni Dr VK Sharma Dr BS Sharma Dr RC Jain
4.	Jr. Certificate Course in Statistics-specialised training in agricultural statistics	Jun 15- Jun 21	3	C.S.O., New Delhi	Prof P Narain Dr HP Singh Sh PN Soni Dr Ranjana Agrawal Dr VK Sharma Dr BS Sharma

1	2	3	4	5	6
					Sh R Gopalan Dr AK Banerjee Dr RC Jain Sh GN Bahuguna Sh KC Bhatnagar Sh HC Gupta
5.	Training in computer for the Animal Husbandry Officials	Oct 08- Oct 12	6	Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi	Prof P Narain Sh Mahesh Kumar Sh SP Doshi Sh ML Chaudhary Sh Balbir Singh Sh HO Agarwal Sh OP Sharma Sh PL Gupta Sh B Chakarvarty
6.	Participants of Regular Course in Statistics of International Statistical Education Centre, Calcutta	Oct 12	24	C.S.O., New Delhi	Prof P Narain SH PN Soni Dr HP Singh Sh R Gopalan Dr (Mrs.) Ranjana Agrawal Dr VK Sharma Dr Prajneshu Dr RC Jain
7.	Training in Computer for the Animal Husbandry Officials	Oct 22- Oct 26	3	Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi	Prof P Narain Sh SP Doshi Sh ML Chaudhary Sh Mahesh Kumar Sh PK Malhotra Dr RC Goyal Sh OP Sharma Sh PL Gupta Sh B Chakarvaty

THIRD INTERNATIONAL TRAINING COURSE ON 'TECHNIQUES OF ESTIMATION OF OUTPUT OF FOOD CROPS'



**Shri BC Gangopadhyay, Secretary General, AARRO
inaugurating the Training Course**



**Dr GR Seth, Former Director, IASRI delivering the
Valedictory Address**

1	2	3	4	5	6
8.	Training in Computer for the Animal Husbandry Officials	Oct 29- Oct 30	6	Department of Agriculture and Cooperation, Krishi Bhavan, New Delhi	Sh SP Doshi Sh Mahesh Kumar Sh HO Agarwal Sh PL Gupta Sh B Chakarvarty
9.	Junior Certificate Course in Statistics specialised training in official Statistics and Related Methodology	Mar 07	27	C.S.O., New Delhi	Dr SK Raheja Dr PR Sreenath Dr Chandrahas
10.	M.Sc. (Stat) students	Mar 18	32	Punjab University, Chandigarh	Prof P Narain

Research Fellowships

During 1990-91, 25 M.Sc. and 19 Ph.D. students received research fellowships. M.Sc. students received fellowship at the rate of Rs. 1200/- p.m. each besides Rs. 3000/- per annum as contingent grant. Out of the 19 Ph.D. students 8 received fellowship at the rate of Rs. 1800/- p.m each in the I and II year and 11 students received fellowship at the rate of Rs. 2100/- p.m. in the III year in addition to Rs. 5000/- per annum as contingent grant.

Hostels

There are two well furnished hostels viz. Panse Hostel and Sukhatme Hostel to cater the residential requirements of the students of M.Sc. and Ph.D. courses at the Institute within its premises.

Officers and other trainees to the various other refresher, short-term and ad-hoc courses organised at the Institute are also provided residential accommodation at the Panse Hostel. Ample facilities exist for the cultural activities and sports for the hostel in-mates. Hostel mess is run by the students on cooperative basis. The general management of the hostels is vested in the Warden, who is assisted by Prefect and the other students. The main activities included :

- Annual Sports meet of the students was organised
- Election of new executive committee for the session 1990-91 was completed at the General Body Meeting held during October, 1991
- Tennis was introduced as one of the out door games

- Annual Day of the Hostels was celebrated July 2, 1991
- Diwali, Christmas, New Year's Day, Saraswati Puja and Holi were celebrated
- An informal meeting with Prof DJ Finney, Key Consultant and Dr Jagdish S Rustagi, Consultant under the UNDP was organised
- The students of IASRI receiving M.Sc. and Ph.D degrees were felicitated jointly by the students and the faculty of the Institute

Students' Annual Day

The IASRI Students' Annual Day Function was organised on July 2. On this occasion some sports events and a cultural programme were also organised. Dr R Nagarcenkar, Deputy Director General (Education), ICAR was the Chief Guest. Prof Prem Narain, Director, IASRI welcomed the Chief Guest and the staff members to the Students' Function. The prizes were distributed by Smt Nagarcenkar to the winners of the

games and sports. The prefect of the Hostels presented a brief report on the activities of the students. Dr PR Sreenath, Warden of the Hostels gave a vote of thanks.

- Participated in the IARI Sports meet and won several prizes in team as well as individual events
- Participated in the Inter-Institutional Sports Meet organised at IARI and bagged several prizes including the ones for best woman athlete and best all rounder for both individual and team events.

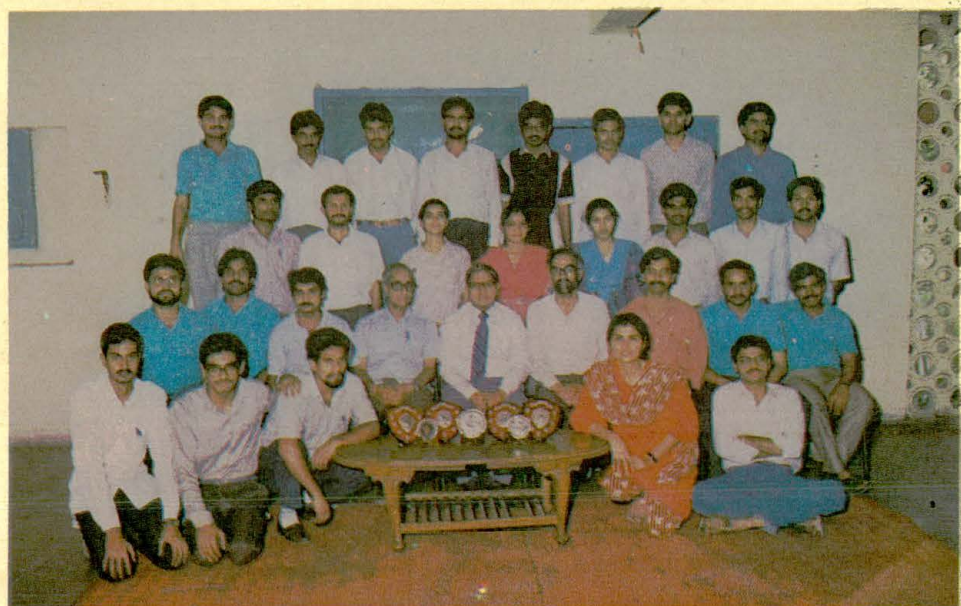
Seminars

The result 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 119 talks were delivered by the scientists, research scholars and various experts, the ones delivered by eminent scientists are :

Sl. No.	Speaker	Topics
1	2	3
1.	Dr J Roy, Prof of Statistics, ISI, Calcutta	Short term forecasting in the presence of seasonality
2.	Dr A Dey, Visiting Professor, ISI, Delhi Centre	Optimal block design with minimum number of observations
3.	Prof Dharma Kumar, Professor of Economic History, Delhi School of	Long term trends in Agrarian economy



Dr R Nagarcar, Deputy Director General (Education), ICAR releasing the Souvenir at Students' Annual Day Function



Student Contingent of IASRI for Inter Institutional Sports Meet at IARI

1	2	3
	Economics and Member Board of Trustees, International Food Policy Research Institute, Washington, DC (USA)	
4.	Dr S Paul, Chief Executive and Chairman NGO-Network for Bio-technology, India House Developments	Coarse Grains—The saving grace for the third world countries.
5.	Prof DJ Finney, Key Consultant, UNDP and formerly Professor and Head, Department of Statistics, University of Edinburgh, UK	Ethics of statistical practice
6.	Prof ML Tikku, Department of Mathematics and Statistics, Mc Master University, Hamilton, Ontario, Canada	A new method of estimation
7.	Dr PC Jain, Retired Professor, ITI, Bombay	Some examples of parellel algorithm for numerical optimization
8.	Prof Oliver Mayo, Chief Division of Animal Production' CSIRO, Sydney, Australia	Conventional and normal approaches to improvements of Australian marino sheep
9.	Prof AR Sen, Department of Mathematics and Statistics, University of Calgary, Canada	Variance component analysis of marine fish catch
10.	Sh Kuldip Singh Aneja, Faculty Fellow, Indian Institute of Management, Ahmedabad	Consumer awareness

National Symposium

A National Symposium on 'Statistical Methodology for Dryland Agriculture' was organised by IASRI in collaboration with Central Research Institute for Dryland Agriculture (CRIDA) from January 28-30, 1991 at CRIDA, Hyderabad. Sh CK Ramanatha Chetty, Director, CRIDA welcomed the participants, Sh PN Bhargava, Principal Scientist, IASRI gave introductory remarks, Dr Appa Rao, Vice-Chancellor, AP Agricultural University gave the inaugural address and Sh PN Soni, Principal Scientist and H.D. (DE and AED), IASRI gave vote of thanks. About 50 delegates participated in the symposium and 35 papers were presented during 5 technical sessions. The topics discussed included collection of optimum information on per unit cost of crop production on dryland using efficient experimental designs and developing suitable statistical and quantitative methods for identifying technologies for increased productivity in dryland areas. Based on prolonged deliberations a number of recommendations covering various issues and problems primarily relating to design of experiments and methodology for data analysis were formulated where the scientists both at IASRI and CRIDA may be required to take up future research work in dryland agriculture.

Annual Day

The Annual Day of the Institute falls on July 2. As a part of celebration a

declamation contest for both students and staff of the Institute was held on Jun 30, 1990. The topic of the contest was 'Need and prospects of environmental statistics in relation to agriculture'. Prof SK Sinha, Professor of Eminence was invited as Chief Guest. Two prizes were given to the best two speakers

On 2nd July the main annual day function was held at which Dr RS Paroda, Deputy Director General (CS), ICAR was the Chief Guest Prof Prem Narain, Director, IASRI welcomed the Chief Guest. Nehru Memorial Medal and Late Sh MK Bose Memorial Award were presented by the Chief Guest to the best students for the session 1987-89.

Award	Name of the Student	Course
Nehru Memorial Medal	Ms Sheeja Phillip	MSc (CAA)
Bose Memorial Award	Shri HS Sikarwar	MSc (CAA)

The Strategy Paper for the IASRI (1990-2000) was also released by Dr RS Paroda on the occasion.

Women in Agriculture Day

The Institute celebrated Women in Agriculture Day on December 4, 1990. On this occasion a seminar on 'Role of Women in Agriculture' was organised. Dr SK Raheja, Officiating Director gave



Prof DJ Finney, Key Consultant, UNDP delivering a seminar talk



Inauguration of National Symposium on 'Statistical Methodology for Dryland Agriculture', CRIDA, Hyderabad

his opening remarks at the function. Scientists and students of the Institute presented the papers. Dr C Prasad, DDG (ICAR) presided and Dr (Mrs) Ranjana Agrawal, Head, Division of Forecasting Techniques conducted the seminar. Ms Simmi Narang, M.Sc. (CAA) student proposed the vote of thanks.

Advisory Service

The Institute continued to play another 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 Institute, 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 Harcharan Dass, Director, National Research Centre for Citrus Crops, Nagpur in connection with planning of experimental programme, adoption of experimental design and the layout.
- Dr AK Sarkar, Prof and Head, Department of Soils, Birsa Agricul-

ture University, Ranchi on statistical design and layout of long term experiments.

