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

LIBRARY AVENUE, NEW DELHI - 110012

annual report

ANNUAL REPORT

1992-93



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

With best compliments from :

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DIRECTOR

1992-93

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PREFACE

It is, indeed, a great pleasure for me in presenting this Annual Report of the Institute which gives the panorama of activities and achievements of the Institute during 1992-93. The projects undertaken by various Divisions of the Institute in different thrust areas are reflected in this compendium.

The functions and the research activities of the Institute during the year are highlighted in the various chapters of the report. It is hoped that the information presented in this report will be of considerable interest to the 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 all the Heads of Divisions, scientists, officers and staff members of the Institute for their endurance, help and cooperation in carrying out the functions and activities of the Institute and for providing the basic material for the report.

This report has been prepared and edited by Shri TB Jain, Head (Coordination Cell). Technical personnel in the Coordination Cell especially Sh PP Singh, Technical Officer and Sh J Srinivasan, Technical Assistant (T-4) provided valuable assistance in editing the voluminous material of the report and deserve appreciation. Thanks are also due to Sh Mahesh Chander, Smt. Rajni Gupta and Sh Ishwar Dutt for assistance in preparing the manuscripts on Personal Computer.

R K PANDEY
DIRECTOR

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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 Departments of Agriculture and Animal Husbandry in planning their experiments, analysis of experimental data, interpretation of results as also rendering advice on the formulation of the technical programmes and examining 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 few years, the method was extended practically to the entire country to cover all principal food and non-food crops. Research in sampling theory and training of field and statistical staff 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 accompanied by appropriate expansion in its strength. The designation of Statistician was changed to Statistical Advisor. 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 the Council on the invitation of the Government of India, activities of the Statistical Branch were further expanded and diversified. In 1949 it was named as Statistical Wing of the ICAR and in August, 1955, it moved to its present campus. 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. It is to commemorate this important event that the Annual Day of the Institute is celebrated on this day every year. An important landmark in the development of the Institute was the installation of an IBM 1620 Model-II Electronic Computer in 1964. Another major land mark for the Institute was the signing of a Memorandum of Understanding with Indian Agricultural Research Institute (IARI), New Delhi in 1964, consequent to which new courses leading to MSc and PhD degrees in Agricultural Statistics were started in collaboration with IARI 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 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 full fledged discipline by itself.

Since the activities of the Institute expanded manifold, a new three-storeyed Computer Centre building was constructed in the campus of the Institute in 1976. A third generation computer Burroughs-4700 system was installed in March, 1977. A large number of computer programmes for specific problems as also general purpose application software have been developed and are available in the Computer Centre. The Institute has installed a Super Mini COSMOS-486 Computer System with more than hundred PC/AT's, PC/XT's and dumb terminals. Computer laboratories equipped with PC/AT's, dumb terminals and printers, etc. have been set up in each of the six divisions as well as in Administrative Wing of the Institute, and have been linked with the Central Computer Laboratory in a Local Area Network (LAN) environment. User friendly software packages like SPSS, Image Processing Software, Harvard Graphics, LOTUS, dBASE IV, DOS, UNIX and a few others have also been made available.

In order to remove and rectify 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, 1983 to March, 1992 the Institute also functioned as a Centre of Advanced Studies in Agricultural Statistics and Computer Applications under the aegis of the United Nations Development Programme (UNDP). This programme aimed 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, thirteen distinguished statisticians and computer experts from abroad (19 visits; 21.5 man months) 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 suggest improvements in the research programmes of the Institute. Seventeen scientists from this Institute (80 man months) have received training abroad 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.

A Multi-storeyed Training-cum-Administration Block of the Institute was formally inaugurated by the Hon'ble Union Minister of Agriculture Dr. Balram Jakhar on July 2, 1992, the Annual Day of the Institute. The building is occupied by the Divisions of Design of Experiments and Analysis of Experimental Data, Biostatistics and Statistical Genetics, and Statistical Economics. It is also shared by the officers and staff of Administration and Training Administration Cell of the Institute.

Heads of the Institute since Inception

Dr PV Sukhatme	...	Sep 1940—July 1951
Dr VG Panse	...	Aug 1951—Mar 1966
Dr GR Seth	...	Apr 1966—Oct 1969
Dr Daroga Singh	...	Nov 1969—May 1971
Dr MN Das	...	Jun 1971—Oct 1973
Dr Daroga Singh	...	Nov 1973—Sep 1981
Dr Prem Narain	...	Oct 1981—Feb 1992
Dr SK Raheja (A)	...	Feb 1992—Nov 1992
Dr RK Pandey (A)	...	Dec 1992 onwards

Functional Set-up

The Institute has the following six Divisions and three 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

- Co-ordination,

—Monitoring, and

—Training Administration

Management Committee

The Director of the Institute, who is in charge 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 periodically examining the progress of the Institute activities and by recommending suitable remedial measures for bottlenecks, if any. The present Management Committee of the Institute was reconstituted for a period of 3 years with effect from Jan 3, 1991. The meetings of the Management Committee were held on June 23, 1992 and February 23, 1993.

Staff Research Council

The Staff Research Council (SRC) is



Management Committee of the Institute in session



A scientist of the Institute presenting his Research Project Proposal at the Staff Research Council Meeting of the Institute

the most important forum in the Institute to plan and monitor research projects and watch their progress on a regular basis. 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.

The meeting of the Staff Research Council was held on May 14-15 under the chairmanship of Dr SK Raheja, Director of the Institute to consider 8 new project proposals and also to review the progress of on-going research projects. As is the practice to associate a Peer Group while discussing and finalising the new research project proposals, Dr A Dey, Professor of Statistics, ISI, New Delhi and Dr Jai Krishna, Former FAO Expert were invited for the purpose. Another meeting of the Staff Research Council was held on November 19 under the chairmanship of Dr SK Raheja to review the progress of the on-going research projects and one revised research project proposal.

Annual Day

The Annual Day of the Institute was celebrated on July 2. As a part of these celebrations a declamation contest for the IASRI students was organised on July 1. The topic of the contest was 'Statistics for Sustainable Agriculture.' Dr PN Bhat, DDG (AS), ICAR was

the Chief Guest and distributed prizes to the three best speakers.

The research highlights of the Institute were also presented by the scientists in a separate session. Dr T.P. Ojha, DDG (Engg), ICAR chaired the session and presented prizes to the two best speakers in the form of books.

On July 2, the main Annual Day Function was held in which Dr Balram Jakhar, Hon'ble Union Minister for Agriculture was the Chief Guest. Dr PN Bhat, DDG (AS), ICAR gave the opening remarks. Dr SK Raheja, Director, IASRI welcomed the Chief Guest and presented a report on Institute activities. Dr OP Bagai, former professor and Head, Department of Statistics, Punjab University, Chandigarh delivered the third Nehru Memorial Lecture on 'New farm technology and small farmers, A statistician's view point.' Professor VL Chopra, Director General, ICAR and Secretary, DARE gave the presidential remarks. The Chief Guest released the Annual Report of the Institute for the year 1991-92 on this occasion and distributed the Nehru Memorial Medal to Km. Simi Narang, a student of M.Sc (Computer Application in Agriculture) for the session 1989-91. He then delivered his address. Dr Randhir Singh, Professor (Ag. Stat.) IASRI gave vote of thanks.

Hon'ble Union Minister for Agriculture formally inaugurated the multi-storeyed Training-cum-Administration Block building of the Institute on the occasion of Annual Day.

Research Collaboration

The collaborative projects which were in operation during 1992-93 are as follows :
Inter-institutional research programme is undertaken by the Institute in collaboration with other institutions.

Sl. No.	Title	Collaborating Agency	Start	Completion
1.	2	3	4	5
1.	Planning, designing and statistical analysis of experiments planned under All India Coordinated Agronomic Research Project at cropping systems research centres and on cultivators' fields	Directorate of Cropping Systems Research, Modipuram, Meerut	Apr, 1968	Continuing
2.	Planning, designing and statistical analysis of data relating to experiments conducted under the All India Coordinated Research Project on Long Term Fertilizer Experiments	(i) Department of Soils, Institutes (ii) Department of Soils, ICAR State Agril. Universities	Jul, 85	Continuing
3.	Pilot studies on pre-harvest forecasting of yield of stick lac	Indian Lac Research Institute, Ranchi	Oct, 87	Dec, 91
4.	Fertilizer response function environment for agro-climatic regions in India	International Food Policy Research Institute, Washington, D.C., U.S.A.	Oct, 88	Sept, 93
5.	Use of remote sensing techniques in crop yield estimation surveys	Division of Agricultural Chemistry and Soil Science, IIRS, Dehradun	Apr, 90	Mar, 93

ANNUAL DAY OF THE INSTITUTE



Dr Balram Jakhar, Hon'ble Union Minister for Agriculture inaugurating the Administration - cum - Training Block of the Institute



Hon'ble Union Minister for Agriculture releasing the Annual Report of the Institute

1	2	3	4	5
6.	Estimation of cost of production of sheep and wool	CSWRI, Avikanagar	Apr, 91	Mar, 94
7.	Survey methodology to study economics of keeping goats	CIRG, Makhdoom	Apr, 91	Sept, 94

Finance

Budget statement for the financial year 1992-93

Head	Non-Plan		Plan	
	Funds (Rs. in Lakhs)	Expenditure (Rs.)	Funds (Rs. in Lakhs)	Expenditure (Rs.)
Pay and Allowance	270.46	2,60,50,837	3.00	—
Travelling Allowances	2.50	2,24,144	0.90	88,891
Contingencies	102.04*	—	129.10*	—
Recurring	—	98,73,068	—	2,98,604
Non-recurring				
(a) Works	—	1,23,200	—	22,53,766
(b) Equipments	—	500	—	8,57,697
(c) Library books and journals	—	10,86,084	—	7,79,472
(d) Vehicles	—	1,996	—	—
(e) Electronic Computer	—	—	—	59,50,374
Grand Total	375.00	3,73,59,829	133.00	1,02,28,804

Abstract (1992-93)

	Funds (Rs. in Lakhs)	Expenditure (Rs.)
Non-Plan	3,75	3,73,59,829
Plan	1,33	1,02,28,804
Total	5,08	4,75,88,633

* Total contingencies 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 Projects (AICARP) on cultivators' fields	KC Bhatnagar Mahesh Kumar NK Sharma
2.	Planning, designing and analysis of experiments planned under AICARP at Cropping System Research Centres	Rajinder Kaur Ajit Kaur

1	2	3
3.	Planning, designing and statistical analysis of data relating to experiments conducted under AICARP on Long Term Fertilizer Experiments	MR Vats PR Sreenath DK Mehta DK Sehgal
✓4.	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		
✓5.	A statistical model to assess the effect of moisture stress on yield	Asha Saksena
Information System for Agricultural and Animal Experiments		
6.	Agricultural field experiments information system	RK Ghai DC Pant OP Khanduri
7.	Agricultural experiments information system for animal sciences	GC Chawla PR Sreenath
Yardsticks of Additional Production		
✓8.	Yardsticks of additional production of oilseeds and pulses, from the combined application of fertilisers	CH Rao KC Bhatnagar GL Khurana
Experimental Designs for Agricultural, Animal and Fisheries Research		
✓9.	Construction of balanced incomplete block designs with nested rows and columns	PR Sreenath
✓10.	Study of 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 Projects on cultivators' fields

The data of about 5000 experiments conducted during 1990-91 in 27 districts

and 11 NARP zones were received. The three stage stratified random sampling was adopted for laying out 5 types of experiments during the year. Emphasis was laid on identification and development of production technology with particular regard to crop intensification

ation, intercropping and optimisation of crop production experiments. The results obtained were summarized and sent to Project Co-ordinator, Dte. of Cropping Systems Research, Modipuram for inclusion in the Annual Report.

In addition, data of about 5500 experiments conducted during 1991-92 at 25 NARP zones and 13 districts in various states were received. The data were scrutinized, coded and are being analysed.

The salient results obtained from the experiments conducted during 1990-91 are as follows :

Studies on crop intensification experiments showed that crop sequences comprising of cereal-pulse, cereal-oilseed or oilseed-pulse under irrigated conditions were more promising than cereal-cereal crop sequences. However, that inclusion of potato crop in a sequence increased the returns substantially. The most promising crop sequences identified were maize-potato (Rs. 40034/ha) in Central Plain Zone of Uttar Pradesh, rice-groundnut (Rs. 32241/ha) at Bellary, rice-potato-greengram (Rs. 23500/ha) at Samastipur and groundnut-mustard/gram (Rs.21120/ha) at Nasik.

In the study of the economics of intercropping systems under irrigated or rainfed conditions it was observed that as high as 270 percent net additional returns could be obtained by intercropping groundnut with redgram at Ranchi

under kharif rainfed conditions. Other intercropping systems netting 100 to 150 percent additional returns were redgram rice at Mayurbhanj, redgram + jowar at Ghazipur, redgram+soyabean at Wardha, bajra + greengram at Jodhpur, wheat+mustard at Ghazipur and groundnut + blackgram at Puddokotai.

In experiments to evaluate the performance of improved varieties and their nutrient requirements it was observed that the average yield of improved varieties of cereals, pulses and oilseeds under irrigated or rainfed conditions with recommended fertilizer level and improved cultural practices was, in general, substantially higher at almost all the districts/NARP Zones than the average yield of local varieties with farmer's practice (Fertilizer level) or the yield of improved varieties with farmer's practice.

In a study to develop suitable integrated nutrient supply system in different cropping system it was seen that at many of districts/NARP Zones it was possible to substitute 50% N in the recommended fertilizer dose (100% NPK) through FYM or Azolla without any decrease in the yield obtained with the application of 100% NPK.

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

During the year 23 types of experiments were planned with the objectives

of (i) development of new cropping system, (ii) nutrient management in cropping systems, (iii) development of system based management practices, (iv) system based maximum yield research. The data for about 340 complex experiments conducted during 1991-92 at 40 cropping system research centres were subjected to critical analysis. Results of these experiments were communicated to different centres. Summary tables were prepared and sent to the Directorate for inclusion in the annual report.

Studies on improving N use efficiency in rice based cropping system through different slow release nitrogenous fertilizers and modified area materials showed that LGU (large granular urea) was more efficient than PUC (prilled urea) at Reva (MP)

In intercropping experiments the results showed the need of fertilization of both the sole crop and intercrop to obtain maximum benefits from the system.

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

Based on the statistical analysis of the data for the years 1987-88 and 1988-89 a national report of the project was prepared in collaboration with the Project Coordinator (LTFE) and presented in the XV Annual Workshop held dur-

ing December, 1992 at IARI, New Delhi. The salient results obtained are as follows :

Integrated chemical NPK fertilizers based on initial soil test with organic manure (FYM @ 10-15 tonne per ha/yr) it was found that the greater stability in crop production under intensely cropped system was maintained.

The normally recommended doses of NPK fertilizers were found to be sub-optimal with the draw down in native soil fertility under intensely cropped system and indicated the need for the periodic revision of fertilizer NPK doses for maintaining higher productivity particularly with respect to rice-wheat system.

The residual effects of fertilizers and manures on succeeding crops in multiple cropping system were estimated with the co-variance analysis technique considering the yield of the preceding crop as the co-variate and that of the succeeding crop as main variate. The residual effect was quite marked with balanced use of NPK fertilizer which enhanced further with the addition of organic manure of most of the cropping centres.

The regression analysis of the available soil nutrient data over the years revealed that continuous application of P fertilizer at optimal dose raised the available P appreciably over the years. The application of K fertilizer at optimum dose over the years improved the available K marginally at two to three

locations while it showed a declining trend at rest of the locations.

4. 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 versus general recommendations.

Analysis of data in respect of Muzza-farpur and Purnea (Bihar), Gurdaspur (Punjab), Faizabad (UP) and Bhandara (Maharashtra) for both kharif and rabi of the years 1977-81 was completed. The analysis of data for the remaining centres viz. Khamman and Krishna (A.P), North Arcot and Tirunelvilli (T.N.), Ganjam & Sundergarh (Orissa) was in progress.

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

For this study the daily rainfall and pan-evaporation data for 1972-89 and pearl-millet yield data for 1972-88 from IARI, New Delhi were utilised. Daily estimates of soil moisture right from the date of sowing till the date of harvest were obtained for each year using modified Shaw's model.

In the process of estimating soil moisture, daily estimates of moisture stress to the crop as compared to water

requirement were obtained. Suitable weights were assigned to daily stress according to the stage of the crop growth. By adding daily stress accumulated weighted stress index was obtained for each year. It was observed that the surplus water/moisture has detrimental effect on crop yield. Taking this into consideration stress index was further improved. This index was related to the yield through a regression equation which shows that reduction in yield from its potential value of 3,000 kg/ha is expected to be 42.71 kg/ha for per unit of stress. Difference in the observed yield and yield estimates from the model for the year 1989 was only -35.2 kg/ha and for 1990 was -19.6 kg/ha. The model is capable of predicting yield at any stage of the crop growth.

6. Agricultural field experiments information system

The reports on results of oil seeds (sunflower and groundnut) experiments have been finalised. In addition, for the period 1978 onwards the regional staff reported during the year, experimental data in respect of 2704 experiments on Index cards/coding schedules prescribed for A.F.E.I.S. while about 342 experiments were reported on the prescribed proformae. Inclusive of these about 21240 experiments on the coding schedules have so far been reported for the system. Processing and validation of data and their storage was in progress.

7. Agricultural experiments information system for animal sciences

The work of preparation of state wise index in respect of animal experiments for the period 1966-1980 was being finalised. The retrieval programmes were modified according to new instruction manual. The data on 80 experiments were collected from NDRI, Karnal,

8. Yardsticks of additional production of oil seeds and pulses from the combined application of fertilizers

The project aims (i) to develop a unified methodology for construction of yardsticks of additional production for combined application of several inputs, and (ii) to work out the yardsticks of additional production of oil seeds and pulses from the use of fertilizer using the above methodology.

The project was recently initiated.

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

The RIRRC designs are useful when

three sources of variation are encountered in the designing of experiments. While blocking takes care of one of the sources, the rows and columns nested within the block allows the elimination of variation due to the other two sources. The development of methods for their construction and their tabulation for $v \leq 30$ treatments in blocks of p rows and q columns, where $k=pq \leq 10$ and $k \leq v$ were the objectives of the study.

The report on the project remained under finalization.

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

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

The report on the findings of the project was being prepared.

