भाकृअनुप
ICAR

1994-95

annual report

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

ANNUAL REPORT
1994-95

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

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PREFACE

It is a great pleasure for me in presenting this Annual Report of the Institute which gives a panorama of activities and achievements of the Institute during 1994-95. The Institute continued its mission-mode research and teaching activities through its various Divisions during the year. I hope that the information presented in this publication will be of considerable interest to the scientific fraternity. Specific suggestions for improvement in subsequent volumes of the annual reports of the Institute would be welcome.

I wish to express my thanks to the Heads of Divisions, scientists and to all other staff of IASRI for their willing support and cooperation in carrying out the functions and activities of the Institute and for providing the basic material for compilation of this report.

The efforts put in by Sh TB Jain, Head, Coordination Cell and his colleagues in compiling and editing the material of the report are commendable. Thanks are also due to Sh Mahesh Chandra, Smt. Rajni Gupta and Sh Ishwar Dutt for assistance in preparing the manuscript on Personal Computer.

OP KATHURIA
Director

CONTENTS

INTRODUCTION

Aims and Functions

The mandate of the Indian Agricultural Statistics Research Institute (IASRI) is to promote and conduct research, education and training in agricultural statistics and computer application in agriculture. To achieve these objectives, the IASRI has the following functions:

- To undertake research in theoretical and applied statistics with an aim to develop new statistical techniques for application to research problems in agriculture, animal husbandry, fishery and allied fields.

-To update and modify existing statistical techniques for application to research problems in the above fields.

-To conduct post-graduate and in-service training courses in agricultural statistics and computer application.

- To develop computer software to cater to the requirements of agricultural research.

- To generate data-base in agriculture and allied subjects.

-To collaborate with national and international agencies in achieving the above objectives.

-To provide advisory and consultancy services in electronic 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 a 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 were developed. The old Burroughs B-4700 system was replaced in 1991 by a Super Mini COSMOS-486 LAN Server with more than hundred PC/AT's, PC/XT's and dumb terminals all in a LAN environment. Recently, COSMOS-486 LAN Server has been replaced by a PENTIUM-90 LAN Server a more powerful system having state-of-art technology. 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. User friendly software packages like SPSS, Image Processing Software, Harvard Graphics, LOTUS, d BASE IV, DOS, UNIX and a few others have also been made available. Two projects have been recently initiated, one for developing data-bases in the field of bio-technology as applicable to Animal Sciences Research, and the other for developing a computer communication Network linking all ICAR Institutes and SAUs. In the former, a Selective Dissemination of Information Service (SDI) is available on bibliographic references from VETCD, BEASTCD and AGRICOLA databases.

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 provided selective information services to scientists in the ICAR Institutes and Agricultural Universities on references to documents relating to areas of their specific interest till 1989.

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.

Heads of the Institute since Inception

Dr PV Sukhatme	...	Sep 1940-Jul 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 (Acting)	..	Feb 1992-Nov 1992
Dr RK Pandey (Acting)	...	Dec 1992-May 1994
Dr PN Bhat	..	Jun 1994-Jul 1994
Dr OP Kathuria	...	Aug 1994 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,
- Training Administration, and
- Monitoring

Management Committee

The Director of the Institute, who is incharge of the overall management of the Institute, is assisted in the discharge of his functions by the Management Committee of the Institute (constituted by the Council) by providing a broad-based platform for decision making process , by periodically examining the progress of the Institute activities and by recommending suitable remedial measures for bottlenecks, if any. The meetings of the Management Committee were held on Aug 2, 1994 and Mar 27, 1994 under the Chairmanship of Dr. PN Bhat and Dr OP Kathuria, Directors respectively.

Staff Research Council

The Staff Research Council (SRC) is 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 meetings of the Staff Research Council were held on August 23, 1994 and Jan 27-28, 1995 under the Chairmanship of Dr OP Kathuria, Director of the Institute to review the progress of on-going research projects.

The Annual Day

The Annual Day of the Institute was celebrated on July 2. As a part of these celebrations a Declamation Contest for the students was held. The topic of the contest was 'How much Agriculture and Allied Sciences should be taught for Post-graduate Course in Agricultural Statistics and

Dr OP Kathuria, Director discussing the progress of on going research projects at the Staff Research Council meeting.

A view of dias at the Annual Day Function of the Institute in which Dr PN Bhat, Director clapping and Dr SN Ray, Director General, CSO as Chief Guest presenting the memento to Dr Padam Singh, Director, IRMS for delivering the Fourth Nehru Memorial Lecture.

Computer Application'. This was chaired by Dr OP Kathuria. The prizes were given to the three best speakers.

Research Highlights by the scientists of the Institute were presented in a session on July 1. Dr Aloke Dey, Professor and Head, Indian Statistical Institute, Delhi Centre chaired the session. Nine scientists presented their recent important findings.

On July 2, the main Annual Day Function was held in which Dr SN Ray, Director General, Central Statistical Organization was the Chief Guest. Dr Padam Singh, Director, Institute of Research in Medical Statistics delivered the Fourth Nehru Memorial Lecture on 'Thrust Areas for Research in Statistics as Input to Planning for Agricultural and Allied Fields'. The Chief Guest distributed the Nehru Memorial Medals to Sh. Lal Mohan Bhar, a student of M.Sc. (Ag. Stat.) and Sh. Rohit Verma of M.Sc (C.A.) course for the year 1991-93. He also awarded the VVR Murthy prize to Sh. Lal Mohan Bhar for the session 1991-93. He then delivered his address.

Research Collaboration

Inter-institutional research programme is undertaken by the Institute in collaboration with other institutions.

The collaborative projects which were in operation during 1994-95 are as follows:

Sl. No.	Title	Collaborating Agency	Start	Completion
1.	2.	3.	4.	5.
1.	Planning, designing and analysis of farm research experiments planned under Project Directorate of Cropping System Research (PDCSR)	Directorate of Cropping Systems Research, Modipuram, Meerut	Apr, 1986	Continuing
2	.Planning, designing and analysis of experiments planned at stations under the PDCSR	,,	,,	,,
3.	Planning, designing and statistical analysis of data relating to experiments conducted under AICRP on Long Term Fertilizer Experiments	(i) Deptt. of Soils, ICAR Institutes (ii) Deptt. of Soils, State Agril.Universities	Jul, 1985	Continuing

1.	2.	3.	4.	5.
4.	Estimation of cost of production of sheep and wool	CSWRI, Avikanagar	Apr, 1991	Mar, 1995
5.	Survey methodology to study economics of keeping goats	CIRG, Makhdoom	Apr, 1991	Jun, 1995
6.	Integrated yield forecast model using biometrical characters, agricultural Inputs, weather and remotely sensed data	Division of Agricultural Physics, IARI New Delhi	Nov, 1992	Oct, 1996

Projects of Emeritus Scientists

Three Emeritus Scientists of ICAR are engaged on the following research projects in the Institute:

S. No.	Project Title	Name of Emeritus Scientist	Date of start
1.	Statistical techniques for mid-course bifurcation of experimental plots, plot yield estimation and statistical models for predicting soil nutrient status under long-term fertilizer experiments.	Sh PN Soni	Sep 1, 1992
2.	Statistical inference and computer packages on multiway crossing in plant breeding research	Dr AS Arya	Sep 28, 1993
3.	Studies on traditional camel rearing fodder plants and socio-economic aspects of camel rearing in the rural desert-eco system in Rajasthan	Dr HP Singh	Feb 16, 1995

Finance

Budget statement for the financial year 1994-95

Head	Non-Plan		Plan	
	Funds (Rs. in Lakhs)	Expenditure (Rs.)	Funds (Rs. in Lakhs)	Expenditure (Rs.)
Pay and Allowances	364.00	3,63,93,95 0	_	_
OTA	0.39	38,999	_	_
Travelling Allowances	2.80	2,79,900	2.00	1,15,024
Other Charges*	51.81		40.00	
i) Assets acquired		2,78,179		3,65,907
ii) Maintenance of Buildings etc.		18,83,750		15,88,091
iii) Other expenditure		63,021		12,05,282
iv) Office contingencies		21,32,698		15,95,910
v) Fellowship		5,63,793		-
vi) Works	2.00	1,25,057	40.00	31,92,637
Grand Total	421.00	4,17,59,437	82.00	80,62,851