- Dr ND Mannikar, Head, Division of Soil Science and Agricultural Chemistry, CICR, Nagpur on analysis of long term experiments involving direct and residual effects.

Sample Survey Methodology and Analysis of Survey Data

- Dy Director, Department of Horticulture, Punjab regarding 'Gap estimation surveys on fruits, vegetables and minor crops'.
- Advisor, Planning Commission on 'Methodology of fertilizer response studies'.
- Shri RC Kapoor, Agricultural Statistical Officer, Himachal Pradesh on sample size and estimation of average yield of potatoes in Himachal Pradesh.
- Five Officers from Animal Husbandry Department, Government of Tamil Nadu on estimation of cost of production of milk, poultry and eggs.
- Sh SL Gupta, Joint Director, Department of Animal Husbandry, Haryana regarding cost of production of milk.
- Shri Benipal, Joint Director (Extension) and Sh JR Agarwal, CE (CADA), Ministry of Water Resources on methodology for assessment of impact of CADP on agricultural production.

—Field Officer and Technical Assistant of Directorate of Horticulture, Punjab regarding analysis of data pertaining to scheme crop estimation surveys on fruits, vegetables and minor crops.

Bio-Statistics and Statistical Genetics

- Dr Fadal Khalif EC Duveini from Egypt on 'Modelling in animal epidemiology and role of spatial patterns in agricultural field experiments'.
- Dr Gautam Banerjee, Scientist-C of Ceramics and Glass Central Research Institute, Calcutta on Mathematical

modelling and spatial patterns fitting of logistic models.

- Prof Felix Blanco from Cuba on modelling the epidemiology of bovine diseases.

Computing Science

- Dr Umed Singh, Prof and Head, Department of Mathematics and Statistics, HAU, Hissar regarding establishment of computer net work for human resource development and MIS support development in HAU, Hissar.



Dr SK Raheja, Acting Director giving opening remarks at a function on 'Women in Agriculture' Day



A scientist of the Institute presenting his Research Project Proposal at SRC meeting with Shri JS Sarma, Emeritus Research Fellow IFPRI, Washington (USA) as special invitee

LIBRARY AND DOCUMENTATION SERVICES

Resource Building

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

Total number of publications as on March 31, 1991.

Books	—	20809
Hindi Books	—	199
Journals	—	2595
Reports etc.	—	6249

Number of publications added upto March 31, 1991.

Books	—	114
Journals	—	463
Reports etc.	—	228
Journals subscribed		
Indian	—	60
Foreign	—	122

Bulletin/Newsletters received on gratis/exchange 78

Number of reprints procured during 1990-91

For exchange	—	9
For users	—	70

Maintenance

Publication bound	—	849
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Library Usage

Working hours : 9.30 A.M. to 4.30 P.M.

Number of readers 21,850

consulted the library

Number of publica- 24,200

tions issued from the library

Library Users

Number of bonafide library 300
members

Number of students (regular) 30
members

Number of ad-hoc trainee users 65

Library Services

Number of documents borrowed 59
or lent out on inter library loan

Number of pages (scientific 15,844
and technical nature) repro-
graphed

Number of issues of 'Current 6
Content Mirror' brought out

Number of electronics stencils 75
and transparencies made

Advisory Services

Provided guidance to ICAR Institutes

and CSIR Libraries and Documentation Officers with regard to technical and organisation part.

Library Management

The management of the library is looked after by a library committee with Director as Chairman and Heads of Divisions and Professors as members.

Art and Photography Unit

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.

Photographic jobs including exposing, processing and printing of about 600 photographs 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.

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. Photographs taken at the special occasions were also displayed. Latest publications were also added.

PUBLICATIONS

Research Papers

The major publications of the Institute comprised over 55 papers and popular articles the details of which are given in Appendices IV and V

Research Reports/Monographs/Compendia

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 (Bajra, Jowar, Maize) during IV and V Five Year Plan periods (1990).

Bhatia, VK and Prem Narain. Design and analysis of experiments for studies on bovine semen metabolism (1990).

Doshi, SP and KC Gupta. Statistical package for Agricultural Research Data Analysis (1991).

Garg, JN ; Prem Narain; Shivtar Singh and Mahesh Kumar. Statistical studies in relation to crop insurance (1991).

Ghai, RK; PN Bhargava; PR Yeri and PK Mitra. Results of cotton experiments in India (1966-77) Vol II (1990).

Gupta, SS; SK Raheja; AK Srivastava; PS Dahiya and VP Malhotra. Sample survey for cost of cultivation, agronomic practices, area and yield rates of potato, Farrukhabad (UP) (1989).

Jain, RC and Ranjana Agrawal. Probability model for crop yield forecasting (1990).

Jain, RC; Ranjana Agrawal and KG Aneja. Yield forecast model based on biometrical characters and agricultural inputs for jowar crop (1990).

Jain, TB and UG, Nadkarni (1989). Statistical investigations on economics of pig production.

Kathuria, OP; AK Banerjee; Jagmohan Singh and KR Rajagopalachar. A report on pilot sample survey to study the impact of flood in agricultural production in region of UP (1989).

Kaul, Sushila; RK Pandey and Ashok Kumar. Study of cost functions for milk production in rural areas (1989).

Malhotra, PK. Programming with FORTRAN-77 (1990)

Satya Pal and AK Srivastava. Study of variability of various components of cost of cultivation of vegetables at different stages of sampling and determination of sample sizes at given levels of precision (1989).

Somayazulu, LBS; SN, Arya and SC Agrwal. Study of distribution of age specific mortality and fertility rates in bovines (1989).

**SEMINARS/WORKSHOPS/SYMPOSIA AND
CONFERENCES ATTENDED BY THE SCIENTISTS**

Sl. No.	Name of the Scientists	Programme title	Place	Period
1	2	3	4	5
1.	Sh Lal Chand	XIII Workshop on All India Coordinated Research Project on Goat Breeding	CIRG, Makhdoom, Mathura	Apr 08-09 (1990)
2.	Sh HC Gupta	XVII Annual Workshop of All India Coordinated Research Project on Post-harvest Technology	Punjab Rao Krishi Vidyapeeth, Akola	Apr 18-21
3.	Dr Prajneshu	Development of Epidemiological Management System (EPIMAN) for an Exotic Animal Disease Emergency	Massey University, Newzealand	Apr 26
4.	Prof Prem Narain Dr VK Bhatia Dr PS Rana	First Conference of the Inter-national Biometric Society (Indian Region)	University of Agricultural Sciences, Bangalore	May 10-11
5.	Dr Prajneshu	Statistics for Field Ecology and Resource Selection	Otago University, Newzealand	Aug 08-10

1	2	8	4	5
6.	Dr JP Jain*	Workshop on Biometrical Genetics	Central Sericultural Research and Training Institute, Mysore	Sep 07-08
7.	Sh PN Bhargava	Rice-Wheat Cropping System Symposium organised by the Project Directorate of Cropping Systems Research	Modipuram	Oct 15-16
8.	Dr SK Raheja	National Workshop on Planning Agricultural Extension Training Programme	Directorate of Extension, Ministry of Agriculture and Cooperation, New Delhi	Nov 27-28
9.	Prof Prem Narain Dr OP Kathuria Sh PN Bhargava** Dr JP Jain*** Sh R Gopalan**** Dr Shivtar Singh Sh TB Jain Sh KB Singh Sh RL Rustagi Sh DK Bhatia Sh GL Khurana	The 44th Annual Conference of the Indian Society of Agricultural Statistics	GAU, Anand	Dec 03-05

*Chaired the Plenary Session on September 08.

**Convener of the Symposium on 'Fertilizers-Issues and Policies' held during the Conference on Dec 03.

***Convener of the Symposium on 'Dairying-Issues and Policies' held during the Conference on Dec 04.

****Convener of the Session on 'Statistical Computing' held during the Conference on Dec 05.

1	2	3	4	5
10.	Prof Prem Narain Dr Randhir Singh Dr RC Jain Dr Chandrahas Dr RC Goyal	National Symposium on Remote Sensing for Agricultural Applications organised by the Indian Society of Remote Sensing	IARI, New Delhi	Dec 06-08
11.	Dr SK Raheja Dr RK Pandey Sh PN Bhargava Dr VK Sharma	National Seminar on 'Fertilizer Scene in Nineties' organised by Fertiliser Association of India	FAI, New Delhi	Dec 06-08
12.	Dr VK Sharma	International Conference on 'Game Theory and Economic Application'	ISI, New Delhi	Dec 18-22
13.	Dr Randhir Singh	National Symposium on Impact of Urbanisation and Industrialisation on Rural Society	Maharaja Surajmal Institute, New Delhi	Dec 19-21
14.	Prof Prem Narain	National Symposium on 'Strategies for Potato Production, Marketing, Storage and Processing' organised by the Central Potato Research Institute, Shimla	IARI, New Delhi	Dec 21
15.	Prof Prem Narain Dr VK Gupta	International Conference on 'Recent Developments in Probability and Statistics'	University of Delhi, Delhi	Dec 22-24
16.	Sh GL Khurana	50th Annual Conference of Indian Society of Agricultural Economics	HAU, Hisar	Dec 27-29
17.	Dr RC Jain	78th Session of Indian Science Congress Association	Indore	Jan 03-08 (1991)

1	2	3	4	5
18.	Prof Prem Narain* Dr OP Kathuria Sh PN Bhargava Sh PN Soni Dr VK Bhatia Sh KC Bhatnagar	National Symposium on Statistical Methodology for Dryland Agriculture	CRIDA, Hyderabad	Jan 28-30
19.	Dr JP Jain	Golden Jubilee Symposium on 'Genetic Research and Education : Current Trends and the Next Fifty Years' organised by Indian Society of Genetics and Plant Breeding	Ashoka Hotel, New Delhi	Feb 12-15
20.	Dr RC Jain Dr PS Rana	National Symposium on Modelling : Stochastic Processes and Operational Research	Kurukshetra University, Kurukshetra	Mar 07-09

*Chaired Technical Session III : Analytical Techniques including stability and sustainability on January 29.

PAPERS PRESENTED AT WORKSHOPS/SYMPOSIA AND CONFERENCES

S. No.	Author	Paper Title	Programme Title	Venue	Period
1	2	3	4	5	6
1.	Bhatia, VK	Role of spatial patterns in studying the variability in agricultural field experiments	First conference of the International Biometric Society (Indian Region)	University of Agricultural Sciences, Bangalore	May 10-11 (1990)
2.	Rana, PS	A compartment model for voluntary intake	..	..	..
3.	Arya, SN Bhatia, DK George, B	Reasons for mortality and disposal of buffaloes	The 44th Annual Conference of Indian Society of Agricultural Statistics	GAU, Anand	Dec 03-05
4.	Bhatia, DK Bajpai, SN Nigam, AK	Statistical evaluation of animal nutrition experiments	..	..	..
5.	Bhatia, DK Bajpai, SN Chawla, GC	Designs adopted in animal nutrition experiments—A review and suggestions	..	..	..

1	2	3	4	5	6
6.	Jagtap, DZ Bansod, RS Mahesh Kumar	Prediction of first lactational milk yield by first missing monthly and commulative milk yield of Red Sindhi cows	The 44th Annual Conference of Indian Society of Agricultural Statistics	GAU, Anand	Dec 03-05
7.	Jain, TB	On economics of pig rearing in a tribal area	..	..	..
8.	Jain, TB	Changes in the life expectancy of non-descript bovines in different agro-climatic regions	..	..	..
9.	Khurana, GL Bhatnagar, KC	Identification of important interactions (package of practices) for higher productivity in rice-rice sequence	..	..	..
10.	Khurana, GL Bhatnagar, KC	Packages of agronomic factors and environment interactions in jowar-wheat sequence and their testing procedures	..	..	..
11.	Rustagi, RL Singh, Shivtar	Comparative study of returns in crop cultivation	..	..	..