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
- Statistical modelling for production and growth
- Energy utilization
- Inland fish catch estimation
- Studies involving repeated measurements
- Production and area estimation
- Assessment and evaluation studies
- Remote sensing technology applications
- Non-sampling errors estimation
- Small area estimation
- Estimation of post production losses

Projects in operation thrust-area-wise

No.	Project title	Project leader and associates
1	2	3

Cost of Production Studies

1. ✓	Estimation of cost of production of sheep and wool	TB Jain JP Jain* PS Rawat (CSWRI) Riyazuddin ,, SC Sharma ,,
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1	2	3
2. ✓	Survey methodology to study economics of keeping goats	RL Rustagi SC Agarwal Shivtar Singh DR Deoghare (CIRG) BU Khan ,,
3. ✓	Pilot sample survey to study the economics of Agnora rabbits	KPS Nirman Shivtar Singh Bhagwan Dass
4. ✓	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 OP Kathuria
Statistical Modelling for Production and Growth		
5. ✓	Statistical modelling for projection of bovine populations and prediction of milk availability	SN Arya SC Agarwal HP Singh
Energy Utilization		
6. ✓	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
Inland Fish Catch Estimation		
7. ✓	Sampling methodology for estimation of fish catch from a lake	HVL Bathla OP Kathuria KK Kher
Studies Involving Repeated Measurements		
8. ✓	Pilot sample survey for estimation of yield of pepper and study of cultivation practices using successive sampling	SS Shastri SK Raheja** VK Jain PM Rameshan
Production and Area Estimation		
9. ✓	Study for estimation of area and production of important vegetable crops on the basis of partial harvest	AK Srivastava DL Ahuja DC Mathur K Chug

1	2	3
10. ✓	Development of estimation procedure for agricultural by-products	NK Ohri PC Mehrotra R.C. Gola
11. ✓	Pilot sample survey for evolving a sampling methodology for estimation of area and yield of cultivated fodders crops other than berseem and jowar crop, cost of production and cultivation practices thereof	Anand Prakash BC Saxena KK Tyagi
12. ✓	Pilot sample survey for estimating the area under waste-land	SS Gupta PC Mehtrotra

Assessment and Evaluation Studies

13. ✓	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
14. ✓	A sampling study on utilization of cross-bred working animals vis-a-vis non-descripts	KB Singh*** JP Goel RS Khatri
15. ✓	Investigations in sampling methods for multiple frames in two stage sampling	BC Saxena AK Srivastava
16. ✓	Sample survey to evolve suitable sampling methodology to study impact of command area irrigation project on agricultural production	AS Gupta SK Raheja**

Remote Sensing Technology Application

17. ✓	Use of remote sensing techniques in crop yield estimation surveys	Randhir Singh RC Goel BM Singh (IIRS) SK Shah (IIRS)
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Non-Sampling Errors Estimation

18. ✓ Investigation on the use of imputation for missing data in sample surveys Randhir Singh
T Rai

Small Area Estimation

19. ✓ Estimation of crop yield for small areas AK Srivastava
DC Mathur
DL Ahuja
SC Sethi
20. ✓ Small area estimation of milk production Shivtar Singh
JP Jain*
DK Bhatia
21. ✓ Pilot sample survey for developing a sampling methodology for estimation of post-production losses of milk in rural areas RS Khatri
KB Singh***
JP Goel
22. ✓ A methodological investigation in estimating seasonal fluctuation of post-harvest food-grains losses (wheat) Jagbir Singh
HC Gupta
OP Kathuria
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* upto September 30, 1992

** upto November 30, 1992

*** upto January 31, 1993

1. Estimation of cost of production of sheep and wool

This project was formulated by this Institute in collaboration with Central Sheep and Wool Research Institute, Avikanagar (Rajasthan) with the objectives to develop a suitable methodology for studying economics of sheep rearing in relation to wool production under stationary type of management, and to secure estimates of different components of cost of rearing of sheep and production of wool.

The survey was initiated in Malpura and Tonk tehsils of Tonk district in Rajasthan. A two-stage random sampling design with villages having sheep as the psu's and households rearing sheep in a selected village as the ssu's was adopted in the project. Out of villages having sheep 16 villages from Malpura tehsil and 24 from Tonk tehsil were selected with probability proportional to sheep population in the village with replacement. For detailed enquiry, 6 sheep rearers were selected from each village.

In the first instance, a preliminary enumeration of all the sheep rearers was carried out in the selected villages. Under detailed enquiry the relevant data on various components of cost of maintenance of sheep and production of wool were collected from selected sheep rearers at a regular interval of one month. The field survey work was completed.

The analysis of data collected under preliminary enumeration from 293 sheep rearers from Malpura tehsil and 355 rearers from Tonk tehsil was completed. The data collected under detailed enquiry survey were being prepared for statistical analysis.

2. Survey methodology to study economics of keeping goats

The project aims (i) to develop sampling methodology for estimation of cost of rearing and maintenance of goats and income accrued from various sources connected with goat keeping with a reasonable degree of precision, (ii) to study the practice of goat keeping and to develop procedures for evaluation of cost components, and (iii) to study variation in cost and its components due to season and size of flock.

The field survey was conducted in Mathura district. Stratified three stage sample design was adopted for selection of samples having 18 panchayats as psu's, 54 villages as ssu's and 324 goat keeping households as tsu's.

Under detailed enquiry survey, the

data on various items of keeping goats were collected twice in a month i.e. at an interval of 15 days for one year. Field survey work was completed and the analysis of data was in progress.

3. Pilot sample survey to study the economics of Angora rabbits

The project was initiated with the objectives (i) to obtain reliable estimates of cost of rearing and maintenance of rabbits, and (ii) to estimate cost of production of rabbit wool with reasonable degree of precision.

The survey was initiated in Kullu tehsil (HP). The data for estimating the rearing cost was generated by adopting sampling design of single stage random sampling with rabbit farms as units of observation. For the selection of rabbit farms, to start with, all the farms in Kullu area were completely enumerated. For detailed enquiry, a sample of 18 farms was selected adopting proportional allocation.

For estimating the maintenance cost of adult rabbits two stage sampling design was adopted. The already selected 18 farms formed the first stage units and adults rabbits as second stage units. Selection of units at the second stage was done with equal probability without replacement. A sample of 10 rabbits (5 males + 5 females) for psu's were selected. In all 180 rabbits formed the size of sample for estimating maintenance cost. These farms were visited regularly at weekly intervals. The field survey work was in progress.

4. **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 objectives of the study are (i) to study variability at different stages of sampling of the components of cost of production of some important and fruit crops, and (ii) to estimate sample sizes for given levels of precision using the above variabilities.

This study is based on secondary data drawn from some pilot studies conducted by IASRI in the recent past to estimate cost of production of some important fruit crops in Gujarat state on the basis of fixed sample sizes.

The data already collected by the method of cost accounting was utilized to determine variability at different stages of sampling for different component of cost and their aggregates according to the different concepts of cost so as to suggest different sample sizes for given levels of precision for the conduct of similar surveys in future. Work of analysis of data was in progress.

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

This project initiated with the objectives (i) to identify (and develop, where necessary) suitable models for projection of bovine population 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.

Analysis of census data pertaining to bovines was in progress. Different models were being tried to project the populations in various categories. Processing of survey data remained in progress.

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

The statistical analysis of data pertaining to various seasons of different agricultural years was completed by working out energy output input ratios as well as estimates of energy utilization for various crops/crop-rotations making use of ratio-type and regression methods of estimation at different stage of sampling.

The project report was under finalization.

7. **Sampling methodology for estimation of fish catch from a lake**

The study was initiated with the objective (i) to review the data collection procedures and the present method of reporting catch from lake/reservoir in the state of Orissa, (ii) to develop a suitable methodology for estimation of fish catch and (iii) to see the feasibility of estimating fish catch by using partial data.

The preliminary analysis of data was completed and the methodology of estimation of catch was being worked out.

8. 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.

Analysis of data for the year 1991-92 pertaining to Maharashtra and Karnataka was completed and that for Tamil Nadu was in progress. Field survey work of collection of data for the year 1992-93 was in progress.

9. 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 framework 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 project is based on secondary data already collected by the Institute under earlier vegetable surveys in Delhi and Pune. The picking wise yield data collected for different vegetables was utilised. The analysis of data was completed and results were being tabulated.

10. Development of estimation procedure for 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 statistical analysis of the secondary data utilized from the project, "Sample survey for study of constraints in transfer of new agricultural technology under field conditions" was in progress. The work of tabulation of secondary data from the records of the project "Pilot sample survey for estimating the energy utilisation for different levels of adoption of modern technology in agriculture," was in progress.

✓ **11. Pilot sample survey for evolving a sampling methodology for estimation of area and yield of cultivated fodder crops other than berseem and jowar crops, cost of production and cultivation practices thereof**

The survey was conducted in Ghaziabad district with the objectives (i) to evolve a sampling methodology for estimation of area and yield of fodder crops other than jowar and berseem and (ii) to estimate the consumption of different feeds fed to the animals and their maintenance practices.

The estimates of area under various fodder crops were being obtained and further analysis was in progress.

✓ **12. Pilot sample survey for estimating the area under wasteland**

The survey on wasteland was taken up in Udaipur district of Rajasthan with the objectives to estimate the area under wasteland, to find out the causes of wasteland and its alternative uses and the extent to which it can be reclaimed.

The field work under the project was in progress.

9 **13. Sample survey for study of constraints in transfer of new agricultural technology under field conditions**

Sampling investigations were undertaken for evolving suitable sampling methodology for studying the effect of new agricultural technology for higher

productivity of land and to identify and investigate factors that inhibit its transfer under field conditions in 16 selected districts spread over 9 states of the country. 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.

Drafting of report and analysis of data for the first year of the survey was in progress. Data for later years were under computer scrutiny and analysis.

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

This study aims (i) to compare the utilisation pattern of the two types 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 analysis of data remained in progress.

✓ **15. 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 multiple frame surveys.

The report on the project was under finalisation.

16. Sample survey to evolve suitable sampling methodology to study impact of command area irrigation project on agricultural production

The objectives of the study are (i) to develop sampling methodology for determining yield rates of crop in command and non-command areas of irrigation project with a reasonable precision, and (ii) to study the impact of command area on cropped area cropping pattern, cropping intensity, agronomic and management practices and other development measures.

The project was in operation in command area of lower Bhawani canal, District Periyar (Tamil Nadu) and its adjoining area as non-command area from 1987-88 to 1990-91. The data for the year 1990-91 has been analysed and the analysis of remaining data was in progress.

17. Use of remote sensing techniques 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. 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 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 examine the relative efficiency of estimator of crop yield from crop yield estimation survey using post-stratification based on digital spectral data (CCT) and the post-stratification based on False Colour Composites (FCC).

The relative efficiency of estimators of crop yield based on stratification using FCC's and using Vegetation Indices were examined. Further analysis and report writing work was in progress.

18. Investigation on the use of imputation for missing data in sample surveys

Data from various surveys conducted by IASRI were examined to see the extent and effect of non-response. Proper records were not maintained in these surveys regarding the cause of non

response. The non response rate was found to be below 2 to 5 percent in most of these surveys mainly because these surveys were for methodological investigations and are schedule based where the enumerators personally visit each selected unit and there is sufficient supervision. As such no further analysis in this regard was attempted.

Simulation technique was used to study relative performance of different imputation procedures. The draft project report was prepared.

19. Estimation of crop yield for small areas

The study was initiated to estimate the crop yields at small area (Block/ Tehsil) level for principal crops utilizing small area estimation techniques.

In this study estimation of average yield of main crops at small area (block) levels is to be attempted. Most of the small area techniques assume the knowledge about some important auxiliary variables at small area or even lower levels. In this situation the information on the important variables such as irrigation, fertiliser etc. is not available. Some alternatives for estimating these auxiliary variables at small area levels and utilizing these estimates in developing the small area estimates were worked out. Work on some theoretical aspects using simulated data was completed. Further analysis work was in progress.

20. Small area estimation of milk production

The growing demand of small area

statistics formulating development programmes at grassroot level and taking policy decisions has necessitated the need for production of reliable small area estimates of various population parameters of interest. In the case of milk, the state level estimates of milk production in the country are obtained through integrated surveys for simultaneous estimation of number of animal products. However, in the larger context of rural development planning it has become imperative to develop such estimates of acceptable quality for each district which is to be considered as the unit of planning. The sample sizes in integrated sample surveys are adequate enough to provide estimates with reasonable precision for numerous population parameters at state level but are inadequate to provide precise estimates at district level. Even then the small area estimates are being built up using the usual estimation techniques within the current sample survey frame work to meet the immediate needs. When the small areas are not represented adequately in the sample, estimates developed from any of the available techniques, lose their relevance and utility. The possibility of zero sample units in a particular district is also not ruled out in which case the usual estimation technique breaks down to provide an estimate. It is in this context that several small area estimation techniques have been developed, which have largely remained unexploited in India so far.

This study was taken up with a view to provide district-wise estimates of milk

production by adopting the known small area estimation techniques.

It was seen that the usual estimates of production of cow milk at district level were accompanied with large standard errors for some districts. Breed of the animal was found to be an appropriate symptomatic variable for grouping the sample observations within each district. An empirical comparison of synthetic estimate with the usual post-stratified estimate when cell sizes are unknown revealed that both the estimates were equally precise. However the usual post-stratified estimate could not be computed when the sample size in a district for a particular breed was zero. Further, the model-based synthetic estimate had a smaller variance than the direct estimate and synthetic estimate also had large bias. As expected for large sample sizes the direct estimates had small standard errors. However, for better results when the assumption of synthetic estimate is not satisfied the composite estimate which is a linear combination of the synthetic and the direct estimate should be used.

In sum both synthetic and direct estimates have their own merits and demerits. For small sample sizes, direct estimate though unbiased would give large standard errors. It is desirable to use synthetic estimate for areas which have small sample sizes. But when the assumption for synthetic estimate is not

satisfied the composite estimate is a better choice.

21. Pilot sample survey for developing a sampling methodology for estimation of post production losses of milk in rural areas

The objectives of the project are (i) to evolve a sampling technique for estimation of post production losses, and (ii) to estimate the percentage of post production losses at different stages. The data were collected from representative sample by careful enquiry and the reference period was the day prior to the day of visit of the enumerator.

Data collection work in the project was completed in Rohtak district (Haryana) and the data preparation work was in progress.

22. A methodological investigation in estimating seasonal fluctuation of post-harvest foodgrains losses (wheat)

The study is based on secondary data utilised from another project undertaken earlier by the Institute on Pilot sample survey for the estimation of post-harvest foodgrains losses.

The study aims (i) to estimate the post-harvest foodgrains losses due to various operational causal factors, (ii) to estimate the seasonable fluctuations in post-harvest foodgrains losses due to

various operations and causal factors, (iii) to investigate the design effect of the used sampling design, and (iv) to determine the optimum sample size.

The zonewise elementary estimates alongwith their variances, based on matched and unmatched sample data on post-

harvest foodgrains loss due to germs, weevils and overall causes at the stage of storing foodgrains in various modes of storage at farm level were worked out.

The analysis work remained in progress.

DIVISION OF BIO-STATISTICS AND STATISTICAL GENETICS

Mandate :

- To conduct statistical research in
- statistical genetics with particular reference to plant and animal breeding
- environmental and ecological statistics in relation to agriculture, pest control management, animal epidemiology, bio-assay especially immunoassays in animal research and physiological pharmacological kinetics, and
- crop insurance, cattle insurance, agriculture and live-stock census.

Thrust Areas :

- Modelling for biological phenomena
- Statistical studies in genetics
- Spatial techniques in agriculture

Projects in operation thrust-areawise

No.	Project Title	Project leader and associates
Modelling for Biological Phenomena		
✓1.	Modelling curvilinear response among crossbred dairy cows with increasing level of exotic inheritance	VT Prabhakaran BS Sharma
Statistical Studies in Genetics		
②.	Statistical modelling for comparing genetic groups of crossbred goats for growth studies based on multiple traits	Lal Chand SD Wahī VK Bhatia
③.	Application of bootstrap techniques for studying the statistical properties of genetic parameters	SD Wahī VK Bhatia Lal Chand
Spatial techniques in agriculture		
✓A.	Studies on spatial patterns and its role in analysis of agricultural field experiments	VK Bhatia Prem Narain JS Samra

1. Modelling curvilinear response among crossbred dairy cows with increasing level of exotic inheritance

The project aims to formulate various hypotheses explaining curvilinear response and to test these hypotheses through empirical data.

The statistical analysis of data remained in progress.

2. Statistical modelling for comparing genetic groups of crossbred goats for growth studies based on multiple traits

The objectives of the project are (i) to develop growth performance index by combining several body measurement traits, (ii) to cluster various genetic groups into homogenous clusters by different clustering procedures and to develop some suitable criterion to compare efficiency of these procedures, (iii) to study the combining ability for individual growth traits and for growth performance index, and (iv) to estimate the genetic parameters such as heritability, phenotypic and genetic correlation etc. for component traits as well as for the index.

Breeding data of goats already available at the Institute was transferred on floppies. After scrutiny and verification of the data, the analysis work with regard to adjustment of data for non-genetic effects and to develop growth performance index based on several body

measurement traits such as birth weight, growth rate, length and height of animal etc. was taken up.

3. Application of bootstrap techniques for studying the statistical properties of genetic parameters

The project aims (i) to examine different procedures for assessing the accuracy of genetic parameters viz. heritability and genetic correlation, (ii) to study the sampling distribution of estimates of genetic parameters, and (iii) to obtain the optimum number of bootstrap replications for getting the satisfactory estimates of sampling variance and confidence intervals.

The study was recently initiated and the data on crossbred goats will be utilised for the purpose.

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.

The work relating to statistical analysis of data which primarily involve variography and kriging was completed. The report on findings of the project was under finalisation.

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

Projects in operation thrust-area wise :

No.	Project title	Project leader and associates
Crop Yield Forecast Models		
①	Integrated yield forecast model using biometrical characters, agricultural inputs, weather and remotely sensed data	Ranjana Agrawal RC Jain
✓ 2	Pilot studies on pre-harvest forecasting of yield of stick-lac	SK Saha (ILRI) AK Jaiswal (ILRI) BH Singh
✓ 3	Composite forecast of sugarcane yield	SC Mehta Chandrahas
✓ 4	Yield forecast based on weather variables and agricultural inputs on agro-climatic zone basis	Ranjana Agrawal RC Jain SC Mehta
✓ 5	Statistical modelling for forecasting of marine fish catch	SS Walia Balbir Singh
⑥	A statistical model for assessing the effect of weeds on crop yield	GN Bahuguna Madan Mohan

1. Integrated yield forecast model using biometrical characters, agricultural inputs, weather and remotely sensed data

Various objective methods are used to forecast crop yields which utilise data on (i) plant characters, (ii) weather variables and inputs, (iii) agro-meteorological variables, and (iv) spectral parameters. Generally one of these different types of data are being used to develop the forecast model. The models so developed are not very satisfactory in many cases. Attempts are being made to develop integrated model using two or more types of data so as to improve forecasting capability of the model. With a view to develop an integrated model for wheat yield forecast using data on spectral parameters, plant characters and agro-meteorological variables, an experiment was conducted at IARI Research Farm during Rabi 1992-93 and fortnightly data were collected. The study remained in progress.

2. Pilot studies on pre-harvest forecasting of yield 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 effecting 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 statistical analysis work was completed and report on the project was being finalised.

3. Composite forecast of sugarcane yield

The objectives of the project are (i) to explore the feasibility of improvement in the models already developed for obtaining pre-harvest forecast of crop yield on the basis of biometrical characters, (ii) to develop appropriate models for forecasting crop yield on the basis of weather parameters, and (iii) to develop suitable statistical methodology for improving forecast of crop yield by combining the forecasts from two approaches based on weather parameters and biometrical characters.