*Includes items (i) to (iv)

Abstract (1994-95)

	Funds (Rs.in Lakhs)	Expenditure (Rs.)
Non-Plan	421.00	4,17,59,437
Plan	82.00	80,62,851
Total	503.00	4,98,22,288

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 experimentaion in agriculture and animal sciences

Thrust Areas :

-Cropping system research

-Information system for agricultural and animal experiments

-Yardsticks of additional production

-Experimental designs for agricultural, animal and fisheries research

Projects in operation thrust-areawise:-

No.	Project title	Project leader and associates
1	2	3
	Cropping System Research	
1.	Planning, designing and analysis of farm research experiments planned under Project Directorate of Cropping System Research (PDCSR)	KC Bhatnager* PK Batra** Mahesh Kumar NK Sharma
2.	Planning, designing and analysis of experiments planned at stations under the Project Directorate of Cropping System Research	Rajinder Kaur Ajit Kaur
3.	Planning, designing ans statistical analysis of date relating to experimetns conducted under AICRP on Long Term Fertilizer Experiments	MR Vats PR Sreenath DK Mehta DK Sehgal
4.	Mathodological investigations in predicting fertilizer responses using soil test values and other site variables	Aloke Lahiri DK Mehta NK Sharma
5.	Astudy of behaviour of crop response to long term fertilizer application with reference to weather parameters	Asha Saksena Ajit Kaur HS Sikarwar***

* Upto Sept 30, 1994 ** From Oct 1, 1994 ***From Jan 27, 1995

1	2	3
	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 pulses, from the combined application of fertilisers	CH Rao KC Bhatnagar* Seema Jaggi*** GL Khurana
	Experimental Designs for Agricultural,Animal and Fisheries Research	
9.	Methodological studies relating to agroforestry experiments	BLChoudhary JK Kapoor PR Sreenath
10.	Some statistical studies relating to the design and analysis of experiments involving fixed quantity of inputs	PK Batra Rajender Prasad OP Khanduri
11.	Studies on optimality of block designs for making test treatment-control comparison	R Srivastava VK Gupta Rajender Prasad
12.	A-optimality of block designs for comparing two disjoint sets of treatments.	Seema Jaggi VK Gupta
13.	Cataloguing and construction of variance balanced block designs: computer algorithms for construction	Rajender Prasad VK Gupta OP Khanduri
14.	Construction of balanced incomplete block designs with nested rows and columns	PR Sreenath
15.	Study of optimality of designs for one-way and two-way elimination of heterogeneity	VK Gupta

* Utp Sept 30, 1994 ***From Jan 27, 1995

1. Planning, designing and analysis of farm research experiments planned under Project Directorate of Cropping System Research

The data of about 3,500 experiments conducted at various on farm research (OFR) centres under Co-ordinated Project (Agronomy) were received at the Institute. These were analysed using appropriate analysis depending upon the design adopted and nature of treatments. The results of these experiments were sent to different centres. Consolidated results of all the experiments were being finalised for onward transmission to Project Co-ordinator (Agronomy) at Modipuram, Meerut. Further work was in progress.

2. Planning, designing and analysis of experiments planned at research stations under the Project Directorate of Cropping System Research

During the year 23 types of experiments were planned with the objectives of (i) development of new cropping sytstem, (ii) nutrient management in cropping systems, (iii) development of system based management practices, (iv) system based maximum yield research. The data for about 300 complex experiments conducted during 1993-94 at 38 cropping system research centres were subjected to critical analysis.

The trends in cropping systems for last few years are the definite indications in favour of stability of high production due to the use of advanced technology and economic gain in the component crops of the system.

Intercropping is one of the most adoptable way for increasing the productivity and monetary returns. Different planting methods and fertilizer use showed maximum yield potentials in Sorghum + Soyabean at Indore and mustard + cowpea and mustard + groundnut at Karjat. Experiments were carried out to study the efficiency of cereal-legume over cereal-cereal cropping systems. The results indicated that when grain legumes were included in the system, they leave considerable favourable residual effects on succeeding cereal crops. Study on increasing nitrogen use efficiency carried out at Rewa in rice-wheat system for two years revealed that there was a good response to fertilizer nitrogen, but none of the modified urea materials showed any beneficial effect on yields. Among the nitrogen fertilizers applied to rice the prilled urea proved superior. There was no marked residual effect in subsequent wheat crop due to any of the sources.

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

During the year 1994-95, the data for the experiments conducted during 1991-92 in respect of yield, plant nutrient uptake and available nutrients in the soil were received, scrutinised and analysed. The statistical results were sent to the cooperating research centres and the Project Coordinator (LTFE). Besides these, the whole data since the initiation of the long term experiment (1971-72) for two locations viz. Ludhiana and

Bhubaneswar were thoroughly scrutinized and subjected to various types of statistical analysis to meet the objectives of the project. Some of the salient results obtained are as follows:

i) The statistical results indicate the need for taking cognizance as the cropping system as a whole instead of main individual crops while formulating the fertilizer recommendations.

ii) Covariance technique was applied, while studying the yield trends over years of different treatments, to eliminate the environmental effect from the individual treatments utilizing the control plot data. The regression analysis of yield data for Bhubaneswar Centre revealed that yield levels obtained with the application of F.Y.M. alongwith optimal dose of NPK improved steadily over a period of 14 years and thereafter declined only marginally, thus exhibiting its superiority over other treatments, as incorporation of FYM alongwith the NPK dose minimizes the adverse effects of Al^{3+} or Fe^{2+} ions in the course of mineralization. In the alluvial soils of Ludhiana maize yields increased during the first 9 years and after remaining stationary for the following three years started declining thereafter. For wheat crop the fitting of various treatments was generally found to be non significant.

iii) The trend study of nutrients fixation or depletion in the soil as a result of continuous cropping and manuring in individual treatments after the comlpetion of each crop cycle at Ludhiana indicated a declining trend over the years in treatments without zinc application excepting in the treatment.(100%NPK+FYM). While in laterite soils of Bhubaneswar soil phosphorous reached plateau during the period 1987-88. At Ludhiana the increase in available soil phosphorous indicated in increasing trend though the magnitude of change was of smaller order as compared to Bhubaneswar soils.

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

The study aims (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.

The data of experiments conducted on cultivators' field during 1977-81 under under AICARP in respect of 13 district centres situated in different agro-climatic regions of the country were utilised .

For rice crop it was observed that reduction in general regional recommended doses of fertilizer is possible at Muzaffarpur and Purnea (Bihar) to the extent of 5-10 percent, at Krishna 6-21 percent, Thiruchirapalli 10-25 percent. At other places reduction is possible for obtaining maximum response of 45-60 q/ha without economic gain.

For wheat crop, in the district of Muzaffarpur and Purnea (Bihar), Amritsar and Gurdaspur (Punjab), Faizabad (UP) and Sundergarh (Orissa), the general rate was better than the soil test based rate whereas using the later rate, maximum response can be achieved.

5. A study of behaviour of crop response to long term fertilizer application with reference to weather parameters

The objectives of the project are (i) to study the behaviour of crop response to fertilizer treatments with reference to weather, and (ii) to examine the association between the responses of different crops of successive seasons.

Data of a long-term experiment conducted a Parbhani (Maharashtra) during 1979-80 on Sorghum (kharif) and wheat (rabi) was analysed to examine the effect of application of a fertilizer doze to same plot for many years. Since the meteorological conditions prevailing in a season have profound effect on the performance of a crop and its response to a treatment, the behaviour of crop response to each of the 18 fertilizer treatments over the period of 13 years was examined in this content. Some of the salient results are given below:

-Bartiett's test showed that the variances of each treatment yields were of the same order for each of the 13 years for sorghum, wheat and their controls. However, in case of treatments T 100 and T 221 for wheat and T220 and T320 for sorghum ther was one year each of exceptionally lowr and higher variance than the rest of years. Results of analysis of variances carried out for each treatment separately showed that the year to year differences in the treatment response were vary high for sorghum, wheat and controls.