1	2	3	4	5	6
12.	Singh, Jagmohan Singh, BH	Forecasting of yield of paddy in the flood affected areas of UP	The 44th Annual Conference of Indian Society of Agricultural Statistics	GAU, Anand	Dec 03-05
13.	Singh, Jagmohan Singh, BH	Forecasting of apple yield in apple orchards with and without inter-crops in UP	„	„	„
14.	Singh, KB	Comparative utilization of crossbred and non-descript working animals under rural conditions	„	„	„
15.	Narain, P	Development of data bases and management information systems in dairying	Symposium on 'Dairying-Issues and Policies' during the above named Conference	„	Dec 04
16.	Raut, KC Singh, Shivtar	Policies for pricing of milk	„	„	„
17.	Narain, P	Potential of KRISHINET -Informatics in Agricultural Research	Session on 'Statistical Computing' organised during the above named Conference	„	Dec 05
18.	Goyal, RC Singh, Randhir Sarma, KSS Das, DK	A study on the use of remote sensing in crop yield forecasting	National Symposium on Remote Sensing for Agricultural Applications	IARI, New Delhi	Dec 06-08

1	2	3	4	5	6
19.	Singh, Randhir Nishi	A study on the robustness for estimation of crop yield	National Symposium on Remote Sensing for Agricultural Applications	IARI, New Delhi	Dec 06-08
20.	Singh, Randhir	Industrialisation and the increasing gap between the rich and the poor	National Symposium on Impact of Urbanisation and Industrialisation on Rural Sector	Maharaja Surajmal Institute, New Delhi	Dec 19-21
21.	Narain, P	On the accuracy of progeny testing with all-or-none type auxiliary traits	International Conference on Recent Developments in Probability and Statistics	University of Delhi, Delhi	Dec 22-24
22.	Bhatnagar, KC, Khurana, GL	Production potentials of crop sequences in different agro-climatic zones of various states in the country	The 50th Annual Conference of the Indian Society of Agricultural Economics	HAU, Hisar	Dec 27-29
23.	Jairth, MS Shanti Sarup	Analysis of inter district disparities in Himachal Pradesh's agricultural development	„	„	„
24.	Bhardwaj, SP Pandey, RK	Growth of fertilizer industry in India	73rd Annual Conference of Indian Economic Association	Muzaffarpur	Dec 28-30
25.	Jain, RC Dass, MN	Efficiency balanced designs through modified pairwise balanced designs	78th Session of Indian Science Congress Association	Indore	Jan 03-08 (1991)

	1	2	3	4	5	6
26.	Bhatia, VK		Some aspects of stability of crop varieties	National Symposium on Statistical Methodology for Dryland Agriculture	CRIDA, Hyderabad	Jan 28-30
27.	Bhargava, PN Ghai, RK		Agricultural field experiments information system	"	"	"
28.	Bhargava, PN		Stochastic model for climatic analysis	"	"	"
29.	Bhatnagar, KC Khurana, GL Bhargava, PN		Statistical evaluation of the performance of crop sequences in dryland areas	"	"	"
30.	Jain, RC Agrawal, Ranjana		Probability model for crop yield forecasting	"	"	"
31.	Kathuria, OP		Data base for research and management of dryland agriculture	"	"	"
32.	Narain, P		Information input in agriculture	"	"	"
33.	Mahajan, Viney, Gupta, AS		Stability of maize in diverse seasons	Golden Jubilee Symposium on 'Genetic Research and Education : Current Trends and the Next Fifty Years' organised by Indian Society of Genetics and Plant Breeding	Ashoka Hotel, New Delhi	Feb 12-15

1	2	3	4	5	6
34.	Mahajan, Viney Gupta, AS	Stability of finger millets in acid alfisols	Golden Jubilee Symposium on 'Genetic Research and Education : Current Trends and the Next Fifty Years' organised by Indian Society of Genetics and Plant Breeding	Ashoka Hotel, New Delhi	Feb 12-15
35.	Rana, PS	On stochasticity in compartment models for physiological kinetics	National Symposium on Modelling : Stochastic Processes and Operational Research	Kurukshetra University, Kurukshetra	Mar 07-09

OTHER INFORMATION ABOUT SCIENTISTS

Fellowship/Membership of Scientific Societies

Prof Prem Narain

- Indian National Science Academy
- Indian Academy of Sciences, Bangalore
- Royal Statistical Society, UK
- International Statistical Institute, Netherlands (Elected)
- National Academy of Sciences, India
- General Council of Edinburgh University, UK (Elected)
- Indian Society of Agricultural Statistics, New Delhi
- Indian Society of Genetics and Plant Breeding
- Indian Society of Agricultural Sciences, New Delhi
- Bernoulli Society for Mathematical Statistics and Probability
- Indian Society of Medical Statistics
- Indian Society of Human Genetics
- Indian Econometric Society
- Indian Society of Mathematical Statistics
- Computer Society of India

—National Academy of Agricultural Science

—Biometric Society, Washington, USA

Dr SK Raheja

- Indian Society of Agricultural Statistics, New Delhi
- Indian Society of Agricultural Sciences, New Delhi
- Secretary, Centre for Agricultural and Rural Development Studies, New Delhi
- Indian Association of Statistics and Applied Research, HAU, Hisar

Dr RK Pandey

- Indian Society of Agricultural Economics, Bombay
- Indian Society of Agricultural Sciences, New Delhi
- Indian Academy of Social Sciences, Allahabad

Dr JP Jain

- Indian Society of Agricultural Statistics, New Delhi
- Indian Society of Agricultural Sciences, New Delhi

- Indian Society of Genetics and Plant Breeding, New Delhi
- Dr PR Sreenath
- Biometric Society, Washington, USA
- Indian Society of Agricultural Statistics, New Delhi
- Dr BS Sharma
- Indian Society of Agricultural Statistics, New Delhi
- Biometric Society, Washington, USA
- Dr VK Sharma
- Indian Econometric Society, Delhi
- Agricultural Economics Research Association, New Delhi
- Dr Shivtar Singh
- Indian Society of Agricultural Statistics, New Delhi
- Indian Society of Agricultural Sciences, New Delhi
- Dr VT Prabhakaran
- Indian Society of Agricultural Statistics, New Delhi
- Biometric Society, Washington, USA
- Indian Society of Agricultural Sciences, New Delhi
- Dr VK Gupta
- Royal Statistical Society of Britain
- 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 Mahesh Kumar
- Society for Information Science
- Sh Shanti Sarup
- Indian Society of Agricultural Statistics, New Delhi
- Indian Academy of Social Sciences, Allahabad
- Sh OP Dutta
- Computer Society of India
- Dr VK Bhatia
- Indian Society of Agricultural Statistics, New Delhi
- Biometric Society, Washington, USA
- Indian Society of Agricultural Sciences, New Delhi
- Dr PK Malhotra
- Indian Society of Agricultural Statistics, New Delhi
- Biometric Society, Washington, USA
- Computer Society of India
- Dr Chandrahas
- Biometric Society, Washington, USA

Sh Lal Chand

- Indian Society of Agricultural Statistics, New Delhi
- Biometric Society, Washington, USA

Dr PS Rana

- Indian Society of Agricultural Statistics, New Delhi
- Biometric Society, Washington, USA
- Acta Cincia Indica

Smt Sushila Kaul, Dr SS Kutaula,
Sh Ashok Kumar

- Agricultural Economics Research Association, New Delhi

Dr OP Kathuria, Dr HP Singh, Dr PC Mehrotra, Dr AK Srivastava, Sh VS Rustogi, Dr (Mrs) Ranjana Agrawal, Dr HVL Bathla, Dr SS Shastri, Dr RC Jain, Dr NK Ohri, Dr Basant Lal, Sh RL Rustagi, Dr GC Chawla, Sh KB Singh, Sh MS Batra, Dr DL Ahuja, Sh SN Arya, Dr VK Mahajan, Sh SD Wahi, Sh KPS Nirman, Sh Satya Pal, Sh AS Gupta, Sh Jagmohan Singh, Sh RS Khatri, Sh KC Bhatnagar, Sh DC Mathur, Sh GL Khurana, Sh HO Aggarwal, Dr Jagbir Singh, Sh BH Singh, Sh JP Goyal, Sh DK Bhatia, Sh SC Sethi, Sh SP Bhardwaj, Sh Tribhuvan Rai, Sh VK Jain, Sh PM Rameshan,

- Indian Society of Agricultural Statistics, New Delhi

Offices in Professional Societies

Prof Prem Narain

- Council Member, Biometric Society, Washington, USA (Elected)

- Council Member, International Statistical Society, Netherlands

- Vice-President, Indian Society of Agricultural Sciences, New Delhi

- Secretary-General, Federation of Indian Societies of Agricultural Sciences and Technology

- Secretary, Indian Society of Agricultural Statistics

- Chairman, Editorial Board, Journal of the Indian Society of Agricultural Statistics

- Member, Editorial Board, Journal of Pure and Applied Mathematics, Indian National Science Academy

- Member, Editorial Board, The Indian Journal of Genetics and Plant Breeding

- Treasurer, National Academy of Agricultural Sciences

Membership of Committees/Panels/ Working Groups

Prof Prem Narain

- Indian Science Congress Association, Calcutta

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

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

- Committee of Direction for the National Bureau of Animal Genetics

- 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 MSD 3 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
 - Chairman, Management Committee, IASRI, New Delhi
 - The reconstituted Technical Advisory Committee for Applied Statistics, Surveys and Computing Division of the Indian Statistical Institute, Calcutta
 - The reconstituted Technical Advisory Committee for Biological Sciences Division of the Indian Statistical Institute, Calcutta
 - 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 Department 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 Steering Committee for monitoring the effective implementation of the Study on Fertiliser Consumption and Quality Seeds : Constraints on their increased use by National Council of Applied Economic Research, New Delhi. The Committee was constituted by Ministry of Agriculture, Govt. of India, New Delhi
 - The Board of Directors of the Centre of Advanced Development Research (CADR), Lucknow
 - Task Force on Agricultural Production Statistics to go into the improvement of the quality, reliability and coverage of Agricultural Statistics by the Ministry of Agriculture, Govt. of India
 - Working Group on Demand and Supply Projections and Improvement of Agricultural Statistics for the formulation of the Eighth Five Year Plan by the Planning Commission, under

- the Chairmanship of Shri Nitin Desai, Chief Economic Adviser, Ministry of Finance
- Chairman, Sub-Group on Animal Husbandry Statistics for formulation of VIII Five Year Plan, by the Ministry of Agriculture, Govt. of India
 - The National Committee on Mathematics Education and Research by the Ministry of Science and Technology, New Delhi
 - Re-constituted Regional Committee No. 4 of ICAR comprising Sub-humid Sutlej-Ganga Alluvial Plains comprising the States of Punjab, Delhi, Uttar Pradesh Plains and Bihar for a period of 3 years w.e.f. Sep 24, 1988
 - The Task Force on the Interaction between Nutrition and Health with Agriculture and Rural Development of the Indian Council of Medical Research, New Delhi
 - The Committee for developing the model qualification for all the categories of scientists and science coordinators and administrators of the ICAR system
 - Selected as Reviewer at Mathematical Review by the American Mathematical Society, USA
 - Chairman, reconstituted Technical Advisory Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics of the Department of Agriculture and Cooperation, Ministry of Agriculture, Govt. of India
 - The reconstituted Working Group on Agricultural Statistics of the Govt. of India, Ministry of Planning, Department of Statistics, NSSO, New Delhi
 - Expert Committee for Review of Methodology of Cost of Production of Crops and made suitable recommendations to the Government
 - The Committee for revision of Agricultural Service Rules
 - Organising Committee for the 'International Conference on Extension Strategy for Minimizing Risk in Rainfed Agriculture' of the Indian Society of Extension and Education held at New Delhi from Jan 19-22, 1991
 - National Organising Committee for Satellite Symposium on Grain Legumes of the Indian Society of Genetics and Plant Breeding held at New Delhi from Feb 9-11, 1991
 - National Advisory Board of the JBS Haldane Centenary Celebrations to be observed in 1992 at the Indian Statistical Institute, Calcutta
 - The Standing Committee for the Promotion of Statistics in the Life