From different growth phases of sugarcane crop viz. planning germination, tillering, early growth, grand growth and flowering etc. some growth periods were identified in which these regressors contributed significantly in the yield variation. After computation of growth indices using data of these growth period models were developed. From these models, taluk-wise forecasts for sugarcane yield were obtained. It was found that the deviation in forecast yields from the observed were 2 to 13 percent in different taluks.

Further analysis work was in progress.

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

Crop yield forecast models using

weather variables were developed on district level. Generally such studies require long series of data on different weather variables and crop yield which are not available for most of the districts. The data of various districts within an agro-climatic zone may be pooled so that a long series could be obtained in a relatively short period. It will also enable us to obtain forecast of crop yield on a wider area. With this view, studies have been taken up to forecast rice and wheat yield using weather variable and agricultural inputs on agro-climatic zone basis. Analysis was in progress for developing forecast models for rice and wheat in rainfed area with deficient rainfall.

5. Statistical modelling for forecasting of marine fish catch

The objective of the projects are (i) to develop appropriate models for forecasting of marine fish catch and (ii) to test the adequacy of the models so as to recommend the most appropriate model for each state under study.

This project is based on secondary data. Quarter-wise actual marine fish landings data for 40 points of time pertaining to ten major maritine estates was collected from special publications of CMFRI, Cochin.

The six different type of models which were developed and their adequacy tested are simple moving average, double moving average, fundamental exponential smoothing method, double exponential smoothing method, triple exponential smoothing method and winter's method. In eighty percent of the states winter's model which accounts for seasonal variations was found to be most suitable.

6. A statistical model for assessing the effect of weeds on crop yield

Considering the need for obtaining objective estimates of crop loss due to weeds, this study was undertaken with the objective of developing a suitable statistical model for this purpose.

Regression models were fitted using weed character viz. weed plant population and dry matter weight of weeds as regressors. Indices of weed characters obtained as weighted accumulation of observations on weed characters in different periods, weights being respective correlation coefficients between wheat yield and weed characters, were also used as regressor variables. The R^2 values were found low in all the cases and hence other models would be tried for improving the goodness of fit of the relationship between wheat yield and weed characters.

DIVISION OF STATISTICAL ECONOMICS

Mandate :

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

Thrust Areas :

- Technological change and its diffusion in agriculture
- Resource use efficiency in agriculture
- Farm planning under risk and uncertainty
- Demand and supply of various agricultural products and inputs

Projects in operation thrust-area wise :

No.	Project title	Project leader and associates
1	2	3

Technological Changes and its Diffusion in Agriculture

- | | | |
|---|---|--|
| ✓ | Non-linear statistical models for adoption of HYVs in India | VK Sharma
Prajneshu
Sushila Kaul |
| ✓ | Implications of technological change on input use and output mix in crop production | RK Pandey
Shanti Sarup |
| ③ | Estimation of economic gains from technological advance in rice production | A Kumar
RK Pandey |

Resource Use Efficiency in Agriculture

- | | | |
|---|---|------------|
| ✓ | Testing relative economic efficiency and determination of factor demand and output supply functions for wheat | SS Kutaula |
|---|---|------------|

Farm Planning Under Risk and Uncertainty

- | | | |
|------|---|---------------------------|
| ✓ 1. | Study of farmers' behaviour towards risk and its impact on cropping pattern, level of resource use and farm income. | SP Bhardwaj
VK Mahajan |
|------|---|---------------------------|

Demand and Supply of Various Agricultural Products and Inputs

- | | | |
|---|--|--------------------------------|
| ⑥ | Estimation of demand for agricultural credit and its effect on employment and income | UN Dixit
A Kumar
Ant Ram |
|---|--|--------------------------------|
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1. Non-linear statistical models for adoption of HYVs in India

The objectives of the project are (i) to develop non-linear statistical models for adoption of HYVs of various foodgrain crops at state level. Modification of the existing statistical theory for auto-correlated errors will also be undertaken, wherever necessary, (ii) to attempt various theoretical generalization 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.

Attempts were made to develop non-linear statistical models that describe the path of adoption of HYVs of rice in different states. The rice growing states considered were: Punjab, Orissa, Haryana, Maharashtra, Bihar, Karnataka, Tamil Nadu, Assam, Madhya Pradesh, Uttar Pradesh, Gujarat, Rajasthan, Himachal Pradesh, West Bengal, Andhra Pradesh, Jammu and Kashmir and Kerala. The area under

HYVs relative to the total area under the rice crop during the year t (y_t) was considered the dependent variable. The general forms of the model that were found to describe the adoption process were :

$$y_t = c - (c - a) \exp(-bt),$$

$$y_t = c / (1 + a \exp(-bt)), \text{ and}$$

$$y_t = a \exp[-b \exp(-ct)]$$

Where a , b , c are constants. Initial values for $t=0$, ceiling values for $t = \infty$ and the rates of growth $1/y \, dy/dt$ were computed for all these states. Further analysis of data to explain the variation in the values of these parameters was in progress.

2. Implications of technological change on input use and output mix in crop production

The objectives of the project are (i) to study the suitability of different types of functions for examining technological change in crop production,

(ii) to examine the effects of technical change on factor share, and (iii) to study the effects of technical change on input use and output mix of crops. The study is undertaken in the state of Uttar Pradesh covering rice and wheat crops in the first phase. The farm level data available under the comprehensive scheme for studying the cost of cultivation of principal crops, from the DES, Ministry of Agriculture will be utilized. Compilation work of the farm level data on wheat for the year 1986-87 was in progress and the input output data of 336 farms on rice for the year 1981-82 has been edited, coded and was being transferred on floppies for statistical analysis.

3. Estimation of economic gains from technological advance in rice production

The project aims (i) to develop an appropriate model for estimating the economic gains from technological advance in rice production, (ii) to examine the historical change in the yield of rice crop across different states due to technological advance, and (iii) to estimate the economic gains across different rice growing states due to new technology in rice production.

The project is based on secondary data. An attempt will be made to develop an empirical frame work for estimating the economic gains from technological advance in rice production. The behavioural change in the yields of rice crop during different periods will be

examined by using spline function and the economic gains from technological advance will be estimated for different rice growing states using the model developed.

4. Testing relative economic efficiency and determination of factor demand and output supply functions for wheat

The objectives of the project are (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 function.

The farm level wheat data of Punjab and Haryana states for the year 1985-86 collected from Directorate of Economics and Statistics, New Delhi were utilised in this study. Necessary softwares were developed and the analysis work was in progress.

5. Study of farmers behaviour towards risk and its impact on cropping pattern, level of resource use and farm income

The project was initiated (i) to study farmers behaviour towards risk with respect to purchased inputs, (ii) to identify the determinants of attitude towards risk for sampled farmers, and (iii) to examine the impact of risk on cropping pattern, level of resource use and farm income.

The analysis of farm level data

collected on various aspects of risks, input use and farming conditions from farmers of Ghaziabad and Alwar districts was in progress.

6. Estimation of demand for and effect of agricultural credit on farm income and employment

The project aims (i) to estimate the

demand for credit on different size of holdings under various farm situations taking into account the risk factor, (ii) to evaluate the effect of credit on income and employment, and (iii) to simulate the models for policy analysis.

The project was initiated recently and the work of collection of secondary data was in progress.

DIVISION OF COMPUTING SCIENCE

Mandate :

- To develop computer software based on modern statistical methods for the analysis of agricultural and animal sciences research data
- To undertake teaching of computer applications in agriculture research
- To conduct adhoc training courses on use of computers in agriculture
- to provide scientific support in research data analysis to research workers

Thrust Areas :

- Development of software for agricultural research data analysis
- Conceptualization and development of expert system and decision support system for agriculture research

Project in operation

No.	Project Title	Project Leader
Development of software for agriculture research		
1.	Development of software for mixed models	IC Sethi

1. Development of software for mixed models

Reviewing the relevant literature the BLUP procedure was adopted for the project. The algorithm of softwares was outlined and the flow-chart for the software was developed, standardized and the models were identified.

Software Development

- Nine programs were developed and a number of existing programs were modified to meet the requirements of users.
- Software was prepared for “Development of A Decision support system for micronutrient management in crops”.

—Software for “Decision support system for cultivation of cotton crop” developed.

Scientific Support in Research Data Analysis

—No. of Ph.D. Scholars : 21
—No. of M.Sc. Scholars : 29
—No. of other research workers : 11

Computing Facilities

The division has a SUPER MINI COSMOS-486. All the six divisional labs of the Institute are linked to the system by Local Area Network (LAN) through ETHERNET Card.

The division continued to provide computing help to the research workers through various labs namely (i) AT—Lab equipped with 4 PC (AT’s) and 16 DT (Dumb Terminals), (ii) XT—Lab equipped with 12 PC (XT’s), (iii) Terminals lab with 20 Dumb Terminals and (iv) Graphics lab with 1 PC (AT) with coloured monitor, 1 PC (XT), A digitiser, mouse and one Laser Printer.

The labs work on both DOS and UNIX operating systems.

The various labs are equipped with following software.

(a) Under DOS

(i) Compilers

Fortran IV
Fortran 77
GW-BASIC
GW-COBOL

PASCAL
C

(ii) Softwares

d Base III
d Base IV
LOTUS 1-2-3
WORD PERFECT
WORD STAR 6.0
SPSS
LINDO
HG (Hardvard Graphics)
SPAR 1
NORTON-Utilities Version
5.0

(b) Under UNIX

(i) Compilers

DCM-FORTRAN
DCM BASIC
LPI PASCAL
SCOUNIX-C

(ii) Software

ORACLE (RDBMS)
SPSS

Computer Utilization

Details of computer utilisation are as under :

(A) P.C. System

—No. of P.C. users : 10,434
—No. of hours of PC use : 13,549

For all the regular and ad-hoc training programs for computer application, conducted by IASRI, P.C.s were used

for practical classes and demonstration purposes.

(B) *Data Entry Unit*

- No. of batches created for recording : 442
- No. of data records created on floppies : 2.90 lacs
- No. of batches created for

transfer from tape to floppies or vice-versa : 2.11 lacs

- No. of records printed : 67, 646
- Total records corrected on floppies : 29,163
- Total records corrected on line : 17,096
- No. of records created on line : 13,031

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 :

- Planning, designing and analysis of experiments planned under AICARP at Cropping Systems Research Centres and on cultivator's fields—5000 on farm units in 40 districts of NARP zones of various states of the country.
- Pilot sample survey for estimating yield and study of cultivation practices of pepper—Sindhudurg (Maharashtra), Kodagu (Karnataka) and Gudalur and Coimbatore (Tamil Nadu)
- Estimation of cost of production of sheep and wool—Tonk (Rajasthan)
- Survey methodology to study economics of keeping goats—Mathura (Uttar Pradesh)
- Pilot sample survey for developing a sampling methodology for estimation of post production losses of milk in rural areas—Rohtak (Haryana)
- Study of farmer's behaviour towards risk and its impact on cropping pattern, level of resource use and farmer income—Alwar (Rajasthan) and Ghaziabad (Uttar Pradesh)
- Pilot sample survey to evolve a sampling methodology for estimation of area and yield of cultivated fodder crops other than berseem and jowar crop, cost of production and cultivation practices thereof—Ghaziabad district (U.P.)
- Pilot survey to study the economics of Angora rabbits, Kullu (H.P.)
- Pilot sample survey for estimating the area under wasteland—Udaipur (Rajasthan)
- Agricultural experiments information systems for animal sciences—NDRI, Karnal

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 these, 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 1992-93, 7 students were admitted to various courses : 3 Ph.D., 2 M.Sc. in (Ag. Stat.) and 2 M.Sc. (Computer Application in Agriculture). Fourteen students : 5 Ph.D. and 7 M.Sc. in Agricultural Statistics and 2 M.Sc. (Computer Application in Agriculture) successfully completed their degree programmes.

Ad-hoc Training Courses

The XVI and XVII short term training courses on 'Use of Computer in Agricultural Research' were organised during Sep 1-15, 1992 and Sep 17-30, 1992 respectively. The XVI course was for scientific/technical personnel from ICAR Institutions located at Delhi. This was attended by 21 scientists/technical personnel from IARI and IASRI. The XVII course was for participants from ICAR Institutes (outside Delhi) and State Agricultural Universities. This was attended by 24 participants.

A valedictory function jointly for the two courses was held on Sep 30, 1992. Shri SN Mathur, Principal Scientist and Course Coordinator presented the report on the training courses. Dr KL Chadha, DDG (Horticulture), ICAR delivered the Valedictory Address and distributed certificates to 45 participants.

The XVIII and XIX short term training courses on 'Use of Computer in Agricultural Research' were organised during Mar 1-12, 1993 and Mar 15-27, 1993 respectively. The XVIII course was for scientific/technical personnel from ICAR Institutions located at Delhi.

This was attended by 25 scientists/technical personnel from IARI and IASRI. The XIX course was for participants from ICAR Institutes (outside Delhi) and State Agricultural Universities. This was attended by 20 participants. Dr. R.K. Pandey, Director, IASRI gave the orientation talk to participants of both the courses.

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 d BASE III Plus application packages. Adequate practice on work on PCs was provided to the trainees. A Valedictory function jointly for the two courses was held on Mar 26, 1993. Dr. R.K. Pandey, gave the Welcome Address and Prof SR Hashim, Adviser (PP), Planning Commission, Government of India delivered the Valedictory Address and distributed certificates to 45 participants.

National Workshop-cum-Seminar

The V Workshop-cum-Seminar on Software Development for Extension Personnel was organised at the instance of the Directorate of Extension, Ministry of Agriculture, Govt. of India during August 24-31. Sh Mahesh Kumar, Scientist (SG), IASRI was the Course Director.

The objective of the Workshop was to provide basic training on the use of

microcomputers and relevant software to the officers of the Monitoring and Evaluation units under Training and Visit system of agricultural extension in various states. The training included BASIC programming language and software packages such as : WORDSTAR, MICROSTAT, LOTUS 1-2-3, d Base III+, PC CARP and SPAR1. The faculty for the Workshop comprised Dr OP Kathuria, Director, Sh SN Mathur, Head, Computing Science Division and all scientists of the Division of Computing Science. The programme comprised 91 lectures and 11 practicals on PCs covering various applications.

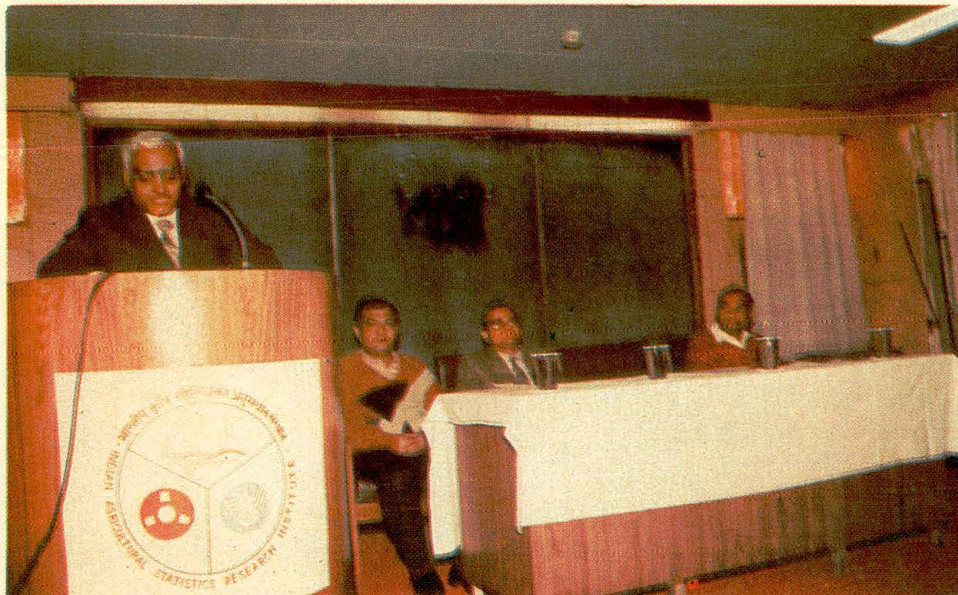
The Workshop was inaugurated by Dr OP Kathuria, Director on August 24. The participants were taken to NIC, New Delhi and were shown the working of a National Computer Network (NIC-NET).

There were 9 participants from 5 states out of which 8 were from Agriculture Directorates and 1 from Animal Husbandry Department. The Valedictory function was held on August 31, in which Dr C Prasad, DDG (AE), ICAR was the Chief Guest. He distributed the certificates and delivered the Valedictory Address.

Refresher Course in Agricultural Statistics

The Refresher Course in Agricultural Statistics was organised for the benefit of scientists and other personnel work-

**SHORT-TERM TRAINING COURSES ON USE OF COMPUTER IN
AGRICULTURAL RESEARCH**



Dr RK Pandey, Director giving the orientation talk to the participants



Dr KL Chadha, DDG (Horticulture), ICAR addressing the participants at the combined Valedictory Function



Dr C Prasad, DDG (AE), ICAR addressing the participants at the Valedictory Function of 'V Workshop-cum-Seminar on Software Development for Extension Personnel'



Dr Randhir Singh, Principal Scientist and Professor (Ag. Stat.) presenting the report on 'V Refresher Course in Agricultural Statistics' at the Valedictory Function

ing in ICAR Institutes and Agricultural Universities.

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, and
- Econometric Theory

The Fifth Refresher Course in Statistics was organised at the Institute from June 2 to August 22. It was attended by 8 participants. The Valedictory Function was held on August 20 in which Dr PV Dehadari, DDG (Fisheries), ICAR was the Chief Guest. Dr OP Kathuria, Director, IASRI welcomed the Chief Guest and gave introductory remarks. Dr Randhir Singh, Professor (Ag Stat) presented the report on refresher course. The Chief Guest delivered the Valedictory Address and distributed the certificates to the participants.

International Training Course

The V International Training Course on 'Techniques of estimation of output of

food crops' was organised at the Indian Agricultural Statistics Research Institute, New Delhi from Feb 6, 1993 to March 20, 1993. The course was jointly funded by the Ministry of External Affairs, Govt. of India under its ITEC programme and Afro-Asian Rural Reconstruction Organisation. Ten participants from 8 different Afro-Asian countries, two each from Egypt and Sudan and one each from Malaysia, Phillipines, Sierra Leone, Ghana, Kenya and India attended the training course. The Training Course was inaugurated by Dr TP Ojha, Dy Director General (Agricultural Engineering), Indian Council of Agricultural Research, New Delhi. The Valedictory function was presided by Dr PN Bhat, Dy Director General (AS), ICAR and the Valedictory Address was delivered by H.E. Mr Ahmed A. Khalil, Secretary General, AARRO. The training programme comprised of lectures on sampling methods and applications, statistical methods, use of PCs, computer languages, storage and marketing system of foodgrains and import and export of foodgrains. Particular emphasis in the training programme was laid on methods of area and yield estimation followed in India for estimating the production of foodgrains. The faculty for the training course was mainly drawn from the Institute and Field Operation Division of National Sample Survey Organisation, New Delhi. Apart from this the faculty was also drawn from various organisations like Indian Agricultural Research Institute, Direc-

torate of Economics and Statistics, Central Statistical Organisation, Ministry of Agriculture, Ministry of Food and Indian Grain Storage Research Institute. The expertise of various senior level retired officers from different organizations was also utilised. Apart from delivering lectures on the subject of area and yield estimation, the participants were also taken to West Bengal and Bihar states for practical demonstration of area and yield estimation in non-land record and land record states.