-Lag correlations of order 1 to 7 were calcutated to examine whether the dependence between the yields of different years. Correlations for sorghum treatments and control were not significantly different from Zero. In case of wheat treatments some stray casses of lag 4, 5or 6 wer significantly different from zero whereas for control only one was significantly different from zero whereas for control only one was significantly different from zero. Thus, it can be inferred that the ordered series of yields has arisen by chance in that order and can be regarded as a random sample from a population or unknown characteristics.

-Correlations between the yields of two seasons, that is yield of sorghum with that of the following seasons wheat yield of each treatment and replication came out to be significant. similarly results were obtained for controls, In case of wheat-sorghum correlation were significantly differnet from zero for all the replications of treatments without phosphorous. This indicates that the behjaviour of respones of treatments without phosphorous are different from other treatments for sorghum as in the next season, and a low wheat yield is followed by a low sorghum yield in the next season.

- There seem to be no evidence in support of the common belief that repeated application of same fertilizer doze and growing of same crop and variety reduces the productivity by deteriorating the soil, as there existed no significant linear trend in any of the treatment yields nor in control yields.

-Preparation of homogeneous groups of years on the basis of significant weather variables at different stages of growth using cluster analysis was in progress.

6.Agricultural field experiments information system

The objectives of the project are to maintain at a central place the results and other ancillary information in respect of all the Agricultural Field Experiments except purely varietal trials conducted at different research stations spread all over the country. This would avoid duplication of research and assist the scientists in developing efficient research programmes. The data under the project is collected by personal visits of the regional staff posted at different regional centres under senior officers of Agriculture Department/Universities.

The system is based on development of data bank which would store on floppies for future retrieval experimental data in respect of field experiments conducted during 1978 and onwards at different research stations in the country. Necessary software of data storage and its retrieval has been developed. For the period 1978 onwards the regional staff reported during the year, experimental data in respect of about 1950 experiments on Index card/coding schedules prescribed for A.F.E.I.S. While about 350 experiments were reported on the prescribed inclusive of these about 25,300 experisments 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

During the period under report, work of preparation of format of various experiments pertaining to different disciplines in animal experimental data was in progress. Computer sheets indexed experiments of various states were being converted to lower case letters.

Further work of data preparation was in progress.

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 workout the yardsticks of additional production of oil seeds and pulses from the combined application of fertilizers .

Methodology for estimation of yardsticks for the application of two inputs was developed and generalised for several inputs.

Yardsticks of additional production of N, P and N in the presence of P were being

worked out using the developed methodology. Further work was in progress.

9. Methodological studies relating to agroforestry experiments

The objectives of the study are (i) to develop suitable proforma/schedule for data collection on agroforestry experiments, (ii) to analyse the different ongoing experiments on agroforesty through various available statistical technique and to develop suitable model and (iii) to suggest and develop suitable design and their statistical analysis.

Proforma for collection of the agro-forestry data was prepared and forwarded to the incharge of respective centres under the All India Coordinated Research Project on Agroforestry.

The experimental data from different centres with different objectives, were received and some of the data were analysed and the results thus obtained were forwarded to the respective incharge of the centres. For other centres, the analysis is under progress.

The analysis of experimental data conducted on agri-silviculture and agri-horticulture under split plot design with different spacing and crop rotations viz. jowar-wheat, jowar-gram and groundnut-wheat and groundnut-gram revealed that (i) to yield of wheat and gram crops nearer to the tree are lower than that away from the tree, (ii) there were losses to the extent of 40-60% (over 4 years) in the yield of rabi crops when grown with fruit trees) whereas there was gain in the yield of these rabi crops when grown with different tree spacing, and (iii) it was also observed that there was no significant difference between the higher spacking with 10x10m. sq., 10x5msq. (for fruit trees) and 10x2 and 6x2msq (Silviculture).

The analysis of the data of experiments conducted at Fatehpur-Shekhawati (Raj.) to identify suitable crops out of the crops moong, moth, cowpea, guar and bajra based on six years revealed that pulses were more stable since less affected by environment than other crops grown under any of the tree acacia, nilotica, acacia tortilis and delbergia sisoo.

Further the analysis also revealed that the stability of different crops does not change after 6 years. The project report was under finalization.

10. Some statistical studies relating to the design and analysis of experiments involving fixed quantity of inputs

The project aims (i) to develop suitable model for describing the response to the fixed quantity of inputs (like fertiliser, pesticides etc.) applied in splits at different crop growth stages and (ii) to develop/ suggest efficient designs for experiments involving split application of fixed dose of inputs.

The experiments conducted on paddy crops with split application of nitrogen fertilizer were analysed using analysis of mixture design. As in most of the experiments, the number of design points were less the full model of given degree could not be filled. Using constrained mixture problem, the attempt were also made in construction of designs.

The work of interpretation of research was in progress.

11. Studies on optimality of block designs for making test treatment-control comparison

The objectives of the project are (i) to critically review the available literature on optimality aspects of block designs for making test treatment-control comparisons, (ii) to obtain optimal block designs for test treatment - control comparisons under two classified, fixed effects and additive homoscadastic with unequal block sizes, (iii) to obtain optimal block designs for test treatments-control comparisons under two way classified fixed effects and additive heteroscedastic model with unequal block sizes, and (iv) to prepare a catalogue of designs obtained under (i), (ii) and (iii).

A sufficient condition for A-optimality of balanced treatment incomplete block designs with unequal - block sizes in terms of design parameters were derived. Some methods of construction of block designs for making test treatments - control comparisons using deletion, merging of treatments and using resistant variance balanced designs were developed. Further work was in progress.

12. A-optimality of block designs for comparing two disjoint sets of treatments.

The objectives of the project are (i) to obtain proper balanced block designs for making comparison among treatments belonging to two disjoint sets, (ii) to obtain balanced block designs with unequal block sizes for comparing two disjoint sets of treatments, (iii) to study the A-optimality of the designs contructed and to investigate the efficiency of these designs, and (iv) to prepare a catalogue of such designs.

Some methods of construction of balanced two disjoint sets of treatment designs with unequal block sizes (BTDTUB) were developed for comparing a set of test treatments to a set of control treatments. These methods are based on the incidence matrices of block designs with known patterns such as BIB designs, PBIB designs, cyclic designs and variance balanced block designs with equal block sizes.

Further work was in progress.

13. Cataloguing and construction of variance balanced block designs: computer algorithms for construction

The broad objectives of the study are (i) to review the available literature on the methods of construction of variance balanced (binary and non-binary) block designs, (ii) to prepare a catalogue of available variance balanced block designs and their efficiency factor, (iii) to make an attempt to fill the gaps by giving some new methods of construction, and (iv) to give computer algorithms/programs to generate variance balanced block designs.

Catalogue of variance balanced block designs obtainable from methods of construction given by Khatri (1982), Kageyama (1974), Calvin (1986) and Calvin and Sinha (1989) were prepared. It was observed that for number of expeimental units (n) < 1000, we can get variance

balanced block designs from Kageyama (1974) upto number of treatments (v) less than or equal to 41, Khatri (1982) for v <43 and Calvin (1986) for v< 13 only. Computer algorithms were developed for the methods of construction of variance balanced block designs given by Khatri (1982) and Kageyama (1974).

Further work was in progress.

14. 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 <30 treatments in blocks of p rows and q columns, where k =pq <10 and k<v were the objectives of the study.

The report on the project was under finalization.