Sciences of the International Statistical Institute, Netherlands

Dr SK Raheja

—PG Faculty of PG School, IARI, New Delhi

—Jury of Appeals for ICAR Zone IV Inter-Institutional Sports Tournament, IARI, New Delhi held from Dec 18-22

—President, Sports Committee of IASRI

Dr RK Pandey

—Board of Studies, Agricultural Economics, Banaras Hindu University, Varanasi

—Editor, Annals of Agricultural Research

Dr OP Kathuria

—Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics constituted by Department of AH, Ministry of Agriculture, Government of India

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

—Working Group for the NSS-48th Round Survey on Debt and Investment and Land and Livestock Holdings

Dr JP Jain

—PG Faculty of PG School, IARI, New Delhi

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

—Course-Progress Review Committee of the Institute

—Chairman, Department Promotion Committee for administrative posts and supporting staff grade I to IV

—UNDP Recommendations Implementation Committee

—Sub-Committee of TCD for improvement of Animal Husbandry Statistics

—Chairman, Grievance Committee of the Institute

—Committee for monitoring the schedules of lectures/reference material relating to teaching course in statistical genetics

—Editorial Board, Indian Journal of Genetics and Plant Breeding IARI, New Delhi

—Editorial Board, Annals of Agricultural Research, New Delhi

Dr PC Mehrotra

—PG Faculty of PG School, IARI, New Delhi

Dr AK Srivastava

- PG Faculty of PG School, IARI, New Delhi
- Editorial Board, Journal of ISAS, New Delhi

Sh VS Rustogi

- PG Faculty of PG School, IARI, New Delhi

Dr Randhir Singh

- Chairman, Board of Studies, Agricultural Statistics, IASRI, New Delhi
- Academic Council, PG School, IARI, New Delhi
- PG Faculty of PG School, IARI, New Delhi
- Secretary, Faculty IASRI, New Delhi
- Chairman, Sub-Committee to review syllabi for MSc/PhD courses in Agricultural Statistics

Dr Shivtar Singh

- Sub-Committee under Technical Committee of Direction for Improvement of Animal Husbandry and Dairying statistics for indepth examination of the statewise estimates of production of milk and eggs
- Committee on Economics of Sheep and Goat Production

Dr RC Jain

- PG Faculty of PG School, IARI, New Delhi
- Indian Science Congress Association, Calcutta
- Sectional Committee of the Section of Statistics for 1991-92 (79th Session of ISCA)

Sh OP Dutta

- Secretary, Board of Studies, M.Sc. (CAA)
- Management Committee of IASRI

Dr VK Bhatia

- PG Faculty of PG School, IARI, New Delhi
- Secretary of Board of Studies in Agricultural Statistics
- Academic Committee on Courses
- Convenor of a Committee of Watch and Review for monitoring the progress of M Sc students of Agricultural Statistics
- Convenor of a Committee on Courses of Statistical Genetics

Dr PK Malhotra

- Convenor, Watch and Review Committee for monitoring the progress of MSc (CAA) students

Sh KB Singh

- Indian Dairy Association, New Delhi

Sh SN Arya

—Secretary, Joint Staff Council, IASRI,
New Delhi

Sh SD Wahi

—Board of Studies of Agricultural
Statistics, IASRI, New Delhi

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

Dr UN Dixit

—Convenor, Sports Committee of
IASRI, New Delhi

—Secretary, Recreation and Welfare
Club of IASRI, New Delhi

Sh RS Khatri

—Association of Statistics and Applied
Research, Hissar

—Indian Dairy Association, New
Delhi

Dr Jagbir Singh

—Committee for selection of candidates
for the post of Field Investigator and
Statistical Assistant in the Institute
for Research in Medical Statistics
(IRMS), New Delhi in September,
1990 and February, 1991 respectively.

Sh BH Singh

—Joint Staff Council, IASRI, New
Delhi

Special lectures, Training, Study tour and meetings

Prof Prem Narain

—Chaired

* The meeting of the Executive
Council of the Indian Society of
Agricultural Sciences held on June
13

* The Staff Research Council meeting
of the Institute on July 9

* The meeting of the Technical Com-
mittee of Direction for improve-
ment of Animal Husbandry and
Dairying Statistics of the Depart-
ment of Animal Husbandry and
Dairying, Ministry of Agriculture,
Government of India held on
February 4 at IASRI, New Delhi

* The Management Committee meet-
ing of the Institute held on March
19

—Attended

* The meeting of National Committee
of Mathematics Education and
Research of Department of Science
and Technology, New Delhi on
April 5

* The meeting of the Committee
constituted to examine draft Rules
of the Agricultural Research Service
held at Krishi Anusandhan Bhavan
on April 9

- * The Research Council Meetings of the National Institute of Science and Technology and Development Studies, New Delhi on April 19 and April 23
- * The meeting of the Sectional Committee BSD-1 on Statistical Methods for Quality and Reliability of the Bureau of Indian Standards, New Delhi on May 2
- * The Council meeting of the Indian Statistical Institute, Calcutta on June 11
- * The meeting of the Divisional Committee of Scientific Workers (DCSW) and the Technical Advisory Committee (TAC) of the Division of Applied Statistics, Surveys and Computing of the Indian Statistical Institute, Calcutta held on June 12
- * A meeting in connection with Development of Management Information System at ICAR Headquarters held on June 15
- * The meeting of the Technical Committee on Progeny Testing Programme in Maharashtra state at the office of the Regional Director, Animal Husbandry Department, Pune held on June 21
- * The meeting of the Executive Council-cum-Editorial Board as President of the Indian Society of Agricultural Sciences on July 7
- * The meeting of the Expert Committee of the Ministry of Agriculture, Govt. of India for review of methodology of cost of production of crops held at Krishi Bhavan, New Delhi on July 17
- * The meeting of the Fellowship Scrutiny Committee of the National Academy of Sciences, India, Allahabad on July 21
- * The programme committee meeting for the XXIX convocation of IARI, New Delhi on December 12
- * The joint meeting of the Executive Council and Golden Jubilee Symposium organizing committee of the Indian Society of Genetics and Plant Breeding held at India International Centre, New Delhi on Jan 9
- * The meeting of the Academic Council of IARI on February 7
- * The meeting of the Standing Committee for Emeritus Scientists of the Council of Scientific and Industrial Research at New Delhi on February 19
- * The Programme Committee meeting of the Indian Association of Social Sciences Institutions, New Delhi on February 27

—Delivered

- * A lecture entitled 'Random process in genetics' to the probationers of ICAR Agricultural Research Service on April 10
- * Shri Shanti Narayan Memorial Lecture entitled 'Conditional markov processes in genetics' at University of Delhi, Delhi on April 14. The lecture was organised by the Indian Mathematical Society.
- * An invited talk entitled 'Optimum group size in progeny testing with auxiliary traits' during the first conference of the International Biometric Society (Indian Region) held at UAS, Bangalore on May 10-11.
- * An invited lecture on 'Statistical Genetics' in the Department of Plant Genetics and Breeding, University of Agricultural Sciences, Bangalore on May 12
- * Two lectures entitled 'Statistical aspects of comprehensive crop insurance scheme' and 'Computerisation of data-bases for agricultural survey planning' on February 6 and 7 respectively to the participants of the CSO sponsored training course on 'Organisation of surveys—recent development in sample survey methods and their applications' organised by the Indian Society of Agricultural Statistics, New Delhi

Dr SK Raheja

—Attended

- * The IJSC meeting as official representative, IASRI, New Delhi on May 21
 - * The meeting of high level Coordination Committee on Agricultural Surveys in Haryana, Chandigarh on August 21
 - * The meeting of the ICAR Scientific Panel on Economics, Statistics and Marketing held on September 20 and 21
 - * The meeting of Expert Group constituted by Government of Karnataka for 'Integration of results of crop cutting experiments conducted under the Crop Insurance Scheme and general service of crop estimation surveys in Karnataka' held at New Delhi on October 9
 - * The meeting of Expert Group constituted by Government of Tamil Nadu for 'Integration of results of crop cutting experiments conducted under Crop Insurance Scheme and crop estimation surveys in Tamil Nadu, Madras held at New Delhi on Nov 29
- Delivered two lectures on 'Sampling methodology for assessment and evaluation of project' to senior level ISS Officers on Jan 29

- * The meeting of Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics, New Delhi held on February 4
- * The meeting of State level Officers, Department of Agriculture, Government of Punjab, Chandigarh held on February 22
- * The meeting of Institute Joint Staff Council at IASRI, New Delhi held on February 25
- * The meeting of Management Committee of IASRI New Delhi held on March 19

Dr RK Pandey

—Attended

- * The meeting of Executive Council-cum-Editorial Board of Indian Society of Agricultural Sciences on June 13, July 9 and December 17

- * केन्द्रीय सचिवालय हिन्दी परिषद की कार्यकारिणी की बैठक की 7 फरवरी को अध्यक्षता की।

—Delivered a lecture on 'Economics of fertilizer use' to the Marketing Executives organised by Fertilizer Association of India at New Delhi on September 18

Sh PN Bhargava

—Attended

- * A group meeting on future strategy for ECF programme on June 5 at ICAR and presented the strategy paper for discussion
- * The group meeting organised by the Project Directorate of cropping systems research under the Chairmanship of Dr JP Abrol, DDG (SAE) in July for taking up the research activities under the AICARP in VIII Plan and presented a note on Experiments on Cultivators' field

- * The group meeting organised for the senior Agronomists and Scientists working under AICARP in Northern region on March 7 and 8

Dr JP Jain

—Delivered

- * A lecture on 'Some improved regression estimators of heritability' in the Workshop on Biometrical Genetics held at CSR and TI, Mysore on September 7

- * A lecture entitled 'Impact surveys' to the participants of the CSO sponsored training programme on 'Organisation of Surveys—Recent

Development in Sample Survey Methods and their Applications' organised by the Indian Society of Agricultural Statistics at IASRI, New Delhi on January 30

Sh PN Soni

—Attended the meeting on rice-wheat cropping system at Modipuram from October 15—16

Dr AK Banerjee

—Attended Steering Committee meeting on 100 villages study on Fertilizer Consumption and Quality Seeds-Constraints on their increased uses held at NCAER, New Delhi on July 18

Dr AK Srivastava

—Delivered four lectures on (i) Overview of sampling methods, (ii) Small area estimation, (iii) Multiple frame surveys, and (iv) Estimation of production of fruits and vegetables in a training course on 'Organization of Surveys-Recent Development in Sample Survey Methods and their Applications' organised by Indian Society of Agricultural Statistics at IASRI, New Delhi during January 28 to February 8. The training was imparted to senior level officers of Indian Statistical Services.