Visit of Chinese Delegation

A Chinese delegation of six members

who were in India at the invitation of National Academy of Agricultural Sciences, India visited the Institute on April 25, 1992 alongwith Dr NC Ganguli, Secretary, National Academy of Agril. Sciences, India. After showing the Institute film, the Director and Heads of Divisions acquainted the visitors with the activities of the Institute with particular reference to buffalo breeding and dairying. The visitors were also taken to the Computer Centre for providing them a glimpse of the role it is playing in the research and development of agriculture in the country.

Training programmes organised for trainees from other organisations

Sl. No.	Name of programme	Dates	No. of trainees	Sponsoring agency	Lecturers
1	2	3	4	5	6
1.	M. Stat.,	Jun 10	22	CSO, New Delhi	Dr SK Raheja Dr HP Singh Dr VK Gupta
2.	Junior Certificate Course in Statistics-Specialised training in (Ag. Stat.)	Jun 25	3	„	Dr SK Raheja Dr RK Pandey Dr OP Kathuria Dr PR Sreenath Dr HP Singh Sh SN Mathur Dr BS Sharma
3.	Summer Short Course on 'PC based computerised Management and use of Farm-Data in Animal Improvement'	Jul 07	25	NDRI, Karnal	Dr PK Malhotra Dr RC Goyal Sh KC Gupta Sh SK Sublania Sh SL Agarwal Smt Rajni Grover

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



Dr RK Pandey, Director, delivering the Welcome Address at the Inaugural Function



Dr HP Singh, Principal Scientist and Course Co-ordinator presenting the report on the course at the Valedictory Function

1	2	3	4	5	6
4.	Short training course in soil testing	Oct 09	7	Division of Soil Science and Agril. Chemistry, IARI, New Delhi	Dr PK Malhotra Dr RC Goyal Sh KC Gupta Sh SK Sublania Sh SL Agrawal Smt Rajni Grover
5.	M.Sc. (Stat.) students	Jan 11	20	Andhra University, Waltair	Dr RK Pandey Sh OP Dutta
6.	Jr. Certificate Course in Statistics-Specialised training in official statistics and related methodology	Feb 18	24	CSO, New Delhi	Dr RK Pandey Dr PR Sreenath Dr (Smt.) Ranjana Agrawal

Research Fellowships

During 1992-93, 21 M.Sc. and 15 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 15 Ph.D. students 9 received fellowship at the rate of Rs. 1800/- p.m. each in the I and II year and 6 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 to the residential requirements of the trainees and 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 inmates. Hostel mess is run by the students on cooperative basis. The general management of the hostel is vested in the Warden, who is assisted by Prefect and other students. The main activities :

—Annual sports meet of students was organised.

—Election of new Executive Committee for the session 1992-93 was completed at the General Body meeting held during October 1992.

- Annual Day of the Hostel was celebrated on July 2, 1992.
- Diwali, Christmas, New Year Day and Holi were celebrated.
- Students of IASRI receiving M.Sc. and Ph.D. degrees were felicitated jointly by the Director and the faculty of the Institute.
- Cricket match between staff and students was held in January 1993 in which Director, IASRI was the captain of the staff side.
- A new colour T.V. was purchased for Sukhatme Hostel during the year.

Students' Annual Day

The Students' Annual Day was celebrated on July 2, 1992 alongwith the annual day of the Institute. Dr NGP Rao, Chairman, Agricultural Scientists

Recruitment Board was the Chief Guest. Dr SK Raheja, Director, IASRI welcomed the Chief Guest. A Souvenir was brought out by students on the occasion. Smt. Kamla Rao distributed prizes to the students for various athletics, team and other sports events. Dr BS Sharma, Warden gave a vote of thanks. The function was followed by an entertainment programme organised by the students.

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 79 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 Leena Mehendale, Director, National Institute of Naturopathy, Pune	Treatment of Common ailments in naturopathy
2.	Prof AL Nagar, Pro-Vice Chancellor, University of Delhi, Delhi	Approximation of distribution of Durbin Watson statistics
3.	Prof A Dey, Professor, ISI, Delhi Centre, New Delhi	Optimal block designs under re- source constraints

STUDENTS' ANNUAL DAY FUNCTION



11. Dr SK Raheja, Director welcoming the Chief Guest



12. Dr NGP Rao, Chairman, Agricultural Scientists Recruitment Board releasing the Souvenir

1	2	3
4.	Prof JS Rustagi, Professor & Chairman Emeritus of the Ohio- State University, U.S.A.	Statistics for quality improve- ment in management
5.	Dr JN Srivastava, Professor, Department of Statistics, Colorado State University, Fort Collins, Colorado, U.S.A.	Some pre-eminent estimators in finite population sampling
6.	Dr Jagbir Singh, Professor, Temple University, Philadelphia, U.S.A.	Survival analysis methods
7.	Dr MN Das, Former Director, IASRI, New Delhi	On support of sampling designs and some sampling techniques
8.	Dr VP Singh, AMPC, GROUP IBM, Corporation San Jose, California, U.S.A.	Automated design of experiment package
9.	Dr Aloke Dey, Professor, I.S.I., Delhi Centre, New Delhi	Non-conventional proofs of some matrix results

Tenth National Conference of Agricultural Research Statisticians

Tenth National Conference of Agricultural Research Statisticians was held at Indian Veterinary Research Institute, Izatnagar from November 2-4, 1992. The main theme of the Conference was "Current Statistical Research Problems in Agricultural Statistics and Computer

Application". In the Inaugural Function, Dr DS Balain, Director, IVRI, Izatnagar gave the Welcome Remarks and Dr SK Raheja, Director, IASRI delivered the Key Note Address. Dr PN Bhatt, Deputy Director General (AS), ICAR was the Chief Guest and inaugurated the Conference. Apart from inaugural session, a special session on action taken on the recommendations

made during the last conference and plenary session, there were following four Technical Sessions :

- Current Statistical Research Problems in Crop Sciences and Agro-Forestry,
- Current Statistical Research Problems in Animal Sciences and Fisheries,
- Teaching of Agricultural Statistics, and
- Computer Application in Agriculture.

Shri MG Sardana, former Director General, Central Statistical Organisation, New Delhi, Dr BN Tyagi, former Director of Agricultural Statistics, Lucknow, Dr AK Nigam, UGC Professor of Statistics and Honorary Director, Institute of Applied Statistics and Development Studies, Lucknow and Dr Alope Dey, Professor of Statistics, ISI, New Delhi attended the conference as special invitees and chaired/co-chaired different sessions. About 60 Statisticians from ICAR Institutes and State Agricultural Universities participated in the deliberation of the conference.

Recommendations that emerged are :

A. Agricultural Statistics

(i) *Crop Sciences and Agro-Forestry*

1. To prepare a catalogue of new designs obtained from time to time on a regular and continuing basis and to identify designs which are optimal and robust against various disturbances.

(Action : ICAR Institutes and SAUs)

2. In inter-cropping and agro-forestry experiments, one gets multiple responses, but all the responses are not available on all the units. In view of this, efficient designs and procedures of analysis may be developed for inter-cropping and agro-forestry experiments.

(Action : ICAR Institutes and SAUs)

3. To develop suitable procedure of analysis of data from experiments on grassland in view of the large plot size and few replications.

(Action : IASRI and IGFRI)

4. Concerted efforts are required to develop more efficient designs and procedure of analysis of experiments for cropping systems research, long-term and rotational experiments.

(Action : IASRI and AICRPs)

5. To evolve suitable sampling techniques and to develop estimation procedures for obtaining small area statistics of crop yields.

(Action : IASRI)

6. To undertake methodological investigations on the use of data obtained by remote sensing techniques in estimation of area under forestry cover and flood affected areas.

(Action : IASRI)

7. To evolve suitable methodology for quick estimation of crop losses due to vagaries of weather like untimely rain, floods, hailstorm, etc.
(Action : IASRI)
8. The researchers and academicians should be encouraged to undertake deeper analysis of the data collected under the agricultural surveys conducted in India.
(Action : ICAR Institutes and SAUs)
9. To undertake studies for evaluation of the effect of infrastructural changes on crop production.
(Action : ICAR Institutes and SAUs)
10. To develop a unified approach for obtaining objective preharvest forecasts crop yields.
(Action : IASRI)
11. Efforts may be made to provide a forum for a closer interaction on a regular basis between Agricultural Statisticians associated with Design and Analysis of Experiments as well as Sample Surveys.
(Action : IASRI)
12. *Development of survey sampling methodologies for estimation of acreage and production for areas under multiple cropping systems, tuber crop (other than potato), condiments, spices and other important minor crops.
(Action : IASRI, CPCRI and CTCRI)
13. *Development of survey sampling methodology for estimation of area and production of field crops in hilly areas.
(Action : IASRI)
- (ii) *Animal Sciences and Fisheries*
14. Use of small area estimation, regression and categorical data analysis technique in sample surveys relating to livestock should be explored and examined.
(Action : IASRI)
15. Problems pertaining to estimation, input-output relationship, price spread and losses in fish trading should be examined.
(Action : ICAR Institutes and SAUs)
16. There is an urgent need to generate accurate livestock census data on breed wise for upgrading indigenous stock.
(Action : IASRI)
17. There is urgent need to build reliable database for dairy cattle under field conditions and its use in evaluation and selection of individual
(Action : NDRI, IVRI, AICRPS and all other concerned)

18. Development of suitable methodology under Indian conditions to study the incidence, morbidity and mortality rates for various animal diseases should be attempted.
(Action : IASRI, IVRI and SAUs)
19. Use of modern statistical theory such as mixed model analysis technique, response surface design, multivariate analysis of experiments with multiple responses, analysis of repeated measurements, etc. should be encouraged.
(Action : IASRI and concerned ICAR Institutes)
20. Work relating to development and standardisation of sampling procedures for serological tests and estimation of quantity of organism in different animal products may be taken up.
(Action : NDRI and IVRI)
21. Simulation studies to study the properties of estimates of genetic parameters may be carried out.
(Action : IASRI)
22. Attempts should be made for the development of newer methodologies for estimation of genetic components of variance and genetic parameters.
(Action : IASRI)
23. *Evaluation of various selection strategies involving MOET technology to find optimum strategy.
(Action : All ICAR Institutes and SAUs)
24. *Development of appropriate methodologies in the area of "Surveillance of important animal diseases" for adjustment for time lag in case reporting; imputation of non-observations, detection of changes in patterns of occurrence in the incidence of disease, description of disease trends over time, identifying aberrations in the occurrence of disease and for assessing the impact of health programmes.
(Action : All ICAR Institutes and SAUs)
25. *Study of the response to selection in finite populations and the effect of linkage on homozygosity of a population under various inbreeding systems through simulation approach.
(Action : IASRI)
26. *Investigations into the sampling techniques for determining area and production of fodder and grasses in hilly tracts.
(Action : IASRI)
27. *Development of methodology for estimation of optimum stocking rate of animals for the rangelands of western Rajasthan.
(Action : NDRI and CAZRI)
- B. Computer Application in Agriculture*
1. Agricultural Statisticians may be provided with the necessary com-

puter software so as to enable them to utilize the hardware efficiently.

(Action : ICAR Institutes and SAUs)

2. Training programs may be organised on regular basis for the benefit of Agricultural Scientists using computers.

(Action : IASRI)

3. Qualified and trained personnel in computers may be appointed to main computer centres at ICAR Institutes and SAUs.

(Action : ICAR Institutes and SAUs)

4. Agricultural Statisticians may keep themselves abreast of the fast changing computer technology and exchange information on softwares, their potentialities, and their updates.

(Action : ICAR Institutes and SAUs)

5. M.Sc. degree program in Computer Application in Agriculture has been there since 1985. Similar programs of M.Sc. in Computer Application in Veterinary Sciences, Dairy Sciences etc. may also be initiated.

(Action : IVRI and NDRI)

6. The work of developing databases may be taken up by those who produce and generate the data for

which standardised formats may be made available by IASRI.

(Action : ICAR Institutes and SAUs)

7. Data from research projects, on completion of projects, may be stored in data base formats for retrieval at a future date.

(Action : ICAR Institutes and SAUs)

8. Computer Hardware may be equipped with 5.25" as well as 3.5" Floppy disk drive to enable the statisticians to meet the newly developed technology in their field.

(Action : ICAR Institutes and SAUs)

9. For making use of international databases which are available on Compact Discs (CD), necessary Compact Disc Read Only Memory (CD ROM) hardware may be procured by Computer Centres at ICAR Institutes and SAUs.

(Action : ICAR Institutes and SAUs)

10. A workshop on DBMS may be organized by IASRI.

(Action : IASRI)

C. Teaching of Agricultural Statistics

1. Eligibility for admission to M.Sc. course in Agricultural Statistics should be B.Sc. (Hons.) in Statistics.

(Action : IASRI and SAUs)

2. The curricula for M.Sc. and Ph.D. courses should be revised periodically. Some new topics like Non-linear regression modelling, Density estimation, Categorical data analysis, Jackknife and Bootstrap techniques, Projection pursuit methods be included in the syllabus.
(Action : IASRI and SAUs)
3. Training for teachers of agricultural statistics in the newly developing areas be periodically organised.
(Action : IASRI)
4. The practical aspects of various statistical techniques need to be highlighted in all the teaching programmes.
(Action : IASRI and SAUs)
5. There should be a separate Department of Statistics in every Agricultural University.
(Action : SAUs)
6. Best teacher's award in Agricultural Universities be limited to those teachers who are devoting at least two-thirds time to teaching.
(Action : SAUs)
7. Statistical divisions in the ICAR Institutes/Statistical Departments in SAUs need to have adequate computing facilities along with relevant software packages. Courses on 'Use of computer' be introduced for M.Sc./Ph.D. students.
(Action : ICAR Institutes and SAUs)
8. *To bridge communication gap between the Agricultural Statisticians and Animal Sciences and Fishery Scientists, short-term training courses in agriculture and animal sciences including fisheries may be planned and organised for statisticians in ICAR Institutes and Agricultural Universities.
(Action : ICAR Institutes and SAUs)
9. *Students majoring in statistics should be actively involved in statistical consultancy work for equipping them with sound background in application of statistical techniques to real life problems in agriculture.
(Action : IASRI and other ICAR Institutes and SAUs)
10. *Exchange of research scientists and teachers in statistics and computer sciences amongst different Agricultural Universities and ICAR Institutes may be encouraged.
(Action : ICAR Institutes and SAUs)

- 11 *To meet the emerging research challenges in agricultural statistics and computer application departments of statistics in Agricultural Universities/ ICAR Institutes should be adequately strengthened and such departments be created if not already existing.

(Action : ICAR Institutes and SAUs)

- 12 *Summer Institutes/Schools in advanced statistical methods may be organised at IASRI and SAUs in specialized areas.

(Action : ICAR, IASRI and SAUs)

Advisory Services

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 Institutes, universities and other research organisations in planning of their experimental investigations and in processing and analysis of data on the computer.

*Recommendations made at earlier Conference.

PUBLICATIONS

The major publications of the Institute comprised over 45 papers and popular articles the details of which are as follow :

Research Papers Published

1. AGGARWAL, RC and KATHURIA, OP (1992). The effect of two stage sampling on OLS estimators. *Jour. Ind. Soc. Agri. Statist.*, 44 (3) : 227-35.
2. ANT RAM and ASHOK KUMAR (1990). Trends and acreage response of groundnut in Gujarat, *Anvesak*, 20 (1-2) : 135-141.
3. ARYA, SN and BHATIA, DK (1992). Incidence of some livestock diseases in Tamil Nadu. *Indian J. Anim. Res.*, 26 (1) : 41-43.
4. ASHOK KUMAR and MOLANA, H (1992). Regional disparities in Indian Agriculture-some empirical evidence, *Centre for Development Studies occasional paper No. 10, University of Glasgow (UK)*.
5. BHATIA, DK; NIGAM, AK; BAJPAI, SN and MATHUR, DC (1992). Statistical evaluation of animal nutrition experiments. *Indian J. Anim. Res.*, 26 (1) : 20-24.
6. BHATIA, VK (1992). On the modified regression analysis for assessing stability of crop varieties. *Annals Agril. Res.*, 12 (4) : 372-77.
7. BHATIA, VK (1992). A comparison of two methods for assessing stability of crop varieties. *Annals Agril. Res.*, 13 (1) : 43-46.
8. BHATIA, VK; NARAIN, PREM and MALHOTRA, PK (1992). Genetic parameters of stayability of different categories of dairy animals. *Jour. Ind. Soc. Agri. Statist.*, 44 (2) : 122-137.
9. CHAUDHARY, BL and BHATIA, AK (1992). A study on mixed Vs intercropping for wheat and mustard. *Annals Agril. Res.*, 13 (2) : 141-44.