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

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

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

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

-Inland fish catch estimation
-Studies involving repeated measurements
-Production and area estimation
-Assessment and evaluation studies
-Small area estimation
-Estimation of post production losses
-Methodological studies in complex surveys

Projects in operation thrust-areawise:

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 PS Rawat (CSWRI) Riyazuddin ,, SC Sharma ,,
2.	Survey methodology to study economics of keeping goats	RL Rustagi SC Agarwal Shivtar Singh*

1	2	3
3.	Pilot sample survey to study the economics of Angora 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
5.	Pilot sample survey to develop a sampling methodology for estimation of poultry meat production.	MS Kaushik TB Jain
	Statistical Modelling for Production and Growth	
6.	Statistical modelling for projection of bovine population and prediction of milk availability	SN Arya SC Agrawal HP Singh*
	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 VK Jain PM Ramesan
	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
10.	Development of estimation procedure for agricultural by-products	NK Ohri PC Mehrotra RC Gola
11.	Pilot sample survey for evolving 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.	Anand Prakash** BC Saxena KK Tyagi

1	2	3
12.	Pilot sample survey for estimating the area under waste-land	SS Gupta PC Mehrotra
13.	Sample survey for estimation of cashewnut and cashew apple yield and a study of its cultivation practices	SS Shastri VK Jain PM Ramesan
	Assessment and Evaluation Studies	
14.	Sample survey for study of constraints in transfer of new agricultural technology under field conditions	PC Mehrotra SS Gupta NK Ohri GS Bassi RC Gola SS Shastri MS Narang
15.	A sampling study on utilization of crossbred working animals vis-a-vis non-descripts	JP Goel RS Khatri
16.	Studies on feed intake by bovines through stall feeding and grazing	BC Saxena
	Small Area Estimation	
17.	Estimation of crop yield for small areas	AK Srivastava DC Mathur DL Ahuja SC Sethi
	Estimation of Post Production Losses	
18.	Pilot sample survey for developing a sampling methodology for estimation of post-production losses of milk in rural areas	RS Khatri JP Goel
19.	A methodological investigation in estimating seasonal fluctuation of post-harvest foodgrains losses (wheat)	Jagbir Singh HC Gupta OP Kathuria
	Methodological studies in complex surveys	
20.	Chi-square tests in survey data	Anil Rai AK Srivastava HC Gupta

*Upto July 31, 1994 **Upto August 31, 1994

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 psus and households rearing sheep in a selected village as the ssus 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 report on the project was under finalisation.

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 at fortnightly intervals for one year. The statistical analysis of the data remained in progress during the year under report. The cost component were evaluated and their proportion as percentage of gross cost were obtained.

Further analysis of data remained 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 work of analysis of data and drafting of the project report 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 components 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. The project report was under finalisation.

5. Pilot sample survey to develop a sampling methodology for estimation of poultry meat production

The project was initiated with the objective to develop a suitable sampling technique for estimating the total poultry meat production in Gurgaon district of Haryana state.

In the first instance the preliminary enumeration work of all the commercial poultry farms in the district was completed and the spade work for conducting the detailed inquiry survey was in progress.

6. Statistical modelling for projection of bovine population and prediction of milk availability

This project aims (i) to identify /develop 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.

Time series data on bovine numbers as per livestock censuses in selected states were utilised for fitting growth curves. Data relating to surveys on estimation of age specific vital rates were analysed to obtain the population vector. This pertained to the sex-age structure of the 'current' population and was being used to estimate the 'future' population with the help of population generation matrix. Analysis of data as well as writing of the report were in progress.

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

The study was initiated with the objectives (i) to review the data collection procedures and the present method of reporting catch from lake/reservoirs 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 study was based on the secondary data on fish catch which is being regularly collected by Department of Fisheries, Orissa from Chilka lake. It was observed from the data that total number of boats arriving at different landing centres in a day varied from 20-300. There was a lot of variation in average fish catch per boat per day for different landing centres and during different months. The data indicated a steady increase in the average fish catch per boat per day over the years.

Estimate of annual fish catch for the lake was obtained by two different estimators based on (i) month-wise estimates for the lake and (ii) annual estimates for different landing centres of the lake. Annual fish catch for the lake for the year 1986 was estimated at 9685150.2 Kgs. (with 19.83% S.E.) and 9545536.8 Kgs. (with 12.94% S.E.) by the two estimators.

Estimate of fish catch per boat per day per landing centre and estimate of fish catch per day per landing centre for the lake were worked out by using ratio method of estimation. The corresponding information on fish catch for the previous year was used as an auxiliary variate. An increasing trend was noticed in estimate of per boat fish catch over the years. A similar trend was observed in the estimate of fish catch per day per landing centre.

For each year, estimates of fish catch (a) per day, (b) per month, and (c) per year for different landing centres and the lake was obtained by two different estimators. In Estimator-I the average fish catch per day on all the observed days for different months and landing centres was taken, whereas, in Estimator-II the average fish catch per observed day for different months and landing centres was taken for the ratio method of estimation and corresponding information of the previous year was taken as auxiliary variate. For the year 1986 (taking 1985 as auxiliary year) per day fish catch for the lake was estimated to be 28556.2 Kgs (3.31% S.E.) by Estimator-I and 29526.2 Kgs. (4.89% S.E.) by estimator-II. Similarly, the corresponding per month estimates for the lake were 867629.8 Kgs. (3.31% S.E.) and 897828 Kgs. (4.91% S.E.) respectively and annual estimates for the lake were 10411557.4 Kgs. (3.31% S.E.) and 10773936.7 Kgs. (4.91% S.E.) respectively.

To examine the use of part of data for estimating fish catch from the lake with a reasonable degree of precision, two different estimators were worked. Estimator-I was based on taking random sample of the months, and Estimator-II was based on taking random samples of landing centres. Random sample of size two, three, four and five was selected in different experiments and five samples of each size were taken in each experiment for both the estimators. It was observed that percentage S.E. was of very high order for all the years in case of Estimator-I, whereas, in Estimator-II with sample size five, the percentage S.E. was comparably within reasonable limits.

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.

The field survey was carried out for the period of three years (from 1991-92 to 1993-94) in Maharashtra, Karnataka and Tamil Nadu states. The design adopted was multistage stratified random sampling and the use of successive sampling. Taluks were the strata, villages the psus cultivators the ssus for studying the cultivation practices and for yield study one more stage i.e. cluster of four pepper standards were considered. Ten villages were selected during first year by srs(wor) and in subsequent years 8 were retained and 2 were taken afresh. Estimates for number of standards and average yield per bearing standards were obtained by using different schemes generated through the design.

Linear estimates for each strata and every year were build up. The arbitrary constants used in linear estimates were obtained by forming normal equations and the estimates of their respective variances were also obtained. Rao's Theorem (1952) and its corollary was used while getting these.

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

In the first phase the theoretical work for sampling from two dimensional populations spread over space and time with particular reference to vegetable crops was completed. The theory was also tested on secondary data already collected under earlier vegetable surveys conducting by IASRI. For second phase study some preliminary information was collected from Delhi state for selection of samples.

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

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

The association was studied between each pair of three variables viz. grain yield (x), straw to grain ratio (y) and straw yield (z). In the study of regression of y on z and z on x, some what identical results were obtained while in the study of regression of y on x an entirely different picture was observed.

The data of Hoshiarpur district of Punjab state was studied in detail after applying the techniques of detection of out-liers. The results obtained for different yield level classes were not found in agreement with the results obtained from the entire data.

The report on the project was under finalisation.

11. Pilot sample survey for evolving a sampling methodology for estimation of area and yield of cultivated fodder crops other than berseem and jowar, 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 design adopted in the study was one of stratified random sampling with tehsils as the strata, villages as the p.s.us, fields as the s.s.us' and a plot of specified size as the ultimate unit of sampling.

The project report was being finalised.

12. Pilot sample survey for estimating the area under wasteland

The survey on wasteland was taken up in Udaipur district of Rajasthan during 1993-94 with the objectives to estimate the area under wasteland, to find out the causes of wasteland and also to find out its alternative uses and the extent to which it can be reclaimed.

The statistical analysis of the data remained in progress.

13. Sample survey for estimation of cashewnut and cashew apple yield and study of its cultivation practices

The project was initiated to study the extent of cultivation, yield and cultivation practices of cashew. The yield will include estimation of bearing and non-bearing young trees, cashew apples and nuts.