Sh VS Rustogi

—Attended the meeting 'To consider

supply plan for inputs for kharif, 1991 season' conducted by Ministry of Agriculture held at NCDC Board, 4, Siri Institutional Area, Hauz Khas, New Delhi on March 12-13

Dr Prajneshu

—Delivered a lecture on some stochastic fish population growth models at the National Institute of Oceanography, Goa on December 27

Dr Shivtar Singh

—Attended

* The first meeting of the Committee on Economics of Sheep and Goat Production at Krishi Bhavan, New Delhi on May 14

* The meeting of the sub-committee for indepth examination of the statewise estimates of milk and egg production on January 17 at IASRI, New Delhi

* The meeting of the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics held on February 4 at IASRI, New Delhi

* A course on Agricultural Research Project Management organised by the National Academy of Agricultural Research Management,

Rajendra Nagar, Hyderabad from
July 17-28.

--Delivered a lecture on 'cost of production of livestock products' to the participants of CSO sponsored training course on 'Organisation of Surveys-Recent Development in Sample Survey Methods and their Applications' organised by the Indian Society of Agricultural Statistics at IASRI, New Delhi on February 1.

Sh JN Garg

* Attended Ninth short-term training course on 'Use of Computer in Agricultural Research' during September 3-October 1 at IASRI, New Delhi.

Dr HVL Bathla

- Attended XII meeting of the State level Committee on Agricultural Statistics held at Andhra Pradesh Secretariate, Hyderabad on September 17.

Sh TB Jain

--Attended

* The meeting of Staff Research Council regarding research project proposal on 'Estimation of cost of production of sheep and wool,' at CSWRI, Avikanagar (Rajasthan) on October 24

* The meeting of committee on 'Economics of Sheep and Goat Production' constituted by ICAR at

CSWRI, Avikanagar (Rajasthan)
on October 25

Dr VK Bhatia

--Delivered a lecture on 'Survival analysis' to the participants of Refresher Course in Bio-statistics at Institute of Research in Medical Statistics (ICMR), New Delhi on May 30

Sh Mahesh Kumar

--Delivered lectures on 'The usage of SPSS software' at Tata Energy Research Institute, Jor Bagh, New Delhi during February 11-15

Dr VK Mahajan

--Attended third training programme on Manpower Economics held at Institute of Applied Manpower Research, New Delhi during September 17-26

Sh KC Bhatnagar

--Attended group meeting of senior scientists under AICARP in Northern Region held at IASRI, New Delhi during March 6-7

Dr Jagbir Singh

--Attended a selection committee meeting at Central Institute for Research and Employment Services, Pusa, New Delhi on June 15

Sh DK Bhatia

--Attended X short term training course on 'Use of Computer in Agricultural Research' during March 4-15 at IASRI, New Delhi

Sh SP Bhardwaj

—Attended third training programme on Manpower Economics held at Institute of Applied Manpower Research, New Delhi during September 17-26

Sh NK Sharma

—Attended X Short term training course on 'Use of Computer in Agricultural Research' during March 4-15 at IASRI, New Delhi

Sh SS Srivastava

—Attended

* Consultative committee on Rationalisation of Periodicals Acquisition on July 31 at INSDOC, New Delhi

* The meeting of Periodicals Consultative Committee of DELNET at INSA, New Delhi on September 14

Participation in ICAR Scientific Panel

S. No.	Name of the Scientist	Name of the Scientific Panel and Date
1.	Dr HVL Bathla	Fisheries on Oct 09-10
2.	Dr BS Sharma	Plant Breeding and Genetics on Dec 04-05
3.	Sh PN Soni	Agronomy on Dec 06-07
4.	Dr Chandrahas	Plant Pathology on Dec 10-11
5.	Dr BS Sharma	Animal Breeding on Dec 26-27
6.	Dr GC Chawla	Animal Physiology on Feb 20 and Animal Nutrition on Feb 21
7.	Sh RS Khatri	Animal Products Technology on Feb 26

MISCELLANEOUS INFORMATION

Prof Prem Narain

—Presided over the Valedictory Function of the 116th one-day course on Medical Rescue and Resuscitation

organized by National Association of Critical Care Medicine (India) at CSIR auditorium, New Delhi on June 30

—Deputed to International Food Policy Research Institute, Washington, DC, USA from August 6-September 3 under the collaborative research project 'Fertilizer Response Function Environment' being undertaken jointly by IASRI and IFPRI, Washington, DC, USA

—Attended the inaugural function of the Diamond Jubilee Session of the National Academy of Sciences, India on February 13 held at IARI, New Delhi

—Attended as Chief Guest in the Valedictory Function of the training programme on Computer Appreciation at the National Bureau of Plant Genetic Resources, New Delhi on March 20

Dr SK Raheja

—Deputed to International Food Policy Research Institute, Washington, DC USA for two months from June 4-July 29, 1990, for developing analytical frame work and methodology for analysis of data under the collaborative research project 'Fertilizer Res-

ponse Function Environment' being undertaken jointly by IASRI and IFPRI, Washington, DC, USA.

Dr AK Banerjee

—Coordinated and supervised the work of the Division of Sample Survey Methodology and Analysis of Survey Data as Head during June 2—July 4

Sh OP Dutta

—Delivered a seminar on 'Use of Computers in Agricultural Research' at Veterinary College, Nagpur on January 07

Sh Ashok Kumar

—Returned after receiving one year training of M. Phil. in Agricultural Policy Analysis under Colombo Plan, 1989-90 at Glasgo University UK

Sh IC Sethi

—Ph D degree received in Agricultural Statistics from PG School of IARI, on the topic 'Some statistical aspects of sire evaluation in dairy cattle.'

CO-ORDINATION AND MONITORING CELLS

CO-ORDINATION 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 Principal Scientists and Heads of Divisions of the Institute from time to time.

Reports/Newsletters/Quarterly Progress Reports

Annual Report, 1989-90

IASRI Newsletter, Jan-Mar, 1990

IASRI Newsletter, Apr-Jun, 1990

IASRI News'etter, Jul-Sep, 1990

IASRI Newsletter, Oct-Dec, 1990

Quarterly Progress Report, Jan-Mar, 1990

Quarterly Progress Report, Apr-Jun, 1990

Quarterly Progress Report, Jul-Sep, 1990

Quarterly Progress Report, Oct-Dec, 1990

Communication of Research Material

ICAR

- For ICAR Reporter, 1990-91
- Schedule of meetings, conferences, seminars during 1990-91
- Data-base on information among the non-aligned and other developing countries
- For DARE Annual Report (1990-91)
- Information on Training Course, Consultancy, Materials and Services provided
- Material for inclusion in the ICAR Annual Report 1989-90 in respect of scheduled castes/scheduled tribes

CSO

- Information of computerised data bases regarding publication of Directory of Statistics of CSO
- Information regarding updating the Directory of Technical Cooperation in Statistics brought out by UN Statistical Office
- For Statistical Newsletters

INSDOC

- Information regarding publication of

Directory of Scientific Research Institutions in India

National Social Science Documentation Centre (ICSSR)

- Information regarding updating ICSSR Directory of Social Science Research Institutions in India

Asian and Pacific Development Centre, Malaysia

- APDC's data base on Institutions

Indian Society for Training and Development

- Information regarding survey on the State of Art of Training Institution in India

Department of Personnel and Training

- Information in respect of Training Programmes planned to be conducted at the Institute during 1991-92

Maharashtra Industrial and Technical Consultancy Organisation Limited, Pune

- Information regarding electronic manpower required by 2000 AD

Department of Science and Technology

- National survey on resources devoted to scientific and technological (S and T) activities in the country.

MONITORING CELL

The main functions of this cell are to monitor the progress of on going research

projects and bring out half-yearly monitoring report, prepare the Annual Action Plan and Activity Milestone and EFC Memos, prepare the material for creation of data base on research projects of ICAR Research Institutes and to maintain the Research Projects Files for submission to ICAR. The items of work undertaken by the Cell are :

- Monitoring report of ongoing research projects for the periods April-September, 1989 and October-March, 1990.

- Information regarding 'Current Agricultural Research Information System' (CARIS) as desired by ICAR as per their proforma was being collected from the different Divisions.

- Preparation of EFC memo of the VIII Plan for submission to ICAR.

- Audit Requisition Memo from the Audit Party

- The following items of work were also undertaken by the Cell for onward transmission to ICAR.

*Document regarding the 'Creation of data-base on research projects of ICAR Research Institutes', for IASRI.

*RPF's for different years from different divisions of the Institute

*Document on activity milestone for 1990-91 for the Institute.

*Material for 'Financial requirements of VIII Plan and Annual Plan 1990-91 for the Institute programme of Agricultural Statistics and Computer Application in Agriculture'.

*Material for 'Provision of one time grant for improving facilities at the Institute'.

*Material for 'Expenditure Finance Committee/Project Implementation Committee of DARE for plan scheme for 1990-91

*A note on Achievement of VII Plan and major missions for VIII Plan alongwith outlay for the same.

*Revised EFC memo for IASRI for 1990-91

STAFF WELFARE ACTIVITIES

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

JOINT STAFF COUNCIL

The Institute has 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 ensuring a high degree of efficiency in service.

The meetings of the Joint Staff Council were held on October 6, 1990 and February 25, 1991 under the chairmanship of the Director.

GRIEVANCE CELL

The Grievance Cell of the Institute (Constituted as per ICAR rules) provides the employees a forum to ventilate their grievances relating to official matters and for taking remedial measures. The meeting of the Grievance Committee was held on February 26, 1991.

BENEVOLENT FUND

The employees of the Institute have constituted a Benevolent Fund from their own contributions to provide relief to the

families of the employees who die in harness and are left in an indigent conditions. An amount of Rs. 907/- was collected in the account of Benevolent Fund contribution from April 1, 1990 to March 31, 1991.

CO-OPERATIVE THRIFT AND CREDIT SOCIETY

The society which is registered with the Registrar, Cooperative Societies, Delhi Administration, Delhi continued its activities in the similar manner as during the past years by advancing loans to its members and looking after their welfare. The source of funds of the Society are share money, compulsory deposits and fixed deposits from the members of the Society. The number of members on the roll of the Society on March 31, 1991 was 496. The General Body meeting of the Society was held on January 16, 1991 in which the accounts for the year 1989-90 were presented and passed.

The new Managing Committee took charge of the Society on March 27, 1990. Prior to this the Managing Committee elected in November 2, 1988 was responsible for the working of the Society during the year 1989-90.

During the accounting year 1989-90 the Society advanced Rs. 18,40,000/- as loan to its members.

Financial help was extended from the Member Welfare Fund to the tune of Rs. 1500/- to the bereaved families of Sh MP Saxena and Shri Har Nath, Rs 51/- is given to those members of the Society who retire from IASRI service. As such a cheque of Rs 51/-each was given to Dr SS Pillai, Dr KG Aneja, Miss CR Leelavathi, Sh SC Rai, Sh Bhagat Singh, Sh HB Choudhary, Sh HC Jain, Sh VN Iyer, Sh D Jain, Sh Ran Singh, Sh JN Anand, Sh Triveni Pal and Sh Budha Ram.

CO-OPERATIVE CANTEEN AND STORE

The Cooperative Store, registered with the Registrar, Cooperative Societies, Delhi Administration, Delhi, continued

to be run for the benefit of the staff members of the Institute. Coffee, cold drinks, snacks, provisions and general merchandise were made available at reasonable rates to the staff members of the Institute. The total membership of the Society as on 31st March, 1991 was 450.