10. CHAWLA, GC (1992). Two factor analysis of asymmetrical type of change over designs. *Annals Agri. Res.*, 13 (4) : 378-84.
11. GUPTA, VK and SRIVASTAVA, R (1992). Investigations on robustness of block design against missing observations. *Sankhya*, 54 (B-1): 100-105.
12. JAIN, RC and DAS, MN (1991). Efficiency balanced block designs using orthogonal arrays. *Cal. Stat. Assoc. Bull.*, 41 (161-164) : 173-178.
13. JAIN RC; AGRAWAL, RANJANA and SINGH, KN (1992). A within year growth model for crop yield forecasting. *Biom. J.*, 34 (7) : 789-798.
14. KATHURIA, OP (1992). Agricultural statistics system in India —A critical appraisal. *Rural Reconstruction*, 15 (2) : 63-73.
15. KAUR, RAJINDER (1991). Role of rhizobium culture in nitrogen management in legume cereal rotation. *Annals Agril. Res.*, 12 (4) : 388-393.
16. KUTAULA, SS (1991). Application of stochastic frontier for the measurement of technical efficiency of paddy crop grown under land-reclamation technology. *Agril. Eco. Res. Review*, 4 (2) : 106-118.
17. KUTAULA, SS (1992). Resource use efficiency and its relevance in agriculture. *Special volume on 'Agriculture in Nineties : Challenges and Research Needs' of Indian Soc. Agri. Sci.* 269-275.
18. MAHAJAN, V; KHERA, AS; PAL, SS and GUPTA, AS (1992). Combining ability of plant height and leaves gained per day in maize. *J. Crop Research*, 5 (2) : 391-394.
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- socio-economic development in Orissa. *Yojana*, 36 (23) : 9-12.
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Research Papers Accepted for Publication

1. JAIN R C; AGRAWAL RANJANA and SINGH, KN—A within year growth model for crop yield forecasting. *Biom. J.*
2. KAUR, AP and BHATIA, VK—Empirical study of different estimators of heritability covariance. *Indian J. Dairy Science.*
3. KAUR, RAJINDER (1993). Response of rice to azola and nitrogen application. *Annals Agril. Res.*, 14 (2).
4. MEHROTRA, PC. A scheme for post-stratification in two-stage sampling. *Jour. Ind. Soc. Agri. Statist.*
5. PRAJNESHU and SHARMA, VK. A non-linear statistical

- model for adoption of high yielding varieties in Punjab. *Indian J. Applied Statist.*
6. RAI, ANIL and KATHURIA, OP. An evaluation of modified chi-square test statistics for survey data. *Jour. Ind. Soc. Agri. Statist.*
 7. RAI, T; BATRA, MS; MOHAN LAL and PATHAK, GM. Economic return through intercropping in chikoo orchard *Annals Agri. Res.*
 8. RANA, PS. Compartment models with stochastic turn over rates *J. Acta Ciencia Indica*
 9. SETHI, IC and JAIN, JP. Closed and open nucleus breeding schemes for the genetic improvement of dairy cattle. *Ind. J. Animal Sciences.*
 10. SETHI, IC and JAIN, JP. Progeny using with multiple evaluation and embryo transfer in cattle. *Ind. J. Anim. Sci.*
 11. SETHI, IC and JAIN, JP. Preliminary selection of sires on partial records in dairy cattle. *Biom. J.*
 12. SETHI, IC and JAIN, JP. Sire Evaluation on partial records in dairy cattle. *Ind. J. Animal Sciences.*
 13. SHANTI SARUP; MAHAJAN, VK and PANDEY, RK. Trends, growth and technological change in oilseeds in Karnataka. *Margin.*
 14. SHARMA, VK. Estimation of seemingly unrelated regressions with unequal numbers of observations. *Sankhya, Series, B.*
 15. WALIA, SS and SINGH, BALBIR (1992). An appropriate forecasting model for marine fish catch. *Punjab Fisheries Bulletin*, 16 (2).
- Research Projects Reports**
- A within year growth model for pre-harvest forecasting of crop yields (1991)
by RC Jain, Ranjana Agrawal and KN Singh
 - Pilot sample survey for estimation of production of hides and skins—Tamil Nadu (1992)
by JP Goyal, JS Maini, KB Singh and RS Khatri
 - Pilot sample survey to evolve a suitable sampling methodology for estimation of area under freshwater ponds/tanks and fish catch from them in a region of Orissa (1992)
by OP Kathuria, HVL Bathla and KK Kher

—Statistical evaluation of fertilizer requirement according to date of sowing (1992)

by Rajinder Kaur, Ajit Kaur, Madan Mohan and PN Bhargava

—Annual report of all India coordinated research project on long term fertilizer experiments for the years 1987-88 and 1988-89 (1992)

by KKM Nambiar, PN Soni, MR Vats, DK Sehgal and DK Mehta

—A study of employment and income of small farmers and agricultural labour (1992)

by Randhir Singh and AK Srivastava

—Pilot sample survey to estimate the acreage under mulberry and production of mulberry leaves and reeling cocoons in Bangalore district (1989)

by TB Jain, OP Kathuria, AK Srivastava and N Nataraja.

Dissertations Approved

Ph.D. (Agri. Economics)

Virupaxappa Kiresur—Technological dualism in agriculture : An econometric analysis of diffusion of technology of Jowar production in Karnataka

Technological dualism is an inherent

characteristic of underdeveloped countries. Introduction of new varieties of crops in the mid-sixties ushered new hopes and dimensions in Indian agriculture. The pattern of diffusion of crop varieties was not uniform but varied sharply among crops and across space leading to unequal distribution of income. Jowar is an important crop of Karnataka state and the present study is an attempt to examine the growth and variation of diffusion of jowar production technology across the districts as well as to investigate adoption of modern technology. The economic models and statistical techniques used in the study are the logistic growth function, discriminant function, log-linear regression models and decomposition models based on production function logit models. The study indicated wide variation in the diffusion of technology across the major jowar growing districts. This might aggravate the already existing problem of inequities in income distribution. The observed level of diffusion of modern technology exhibited sharp differences across the districts as indicated by the analysis of variance. Also there was a wide variation in the estimated logistic parameter of diffusion across the district. The structural break in the production response due to introduction of modern varieties was of neutral type. This implies that the technological change in jowar production has left the factor proportion almost unchanged. Productivity differences between two techn-

ologies were predominantly due to technological differences. The probability that a farmer would adopt the modern technology was positively and significantly influenced by the social participation index of the farmer. The modern varieties were perceived by the farmers to be inferior to the traditional varieties of jowar with respect to grain and fodder qualities. Therefore, while developing the second and third generation hybrids and varieties, these quality aspects have to be taken care of by the crop improvement researches so that the taste and preferences of farmers and their fodder requirement will be met by the new varieties.

(Guide : Dr RK Pandey)

M.Sc (Ag. Stat.)

1. IBRAHIM, AI—Use of remote sensing data in a Markov Chain model for crop yield forecasting

Forecasting of crop yields is a formidable challenge. Most of available models are based on regression approach with least square technique for estimating the parameters. However the advent of remote sensing technology has opened new visits in the study of earth resources, and the multivariate spectral data offers good advantages in crop identification and monitoring crop growth. Moreover the spectral data in the form of vegetation indices observed at specific times during the crop growth have been empirically evaluated to dis-

criminate vegetation vigour and to bear good correlation with yield.

In the present study an attempt is made to investigate the utility of the multivariate spectral data taken at selected intervals during the intermediate growth period of the crop, in a Markov Chain model to forecast crop yield and to improve upon the existing forecasting models.

The spectral data observed through a hand-held spectral radiometer from an actual field experiment conducted in the experimental plots of IARI during 1986 for wheat crop at fortnightly intervals during the growth process has been used. A simulation study based on a stochastic model has been carried out making use of spectral parameters observed at the different growth stages alongwith the observed yield data.

The Normalized Difference vegetation Indices obtained from the spectral observations have been used as predictor variables of yield, their quartiles at each defined stage of growth have been used to stratify the crop condition into homogeneous vegetation vigour classes.

A Markov Chain model has been developed based on the available spectral information. The transition probability matrices as well as the predicted yield distribution for different stages have been obtained from the model. The predicted yield forecast model has also been compared to a conventional

model based on regression approach with the same set of input variables.

(Guide : Dr Randhir Singh)

2. VIJAYA, R—Some investigations on changeover designs

Design in which each experimental unit receives a sequence of several treatments in successive periods are known as change-over designs (COD) or 'cross-over designs' or repeated measurement designs'. In an experiment involving COD, the effects of some treatments continue even after application of the treatments is discontinued. As a result, the effect of a given treatment is influenced by what is called carry-over or residual effect of the previous treatments. In the present investigation, we have confined ourselves to the designs which take only the first residual effects into account. In one part of thesis, analysis of change-over designs with time trend has been studied. When a number of periods are involved in an experiment, the possibility of a trend exhibited by observations over periods may not be ignored. If the trend in the period means is analysed into its linear, quadratic and higher order degree components, the variance from unit to unit of the linear component may be substantially large than that of the other components. The present study deals with the analysis of COD's by incorporating the linear trend component in the model along with an illustration using hypothetical data. The linear trend component has been obtain-

ed for various classes of change-over designs and a general method for testing the time trend is also presented.

In second part of the thesis some important two-treatment change-over designs available in literature were studied with a view to improve the efficiency of estimation of direct, residual and cumulative effects contrasts, when the observations follow a specific covariance structure. The first period in COD's does not contain any residual effects. As a result, the period effects and residual effects become non-orthogonal. By inserting residual effects in the first period, this non-orthogonality may be eliminated. This may be done by introducing a 'preperiod' or an 'initial period' with a specific set of treatments, before the first period. The two-treatment COD's have been studied here alongwith a pre-period. It has been observed that the most optimal two period design among all the designs discussed is :

	Units			
	1	2	3	4
Pre period	A	B	B	A
Periods	I A	B	A	B
	II B	A	A	B

In 3-period designs, the following designs are found to be optimal for estimating contrasts among direct, residual and cumulative effects

		Units			
		1	2	3	4
Pre period	B	A	A	B	
Periods	I	A	B	A	B
	II	A	B	B	A
	III	B	A	B	A

		Units			
		1	2	3	4
Pre period	A	B	A	B	
Periods	I	A	B	A	B
	II	B	A	B	A
	III	B	A	A	B

For estimating cumulative effects contrasts, the optimal design is :

		Units	
		1	2
Pre period		A	B
Periods	I	A	B
	II	B	A
	III	B	A

Among 4-period cases, the design given below is optimal. Infact, this design is found to be optimal among all the designs :

		Units	
		1	2
Pre period		A	B
Periods	I	A	B
	II	B	A
	III	B	A
	IV	B	A

(Guide : Dr VK Sharma)

3. DEVAS, VIPUL—Some investigations on the estimation of systems of seemingly unrelated regression equations.

Systems of seemingly unrelated regression equations have been advantageously used in analysing the data from many fields of research such as agriculture, industry, social and biological sciences. A comprehensive upto-date survey of literature on the subject has been presented. An attempt has been made to study the estimation of SURE models when number of observations on the different equations were unequal. Specifically estimation procedure for two equation and three equation models were developed for particular situations. The efficient coefficient estimates based on known disturbance covariance matrix have been derived.

It is often the case that either data based or non data based prior information suggests certain restrictions on the regression parameters of the SURE model. Accordingly, an attempt was made to estimate the parameters of two-equation model when both the equations were subjected to linear restrictions on the parameters. An efficient estimator was proposed alongwith its covariance matrix for the case of known disturbance covariance matrix. Two particular cases of the model have been discussed which pertain to linear restrictions on one of the equations of the model. Finally, the specification bias on the estimation of the seemingly unrelated regression equation model was examined. The case of

inclusion of irrelevant variables was investigated and the results showed that though estimators were unbiased, yet their efficiencies decreased.

In case of unknown disturbance covariance matrices in all estimation problems dealt with, the coefficients estimates were consistent and asymptotically efficient when consistently estimated disturbance covariance matrices were used.

(Guide : Dr VK Sharma)

4. JAYASENKAR J—Use of bootstrap technique for variance estimation of heritability estimators

Although a number of estimators have been proposed in literature for the estimation of heritability but there is still a need for a dependable estimator of its precision. With this background, this study is an attempt to find out a reliable estimate of standard error of the heritability using the application of analytical procedure 'bootstrap'. The bootstrap technique was carried on the data generated by computer for different values of population parameters. From every data set thus generated 100 bootstrap replications were taken. The results obtained from simulated data as well as from bootstrap samples, it is seen that in almost all the cases, the measure of central tendency of the estimates of heritability (whether based on mean or median) is very close to the estimated value of heritability from the simulated

data rather than population parameters. This clearly shows that bootstrap is not the appropriate technique for getting a close estimate of the population parameter. It only depends upon the original sample considered for generating different bootstrap samples. Whereas on the other hand, it is observed that value of the standard error based on the adequate number of bootstrap samples is very close to the true value of standard error. Thus the closeness of the bootstrap estimates to the expected values and the consistency of their performance irrespective of the nature of sample increase the amount of dependency upon the method of bootstrapping.

(Guide : Dr VK Bhatia)

5. DHANDAPANI, A—On estimating the distribution function and median

Estimation of distribution function is useful in estimation of quartiles. Median is one of the quartiles and is quite often useful as a measure of central tendency. It is not affected by extreme values. Sometimes, interest lies in other quartiles when one is interested in extreme values. Recently there is a growing awareness and interest in the estimation of distribution functions particularly in the context of sampling from finite population.

In the present dissertation, an attempt has been made to critically review the existing literature on estimating the

distribution function and median. A comparative study for various estimators of distribution function available in the literature is also made on the basis of an empirical study. The corresponding problem of median estimation is also studied.

It is observed that the design-model estimator due to Rao (1990) is efficient under non-EPSEM designs. Among other estimators, the difference estimator is to be preferred. Among the median estimators, the ratio estimator may be preferred over difference estimator. But if y 's and x 's are not correlated well then these estimators may perform badly. In such cases, the position or stratification estimator may be preferred.

(Guide : Dr AK Srivastava)

6. AHMED, TAUQEER—An empirical investigation on estimation of crop yield at block level

For estimating the average crop yield at block level, alternative estimators have been tried using simple random sampling, double sampling ratio and double sampling regression methods of estimation with farmer's eye estimation as the auxiliary variable. The yield of the chosen crop is estimated by the farmer's eye appraisal from a larger sampling while from a sub-sample of the fields the yield is estimated physically by method of crop cutting. Farmer's eye estimate were taken one week prior to the harvest of the crop. Besides information on farmer's estimate information on area of the fields is also available.

The correlation between crop cut estimate and (i) farmer's eye estimate (ii) area of the fields are found to be positive and significant. These information have been utilized as auxiliary variable in improving the precision of the estimates.

In the present investigation, various alternative, namely, simple arithmetic mean, double sampling ratio estimator, double sampling regression estimator, multivariate ratio and regression estimators in case of double sampling for estimating average crop yield at block level have been proposed. The efficiencies of these estimators have been compared to each other.

It has been observed that the double sampling regression estimator, multivariate ratio estimator and multivariate regression estimator using double sampling are having less standard error in comparison to other estimators. Multivariate ratio estimator and multivariate regression estimator using double sampling are performing better than the double sampling ratio estimator and double sampling regression estimator using auxiliary variable. Double sampling ratio estimator and double sampling regression estimator using farmer's eye estimate as auxiliary variable are performing better than the double sampling ratio and double sampling regression estimators using area of the fields as auxiliary variable respectively. Among all the estimators multivariate regression estimator using double sampling is the most efficient estimator.

Different types of linear models have been fitted in the case of farmer's eye estimate as well as crop cut estimate separately. It has been observed that the heteroscedastic linear model with intercept term was the best fitted model. On the basis of model fitting it has been observed that farmer's eye estimate is better than the crop cut estimate at block level. Graphs have been plotted in case of farmer's eye estimate as well as crop cut estimate. On the basis of graphs presented it has been observed that the farmer's eye estimate is better than the crop cut estimate at block level.

(Guide : Dr OP Kathuria)

M.Sc. (CAA)

1. KUMAR, AVNISH—Development of a decision support system for micronutrient management in crops

Decision support systems (DSSs) are interactive computerbased systems that utilize data and models for aiding an organisational decision maker in semi-structured problems.

Both DSSs and expert systems (ESs) enhance human decision making. But they are fundamentally different in their philosophies and approaches. ESs replace human decision makers while DSSs provide intellectual support to potential decision makers.

Micronutrients management is very important for successful crop cultivation and crops show spectacular response to micronutrient fertilization. In the present

system three times of decision making were considered for micronutrient management in crops and based on this three subsystems were developed. The systems made use of expert system techniques.

The subsystem based on laboratory test data makes use of critical limits for various extractants to make decision. Rules of the form if-then-else were used in the system.

The subsystem based on factors affecting availability of micronutrients in soils makes use of data about certain soil features such as pH, texture, organic matter, moisture etc. to make decisions. The statistical approach of induction was used in the subsystem. In this approach a scoring function was assigned to each micronutrient and decisions were made based on score of a soil for a micronutrient.

The subsystem based on deficiency symptoms makes use of visible deficiency symptoms in respect of micronutrients. The techniques of induction of decision trees was used in the subsystem.

The system was programmed in C programming language. A modular approach of programming was taken. In this approach, functions are written in separate files which are included in main module.

The system is a menu driven/user friendly software which can be executed on microcomputer having DOS environ-

ment by typing name of execution file "micmain" on DOS prompt. Menues for accepting data are displayed and finally micronutrient-fertilization measures are suggested if deficiency of a micronutrient is detected.

(Guide : Sh SN Mathur)

2. ANAND, N—Decision support system for cultivation of cotton crops

Presently the system has been developed by taking data for cotton crop from Tamil Nadu state. The DSS de-

veloped shall provide help to the farmers on making decisions on the following :

- To select a cotton crop variety for a given location based on a particular season.
- To give information about agronomic practices to be followed viz. spacings, seed rate, fertilizer requirements and dates for irrigation scheduling.
- To provide expert opinion about insect-pests and diseases management in the cultivation of cotton crop.

(Guide : Sh OP Dutta)

SEMINARS/WORKSHOPS/SYMPOSIA AND CONFERENCES ATTENDED BY THE SCIENTISTS

Sl. No.	Names of the Scientists	Programme Title	Place	Period
1	2	3	4	5
1.	Sh RS Khatri	The National Seminar on 'Export of Agricultural Commodities 2000 AD-A perspective' organized by Farmer's Education and Welfare Society	New Delhi	May 25-26
2.	Dr SK Raheja Dr PR Sreenath Sh KC Bhatnagar Smt Rajinder Kaur	The 20th Annual Workshop of the Project Directorate for the Cropping Systems Research	TNAU, Coimbatore (TN)	June 01-04
3.	Dr Jagbir Singh Sh GL Khurana	National Seminar on 'Agricultural Policy Frame' organised by Federation of Agricultural and Allied Association	IASRI, New Delhi	June 08
4.	Dr VK Bhatia	Workshop on 'Meaningful Learning as a Communication Process'	NAARM, Hyderabad	July 07-10
5.	Sh SS Srivastava	Workshop on 'Library and Information Management'	DRTC, Bangalore	Aug 07-09
6.	Dr BS Sharma Sh SD Wahi	The National Seminar on 'Animal Genetics and Breeding Research and Education-Present Status and Future Thrusts'	IVRI, Izatnagar	Oct 12-13

1	2	3	4	5
7.	Dr RK Pandey	National Symposium on 'Minimising and Sustaining Crop and Animal Productivity by Modern Techniques' organised by Indian Society for Nuclear Techniques in Agriculture and Biology	BHU, Varanasi	Oct 14-17
8.	Dr SK Raheja* Dr PR Sreenath** Dr HP Singh** Sh SN Mathur** Dr Prajneshu*** Dr AK Srivastava** Sh R Gopalan*** Dr Randhir Singh** Dr (Smt) Ranjana Agrawal** Sh TB Jain*** Dr VK Gupta*** Dr VK Bhatia***	10th National Conference of Agricultural Research Statisticians	IVRI, Izatnagar	Nov 02-04
9.	Dr RK Pandey Dr SK Raheja	National Convention on 'Agricultural Policy and Intellectual Property Rights in Agriculture' organised by ARS Forum	IARI, New Delhi	Nov 16-18
10.	Dr RC Jain	National Symposium on 'Remote Sensing for Sustainable Development'	RSAC, Lucknow	Nov 17-19
11.	Dr RK Pandey Dr VK Sharma	Annual Seminar on Fertilizer and Food Security' organised by Fertilizer Association of India	Ashoka Hotel, New Delhi	Dec 10-12

* Delivered the Keynote Address and chaired a Technical Session and the Plenary Session.