The design adopted was stratified multistage random sampling with taluk as strata, villages as psus survey numbers as ssus and cluster of trees as tsus. The entire district of Goa comprising all the eleven taluks was divided into two main strata viz. North and South Goa. From the taluk or group of taluks sample of 10 per cent of the total number of villages growing cashew in the entire district was considered. These villages were allotted to different taluks/ strata on the basis of their contribution of cashewnut production to the district level figures. These pre-assigned number of villages in each stratum were selected by ssrs(wor). From the list of orchards, four orchards belonging to different survey numbers were selected randomly. Similarly

from the list of stray trees eight bearing cashew trees were selected randomly so that they belong to two separate survey numbers each having four bearing trees. The information on cultivation practices was collected from these selected orchards and survey numbers of stray trees. The yield study is undertaken in the two orchards and one survey number of stray trees from the corresponding orchards and stray trees survey numbers already selected for studying cultivation practices. Further from each selected garden two clusters of four trees each and from survey number of stray trees one cluster of four trees were selected randomly. For studying yield, enumerators were asked to record from the selected trees separately the yield on day of visit (number of nuts and weight) as well as the total nuts collected during next day of previous visit to previous day of the present visit. In the case of apple number of apples on the day of visit only were recorded. The sample of 300 gms of nuts from each cluster of four trees was considered for driage experiment.

Analysis of data was in progress.

14. 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.

The work of drafting of the consolidated report for the entire period of the survey 1985-86 to 1988-89 was in progress.

15. 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 of working animals, (ii) to estimate the extent of utilisation of working animals, and (iii) to study the factors influencing varying levels of utilisation of working animals.

The report on the project was under finalisation.

16. Studies on feed intake by bovines through stall feeding and grazing

The objective of the project is to study the extent of feed intake by bovines through regular stall feeding and also through grazing. Besides obtaining information on feeding and grazing practices followed in the area, an attempt will be

made to work out the availability and requirements of the nutrients by bovines through both the sources.

The field work in Tamil Nadu state was in progress.

17. Estimation of crop yield for small areas

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

The project is based on both simulated as well as secondary data. The secondary data used in the study related to crop cutting experiments of wheat and paddy crops during 1987-88 to 1988-89 from Haryana state. The data collected on selected fields consisted of plot yield, irrigation, manures, fertilizers etc. have been utilized. The total area sown under these crops for individual blocks have also been utilized. The districts covered for wheat were Hissar, Sonepat, Gurgaon, Faridabad, Kurukshetra, Ambala and Mahendergarh while for paddy were Hisar, Sirsa, Sonepat, Faridabad, Karnal, Kurukshetra, Ambala and Zind. During the period under report for all the districts, the block-wise estimates of crop yield as well as S.E's were calculated using synthetic method approach. The results are quite satisfactory with respect to their consistency as well as efficiency. The standard errors in case of wheat were around 3 per cent except for one district while for paddy it was around 5 per cent.

The project report remained under finalisation.

18. 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 a representative sample using stratified two stage random sampling design with tehsils as strata, village as p.s.u and household as s.s.u. A total sample of 20 p.s.us' was allocated to different strata in proportion to the number of village in them. In every selected p.s.u, the households were classified as 'producers' and 'purchasers' and 5 households from each village were selected every day from both the classifications for detailed enquiry. In addition to this all the cycle venders and confectioners located in the selected p.s.u. were observed. The data were collected by careful enquiry and reference period was the day prior to the day of visit of the enumerator.

The analysis and report writing work was in progress.

19. A methodological investigation in estimating seasonal fluctuations 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 objectives of the study are (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 sampling design of the present study was of a partial replacement pattern of the sampling units.

The design effects of the sampling design used for estimating the percentage food grains losses at the stages of harvest, threshing and storage and for total loss were estimated as 0.75, 0.25, 0.61 and 0.62 respectively. Finally, if it is desired to estimate the percentage foodgrains losses at harvest stage with 7.0 per cent S.E., at threshing stage with 6.0 per cent S.E. and at storing stage with 8.0 per cent S.E.; a sample of 45 villages at district level should be observed.

The report on the project was under finalisation.

20. Chi-square tests in survey data

The study was initiated with the objectives (i) to find out the effect of sampling design on ordinary chi-square tests for survey data, (ii) to evaluate the performance of various modified chi-square statistics for survey data and (iii) to suggest suitable modification for chi-square statistics in sparse contingency table.

Different subroutines for the analysis in case of 1 and 2 objectives were developed. The important subroutines are for stratification, clustering of the population limits, different methods of sample solution, for finding out the area under normal probability integral, the latent roots and latent vectors and for finding out the distribution of quadratic form. Also the part of the data of the project on constraint analysis was obtained and transformed in required form.

Further analysis work was in progress.

DIVISION OF BIO-STATISTICS AND STATISTICAL GENETICS

Mandate:

The Division is responsible for conducting applied and basic research in the field of Bio-statistics and Statistical Genetics

Thrust Area :

- Modeling of newer scientific phenomena in agriculture

Projects in operation thrust-areawise:

No.	Project title	Project leader and associates
	Modeling of Newer Scientific Phenomena in Agriculture	
1.	Modeling curvilinear response among cross-bred dairy cows with increasing level of exotic inheritance	VT Prabhakaran BS Sharma
2.	Statistical modeling for comparing genetic groups of crossbred goats for growth studies based on multiple traits	Lal Chand SD Wahi VK Bhatia
3.	Application of bootstrap techniques for studying the statistical properties of genetic parameters	SD Wahi VK Bhatia Lal Chand
4.	Studies on spatial patterns and its role in analysis of agricultural field experiments	VK Bhatia Prem Narain(IARI) JS Samra(CSWCTRI)

1. **Modeling 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 was completed and the project report was being finalised.

2. Statistical modeling 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 homogeneous clusters by different clustering procedures and to develop some suitable criterion to compare the 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 adjusted for various effects like season, period, parity order etc. were utilised to estimate genetic parameters such as genetic correlation, heritability etc. by half-sib method for body weight, body measurement traits, growth velocity and growth rate at different stages of age of the animals for each genetic group.

Analysis work regarding clustering of various heterogeneous groups into homogeneous groups by (i) Tochers methods, (ii) Graphical presentation of the relationship among different genetic groups and (iii) Similarity matrix method carried out for comparing the performance of goats on the basis of multiple traits was in progress.

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 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 results for the heritability were obtained by using the bootstrap technique and estimates of standard error and confidence intervals and optimum number of bootstrap replications by two methods.

The required softwares were being developed to study the genetic correlation and to obtain their standard error, confidence intervals and the optimum number of bootstrap replications.

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 project report remained 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 Area:
- 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 Gurcharan Singh (IARI) BC Panda " RC Jain RN Garg (IARI)
2.	Composite forecast of sugarcane yield	SC Mehta Chandrahas
3.	Yield forecast based on weather variables and agricultural inputs on agro-climatic zone basis	Ranjana Agarwal RC Jain SC Mehta
4.	Statistical modelling for forecasting of marine fish catch	SS Walia Balbir Singh

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.

This is a collaborative project between Division of Agriculture Physics, IARI, New Delhi and IASRI to develop an integrated model for wheat yield forecast.

The third round of field experiment were planned and laid out accordingly.

Fortnightly observations were collected on the characters pertaining to:

i) *Plant characters*: number of plants per metre row length, plant height, length and breadth of flag leaf, leaf area index, dry matter, grain yield at harvest,

ii) *Agromet parameters*: soil moisture and canopy temperature, and

iii) *Spectral data*: Crop reflectance corresponding to 4 bands used in satellite data.

The work of data preparation was in progress.

2. **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.

The entire data on weather parameters such as rainfall, temperature, relative humidity, wind speed, number of rainy days and clound amount etc., were converted into fortnightly units before utilising these variables for models development.

Talukawise forecasts computed from the models based on the data on weather parameters and biometrical characters were obtained. The percentage deviation of the forecast yield from the observed yield obtained from the data on weather parameters ranged from 2 to 34 percent while that of the estimate from the data on biometrical characters ranged from 2 to 37 percent .

Future analysis of data was in progress.

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

Earlier crop yield forecast models using weather variables were developed at 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 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.

Various forecast models were developed for rice and wheat crop in rainfed agro-climatic zone of Madhya Pradesh. Models were developed but none of the models was very satisfactory. This may perhaps be due to lot of missing values in the data.

Data were again screened to look into the problem of missing values. It was found that number of missings was quite large in wind velocity. Analysis was carried out deleting the wind velocity from the model so as to have more data points. Situation improved somewhat when models were developed using complete crop season data. However, models using partial crop season data were again not satisfactory. Therefore, attempts were being made to procure more data points for further analysis.