SPORTS

The ICAR Inter-Zone Final Tournament for the year 1989-90 were organised by Central Institute of Agricultural Engineering, Bhopal at the gigantic BHEL Sports Complex, Bhopal during January 21-24, 1991. The Institute Table-Tennis team comprising Dr KK Tyagi, Sh GM Pathak, Sh SK Upadhyay and Sh KK Hans participated in the Tournament and won the runners-up Trophy for the Institute in Table-Tennis (Team Events).

हिंदी के प्रयोगी प्रयोग से प्रामा

अप्रै 1990 से मार्च 1991 के दौरान, संस्थान में राजभाषा के प्रयोग को गति प्रदान करने के लिये, निम्नलिखित प्रवृत्तियाँ प्रारम्भ की गयीं-
 प्रामाणिक रूप से प्रयोगी प्रयोग से प्रामाणिक प्रवृत्तियों को प्रोत्साहित करने के लिये, संयुक्त निदेशक की अध्यक्षता में निम्नलिखित समिति का गठन किया गया :

1. राजभाषा कार्यसमिति के सदस्य :

निदेशक महोदय की अध्यक्षता में, संस्थान की राजभाषा कार्यसमिति की समिति की निम्नलिखित कार्यसमिति का गठन किया गया :

1. डॉ. सुदेश कुमार रेड्डी अध्यक्ष
2. डॉ. विजय कुमार शर्मा सदस्य
3. डॉ. रणधीर सिंह
4. डॉ. (श्रीमती) रंजना अग्रवाल
5. श्री शरद शरण श्रीवास्तव
6. श्री चरण सिंह शर्मा सदस्य-सचिव

संस्थान राजभाषा कार्यसमिति की अध्यक्षता में उपरोक्त समिति के सदस्यों ने हिंदी के प्रयोग को प्रोत्साहित करने के लिये, निम्नलिखित कार्यसमिति का गठन किया गया :
 डॉ. सुदेश कुमार रेड्डी अध्यक्ष, निदेशक महोदय की अध्यक्षता में हिंदी प्रयोग को प्रोत्साहित करने के लिये, निम्नलिखित कार्यसमिति का गठन किया गया :
 डॉ. सुदेश कुमार रेड्डी अध्यक्ष, निदेशक महोदय की अध्यक्षता में हिंदी प्रयोग को प्रोत्साहित करने के लिये, निम्नलिखित कार्यसमिति का गठन किया गया :

समिति का गठन किया गया :
 निम्नलिखित कार्यसमिति का गठन किया गया :
 डॉ. सुदेश कुमार रेड्डी अध्यक्ष, निदेशक महोदय की अध्यक्षता में हिंदी प्रयोग को प्रोत्साहित करने के लिये, निम्नलिखित कार्यसमिति का गठन किया गया :
 डॉ. सुदेश कुमार रेड्डी अध्यक्ष, निदेशक महोदय की अध्यक्षता में हिंदी प्रयोग को प्रोत्साहित करने के लिये, निम्नलिखित कार्यसमिति का गठन किया गया :

1. डॉ. विजय कुमार शर्मा अध्यक्ष
2. श्री श्रीवास्तव शर्मा सदस्य
3. डॉ. राजेश्वर सिंह शर्मा
4. डॉ. (श्रीमती) रंजना अग्रवाल
5. श्री शरद शरण श्रीवास्तव
6. श्री चरण सिंह शर्मा सदस्य-सचिव

संस्थान के प्रमुख अधिकारी/कर्मचारियों से प्रामाणिक प्रवृत्तियों को प्रोत्साहित करने के लिये, निम्नलिखित कार्यसमिति का गठन किया गया :
 डॉ. सुदेश कुमार रेड्डी अध्यक्ष, निदेशक महोदय की अध्यक्षता में हिंदी प्रयोग को प्रोत्साहित करने के लिये, निम्नलिखित कार्यसमिति का गठन किया गया :

लिया और इन सभी ने प्राज्ञ परीक्षा में सफलता प्राप्त की।

3. के० स० हि० प० शाखा

शाखा प्रधान डा० रमा कान्त पाण्डेय की अध्यक्षता में संस्थान की बैठकें दिनांक 1 अगस्त 1990 एवं 7 फरवरी 1991 को हुईं जिनमें सदस्यता अभियान को गति प्रदान करने तथा हिन्दी व्यवहार पखवाड़े और अन्यानेक गति-विधियों के अलावा अनेकों प्रतियोगिताओं के आयोजन से सम्बद्ध निर्णय लिए गए। निम्नोक्त हिन्दी प्रतियोगिताओं का सफल आयोजन हुआ :

1. हिन्दी टिप्पण एवं प्रारूपण
प्रतियोगिता 16 अगस्त
2. हिन्दी लेख प्रतियोगिता 18 अगस्त
3. हिन्दी अनुवाद प्रतियोगिता 20 अगस्त
4. हिन्दी वाद-विवाद प्रतियोगिता } 4 सितम्बर
5. हिन्दी अन्ताक्षरी प्रतियोगिता }
6. हिन्दी प्रश्न-मंच प्रतियोगिता 14 सितम्बर

दिनांक 16 अगस्त से 30 अगस्त 1990 तक हिन्दी व्यवहार पखवाड़ा मनाया गया जिसके दौरान संस्थान के सभी प्रभागानुभागादि के अधिकारियों एवं कर्मचारियों से अपना अधिकाधिक कार्य हिन्दी में करने की अपील की गई और इस विषय में संकल्प लेने का अनुरोध किया गया।

इस दौरान किये गये हिन्दी कार्यों का निरीक्षण, संस्थान की नवगठित निरीक्षण उप-समिति ने दिनांक 5 तथा 6 सितम्बर 1990 को किया, जिसके आधार पर अपना अधिकांश कार्य हिन्दी में करने वाले प्रशासन—1 अनुभाग को चल-

शील्ड एवं उत्साही तथा हिन्दी में अच्छा कार्य करने वाले कर्मचारियों को व्यक्तिगत तौर पर पुरस्कार दिया गया।

दिनांक 14 सितम्बर 1990 को, ठीक हिन्दी दिवस के दिन, संस्थान में हिन्दी दिवस/वाषि-कोत्सव 1990 मनाया गया। केन्द्रीय सचिवालय हिन्दी परिषद की संस्थान शाखा के प्रधान एवं राजभाषा कार्यप्रभारी, डा० रमा कान्त पाण्डेय ने मुख्य अतिथि का स्वागत किया, हिन्दी अधिकारी श्री चरण सिंह वर्मा, ने संस्थान की विभिन्न हिन्दी गतिविधियों से अवगत कराते हुए वाषिक रिपोर्ट प्रस्तुत की, “हिन्दी प्रसारिका” के नए वाषिक संस्करण का विमोचन मुख्य अतिथि द्वारा किया गया, प्रश्न मंच प्रतियोगिता सम्पन्न हुई, 60 से अधिक विजेता हिन्दी प्रतियोगियों को मुख्य अतिथि ने पुरस्कृत किया। मुख्य अतिथि, डा० सुदर्शन कुमार रहेजा, ने संस्थान में हिन्दी अधिकारी एवं हिन्दी अनुभाग के कर्मचारियों की हिन्दी के प्रति समर्पण भावना की सराहना की, विजेताओं को मुबारकवाद दिया तथा सभी हिन्दी प्रेमियों को प्रेरित एवं प्रोत्साहित किया। संस्थान के मुख्य प्रशासनिक अधिकारी एवं शाखा उप-प्रधान, श्री सच्चिदानन्द झा, ने धन्यवाद प्रस्ताव के माध्यम से मुख्य अतिथि एवं अन्य उपस्थितों और आयोजकों की भूमिका एवं योगदान की भूरि-भूरि प्रशंसा की।

संस्थान के तकनीकी अधिकारियों एवं कर्मचारियों के लिए आयोजित एक विशेष हिन्दी कार्यशाला दिनांक 23 एवं 24 जुलाई 1990 को हुई जिसमें लगभग 32 कर्मचारियों ने भाग लिया और विभिन्न विषय-विशेषज्ञों को, इस वर्ग से सम्बद्ध कार्य को हिन्दी में करने संबंधी व्याख्यान देने एवं अभ्यास कराने के लिये, आमंत्रित किया

गया । समापन के अवसर पर, इस कार्यशाला में भाग लेने वालों द्वारा व्यक्त किए गए विचारों से इस बात की पुष्टि हुई कि ऐसी कार्यशालाओं का आयोजन कुल मिलाकर बहुत ही उपयोगी है और कि विभिन्न वर्गों के लिए आयोजित ऐसे विशिष्ट कार्यक्रम समय-समय पर होते रहे तो अत्यन्त लाभकारी सिद्ध होंगे ।

दिनांक 25 जुलाई 1990 को एक हिन्दी विचार गोष्ठी का आयोजन किया गया जिसमें विशेषकर राजभाषा संस्थान द्वारा संचालित विशेष कार्यशाला के सन्दर्भ में विभिन्न कार्य-शालाओं की उपयोगिता पर डा० रमाकान्त पाण्डेय एथा श्री सुरेश चन्द्र राय, प्रधान वैज्ञानिकों के अलावा अनेक अधिकारियों एवं कर्म-

चारियों ने भी विशेष-विशेष पर विचार अभिव्यक्ति की और इनकी महत्ता एवं अन्य विशिष्ट मद्दों पर प्रकाश डालते हुए गोष्ठियों के आयोजन पर बल दिया ।

दिनांक 14 सितम्बर 1990 को हिन्दी दिवस/वाषिकोत्सव के अवसर पर मुख्य अतिथि द्वारा “हिन्दी प्रसारिका” नामक पत्रिका के नए वाषिक संस्करण का विमोचन कराया गया । यह पत्रिका पिछले कई वर्षों से छमाही संस्करण के रूप में प्रकाशित होती रही थी और अब विभिन्न स्तम्भों के अन्तर्गत इसका आकार बढ़ाकर लगभग 50-60 पृष्ठों में समाहित करने का प्रयास किया गया है ।

IASRI PERSONNEL

(As on 31.03.91)

Prof Prem Narain, Director

Dr SK Raheja, Jt. Director

Division of Design of Experiments and Analysis of Experimental Data

Principal Scientists

Shri PN Soni, Head

Shri PN Bhargava

Dr PR Sreenath

Scientists (SG)

Dr VK Gupta

Mrs Asha Saksena

~~Dr BL Chaudhary~~

~~Shri RK Ghai~~

Shri JK Kapoor

Dr GC Chawla

Shri Ravindra Srivastava

Shri PK Batra (on study leave)

Shri KC Bhatnagar

Scientists

Mrs Rajinder Kaur

Shri Onkar Sarup

Shri DK Mehta

Shri GL Khurana

Shri MR Vats

Shri DK Sehgal

Shri Alope Lahiri

Shri NK Sharma

Mrs Ajit Kaur Bhatia

Shri CH Rao

Division of Sample Survey Methodology and Analysis of Survey Data

Principal Scientists

Dr HP Singh, Head

Dr OP Kathuria

Dr JP Jain

Dr AK Banerjee

Dr PC Mehrotra

Dr AK Srivastava

Shri VS Rustogi

Dr MG Mittal

Scientists (SG)

Dr Randhir Singh

Dr Shivtar Singh

Dr HVL Bathla

Dr BC Saxena

~~Shri Anand Prakash~~

Shri SS Gupta

Shri TB Jain
Dr SS Shastri
Dr NK Ohri
Shri RL Rustagi
Shri KB Singh
Dr KK Tyagi
Shri MS Batra
Dr DL Ahuja
Shri SN Arya
Shri GS Bassi
Shri KPS Nirman
Shri Satya Pal
Shri AS Gupta
Shri SP Verma (on study leave)
Shri RS Khatri