** Presented Discussion Paper in a Technical Session.

*** Acted as Rapporteur in a Technical Session.

1	2	3	4	5
12.	Dr (Smt) Ranjana Agrawal Dr HVL Bathla Dr VK Gupta Dr GC Chawla Dr PS Rana	Workshop on 'Generalized Inverses'	ISI, New Delhi	Dec 11-16
13.	Dr PR Sreenath Sh DK Mehta Sh MR Vats Sh DK Sehgal	XV Workshop of All India Coordinated Research Project on Long Term Fertilizer Experiments'	IARI, New Delhi	Dec 14-17
14.	Sh MR Vats	Seminar on 'Long term nutrient management strategy for sustainable productivity of rice based on cropping systems jointly organised by IARI and ICAR	IARI, New Delhi	Dec 16-17
15.	Dr PR Sreenath Dr AK Srivastava Dr Randhir Singh Dr (Smt) Ranjana Agrawal Dr VK Gupta Dr VK Bhatia Dr KK Tyagi Dr PS Rana Dr Jagbir Singh	VII International Conference on 'Multivariate Analysis'	Delhi University, Delhi	Dec 18-23
16.	Dr RK Pandey	52nd Annual Conference of Indian Society of Agricultural Economics	TNAU, Coimbatore	Dec 21-23
17.	Dr HP Singh	Symposium on 'Future Thrust of Camels Research in India'	NRCC, Bikaner	Jan 31

1	2	3	4	5
18.	Dr RC Goyal Sh RS Khatri	The National Workshop on Information System for Livestock Research and Development	CSWRI, Avikanagar	Feb 01-03
19.	Sh R Gopalan Dr Shivtar Singh Dr VK Bhatia Sh SD Wahi Sh GL Khurana Sh Satya Pal Sh T Rai Sh Madan Mohan	The 46th Annual Con- ference of Indian Society of Agricultural Statistics	OUAT, Bhubane- shwar	Feb 20-22
20.	Dr RK Pandey Dr VK Sharma Sh Shanti Sarup	First National Conference on Agricultural Policy in the context of New Economic Policy organized by 'Economics Research Association'	IARI, New Delhi	Feb 24-25
21.	Dr PR Sreenath	Seminar on 'Agroforestry in 2000 AD for the Semi- Arid and Arid Tropics'	NRCAF, Jhansi	Mar 12-13

PAPERS PRESENTED AT WORKSHOPS/SYMPOSIA AND CONFERENCES

Sl. No.	Author(s)	Paper Title	Programme Title	Venue	Period
1	2	3	4	5	6
1.	Raheja, SK Bhatnagar, KC Sreenath, PR Bhatia, AK	Statistical aspects in the design and layout of experiments under 'On Farm Research' programme	The 20th Annual Workshop of the Project Directorate for the Cropping Systems Research	TNAU, Coimbatore	June, 01-04
2.	Singh, Randhir	Human Resources in agriculture	National Seminar on 'Agricultural Policy Frame'	New Delhi	Jun 05
3.	Wahi, SD Bhatia, VK	Application of bootstrap technique in comparing the performance of linear discriminant functions	The National Seminar on 'Animal Genetics and Breeding Research and Education-Present Status and Future Thrusts'	IVRI, Izatnagar	Oct 12-13
4.	Pandey, RK Sarup, Shanti	Sustainable agricultural development and use of animal energy	National Symposium on 'Maximising and Sustaining Crop and Animal Productivity by Modern Techniques' organised by Indian Society for Nuclear Techniques in Agriculture and Biology	BHU, Varanasi	Oct 14-17

1	2	3	4	5	6
5.	Agrawal, Ranjana	Forecasting of yield of crops	10th National Conference of Agricultural Research Statisticians	IVRI, Izatnagar	Nov 02-04
6.	Mathur, SN	Teaching of computer application in agriculture and networking	"	"	"
7.	Singh, HP	Current statistical research problems in animal sciences and fisheries covering the aspect of sample surveys	"	"	"
8.	Singh, Randhir	Teaching of Mathematics and Statistics in agricultural universities	"	"	"
9.	Sreenath, PR	On some problems in designing and analysis of experiments in crop sciences and agroforestry	"	"	"
10.	Srivastava, AK	Current problems in sample survey research relating to crops and agroforestry	"	"	"

1	2	3	4	5	6
11. Singh, Randhir	Teaching of Mathematics and Statistics in Agricultural Universities	National Convention on 'Agricultural Policy and Intellectual Property Rights in Agriculture' at the Session on Agricultural Research and Education Policy	IARI, New Delhi	Nov 16-18	
12. Pandey, RK Raheja, SK	Some reflections on employment in rural areas	National Convention on 'Agricultural Policy and Intellectual Property Rights in Agriculture' at the Session on Input Use and Farmers' Incentives/ Subsidies	"	"	
13. Singh, Randhir	Use of spectral data for crop yield modelling	National Symposium on 'Remote Sensing for Sustainable Development'	RSAC, Lucknow	Nov 17-19	
14. Bhatia, DK Arya, SN Singh, Shivtar	A study on the effect of breed-category-sex classification on cause of death among cattle	The 46th Annual Conference of Indian Society of Agricultural Statistics	OUAT, Bhubaneswar	Feb 20-22	
15. Bhatia, VK Malhotra, PK	On some aspects of estimation and comparison of retention times of different categories of dairy cattle	"	"	"	

1	2	3	4	5	6
16.	Bhatia, VK Jayasankar, J Wahi, SD	Use of bootstrap technique for various estimation of heritability estimators	The 46th Annual Conference of Indian Society of Agricultural Statistics	OUAT, Bhubaneswar	Feb 20-22
17.	Bhatia, VK Malhotra, PK	A note on the distribution of retention times of dairy cattle with different level of exotic inheritance	”	”	”
18.	Bhatia, VK Malhotra, PK	Relationship between retention times and explanatory variables in dairy cattle	”	”	”
19.	Bhatia, VK Wahi, SD	An empirical procedure for comparing the performance of linear discriminant functions	”	”	”
20.	Chugh, K Rameshan, PM Singh, Shivtar	Trends in potato production in Uttar Pradesh	”	”	”
21.	Bhatnagar, KC Khurana, GL	Statistical assessment of crop sequences	”	”	”
22.	Khurana, GL	Graphical presentation of bivariate data of inter-cropping experiments	”	”	”

1	2	3	4	5	6
23.	Madan Mohan Rajinder Kaur	Statistical evaluation of effects of dates of transplanting and fertilizer application on crop yield of rice	”	”	”
24.	Narain, Prem Singh, Shivtar	Data needs for monitoring and evaluation of poverty alleviation programmes at micro level	Symposium on ‘Poverty and Agriculture’ during the above conference	”	”
25.	Rai, SC Sarup, Shanti	Estimation of stability parameters for binary responses	The 46th AC of ISAS	”	”
26.	Rai, T	Wheat production in India in 2000 AD	”	”	”
27.	Rai, T	A statistical approach to identify the contribution of natural resources for production of coarse cereal in India and its states	”	”	”
28.	Rao, CH Satya Pal	Yardstick of phosphorous at various levels of nitrogen	”	”	”

1	2	3	4	5	6
29.	Rao, CH Satya Pal	Economic efficiency of nitrogen and phosphorus fertilization on rainfed green gram (Mung) in Telengana region of AP	The 46th Annual Conference of Indian Society of Agricultural Statistics	OUAT. Bhuba- neshwar	Feb 20-22
30.	Satya Pal Khurana, GL Rao, CH	Comparative study of different varieties of wheat grown in different states	”	”	”
31.	Singh, BH Madan Mohan	Use of biometrical characters in forecasting the yield of groundnut	”	”	”
32.	Wahi, SD	Cluster analysis of genotypes comparison of distances measures with and without use of within genotype variability	”	”	”
33.	Wahi, SD	Estimator of repeatability for perennial crops	”	”	”
34.	Wahi, SD Malhotra, PK	Comparative performance of estimators of repeatability	”	”	”
35.	Sreenath, PR Chaudhary, BL	Experimental designs for agro-forestry research	Seminar on Agro-forestry in 2000 AD for the Semi-Arid and Arid Tropics	Jhansi	Mar 12-13

OTHER INFORMATION ABOUT SCIENTISTS

Fellowship/Membership of Scientific Societies

Dr RK Pandey

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

Dr SK Raheja

- Indian Society of Agricultural Statistics, New Delhi
- Indian Society of Agricultural Science, New Delhi
- Indian Association of Statistics and Applied Research, Hisar
- Indian Society of Medical Statistics, New Delhi
- Federation of Agricultural and Allied Services Association, New Delhi
- Computer Society of India, New Delhi
- Centre for Agricultural and Rural Development Studies, New Delhi

—Centre for Land, Water and Environmental Studies, New Delhi

Dr OP Kathuria

- Indian Society of Agricultural Statistics, New Delhi
- International Association of Survey Statisticians

Dr JP Jain

- Indian Society of Agricultural Statistics, New Delhi
- Indian Society of Agricultural Science, New Delhi
- Indian Society of Genetics and Plant Breeding, New Delhi

Dr HP Singh

- Indian Society of Agricultural Statistics, New Delhi
- Indian Association of Statistics and Applied Research, Hisar

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 VK Gupta

- Indian Society of Agricultural Statistics, New Delhi
- International Institute, Netherlands

Sh TB Jain

- Indian Society of Agricultural Statistics, New Delhi
- Indian Society of Agricultural Economics, Bombay

Dr VK Bhatia

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

Sh Shanti Sarup

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

Sh OP Dutta

- Computer Society of India, Bombay

Dr PK Malhotra

- Indian Society of Agricultural Statistics, New Delhi
- Computer Society of India, Bombay

Sh SN Arya

- Indian Society of Agricultural Statistics, New Delhi
- Federation of Agricultural and Allied Services Association, New Delhi
- Bhartiya Krishi Anusandhan Samiti

Dr Chandras

- Biometric Society, Washington, USA

Dr PS Rana

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

Sh RS Khatri

- Indian Society of Agricultural Statistics, New Delhi
- Indian Association of Statistics and Applied Research, Hisar

Dr Jagbir Singh

- Indian Society of Agricultural Statistics, New Delhi
- Indian Society for Medical Statistics, New Delhi

Sh SN Mathur and Sh Mahesh Kumar

—Computer Society of India, Bombay

—Society for Information Sciences,
New Delhi

Dr Shivtar Singh, Dr GC Chawla, Dr
Basant Lal, Sh Jagmohan Singh,
Sh Satya Pal and Sh T Rai

—Indian Society of Agricultural
Statistics, New Delhi

—Indian Society of Agricultural
Science, New Delhi

Smt Sushila Kaul, Dr SS Kutaula and
Sh Ashok Kumar

—Agricultural Economics Research
Association, New Delhi

Dr Prajneshu, Dr AK Srivastava,
Dr PC Mehrotra, Dr Randhir Singh,
Sh VS Rustogi, Dr (Mrs) Ranjana
Agrawal, Dr HVL Bathla, Dr SS Shastri,
Dr RC Jain, Dr NK Ohri, Dr VT
Prabhakaran, Sh RL Rustagi, Dr
GC Chawla, Sh MS Batra, Dr KK
Tyagi, Sh Lal Chand, Sh SP Verma,
Dr VK Mahajan, Sh KPS Nirman,
Sh PK Batra, Sh SD Wahi, Sh AS Gupta,
Sh KC Bhatnagar, Sh DC Mathur,
Sh BH Singh, Sh JP Goyal, Sh DK
Bhatia, Sh SC Sethi, Sh VK Jain,
Sh HO Aggarwal, Sh Madan Mohan,
Dr Anil Rai, Sh CH Rao and Sh PM
Rameshan

—Indian Society of Agricultural
Statistics, New Delhi

Offices in Professional Societies

Dr RK Pandey

—Vice-President, Indian Society of
Agricultural Economics, Bombay

Dr SK Raheja

—Vice-President, Indian Association of
Statistics and Applied Research
(IASAR), Hisar

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

—Treasurer, Centre for Land, Water
and Environmental Studies, New
Delhi

Membership of Committees/Panels/Working Groups

Dr RK Pandey

—Board of Studies, Agricultural Eco-
nomics, Banaras Hindu University,
Varanasi

—Editorial Board of Annals of Agricul-
tural Research, New Delhi

—Board of Studies, Agricultural Eco-
nomics, IARI, New Delhi

—PG Faculty of PG School, IARI,
New Delhi

—Chairman, Management Committee,
IASRI, New Delhi

- The reconstituted National Advisory Board on Statistics of the Department of Statistics, Planning Commission, Govt. of India, New Delhi
 - 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
- Dr SK Raheja
- PG Faculty of PG School, IARI, New Delhi
- Dr OP Kathuria
- PG Faculty of PG School, IARI, New Delhi
- Dr PR Sreenath
- PG Faculty of PG School, IARI, New Delhi
- Dr JP Jain
- PG Faculty of PG School, IARI, New Delhi
 - Sub-Committee of TCD for Improvement of Animal Husbandry Statistics
 - Editorial Board, Indian Journal of Genetics and Plant Breeding IARI, New Delhi
 - Editorial Board, Annals of Agricultural Research, New Delhi
- Dr HP Singh
- Management Committee of IASRI, New Delhi
- PG Faculty of PG School, IARI, New Delhi
- Dr Prajneshu
- PG Faculty of PG School, IARI, New Delhi
- Sh SN Mathur
- PG Faculty of PG School, IARI, New Delhi
- Sh R Gopalan
- 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
- Dr PC Mehrotra
- PG Faculty of PG School, IARI, New Delhi
- Liaison Officer of IASRI for looking after the interest of SC/ST employees
- Dr BS Sharma
- PG Faculty of PG School, IARI, 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
 - Studying Committee on Courses, curricula and Academic Affairs. PG School, IARI, New Delhi
- Dr VK Sharma
- PG Faculty of PG School, IARI, New Delhi
- Dr (Mrs) Ranjana Agrawal
- PG Faculty of PG School, IARI, New Delhi
- Dr BC Saxena
- PG Faculty of PG School, IARI, New Delhi
- Dr RC Jain
- PG Faculty of PG School, IARI, New Delhi
 - Indian Science Congress Association, Calcutta
- Dr HVL Bathla
- PG Faculty of PG School, IARI, New Delhi
 - Secretary, Staff Research Council, IASRI, New Delhi
- Dr VK Gupta
- Panel on Design of Experiments (MSD-3 : 1/P-4), Bureau of Indian Standards, New Delhi
- PG Faculty of PG School, IARI, New Delhi
- Dr VT Prabhakaran
- PG Faculty of PG School, IARI, New Delhi
 - Editorial Board, Journal of PG School, IARI, New Delhi
- Sh Mahesh Kumar
- PG Faculty of PG School, IARI, New Delhi
- Dr PK Malhotra
- PG Faculty of PG School, IARI, New Delhi
- Dr VK Bhatia
- PG Faculty of PG School, IARI, New Delhi
 - Executive Council of ISAS, New Delhi
 - Editorial Board of Indian Society of Agricultural Sciences, New Delhi
 - ISI Panel on Sensory Evaluation of Foods, Government of Maharashtra
 - Technical Committee on Progeny Testing
- Sh OP Dutta
- PG Faculty of PG School, IARI, New Delhi
 - Management Committee of IASRI

Dr GC Chawla

—PG Faculty of PG School, IARI,
New Delhi

Sh SD Wahi

—PG Faculty of PG School, IARI,
New Delhi

Sh BH Singh

—PG Faculty of PG School, IARI,
New Delhi

Special lectures, Training, Study tour and Meetings

Dr RK Pandey

—Attended

- * The meeting of Academic Council at IARI on Jan 15
- * The Board of Studies Meeting in the discipline of Agricultural Statistics on Jan 19
- * The meeting of Board of Studies in the discipline of Computer Application in Agriculture on Feb 1
- * The meeting of National Advisory Board of Statistics on Feb 3
- * The 1st meeting of Research Advisory Committee of Livestock Biotechnology Project on NARP at NDRI Karnal on Feb 11

- * The Meeting of Board of Studies in the discipline of Agricultural Statistics on Mar 16

Dr SK Raheja

—Chaired

- * The Faculty meeting of the disciplines of Agricultural Statistics and Computer Application in Agriculture on April 18
 - * The meeting with CPWD Engineers in connection with the Master Plan of the Institute on May 4
 - * The meetings of Sectional committee No. MSD-3 : 1/P/4 of Design of Experiments held at Bureau of Indian Standards, New Delhi on May 12, 29, June 9 and 24
 - * The meeting of the Institute Joint Staff Council on May 13
 - * The meeting of Staff Research Council of the Institute on May 14 and 15
 - * The meeting of the Management Committee of the Institute on June 23
- Attended
- * The meeting of the Academic Council of IARI on April 2, 6, 8 and 27 and May 13
 - * The meeting of the Sectional Committee No. MSD-3 on Statistical Methods for Quality and Reliability

at Bureau of Indian Standards, New Delhi on May 5

* The meeting of Board of Studies (Agril. Stat.) on May 8

* The meeting of Academic Council of IARI on May 23

* The meeting of the Steering Committee of ICAR conducted project "On-farm Water Management" chaired by Addl. Secretary, Ministry of Water Resources, Shastri Bhavan, New Delhi on June 25

* The meeting of the High Powered Committee in the Department of Agriculture, Chandigarh on Oct 7

* The meeting of the State Level Committee on Agricultural Statistics at the Bureau of Economics and Statistics, Hyderabad on Oct 19

* The First Agricultural Science Congress held at IARI, New Delhi during Nov 12-14

—Delivered

* A lecture entitled "Methodology for estimation of area and yield for crop estimation surveys" to the trainees of Commonwealth Secretariat Training Course on Methodology of Agricultural Sample Surveys, Crop Yield Modelling and Computer Programming at the Institute on April 3

* The Welcome Address at the Valedictory Function of the Commonwealth Secretariat Training Course on April 30

* The Orientation Talk to the trainees of V Refresher Course in Agricultural Statistics on June 4

* The Welcome Address at the National Seminar on "Agricultural Policy Frame" organised by the Federation of Agricultural and Allied Services Association (FAASA), New Delhi on June 8

* A seminar talk on 'Statistical methodology for study of fertilizer behaviour under field conditions' at the Institute on Oct 23 regarding his visit to IFPRI, Washington, D.C., USA

Dr Prajneshu

* Delivered an invited talk on 'Nonlinear models' at the Department of Statistics, Rohtak University on Feb 20

Dr Randhir Singh

* Delivered a lecture on 'Non-Sampling Errors' at Maharishi Dayanand University, Rohtak on Mar 20

Dr KK Tyagi

—Attended

* The course on Agricultural Research Project Management organised by NAARM, Hyderabad during April 20-May 2

—Delivered four lectures on 'Randomised response techniques' to the participants of first UGC sponsored Refresher Course in Statistics on 'Reliability Analysis' at University of Allahabad during Nov 10-11

Sh TB Jain

—Attended a meeting convened by Director, CSWRI at Avikanagar regarding discussion on the collaborative research project 'Estimation of cost of production of sheep and wool' on June 29

Sh SS Srivastava

—Attended

* The DELNET meeting on rationalization of periodicals and library

networking at India International Centre, New Delhi on Sep 16

* The panel discussion on library automation at India International Centre on Jan 2

* The meeting of Delhi Library Networking (DELNET) and consultative committee on rationalisation of periodicals at India International Centre on Jan 25.