4. Statistical modelling for forecasting of marine fish catch

The study was taken up with the primary objective to develop appropriate model for forecasting of marine fish catch and to test the adequacy of models developed so as to recommend most appropriate models for each state under study. There are twelve maritime states/union territories in India. The fish catch data was not available for two Union Territories, namely, Andaman and Nikobar and Lakshdweep.

Quarter-wise actual marine fish landings data for 40 points of time pertaining to ten maritime states/Union Territories, namely, Orissa, Kerala, Tamil Nadu, Pondicherry and Karaikal, Karnataka, Goa, Andhra Pradesh, Maharashtra, Gujarat and West Bengal were collected from special publications of Central Marine Fisheries Research Institute, Cochin released on 40th Anniversary of the Institute under the heading 'An appraisal of marine fisheries for the ten states/Union Territories mentioned above. The data were compiled in the form of time-series for different states and different points of time were denoted as period 1 to 40.

The report on the project was finalised.

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-areawise:

No.	Project title	Project leader and associates
	Technological Change and its Diffusion in Agriculture	
1.	Non-linear statistical models for adoption of HYVs in India	VK Sharma Prajneshu Sushila Kaul
2.	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	
4.	Testing relative economic efficiency and determination of factor demand and output supply functions for wheat	SS Kutaula

1	2	3
5.	Estimation of farm level technical efficiency and its related parameters under error decomposition methodology of stochastic frontier model in the production of wheat.	SS Kutaula RK Pandey
	Farm Planning Under Risk and Uncertainty	
6.	Study of farmars' 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	
7.	Estimation of demand for agricultural credit and its effect on farm income and employment	UN Dixit A Kumar Ant Ram

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 High Yielding Varieties (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 have been made to obtain stochastic versions of non-linear logistic and Gompertz models. Since the complete analysis of a non-linear stochastic model is well-neigh impossible, therefore most of the studies for these types of models confine either to the deterministic treatment or else use Monte-carlo estimates for the evolution of the process which are often extremely expensive in computer time and depend on the particular choice of the parameters. The general solution of a stochastic model, when it can be evaluated, is usually tedious and offers little insight into the behaviour of the process. Consequently, the asymptotic solution often leads to greater insight than the exact solution. The diffusion approximation technique has been employed in the study to analyse the stochasticity of these models. The behaviour of the stochastic models have been represented by the deterministic solutions with suitable Gaussion processes of small orders superimposed which

describe the fluctuations of the process. It may be emphasized that, whenever the Kolmogorov equations of the process cannot be explicitly solved, the technique presented here is of great importance. The chief merit of this method is that a complete picture of the time evolution of the stochastic as well as deterministic aspects of the given process can be obtained under very mild restrictions. A 3-equation model was developed in an alternative way to identify the factors responsible for variation in the parameters of the adoption process of HYVs. Instrumental variables technique was employed to estimate the coefficients of the model assuming that the explanatory variables are subject to error. The report on project was being finalized.

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

The project aims (i) to examine the suitability of different models for studying technological change in crop production, (ii) to examine the effects of technological change on factor shares, and (iii) to study the effect of technological change on input use and output mix of crops.

The study is undertaken on rice and wheat crops in the state of Uttar Pradesh . Crop wise production functions for two periods were estimated for examining the resource productivity and factor share in the production of these crops. Hicksian model of technical change was utilized to measure the nature of technical change. Chow test and analysis of covariance were employed to identify whether the structural break in shift from LV to HYV and other improved practices is of Hick's neutral or non-neutral technical change. Further analysis work was in progress.

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.

In this project consumers' surplus approach was used to estimate the economic gain. It was observed that the effect of technological advance in rice production across states vary from high quality of land-dependent case to low quality of land-invariant case. In general producers were the main beneficiaries of technological advance in rice production in all the states. The consumers' gains were found to be insignificant as compared to producers gain in all the states. Gains from technological advance are mainly dependent on shift in supply curve and the movement of price. Consumers' gains mainly depend on price movement while producers' gains depend on the extent of shift in supply curve.

The project report was being finalised.

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.

By Unit Output Profit (UOP) function approach and applying the Lau-Yotopoulos test the study inferred that there are no significant differences between the large and small farmers in their relative economic efficiency in both the states. the same set of conclusions are also drawn when the data of both the categories of farmers are applied to Chow-test indicating the fact that the two groups of sample farms do not give different relationship. Therefore, there are reasons to believe that the Punjab and Haryana agriculture has been modernised, relying on new varieties of seeds, fertilizers, irrigation and other chemical inputs for which both the large and small farms have similar access. Further, the salient features of the present study reveals that in all the estimating equations, the 1985-86 wheat data of Punjab and Haryana provides goodness of fit as witnessed by the values of coefficient of determination and F-statistic. In almost all the cases normalised price elasticities of variable inputs are less than one indicating inelastic response. However, the price elasticities of output obtained from relevant estimating equations are greater than one indicating elastic response. The estimated coefficient of land input is highly significant. Almost in all the cases unconstrained joint GLS coincides with the LS estimates. The reduction in the standard error and substantial improvement in the estimates of the coefficient of normalised prices of variable inputs, is obviously a clearcut indication that constrained joint GLS should be preferred over unconstrained joint GLS of SURE methodology under the framework of UOP project function.

Project report was under finalisation

5. Estimation of farm level technical efficiency and its related parameters under error decomposition methodology of stochastic frontier model in the production of wheat

The objectives of the project are (i) to examine production elasticities of various inputs, (ii) to estimate the related parameters of technical efficiency, namely variances of one-sided, error term and symmetric error terms and ratios of standard error of one-sided error term to symmetric error terms, (iii) to identify discrepancy parameters for finding discrepancies between observed output (actual) and maximal output (frontier), (iv) to estimate mean technical efficiency of sample forms, and (v) to estimate the technical efficiency of individual farms.

The work of farm level wheat data collection for 1986-87 from Punjab state was completed. Further work was in progress.

6. 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 results obtained from Alwar district showed yield was the major source of risk in the crop production . In oilseeds and pulse crops witnessed larger variation in yield during the period 1966-80 and the same reduced over the period of 1981-91. The farmers behaviour towards risk in the investment on purchased inputs revealed that they behave differently. The observed value of risk-averse coefficient 'K' suggests that farmers can still invest more in organic manners in respect of wheat and gram crops. In case of DAP fertilisers they can invest more in barley and mustard crops. While in urea the further scope of investment formed in barley, mustard and wheat crops. Among different categories of farmers, the small farmers found to be high risk averse as compared to medium and large categories.

7. Estimation of demand for agricultural credit and its effect 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.

In this study, the secondary as well as primary data were collected on the basis of high level of input consumption. The primary data were collected from Muzaffarnagar district .

The district was divided into 4 administrative zones. Two zones on the basis of highest and lowest level of credit disbursement per village were selected. From each zone two block and from each block 8 villages were selected randomly. From each village 10 farmers representing marginal, small, medium and large category of holding size were selected randomly in proportion to the size of farmers in each category.

Data collected from primary and secondary sources were being analysed.

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 agricultural research
- To conduct adhoc training courses on use of computers in agricultural research
- To provide scientific support in research data analysis to agricultural research and animal sciences workers

Thrust Areas :

- Development of software for agricultural research methods for data analysis and data base management system
- System modelling and simulation

Project in operation :

No.	Project title	Project leader
	Development of software for agricultural research data analysis	
1.	Development of software for mixed models	IC Sethi

1. Development of software for mixed models

The objective of the project was to develop software for mixed models and to write the users manual.

The report on the project was under finalisation.

Software Developments

-A new interactive program for North Carolina Design I was developed and a number of other existing programs were modified to meet the requirements of users.

-Softwares developed as part of M.Sc (C.A.) dissertations are.

"Development of Computerised Information System for selecting major crops"

"Modelling a Database for Research in Dairy cows'.

"A Simulation Optimisation approach for predicting APHID population".

"The Design of Drip Irrigation System".

Training Activities

The Division organised the following training courses on "Use of computers in agricultural research" for the benefit of scientists of Agricultural Universities and scientists and technical/ administrative staff of ICAR Institutes/ Headquarter.