Scientists

Shri DC Mathur
Shri MS Kaushik
Shri RC Gola
Dr Jagbir Singh
Shri SC Agarwal
Shri JP Goyal
Shri HC Gupta
Shri DK Bhatia
Shri SC Sethi
Shri Bhagwan Das
Shri MS Narang (on study leave)
Shri T Rai
Shri Satya Pal
Shri KK Kher
Shri VK Jain
Shri RM Sood
Shri K Chugh

Division of Statistical Economics

Dr VK Sharma, Head
Principal Scientist
Dr RK Pandey

Scientists (SG)

Shri Shanti Sarup
Dr VK Mahajan
Dr UN Dixit

Scientists

Shri Ashok Kumar
Smt Sushila Kaul
Shri Ant Ram
Shri SP Bhardwaj
Dr SS Kutaula

Division of Forecasting Techniques for Crops, Diseases and Pests

Dr (Smt) Ranjana Agrawal, Head

Scientists (SG)

Dr RC Jain
Shri GN Bahuguna
Dr Chandrahas
Shri Jagmohan Singh

Scientists

Shri SC Mehta
Shri BH Singh
Shri SS Walia
Shri Madan Mohan

Division of Bio-Statistics and Statistical Genetics

Dr Prajneshu, Head

Principal Scientist

Dr BS Sharma

Scientists (SG)

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Dr VT Prabhakaran
Dr VK Bhatia
Shri SD Wahi
Shri Lal Chand
Dr PS Rana

Scientists

Shri RK Jain
Shri Indra Singh

Division of Computing Science

Principal Scientists

Shri R Gopalan, Head
Shri SN Mathur

Scientists (SG)

Dr IC Sethi
Shri SP Doshi
Shri Mahesh Kumar
Shri OP Dutta
Dr PK Malhotra
Shri KC Gupta
Shri ML Chaudhary
Dr RC Goyal

Scientists

Shri HO Aggarwal
Shri Balbir Singh

Coordination Cell

Dr JP Jain, Principal Scientist and Head
Shri TB Jain, Scientist (SG)
Shri DS Aneja, Scientist

Monitoring Cell

Dr PC Mehrotra, Principal Scientist and Head

UNDP Cell

Dr PR Sreenath, Principal Scientist and Head

Training Administration Cell

Dr Randhir Singh, Prof (Ag. Stat.)
Shri SN Mathur, Prof (CAA)

Technical Officers

Shri SK Suri, Field Officer
Shri SD Sharma, Field Officer
Shri SS Srivastava, Librarian
Shri SK Sublania, MTO
Shri SK Mahajan, Technical Officer
Shri DC Pant, Technical Officer
Shri Amar Ranjan Paul, Sr Artist

Administration

Shri SN Jha, Chief Administrative Officer
Shri R.K. Verma, Finance & Accounts Officer

SANCTIONED AND FILLED-UP POSTS

(As On 31.03.91)

S. No.	Designation	Scale of Pay (Rs.)	No. of Posts		No. of SC/ST Employees	
			Sanc-tioned	Filled	SC	ST
1	2	3	4	5	6	7
1.	Director	4500-7300	1	1	—	—
2.	Joint Director	4500-7300	2	1	—	—
3.	Scientist S-3* exceed- ing 16 years	4500-7300	22	20	—	—
4.	Scientist S-3* up to 16 years	3700-5700				
5.	Scientist S-2* exceed- ing 8 years	3700-5700	29	51	—	—
6.	Scientist S-2* up to 8 years	3000-5000				
7.	Scientist	2200-4000	65	41	3	—
8.	Experimental Scientist	1740-3000	35	3	—	—
9.	Chief Admn Officer	3000-5000	1	1	—	—
10.	Sr Admn Officer	3000-4500	1	—	—	—
11.	Finance and Accounts Officer	2200-4000	1	—	—	—
12.	Field Officer	2200-4000	3	2	—	—
13.	Mech Tabu. Officer	2200-4000	1	1	1	—
14.	Librarian	2200-4000	2	1	—	—

1	2	3	4	5	6	7
15.	Tech Officer	2200-4000	3	2	—	—
16.	Sr Artist	2200-4000	1	1	—	—
17.	Asstt Field Officer	2000-3500	1	1	—	—
18.	Asstt Engineer	2000-3500	1	1	—	—
19.	Asstt Admn Officer	2000-3500	3	3	1	—
20.	Hindi Officer	2000-3500	1	1	—	—
21.	+Security Officer	2000-3500	1	—	—	—
22.	Electronic Computer Operator	1640-2900	8	—	—	—
23.	Artist	1640-2900	1	1	—	—
24.	Superintendent	1640-2900	8	7	1	1
25.	Sr Personal Asstt	1640-2900	1	1	—	—
26.	Photographer	1400-2300	1	1	—	—
27.	Tech Asstt (Stat)	1400-2300	155	126	20	1
28.	Tech Asstt (Eco)	1400-2300	8	8	—	—
29.	Tech Asstt (Lib)	1400-2300	2	2	—	—
30.	Asstt EC Operator	1400-2300	6	3	—	—
31.	Field Inspector	1400-2300	2	2	—	—
32.	Hindi Translator	1640-2900	1	1	—	—
		1400-2300	1	1+	—	—
33.	Assistant	1400-2300	25	25	7	1
34.	Stenographer	1400-2300	11	11	1	—
35.	Jr Stenographer	1200-2040	18	12	3	1
36.	Sr Clerk	1200-2040	21	21	3	—
37.	Field Supervisor	1200-2040	6	4	—	—
38.	Punch Supervisor	1200-2040	3	3	1	—
39.	Card Librarian	1200-2040	1	1	—	—
40.	Receptionist	975-1540	1	—	—	—
41.	Electrician	975-1540	1	1	—	—
42.	Key Punch Operator	975-1540	45	43	4	1

1	2	3	4	5	6	7
43.	Field Investigator	975-1540	30	30	5	1
44.	Coders	975-1540	10	2	—	—
45.	Reference Asstt	975-1540	1	—	—	—
46.	Counter Asstt	975-1540	1	1	—	—
47.	Telephone Operator	975-1540	3	3	—	—
48.	Tubewell Operator	975-1540	2	2	—	—
		950-1500	1	1+	1	—
49.	Sr Gestetner-Operator	950-1400	1	1+	—	—
50.	Carpenter	975-1540	1	—	—	—
51.	Driver	975-1540	2	2	2	—
		950-1500	4	2+	—	—
52.	Zerox Operator	950-1500	1	1	—	—
					(Un-classified)	
53.	Jr Clerk	950-1500	38	32	6	1
54.	Supporting Staff					
	Grade-I	750- 940	55	47	11	1
	Grade-II	775-1025	27	26	7	1
	Grade-III	800-1150	14	12	4	—
	Grade-IV	825-1200	7	7	4	1

Note : *Pre-revised
+Auxiliary Posts

DISSERTATIONS APPROVED

Ph.D. Degree**1. K MURLIDHARAN—Some studies on gene flow technique for optimum selection strategies with overlapping generations**

This thesis extends the gene flow technique for predicting response to selection in random mating populations with overlapping generations to include more realistic situations. Since non-random matings are more common in many populations one important direction in which the technique is extended any system of mating. This called for introducing a few new concepts appropriate to non-random mating. In analogy to the concept of breeding value defined for random mating equilibrium populations, the 'transmittable genetic value' of an individual is defined as the average value of its expected progeny for any system of mating. This concept is developed by utilising the idea of average excess of an allele substitution with regard to the expected genetic structure of the progeny population. The non-random mating system is described by means of coefficient of deviation from random mating. Lastly a fundamental

relation on response to selection in terms of 'transmittability coefficient'—the regression of transmittable genetic value on phenotypic value is derived. This, inter alia, included extending the concepts of average coefficients of consanguinity and kinship to age-structured populations. The theory so developed has been illustrated with respect to a full-sib mating system.

Classification of individuals into functionally distinct stage-groups is found to be more meaningful in the case of livestock species as the demographic parameters are generally available for different stages rather than for different age groups. Such a population is characterised by the population projection matrix. From a modified projection matrix, the gene flow specification matrix which describes the flow of genes between various sex-stage groups of the population is derived. This formulation of gene flow method in terms of demographic parameters will be useful in dealing with response to selection in populations which have not attained a constant age-structure. The gene flow methods is also modified to include sequential selection

strategies in uni-sex situations and used to compare two alternative selection strategies.

(Guide : DR JP Jain)

2. IC SETHI—On some statistical aspects of sire evaluation in dairy cattle

The subject of sire evaluation has once again assumed importance because of change in reproduction technology and shift from single trait to multi-trait improvement strategy. This thesis makes an indepth study into the various aspects of testing of dairy sires. The topics covered included, inter alia, sire evaluation for multiple traits, sire evaluation based on partial records and sire evaluation using MOET technology.

The multi trait models considered for sire evaluation were of unrestricted and restricted types with both equality and inequality constraints. The various aspects examined in these models were effect of inaccurate estimates on prediction error variance and ranking of sires, effect of non-orthogonality in the data, effect of negative definite variance-covariance matrix and effect of relationship among sires.

In the context of using partial records answers to the following questions are provided : (i) minimum duration of partial records for use in testing; (ii) optimum progeny group size when tests are based on partial records; (iii) changes in ranking of sires when tests are based on partial records; and (iv) should the sires be selected on partial records alone

or preliminary selection done on partial records and final selection on complete records ?

Two nucleus breeding schemes-closed as well as open-are considered for effecting genetic improvement in dairy cattle using the new technique of reproduction physiology viz. Multiple ovulation and Embryo Transfer (MOET) as an alternative to progeny testing.

(Guide : Dr JP Jain)

3. PUNYAVRAT SUVIMALENDU PANDEY—Some contributions to small area estimation

With increasing emphasis on planning, administering and monitoring development programmes at small area level, there has been demand for more and good quality estimates at these levels from various sources. Many small area techniques are available in literature which are applicable under different situations of data availability mainly in application areas like health, demography, labour employment etc. These techniques have, however, not been applied in Indian situations, particularly in the context to estimation of parameters like production of crops, livestock products etc. at the block/tehsil level with a reasonable level of precision when the existing techniques provide, at best estimates at state/district level. Therefore, it becomes necessary to investigate some small area methods keeping in view the availability of different types of data under Indian situations.

The thesis deals with different aspects of small area methods. It includes some small area models, composite method of estimation, use of double sampling in small area and the effect of measurement error on small area estimators. Various composite estimators which are weighted function of the best linear unbiased estimators (BLUE's) have therefore been proposed under different models. Optimal weights and the mean square errors of composite estimators have also been worked out in explicit form. Data on production of milk of cows in Himachal Pradesh, have been used to illustrate some of the results. It has been observed that the MSE's of the composite estimators are smaller than the larger of the two mean square errors of the component estimators. However, the gain due to composite estimators are very small when the MSE's of the two component estimators do not differ significantly.

In this study double sample synthetic ratio and regression estimators with their variances and estimates of variances upto second order of approximation have been worked out. It has also been observed that the estimator using double sampling in base unit method reduces to estimator as obtained by Cohen and Kalsbeek (1977) under certain conditions. Generally, it is assumed that variables related to character under study and auxiliary character are measured without errors. However, these variables may be subject to measurement errors. Therefore, a synthetic estimator for small area total,

when both the variables (variable under study and auxiliary variables) are subject to measurement error, along with its variance has been proposed.