* The meeting on strategies for information at India International Centre on Feb 4

Participation in ICAR Scientific Panel Meetings

S. No.	Name of the Scientist	Name of the Scientific Panel	Date
1.	Dr HVL Bathla	Fisheries	May 07
2.	Dr R Srivastava	Agronomy	June 09
3.	Dr VK Bhatia	Plant Breeding and Genetics	Jul 15
4.	Dr BS Sharma	Animal Breeding	Jul 27-28
5.	Sh RS Khatri	Dairy and Animal Products Technology	Sep 08
6.	Dr PS Rana	Animal Nutrition Animal Physiology	Sep 21 Sep 23
7.	Dr HVL Bathla	Fisheries	Nov 12-13
8.	Dr PR Srivenath	Agronomy	Dec 21

MISCELLANEOUS INFORMATION

Dr RK Pandey

- * Joined as Acting Director, IASRI on November 30 (AN)
- * Presided over the meeting of the Management Committee of IASRI on Feb 23
- * Inaugurated 19th Short Term Training Course on Use of Computer in Agricultural Research at IASRI, on Mar 1

Dr SK Raheja

—Deputed to International Food Policy Research Institute, Washington, DC, USA from Jul 6-Sep 13, 1992 for developing analytical frame work and methodology for analysis of data under the collaborative research project 'Fertilizer Response Function Environment' being undertaken jointly by IASRI and IFPRI, Washington, DC, USA

Dr VK Sharma

—Reviewed the book "Agricultural development price policy and market surplus in India" (Review appeared in Agricultural Economics Research Review : 5(1), 1992 : p 159-161

Dr HVL Bathla

—Accompanied the participants of the Commonwealth Training Course to Orissa and Madhya Pradesh

Dr VK Bhatia

- * Attended meeting of technical committee on progeny testing performance (Maharashtra Government)

Dr KK Tyagi

- * Nominated as Chef-de-mission of IASRI Sports Contingent in the IX ICAR Inter-Zonal Sports Meet organised by IVRI, Izatnagar during June 14-19
- * Represented as a member of Institute Table-Tennis Team for playing in semi final and finals of Table Tennis (Team-Events) and won the winners trophy for the Institute in the ICAR Zone-II sports meet held at NDRI, Karnal during Mar 4-5

- * Deputed as Chef-de-mission-cum-player of the Institute Table Tennis Team which won the championship trophy for the Institute in the ICAR Inter-Zonal Sports Meet organized by NBSS & LUP, Nagpur during Mar 28-31

Sh TB Jain

- * Visited CCS Haryana Agricultural University, Hisar in connection with holding of X National Conference of Agricultural Research Statisticians at Hisar

Sh Lal Chand

- * Attended the first training course on use of UNIX operating system held at IASRI during Nov 30 to Dec 5, 92

Dr BC Saxena, Shri RL Rustagi, Dr GC Chawla, Sh JK Kapoor, Dr PS Rana, Sh GL Khurana, Sh Alope Lahiri, Sh DC Dahiya, Sh AK Gupta, Mrs Shubh Lata Paul, Mrs Sudesh Vaid, Mrs Meena Nanda, Mrs Uma, Sh Pramod Kumar and Sh UC Bandooni

- * Attended XVI short term course on use of computer in agricultural research held at IASRI during Sep 1-15, 92

Sh GN Bahuguna, Sh BH Singh and Sh Indra Singh

- * Attended second training course on use of UNIX operation system held at IASRI during Feb 8-12, 93

Dr SP Verma, Sh Madan Mohan, Sh DC Pant, Sh RC Tripathi, Sh BJ Gahlot, Sh DP Sharma and Shri Ram Shay

- * Attended XVIII short term course on use of computer in agricultural research held at IASRI during Mar 1-12, 93

COORDINATION AND MONITORING CELLS

COORDINATION CELL

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

Reports/Newsletters/Quarterly Progress Reports

- Annual Report, 1991-92
- IASRI Newsletter, Jan-Mar, 1992
- IASRI Newsletter, Apr-June, 1992
- IASRI Newsletter, Jul-Sep, 1992
- IASRI Newsletter, Oct-Dec, 1992
- Quarterly Progress Report, Jan-Mar, 1992
- Quarterly Progress Report, Apr-Jun, 1992
- Quarterly Progress Report, Jul-Sep, 1992

—Quarterly Progress Report. Oct-Dec, 1992

Communication of Research Material

ICAR

—Material for inclusion in

- (i) ICAR Reporter (A quarterly publication of ICAR) for the quarters falling due upto March, 1993
- (ii) Annual DARE Report for the year 1992-93
- (iii) Annual Report of ICAR for the year 1992-93
- (iv) Publication of Institutes information, Computer facilities, Training, Consultancy and materials of ICAR Institutes
- (v) Six monthly programme of Conferences/Seminars/Symposia/Workshops/Meetings etc. proposed to be held upto June, 1993

CSO, New Delhi

—Information on current publications of central and state statistical organisations for inclusion in their

quarterly brochure for the period April-June, 1992

NISTADS, New Delhi

—Statement showing Personnel trained abroad with external technical assistances, 1980-90

NCAER, New Delhi

—Information about the profile of Scientific and Technical personnel engaged in R & D activities

Biotech Consortium India Limited, New Delhi

—Information for their Directory of Institutions Involved in the Field of Bio-technology

National Social Science Documentation Centre (ICSSR), New Delhi

—Information to up date the ICSSR Directory of Social Science Research Institutions in India

Department of Science and Technology, New Delhi

—Information regarding National survey on resources devoted to research and development (R & D) activities in the country for 1992-93 edition

Office of the Principal Director of Audit Scientific Departments, New Delhi

—Consolidated information on Science and Technology Institution's profile

Indian Institute of Finance, New Delhi

—Calander of the Training Programme for the year 1993 to be organised by the Institute for inclusion in their quarterly Journal

M/s Economy A Trade, New Delhi

—Profile of the Institute for inclusion in Trade and Technology Directory of India for 1993-94 edition

KK Birla Foundation

—Information regarding scientists working in the Institute

NAARM, Hyderabad

—Information regarding study on Communicative Openness among Scientists in Agricultural Research Organisations

Division of Mycology and Plant Pathology, IARI, New Delhi

—List of staff members of the Institute

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, 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 :

- EFC Memo in respect of on-going schemes for the year 1992-93 was prepared for obtaining fresh approval and submitted to ICAR.
- EFC Memo for the VIII Plan (1992-97) for the Institute (Provisional) was prepared and submitted to ICAR.
- Monitoring Progress Reports for the six months period ending March, 1992 and September 1992.
- Detailed Project Document/EFC Memo for the VIII Plan (1992-1997) for the Institute was prepared and sent to ICAR.
- Annual Plan of IASRI for 1993-94 was prepared for transmission to ICAR
- RPF Proformae in respect of five Divisions were sent to ICAR
- Prepared a detailed document on 'Counter Comments on Comments of Expenditure Finance Committee of VIII Plan in respect of the Institute' and forwarded to ICAR
- Material regarding Annual Action Plan of IASRI for 1993-94 was prepared and sent to ICAR

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, 1993

Books	—	22590
Hindi Books	—	309
Journals	—	5028
Reports etc.	—	6562
Number of publications added during 1992-93		
Books	—	341
Journals	—	1150 issues
Reports etc.	—	167
Journals subscribed		
Indian	—	37
Foreign	—	120
Bulletin/Newsletters received on gratis/exchange : 100		

Maintenance

Number of publication bound —887

Library Usage

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

Number of readers consulted the library

: 27,400

Number of publications issued from the library

: 28,500

Library Users

Number of bonafide library members —309

Number of students (regular) members —11

Number of ad-hoc trainee users —61

Library Services

Number of documents borrowed or lent out on inter library loan basis —60

Number of pages of scientific and technical nature reprographed —71,949

Number of issues of 'Current Content Mirror' brought out —14

Current book reviews —2

Current Awareness Services —1

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 expos-

ing, processing and printing of about 500 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.

STAFF WELFARE ACTIVITIES

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

JOINT STAFF COUNCIL

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

A meeting of the newly constituted Joint Staff Council was held on May 13 under the chairmanship of Director. At the outset the chairman welcomed the newly elected members of the Joint Staff Council. Before taking up the agenda, items it was unanimously decided to place on record the appreciation and thanks to the members of the outgoing JSC for their contribution regarding smooth functioning of its activities.

The meetings of the Institute Joint Staff Council were held on July 4, November 7 and 30, 1992 and March 11 and 15, 1993 under the chairmanship of Director of the Institute and various items as per agenda were discussed.

GRIEVANCE COMMITTEE

The Grievance Committee 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. A meeting of the Grievance Committee was held on Nov 24, 1992.

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 2311 was collected in the account of Benevolent Fund contribution from April 1, 1992 to March 31, 1993.

COOPERATIVE 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, 1993 was 513. The General Body meeting of the Society was held on October 20, 1992 in which the accounts for the year 1991-92 were presented and passed.

The election of new Managing Committee was held on December 1, 1992. Prior to this the Managing Committee elected on August 5, 1991 was responsible for the work during the year 1991-92. During the accounting year 1991-92 the Society advanced Rs. 21,39,100 as loan to its members.

Financial help was extended from the members welfare fund to the tune of Rs. 5500 to the bereaved families of three members and also Rs. 101 was given as gift to each of the 7 members who retired during the year.

COOPERATIVE 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 general merchandise were made available at reasonable rates to the staff members of the Institute. The total membership of the Society as on March 31, 1993 was 406.

RECREATION AND WELFARE CLUB

The Institute has a Recreation and Welfare Club which provides facilities for indoor and outdoor games, promotes social and friendly relations among the members and looks after the general welfare of its members.

SPORTS ACTIVITIES

The IX ICAR Inter-Zonal Sports Meet was organised by Indian Veterinary Research Institute, Izatnagar during June 14-19, 1992. The Institute's Table Tennis Team comprising of Sh OP Khanduri (Captain), Dr KK Tyagi, S/Shri GM Pathak, SK Upadhyay, KK Hans, Praveen Kumar and Ram Bhool won the Championship Trophy. Dr KK Tyagi, Sr Scientist was the Chef-de-Mission of IASRI Sports Contingent.

The Institute's sports teams participated in the ICAR Zone II sports tournament organised by National Dairy Research Institute, Karnal from March 2-6, 1993 with Dr UN Dixit, Sr Scientist as Chef-de-Mission. The Table Tennis team won the Championship shield for the Institute.

The IASRI Table Tennis team also participated in open tournaments organised by IARI and INSTADS and won the team championship in both the tournaments.



.. Chinese Delegation visiting the Computer Centre of the Institute .



.. Joint Staff Council of the Institute in session

अगस्त 1992 को संस्थान की राजभाषा निर्देशक मंडलिय की अध्यक्षता में दिनांक 7

प्रतिनिधियों का विधिवत चुनाव हुआ।
विभागीय, कार्यकारिणी के सदस्यों तथा केन्द्रीय
संस्था में सर्वसम्मति से सभी पदा-
सभा द्वारा अनुमोदन के पश्चात् चुनाव प्रक्रिया
श्रीवास्तव द्वारा प्रस्तुत बाधक लेख के आस
प्रस्तुत किया तथा कोषाध्यक्ष, श्री शंकर शरण
सही, श्री चरण सिंह वर्मा ने बाधक प्रतिवेदन
भाषा की आस सभा की बैठक हुई। भाषा
संस्थान की केन्द्रीय सचिवालय दिल्ली परिसर
श्री. सुदशन कुमार रहेवा की अध्यक्षता में
भाषा संरक्षक एवं संस्थान के निर्देशक,

अधीनस्थ की जाए।

विषयों पर दिल्ली गीठिया/व्याख्यात्मक
लिया गया कि वैधानिक अथवा अन्य संविद्ध
अध्यक्ष मंडलिय के प्रस्ताव पर, यह भी निर्णय
का निर्णय लिया गया। इसके अतिरिक्त, स्वयं
करने के लिए 10 अतिरिक्त पदिकाएँ लगावने
'आज का शब्द' की और अधक प्रचारित

गया।

गया और इसके सामयिक मूद्रण पर और दिया
प्रकाशन फिर से आरंभ करने का निर्णय लिया
समाचार नामक विभागीय दिल्ली संस्करण का

दिल्ली के प्रयोग में प्रति

कारियों से अनुरोध किया। अधिसूचना
के लिए निर्देशक मंडलिय ने सभी संबद्ध अधि-
कार्यक्रम के लक्ष्यों की मदवार पूरा करने
विभाग से प्राप्त वर्ष 1991-92 के बाधक
निर्णय लिये गये। यह-मंत्रालय के राजभाषा
मंडलिय विषयों पर विचार-विमर्श हुआ और
बैठक 4 मार्च 1992 की हुई जिसमें अनेक
संस्थान की राजभाषा कार्यविद्यन समिति की
निर्देशक मंडलिय की अध्यक्षता में

है :

द्वारा निर्णय लिए गए कार्यों का अंश पर कार
अपनाते का संकल्प लिया। प्रतिवेदनार्थीन वर्ष के
हुई और उद्देश्ये अनेक कामकाज में दिल्ली
वैधानिक/अधिकारी एवं कार्यकारी दिल्ली से
लिये गये। इनके फलस्वरूप संस्थान के अनेक
और उद्देश्ये लागू करने के मंडलिय निर्णय
नये-नये कार्यक्रमों पर विचार-विमर्श किया गया
में दिल्ली के प्रयोग में ब्रिड करने के लिये
निर्णय रूप से अधीनस्थ हुई और उन्में संस्थान
राजभाषा कार्यविद्यन समिति की सभी बैठक
ब्रिड हुई। प्रतिवेदनार्थीन वर्ष के द्वारा
स्वरूप संस्थान में दिल्ली प्रयोग में अन्वयित
अनेक नये कार्यक्रम लागू किए गए इनके फल-
लिए उपलब्धियों का वर्ष रहा। इस द्वारा के
प्रतिवेदनार्थीन वर्ष दिल्ली अनुयोग के

कार्यान्वयन समिति की बैठक हुई जिसमें 'व्यक्तिगत सम्पर्क अभियान' आरम्भ करने तथा हिन्दी दिवस को जोर-शोर से मनाने का निर्णय लिया गया। साथ ही संस्थान में सदैव की भाँति हिन्दी पखवाड़ा मनाने एवं उसके दौरान बिभिन्न प्रतियोगिताएं आयोजित करने का भी निर्णय लिया गया। इसके अतिरिक्त, भविष्य में नियमित रूप से हिन्दी कार्य के तिमही निरीक्षण का कार्य सुचारु रूप से हो सके, संस्थान की निरीक्षण समिति का पुनर्गठन निम्नानुसार किया गया :

1. डा. श्रीमती रंजना अग्रवाल अध्यक्ष
 2. डॉ. रणधीर सिंह सदस्य
 3. श्री शब्द शरण श्रीवास्तव सदस्य
 4. श्री जीतराम निर्वाल सदस्य
 5. श्रीमती संगीता दुग्गल सदस्य
 6. श्री अखिलेन्द्र पाल सिंह सदस्य-सचिव
- संस्थान की आठवीं सात व्याख्यानों की एक प्रशासनिक एवं तकनीकी हिन्दी कार्यशाला का उद्घाटन दिनांक 3 अगस्त 1992 को संस्थान निदेशक ने किया जो एक दिन छोड़कर एक दिन 17 अगस्त 1992 तक चली।

हिन्दी पखवाड़े के दौरान हिन्दी प्रचार-प्रसार के अलावा अनेकों प्रतियोगिताओं का आयोजन किया गया। दिनांक 20 अगस्त 1992 से 8 सितम्बर 1992 तक निम्न प्रतियोगिताओं का संकलन आयोजन हुआ :

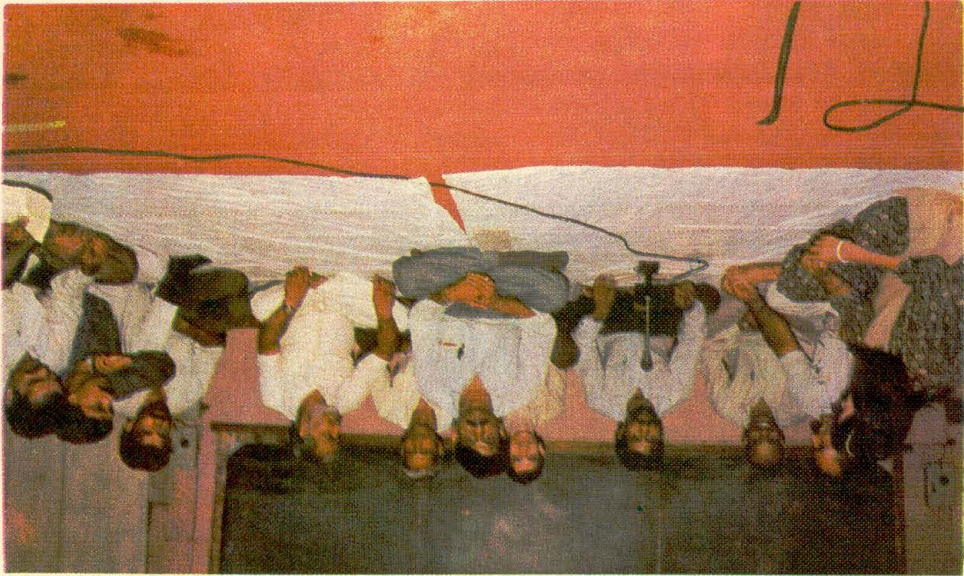
1. हिन्दी अनुवाद प्रतियोगिता
2. हिन्दी लेख एवं निबंध प्रतियोगिता

3. हिन्दी टिप्पण एवं प्राकरण प्रतियोगिता
4. हिन्दी टंकण प्रतियोगिता
5. हिन्दी आशुलिपि प्रतियोगिता
6. हिन्दी अन्तःक्षरी प्रतियोगिता
7. वाद-विवाद प्रतियोगिता
8. हिन्दी काव्य पाठ प्रतियोगिता
9. हिन्दी गोष्ठी
10. हिन्दी व्यवहार [सामूहिक] प्रभागादि
11. हिन्दी [सामूहिक] अनुभागादि
12. हिन्दी व्यवहार [व्यक्तिगत]
13. प्रश्न मंच प्रतियोगिता