(i) Three training courses for NARP Scientists.

(ii) Four regular short term training courses for ICAR Institutes and Agricultural Universities.

(iii) One training programme for Administrative Staff of IASRI

(iv) Two training courses for Key Punch Operators of IASRI

(v) Five training courses for senior/ middle level officers of ICAR headquarter

(vi) Three training programme for junior level staff of ICAR headquarter

Scientific Support in Research Data Analysis

The Division provided help in data processing, analysis and interpretation of results to the following reesearch workers from various ICAR Institutes and Agricultural Universities.

- No. of Ph.D. Scholars : 15
- No. of M.Sc. students : 22
- No. of other research workers : 7
- No. of Biotechnological abstracts output given : 20,000 references

Computer Utilization

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

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:

- Pilot sample survey for estimation of yield of pepper and study of cultivation practices using successive sampling - Sindhudurg (Maharashtra), Kodagu (Karnataka) and Gudalur and Coimbatore (Tamil Nadu).

- Sample survey for estimation of cashew nut and cashew apple yield and study of its cultivation practices (Goa).

- Studies on feed intake by bovines through stall feeding and grazing - Dharshnapuri (Tamil Nadu).

- Pilot sample survey to develop a sampling methodology for estimation of poultry meat production - Distt. Gurgaon

- Estimation of demand for agricultural credit and its effect on farm income and employment - Distt. Muzaffar Nagar.

POST-GRADUATE TRAINING AND EXTENSION

Regular Training Courses

The four regular post-graduate training courses: Profesional Statisticians' Certificate Course, Diploma in Agricultural and Animal Husbandry Statistics Course, Senior Cerficate 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 Statsticians and Agricultural Scientists and a short term course on the Use of Computer in Agricultural Research have been started from 1986 and are being conducted on a regular basis. To meet the growing demands from various agencies for training to their staff a new certificate course in Statistical Computing has been introduced from 1993. Apart from this, the Institute continued to conduct, in collaboration with IARI, two degree courses leading to M.Sc. and Ph.D. degrees in Agricultural Statistics and M.Sc. degree course in Computer Application in Agriculture. During 1994-95, 5 students were admitted to various courses: 3 Ph.D., 1 M.Sc. in (Ag. Stat.) and 1 M.Sc. (Computer Application). Seven students: 2 Ph.D. and 2 M.Sc. in Agricultural Statistics and 3 M.Sc. (Computer Application) successfully completed their degree programmes.

Adhoc Training Courses

Short-term Courses on 'Use of Computer in Agricultural Research'

The XXIII short-term training course on "Use of Computer in Agricultural Research" was organised during April 1 - 15, 1994 for scientific and technical personnel of various ICAR Institutes and State Agricultural Universities. This was attended by nineteen participants. The various topics covered included DOS operations, data base management systems, dBASE IV, the statistical package MICROSTAT and SPAR1 and the computer programming language BASIC.

The Valedictory function jointly for XXII and XXIII short term courses was held on April 14, 1994. Dr NN Goswami, Dean and Joint Director, IARI, New Delhi delivered the valedictory address and distributed certificates to the participants.

The XXIV and XXV short-term training courses on "Use of Computer in Agricultural Research" were organised during September 1 - 15, and September 16-20, respectively. The XXIV Course was for scientific/technical personnel from ICAR Institutions located in Delhi. This was attended by 25 scientists/ technical personnel. The XXV Course was

for participants from ICAR Institutes (outside Delhi) and State Agricultural Universities. This was attended by 22 participants. 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, SPAR1 and dBASE IV 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 September 30. Dr. OP Kathuria, Director of the Institute welcomed the Chief Guest, Dr. Panjab Singh, Joint Director (Research), IARI, New Delhi who delivered the Valedictory address and distributed certificates to the participants.

The XXVI short-term training course on "Use of Computer in Agricultural Research" was organised during March 16 -30, 1995. The course was for scientific and technical personnel of ICAR Institutes located in Delhi. This was attended by seventeen participants. The various topics covered included DOS operations, data base management systems, dBASE IV, the statistical package MICROSTAT and SPAR1 and the computer programming language BASIC.

Short term training course on use of computer in Administration

The first short term training course on use of computer in administration was organised from Oct 03-28 at the Institute. The course was inaugurated by Sh GS Sahni, Secretary, Indian Council of Agricultural Research on Oct 03. This was attended by 15 participants.

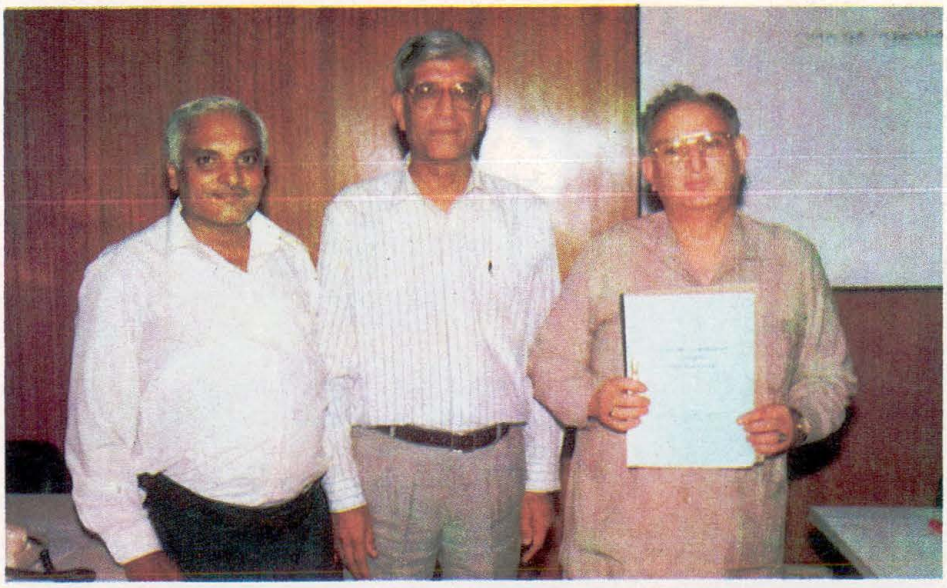
The course coverage comprised of computer fundamentals, DOS operating system, text processing package WORDSTAR, the accounting package LOTUS 1-2-3 and data base management package dBASE.

NARP Training Programs

Third training course on "Use of computer in agricultural research" for NARP scientists was organised from April 25-May 07 at IASRI. The course was inaugurated by Dr N Vijayditia, Deputy Director General, NIC, New Delhi and attended by thirteen participants. The course comprised of lectures and practical classes on the operating system MSDOS, the spread sheet package LOTUS 1-2-3, the data base management system REFLEX 2.0, the text processing package WORDSTAR 6.0, the graphics package HARVARD GRAPHICS, the statistical package MSTAT-C and SPAR1. Some special lectures on Computer networking and Recent Trends in Information Technology were arranged.

The fourth training course on 'Use of Computer in Agricultural Research' for National Agricultural Research Projects (NARP) scientists was organised at the Institute from July 29 - Aug 11 which was attended by 10 participants. The Course was inaugurated by Dr PN Bhat, Director of the Institute, on July 29. He also released a book entitled "Computer fundamentals including operating systems". Dr PN Bhat, OSD, ICAR delivered the Valedictory address on Aug 11 and distributed certificates to the participants.