(Guide : Dr OP Kathuria)

M.Sc. Degree

1. ARCHNA PANDEY—E-optimal designs for two-way elimination of heterogeneity

The E-optimality of row-column designs has been investigated in a certain class of treatment-connected designs. The upper bound to the smallest positive eigen value of the information matrix is obtained and this bound is then used to obtain sufficient conditions for a design to be E-optimal. The E-optimality of certain balanced designs, under some conditions, is established under regular and non-regular settings. The E-optimality of quotient designs, derivable from balanced incomplete block designs, has also been established. Some of the designs obtainable from balanced incomplete block designs are not E-optimal but have a very high E-, A- and D-efficiency.

(Guide : Dr VK Gupta)

2. NEERAJ PANT—Sampling from two dimensional population with specific reference to cotton crop

The study deals with sampling from two dimensional population spread over space and time with reference to cotton crop. This crop is a case of population where the ultimate sampling unit has to be observed a number of times and hence increases the cost of survey very much.

Keeping the nature of the population and cost aspect of the survey in view a sampling scheme is developed. This scheme is better in terms of cost as well as time.

Under this scheme the entire period of 2nd picking is divided into a number of small intervals, and then selecting one of the intervals randomly. The sampling is restricted to this interval only.

For this situation, the method of two phase sampling is used. During first phase a bigger sample is selected from the population by Simple Random Sampling. For the second phase the sampling is restricted in a selected interval within the first phase sample. The second phase sampling is a binomial sampling. Under this it is proved that sample estimate of the total is unbiased for population total and this estimator is compared with simple random estimator.

Data collected from Hisar district of Haryana during 1977-78 under the project of IASRI, viz. Sample Survey for Methodological Investigations into High Yielding Varieties Programmes is used for illustrating the present study. Obtained results shows that the proposed sampling design is better than simple random design in respect of heavy cost involved in the survey.

(Guide : Sh VS Rustogi)

3. NISHI—Robustness of post-stratification based on spectral data for estimation of crop yield

The crop production estimates which

are of vital importance to the country are generally based on the area under the crop and the yield per unit area. The existing approach of crop production estimation consists of complete enumeration or sample survey for estimating the crop acreage and yield estimation surveys based on crop cutting experiments for estimating the crop yield.

The advent of remote sensing technology and availability of satellite spectral data with high resolution at regular time intervals has opened newer possibilities of improving the agricultural systems all over the world.

In the present study the satellite spectral data from Landsat (TM) for February 26, 1986 for Sultanpur district has been used to post-stratify the crop area and hence to obtain an improved estimates of crop yield.

But the process of identification and allocation of units to different strata is manual and thus may result in deviations in strata boundaries. The robustness of stratification with respect to such deviations has been studied through simulation and it is observed that the post stratified estimates of crop yield is robust against deviations in strata boundaries (from the optimum)

(Guide : Dr Randhir Singh)

M.Sc. (CAA)

1. RAJNI JAIN—Developing an information system for budget management

Information System (IS) means a set

of organised procedures and data which an execution provides information for decision making and control over the various activities of the concerned system. Financial activities of an educational institute are less diverse as compared to commercial organisations. These activities in educational and research based institute are mostly restricted to disbursement of pay and allowances, budgeting and related record keeping.

The present dissertation work entitled 'Developing an information system for budget management' is to show the feasibility of developing an IS for Budget Management. As such, the objectives of this dissertation work are : (i) to study the existing system of budget management, (ii) to enumerate and assess the information needs of various subsystems, (iii) to develop a design for IS, and (iv) to develop software to operate the IS as developed above.

In order to identify user's requirements and functions that the automated system is expected to perform, the study of the manual system is required. For this, IASRI Accounts Section is taken as an example. Various forms and registers used in manual system are studied. As a result, it is found that budgeting includes :

1. Preparation of budget estimates under various heads and subheads. For example :
 - (i) Establishment charges
 - (ii) TA
 - (iii) Other charges

This is further divided into

- (a) Assets acquired
 - (b) Petty works and maintenance
 - (c) Office contingencies
 - (d) Miscellaneous contingencies
 - (e) Other expenditure
- (iv) Works
- (v) Equipments

2. Allocation and reappropriations are made from time to time keeping in view the requirements under the allocated budget.
3. Preparation of revised estimates under the same heads and subheads as above.

To determine the information requirements of the existing system, the whole system is divided into four subsystems as :

1. Establishment charges subsystem
2. TA subsystem
3. Other charges subsystem
4. Works subsystem

Each of these subsystem are related to corresponding head of the budget. Each of these are studied and information needs of the management are identified after discussions with the users of the system. Suitable reports are designed to satisfy the information requirements.

For example, information regarding payments under various heads and sub-heads is needed periodically. To satisfy this requirement, monthly, annual and on demand payment reports are developed.

After studying all the components of the application, the databases are designed. Also input sheets for collecting the data and screens for updating the data files are designed.

Once, the design of the IS is over, software to operate the IS is developed. The software has been developed in modular fashion so that new facilities can easily be added in it.

This information system, when actually implemented, would provide timely information for managing the budget in a suitable manner.

(Guide : Sh SN Mathur)

2. SANGEETA WADHWA-Near natural language interface to SQL

In modern times, in large enterprises, collection and processing of data for different purposes specially for management, has become an important activity. It has been observed that more than 60% of employees in any enterprise work on data base of one kind or another. Computers are used for storage of data and retrieving of data by staff at various levels for taking appropriate decisions. For this they store data in the form of data bases and to retrieve it from these

data bases they use some query language which require users to learn the different commands of the language before using them, which require time and efforts. To avoid all this a NL interface to these query languages is the most desirable thing.

In the present investigation an attempt has been made to prepare suitable programs for interfacing NL with SQL which will be very useful for retrieving data from data bases.

The design of the system is made in such a manner that the user can use the system without any detailed knowledge of the data base at every stage the system presents the user a number of alternatives to be chosen, in the form of menus, also at various places help is being provided to the user. This package has been developed for the PC-XT/ATS with MS-DOS operating system.

(Guide : Sh Mahesh Kumar)

3. VANDANA CHHABRA — COBOL program generator

Business applications involve processing large amount of data. COBOL is generally used to do this. COBOL programs are generally run by non-technical people, but at times these applications require certain enhancements to be made. Rules of the language i.e. COBOL are very rigid, and also the programs are very

lengthy. So, the modifications generally being in lot of errors involuntarily by the user's. This program "COBOL-Program-Generator" is a user-friendly program. This generator provides to the beginners HELP-screens menu's to select

from various options. Also the program provide standard syntax for various option to be exercised by the user while keeping in his requests for program generation in COBOL.

(Guide : Sh OP Dutta)

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21. NARAIN, P (1991). Conditional Markov processes in genetics. *The Mathematics Student*, 57 (1-4) : 1-7
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8. KHURANA, GL and BHAT-NAGAR, KC—Interactions of agronomic factors with the environment and their implications on testing procedures. *Indian J. Agril. Sci.*
9. सिंह, सी. बी.; गर्ग, आर. एन. एवं जैन, वी. के.—पानी की उचित व्यवस्था करके ग्रीष्म कालीन मूंग से अधिक मुनाफा कमाएं। कृषि चयनिका।
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**APPOINTMENTS, PROMOTIONS, TRANSFERS,
DEPUTATIONS, RETIREMENTS AND RESIGNATIONS**

Appointments

Name	Grade (Rs.)	w.e.f.
1. Smt Nidhi Pundhir	1400-2300	03.05.1990
2. Sh Ramesh Ananta Charya Joshi	1400-2300	05.05.1990
3. Sh Asoken S	1400-2300	07.05.1990
4. Sh Vijay Ramchandra Bavalekar	1400-2300	08.05.1990
5. Smt Manjeet Kaur	1400-2300	01.06.1990
6. Smt Neelam	1400-2300	27.03.1991
7. Sh Shib Singh	975-1540	12.03.1991

Promotions

Name	Grade (Rs.)	w.e.f.
1	2	3
1. Sh CH Rao	2200-4000	01.07.1982
2. Sh KK Kher	2200-4000	01.07.1984
3. Sh RM Sood	2200-4000	01.07.1985
4. Sh VK Jain	2200-4000	01.07.1985
5. Sh Indra Singh	2200-4000	01.07.1985
6. Sh Kanwal Chug	2200-4000	01.07.1985
7. Sh MM Manchanda	2000-3500	01.01.1988

1	2	3
8. Sh Lal Mani Verma	2000-3500	01.01.1989
9. Sh Kamlesh Narain	2000-3500	01.01.1989
10. Sh SV Bhagwat	1640-2900	01.07.1988
11. Smt PR Verma	1640-2900	01.07.1988
12. Sh VK Srivastava	1640-2900	01.01.1989
13. Sh Rakesh Chand	1640-2900	01.01.1989
14. Sh Ram Singh Pal	1640-2900	01.01.1989
15. Sh Naresh Chand	1640-2900	01.07.1989
16. Sh RP Gupta	1640-2900	01.07.1989
17. Sh JK Gahlot	1400-2300	01.01.1989
18. Sh BP Morya	1400-2300	01.01.1989
19. Sh DC Sharma	1400-2300	01.07.1989
20. Sh SL Savita	1200-2040	01.07.1988
21. Smt Renu Dutta	1200-2040	01.07.1988

Transfers

(a) On transfer from other Institute

Name	Grade (Rs.)	From	Date of joining
Sh SN Jha	3000-5000	CAZRI, Jodhpur	03.08.1990

(b) On transfer from this Institute

Name	Grade (Rs.)	Place of Joining	Date of Relieving
1. Sh Chironji Lal	3000-4500	ICAR, New Delhi	15.02.1991
2. Sh RK Verma	2200-4000	NDRI, Karnal	14.01.1991
3. Sh Karanveer Anand	1400-2300	DCSR, Modipuram	06.08.1990

Deputation

Name	Grade (Rs.)	Place of joining	Date of Relieving
Sh DC Dahiya	2200-4000	Ministry of Agriculture, Krishi Bhavan, New Delhi	16.08.1990

Retirements

Name	Grade (Rs.)	Date of Retirement
1. Sh LK Garg	4500-7300	31.05.1990
2. Dr JS Maini	4500-7300	28.02.1991
3. Dr AK Banerjee	4500-7300	31.03.1991
4. Sh BL Kaul	3700-5700	30.11.1990
5. Sh KR Rajagopalachar	3700-5700	31.12.1990
6. Sh B Ramakrishnan	2000-3500	30.04.1990
7. Sh AK Mukherjee	2000-3500	31.10.1990
8. Sh Amar Singh	1400-2300	30.09.1990

Resignation

Name	Grade (Rs.)	Date of Resignation
Sh Satish S	1400-2300	06.08.1990

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 :

- Sample survey for study of constraints in transfer of new agricultural technology under field conditions—Chandigarh.
- Pilot studies on pre-harvest forecasting of yield of groundnut.
- Planning, designing and statistical analysis of the data relating to experiments conducted under AICARP on long term fertilizer experiments—Rahuri, Kalyani, Burdwan, Jorhat and Palampur.
- Agricultural field experiments information system—Bangalore (Karnataka), Coimbatore (TN) and Hyderabad (AP).
- A sampling study on utilization of cross-bred working animals vis-a-vis non-descripts—District Kathua (J&K).
- Agricultural experiments information systems (Animal sciences)—CSWRI, Avikanagar.
- Study for comparing the estimates of wheat production obtained through crop cutting technique and the farmer's reponse—New Delhi.
- Planning, designing and analysis of experiments planned under AICARP at various cropping systems research centres in Eastern Region—Gujarat, Rajasthan, Indore, Ranchi, Barrackpur, Bhubaneshwar, Bangalore, Coimbatore and Madras.