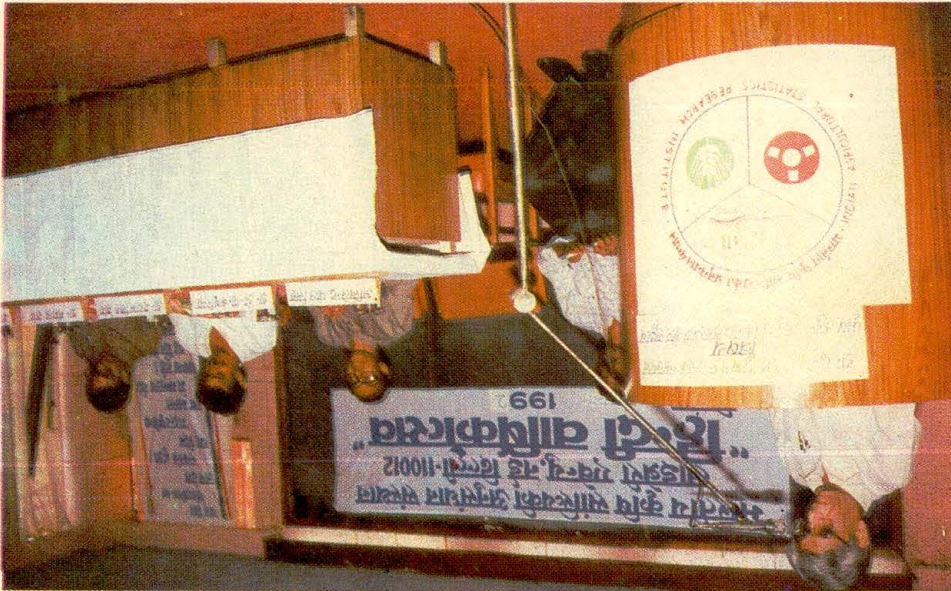
दिनांक 20 अगस्त से 8 सितम्बर तक 15 कार्य दिवसों का हिन्दी व्यवहार प्रतियोगिता का आयोजन किया गया जिसके दौरान संस्थान के सभी प्रभागानुभागादि के अधिकारियों एवं कर्मचारियों से अपना अधिकाधिक कार्य हिन्दी में करने की अपील की गई और इस दौरान किये गये हिन्दी कार्यों का निरीक्षण, संस्थान की नवगठित निरीक्षण उप-समिति ने दिनांक 1 सितम्बर से 4 सितम्बर 1992 के बीच किया, जिसके आधार पर अपना अधिकांश कार्य हिन्दी में करने पर रोकड़ अनुभाग को चल शील्ड एवं उरसाही तथा हिन्दी में अच्छा कार्य करने वाले कर्मचारियों को व्यक्तिगत तौर पर पुरस्कृत किया गया।

इसी दौरान 1 सितम्बर 1992 से हिन्दी अनुभाग ने व्यक्तिगत सर्क अभियान चलाया जिसके अन्तर्गत संस्थान के विभिन्न अनुभागों प्रभागों का हिन्दी अनुभाग के कर्मचारियों ने

हिन्दी पखवाड़े के दौरान आयोजित काव्य गोष्ठी का दृश्य



डा० ओ० पी० कर्पूरिया, निदेशक, हिन्दी वार्षिकोत्सव में स्वागत भाषण देते हुए ।



दौरा किया और इन्हें राजभाषा नियम एवं वार्षिक कार्यक्रम 1992-93 की जानकारी दी और संस्थान कर्मचारियों से अपना दैनिक सरकारी कामकाज नियमानुसार हिन्दी में ही करने को प्रेरित किया और दोरे के दिन से ही कर्मचारियों की फाईलों पर हिन्दी में काम आरम्भ करवाया।

तदोपरान्त, दिनांक 14 सितम्बर 1992 "हिन्दी दिवस" के दिन, संस्थान में हिन्दी दिवस वार्षिकोत्सव मनाया गया, उस समय के निदेशक डॉ. ओ. पी. कथूरिया ने मुख्य अतिथि जाने माने समाज शास्त्री एवं कवि डॉ. श्याम सिंह "शशि", निदेशक प्रकाशन विभाग सूचना एवं प्रसारण मंत्रालय का स्वागत किया। श्री अखिलेन्द्रपाल सिंह ने संस्थान में हुई विभिन्न हिन्दी गतिविधियों से अवगत कराते हुए वार्षिक रिपोर्ट प्रस्तुत की। तत्पश्चात्, डॉ. दरोगा सिंह स्मारक व्याख्यान माला का आयोजन किया गया जिसमें मुख्य वक्ता भा. कृ. अ. प. के सहायक महानिदेशक (बीज) डॉ. मंगला राय ने अपने ऐतिहासिक व्याख्यान से उपस्थित जनसमूह को हिन्दी के प्रति उत्साहित किया। "हिन्दी प्रसारिका" के वार्षिक संस्करण का विमोचन मुख्य अतिथि द्वारा किया गया लगभग 50 से अधिक सफल प्रतियोगियों को मुख्य अतिथि ने अपने कर कमलों से पुरस्कृत किया। मुख्य अतिथि पदम श्री डॉ. श्याम सिंह शशि ने संस्थान में हो रही हिन्दी कार्यों की प्रगति के लिए संस्थान के निदेशक एवं हिन्दी अनुभाग के कर्मचारियों को बधाई दी और सभी उपस्थित जनमानस का आह्वान किया कि सरकारी कामकाज से हिन्दी का प्रयोग सभी को अपना नैतिक दायित्व समझते हुए करना चाहिए। डॉ. "शशि" जी का कहना था कि राजभाषा हिन्दी की पहचान बनानी है

तो भारत की राजभाषा के रूप में हिन्दी का अधिकधिक प्रयोग स्वप्रेरणा से और देशभक्ति की भावना से करना चाहिये।

प्रतिवेदनाधीन के दौरान संस्थान में हिन्दी के प्रगामी प्रयोग में वृद्धि करने के उद्देश्य से संस्थान में पाँच सेमीनारों की एक शृंखला की योजना तैयार की गई और विभिन्न वर्गों के अधिकारियों/कर्मचारियों और वैज्ञानिकों के लिए निम्न विषयों पर पाँच सेमीनार 28 दिसम्बर से 29 जनवरी तक आयोजित किये गये।

1. भारत के संविधान में राजभाषा हिन्दी के लिए संवैधानिक प्रावधान।
2. राजभाषा अधिनियम, 1963 और यथा संशोधित राजभाषा अधिनियम, 1967।
3. राजभाषा नियम, 1976 और उसके तहत राजभाषा विभाग द्वारा जारी किये जाने वाले वार्षिक कार्यक्रम में निर्धारित लक्ष्य और उन्हें पूरा करने की अनिवार्यता।
4. विभिन्न प्रोत्साहन योजनाएं।

सेमीनारों की शृंखला का उद्घाटन 28 दिसम्बर, 1992 को संस्थान के निदेशक डॉ. आर. के. पाण्डेय ने किया तथा अपने उद्घाटन भाषण में उपस्थित महानुभावों से कहा कि इन सेमीनारों में सभी हिस्सा लें और इनमें दी जा रही जानकारी का व्यवहारिक जीवन में प्रयोग करने के हरसम्भव प्रयास करें।

सेमीनारों के अलावा संस्थान में हिन्दी

अनुभाग के कर्मचारियों ने व्यक्तिगत संपर्क के दौरान धारा 3(3) का प्रभावी रूप से अनुपालन करने पर विशेष जोर दिया। और साथ ही वार्षिक कार्यक्रमों में निर्धारित लक्ष्यों की प्राप्ति के उद्देश्य से विभिन्न अनुभागों/प्रभागों के अधिकारी/कर्मचारी और वैज्ञानिकों को अपना

अधिकार्षिक कार्य दिश्री में करने के लिए प्रेरित किया। इसके अतिरिक्त, संस्थान में भारत सरकार की विभिन्न प्रोत्साहन योजनाओं को 15 दिसम्बर 1992 से विद्यवत लागू किया गया और इसका समुचित प्रचार किया गया।

IASRI PERSONNEL

(As on 31-03-1993)

Dr RK Pandey, Director

**Division of Design of Experiments and
Analysis of Experimental Data**

Dr PR Sreenath,
Principal Scientist and Head

Scientists (SG)/Sr. Scientists

Dr VK Gupta
Dr Basant Lal
Smt Asha Saksena
Sh RK Ghai
Sh JK Kapoor
Dr GC Chawla
Dr Ravindra Srivastava
Sh PK Batra
Sh KC Bhatnagar

Scientists

Smt Rajinder Kaur
Sh Onkar Sarup
Sh CH Rao
Sh DK Mehta
Sh GL Khurana
Sh MR Vats
Sh DK Sehgal
Sh Alope Lahiri
Sh NK Sharma
Smt Ajit Kaur Bhatia

Dr (Km) Seema Jaggi
Dr Rajendra Prasad

**Division of Sample Survey Methodology
and Analysis of Survey Data**

Dr HP Singh,
Principal Scientist and Head

Principal Scientists

Dr AK Srivastava
Dr PC Mehrotra
Dr MG Mittal
Dr Randhir Singh
Dr Shivtar Singh

Scientists (SG)/Sr. Scientists

Dr HVL Bathla
Dr BC Saxena
Sh SS Gupta
Sh Anand Prakash
Sh TB Jain
Dr SS Shastri
Dr NK Ohri
Sh RL Rustagi
Sh SN Arya
Sh MS Batra
Dr DL Ahuja
Sh KPS Nirman

Sh GS Bassi
Sh AS Gupta
Dr KK Tyagi
Sh RS Khatri

Scientists

Sh JP Goyal
Sh HC Gupta
Sh DC Mathur
Sh Mahander Singh
Sh RC Gola
Dr Jagbir Singh
Sh SC Agarwal
Sh DK Bhatia
Sh SC Sethi
Sh Bhagwan Dass
Sh MS Narang (Study Leave)
Sh Satya Pal
Sh KK Kher
Sh T Rai
Sh VK Jain
Sh RM Sood
Sh K Chugh
Dr Anil Rai

Division of Statistical Economics

Dr RK Pandey,
Principal Scientist and Head

Principal Scientist

Dr VK Sharma

Scientists (SG)/Sr. Scientists

Sh Shanti Sarup
Dr UN Dixit
Dr VK Mahajan

Scientists

Sh Ashok Kumar

Smt Sushila Kaul
Sh Ant Ram
Sh SP Bhardwaj
Dr SS Kutaula

**Division of Forecasting Techniques for
Crops, Diseases and Pests**

Dr OP Kathuria,
Principal Scientist and Head

Scientists (SG)/Sr. Scientists

Dr (Smt) Ranjana Agrawal
Dr RC Jain
Sh GN Bahuguna
Dr Chandrahas
Sh Jagmohan Singh

Scientists

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

**Division of Bio-Statistics and Statistical
Genetics**

Dr Prajneshu,
Principal Scientist and Head

Principal Scientist

Dr BS Sharma

Scientists (SG)/Sr. Scientists

Dr VT Prabhakaran
Dr VK Bhatia
Sh SD Wahi
Sh Lal Chand
Sh SP Verma
Dr PS Rana

Scientists

Sh RK Jain
Sh Indra Singh

Division of Computing Science

Sh SN Mathur,
Principal Scientist and Head

Principal Scientist

Sh R Gopalan

Scientists (SG)/Sr. Scientists

Dr IC Sethi
Sh Mahesh Kumar
Sh OP Dutta
Dr PK Malhotra
Sh KC Gupta
Dr RC Goyal

Scientists

Sh HO Aggarwal
Sh Balbir Singh

Coordination Cell

Sh TB Jain
Scientist (SG) and Head

Monitoring Cell

Dr PC Mehrotra,
Principal Scientist and Head

Training Administration Cell

Dr Randhir Singh, Prof (Ag. Stat.) and
Head

Sh Mahesh Kumar, Prof (CAA)

Technical Officers

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

Administration

Sh GC Sharma, Chief Administrative
Officer

Sh JR Nirwal, Senior Administrative
Officer

Smt Sangita Duggal,
Finance & Accounts Officer

APPENDIX—II

SANCTIONED AND FILLED-UP POSTS

(As on 31-03-93)

S. No.	Designation	Scale of Pay (Rs.)	No. of Posts		No. of SC/ST Employees	
			Sanctioned	Filled	SC	ST
1	2	3	4	5	6	7
1.	Director	4500-7300	1	—	—	—
2.	Joint Director	4500-7300	1	—	—	—
3.	Principal Scientist	4500-7300	22*	14	—	—
4.	Sr. Scientist	3700-5700	29	21	—	—
5.	Scientist (SG)	3700-5700	100	71	3	—
6.	Scientist	2200-4000				
7.	Experimental Scientist	1740-3000				
8.	Chief Admn Officer	3000-5000	1	1	—	—
9.	Sr Admn Officer	3000-4500	1	1	1	—
10.	Finance and Accounts Officer	2200-4000	1	1	—	—
11.	Field Officer	2200-4000	3	2	—	—
12.	Mech. Tab. Officer	2200-4000	1	1	1	—
13.	Librarian (T-7)	2200-4000	2	1	—	—
14.	Tech Officer (T-6)	2200-4000	3	2	—	—
15.	Sr Artist (T-6)	2200-4000	1	1	—	—
16.	Asstt Field Officer	2000-3500	1	1	—	—
17.	Asstt Engineer (T-5)	2000-3500	1	1	—	—
18.	Asstt Admn Officer	2000-3500	3	3	1	—

1	2	3	4	5	6	7
19.	Asstt. Director (OL)	2000-3500	1	—	—	—
20.	**Security Officer	2000-3500	1	—	—	—
21.	Artist	1640-2900	1	1	—	—
22.	Superintendent	1640-2900	8	7	1	1
23.	Sr Personal Asstt	1640-2900	1	1	—	—
24.	Photographer	1400-2300	1	1	—	—
25.	Tech Asstt (Stat)	1400-2300	163	122	14	1
26.	Tech Asstt (Eco)	1400-2300	8	8	—	—
27.	Tech Asstt (Lib)	1400-2300	2	2	—	—
28.	Asstt EC Operator	1400-2300	6	3	—	—
29.	Field Inspector	1400-2300	2	1	—	—
30.	Hindi Translator	1400-2300	2	2	—	—
31.	Assistant	1400-2300	25	25	8	1
32.	Stenographer	1400-2600	11	11	1	—
33.	Jr Stenographer	1200-2040	18	11	2	—
34.	Sr Clerk	1200-2040	21	21	3	—
35.	Field Supervisor	1200-2040	6	4	1	—
36.	Punch Supervisor	1200-2040	3	3	1	—
37.	Card Librarian	1200-2040	1	1	—	—
38.	Electrician	975-1540	1	1	—	—
39.	Key Punch Operator	975-1540	45	42	4	1
40.	Field Investigator	975-1540	30	30	5	—
41.	Coders	975-1540	10	2	—	—
42.	Reference Asstt	975-1540	1	1	1	—
43.	Counter Asstt	975-1540	1	1	—	—
44.	Telephone Operator	975-1540	3	3	—	—
45.	Tubewell Operator	975-1540	3	3	1	—
46.	Sr Gestetner Operator	950-1500	1	1	—	—
47.	Carpenter	975-1540	1	1	—	—
48.	Driver	975-1540	6	4	2	—

J	2	3	4	5	6	7
49.	Zerox Operator	950-1500	1	1	—	—
50.	Jr. Clerk	950-1500	38	30	5	1
51.	Jr. Gestetner Operator	800-1150	1	—	—	—
52.	Supporting Staff					
	Grade-I	750-940	55	46	10	1
	Grade-II	775-1025	27	25	7	1
	Grade-III	800-1150	13	10	4	—
	Grade-IV	825-1200	7	7	4	1

* One post of Principal Scientist transferred to IARI, New Delhi on Feb 5, 1992 alongwith its incumbent and same post will come back as and when vacated by the said incumbent.

** Auxiliary Post.

**APPOINTMENTS, PROMOTIONS, TRANSFERS,
DEPUTATION AND RETIREMENTS**

Appointments

Name	Designation	Grade (Rs.)	w.e.f.
Dr Anil Rai	Scientist	2200-4000	29.12.92
Dr (Miss) Seema Jaggi	Scientist	2200-4000	29.12.92
Dr Rajendra Parsad	Scientist	2200-4000	12.02.93

Promotions

Name	Designation	Grade (Rs.)	w.e.f.
1	2	3	4
1. Dr Prajneshu	Principal Scientist	4500-7300	1.1.86
2. Dr VK Sharma	Principal Scientist	4500-7300	1.1.86
3. Dr Randhir Singh	Principal Scientist	4500-7300	1.1.86
4. Dr Shivtar Singh	Principal Scientist	4500-7300	1.1.86
5. Sh Ramji Lal	T-5	2000-3500	1.1.87
6. Sh PK Saxena	T-5	2000-3500	1.7.90
7. Smt Neelam	T-5	2000-3500	1.1.91
8. Dr Ved Prakash	T-5	2000-3500	1.1.91
9. Dr SK Bhatnagar	T-5	2000-3500	1.1.91
10. Smt Meena Nanda	T-5	2000-3500	1.1.91
11. Sh AP Singh	T-5	2000-3500	1.1.91

1	2	3	4	5
12.	Sh PP Singh	T-5	2000-3500	1.7.91
13.	Km Sheela	T-5	2000-3500	1.7.91
14.	Sh MK Bhatt	T-5	2000-3500	1.1.92
15.	Smt Vinod Narang	T-5	2000-3500	1.7.92
16.	Smt Satninder Pal	T-4	1640-2900	1.7.90
17.	Sh Naresh Kumar	T-4	1640-2900	1.7.90
18.	Sh Rukmesh Chand	T-4	1640-2900	1.7.91
19.	Sh UC Bandooni	T-4	1640-2900	1.7.91
20.	Sh Devander Kumar	T-4	1640-2900	1.7.91
21.	Sh Ajeet	T-4	1640-2900	1.7.91
22.	Sh CP Singh	T-4	1640-2900	1.7.91
23.	Sh J Srinivasan	T-4	1640-2900	1.7.91
24.	Smt Savita Wadhwa	T-4	1640-2900	1.7.91
25.	Sh Anil Garg	T-4	1640-2900	1.7.91
26.	Smt Jyoti Gangwani	T-4	1640-2900	1.7.91
27.	Sh UP Singh	T-4	1640-2900	1.7.91
28.	Sh Arvind Kumar	T-4	1640-2900	1.1.92
29.	Sh Ashwani Kumar	T-4	1640-2900	1.7.92
30.	Sh Meer Singh	Coder	1200-2040	1.1.92

Transfers

(a) On transfer from other Institute

Name	Designation	Grade (Rs.)	From	Date of joining
Smt Abha Kant	Tech Officer	2000-3500	CMFRI Cochin	18.03.93

(b) On transfer from this Institute

Name	Designation	Grade (Rs.)	Place of Joining	Date of Relieving
Sh V Radhakrishnan Nair	Tech. Asstt	1400-2300	CMFRI Cochin	19.03.93

Deputation

Name	Designation	Grade	Office	Period
Sh SP Jain	Tech. Officer	2000-3500	Ministry of Agriculture	3 Years w.e.f. 19.03.93

Retirements

Name	Designation	Grade (Rs.)	Date of retirement
1. Sh PR Yeri	Technical Officer	2000-3500	31.05.92
2. Sh CS Verma	Assistant Director (OL)	2000-3500	31.08.92
3. Dr JP Jain	Principal Scientist	4500-7300	30.09.92
4. Sh DS Aneja	Scientist	2200-4000	30.09.92
5. Dr SK Raheja	Joint Director	4500-7300	30.11.92
6. Sh VS Rustogi	Principal Scientist	4500-7300	30.11.92
7. Sh ML Choudhary	Scientist (SG)	3700-5700	31.01.93
8. Sh KB Singh	Scientist (SG)	3700-5700	31.01.93
9. Sh. Mani Raj	SS G. III	850-1150	31.01.93
10. Smt Sarbati Devi	SS G. III	850-1150	31.01.93

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