The fifth training course on 'Use of Computer in Agricultural Research' for NARP scientists was organised from Aug



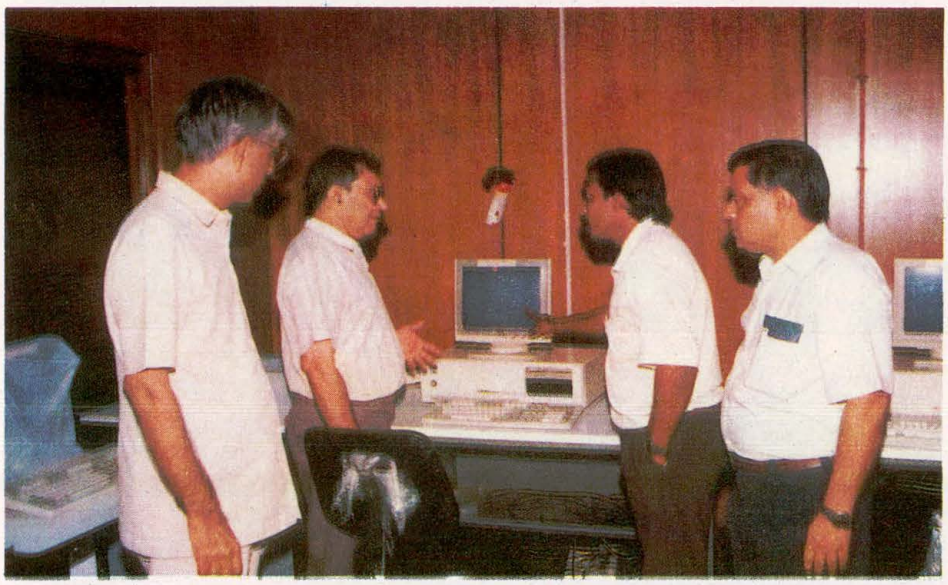
At the Inaugural function of XXV short-term course on Use of Computer in Agricultural Research (Standing from L to R) Dr RK Pandey, Dr OP Kathuria and Dr PN Bhat, Director.

Dr Panjab Singh, Joint Director (Research), IARI, distributing the certificates at the Valedictory Function of XXIV and XXV Short-term courses on Use of Computer in Agricultural Research.

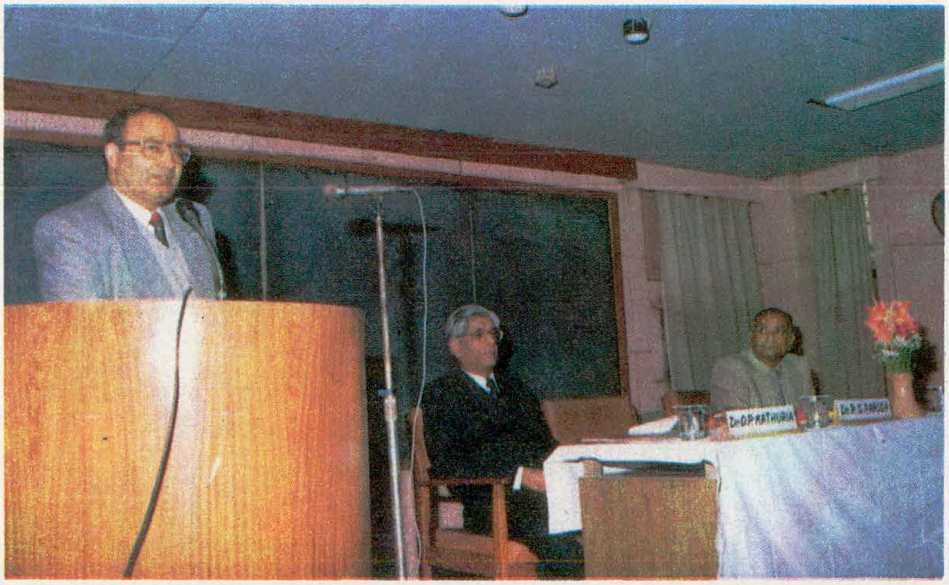
Sh GS Sahni, Secretary, ICAR delivering the Inaugural Address at the first short-term training course on Use of Computer in Administration.

Dr N Vijayditia, Deputy Director General, NIC inaugurating the NARP Laboratory at the Institute.

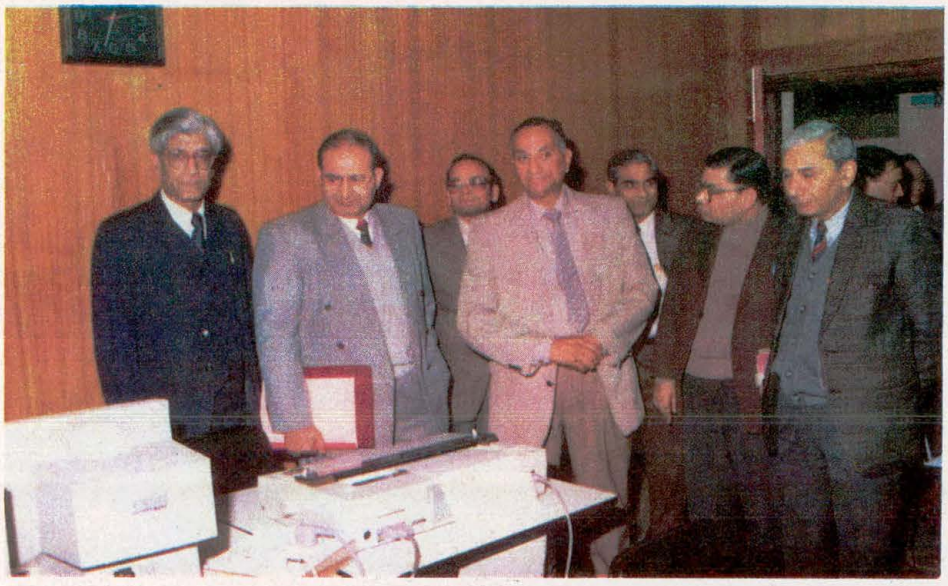
Dr PV Dehadrai, Deputy Director General (AS), ICAR delivering the Valedictory Address at the fifth training course on Use of Computer in Agricultural Research for NARP Scientists.



Dr PV Dehadrai, Deputy Director General (AS), ICAR visiting the Computer Centre of the Institute



Dr RS Paroda, Director General, ICAR and Secretary, DARE inaugurating the first training programme on Computers for ICAR Headquarters Staff.



Dr RS Paroda, Director General, ICAR and Secretary, DARE and Dr DS Balain, Deputy Director General (AS) visiting the Computer Centre of the Institute.

17-31. Dr OP Kathuria, Director of the Institute delivered the Orientation Talk. The course was attended by 19 participants. Dr PV Dehadrai, DDG(AS), ICAR delivered the Valedictory address and distributed certificates to the participants.

The courses coverage comprised of lectures and practical training on operating system MSDOS operations, text processing package WORDSTAR, the graphics package Harvard Graphics and introduction to statistical packages SPSS and SPAR1. Some special lectures on Computer Networking and recent trends in information technology were arranged during the courses at NIC.

Training Programmes on Computers for ICAR Headquarter Staff

Eight training programmes viz. five for senior/ middle level officers and three for Junior level staff of ICAR Headquarter were or ganised at the Institute. Dr RS Paroda, Director General, ICAR and Secretary DARE inaugurated the first training programme on Jan 6. These courses were attended by 33 senior/ middle level officers and 43 junior staff of the ICAR headquarter. The various topics covered included MS-DOS operation, Date Base management IV, Nortern Editor (NE), the text processing package WORD STAR, WP etc.

Workshop-cum-seminar on 'Optimality and Robustness of Design'

The workshop-cum-seminar on 'Optimality and Robustness of Design' was organised at the Institute from April 25-29, 1994. The workshop was inaugurated by Dr SS Acharya, Chairman, Commission for Agricultural Costs and Prices. Seventeen participants from ICAR Institutes/ Agricultural Universities including 8 participants from IASRI attended the workshop. Topics covered in the course are (i) introduction to various optimality criteria, (ii) optimality of designs with minimal observations, (iii) optimality of designs under a homoscedastic model (fixed effect model) (Proper, non-proper, partially balanced designs, row-column designs), (iv) optimality of designs under hetroscedastic model, and (v) optimality of designs under a mixed effects model.

A valedictory function for the course was held on Apr 29 and the certificates were distributed to the participants.

Summer Institute

A summer Institute on "Recent Advances in Agricultural Statistics with Special Reference to General Linear Models and Applied Regression Analysis" was held at IASRI, New Delhi from May 16- Jun 4 1994. Thirty scientists from various ICAR Institutes, State Agricultural Universities and IASRI were admitted to the Summer Institute out of which 24 scientists joined including 3 from IASRI. A total number of 64 class room lectures of one hour duration each were arranged. Twenty seven lectures were delivered by distinguished and eminent guest speakers and the remaining 37 by the distinguished faculty members of IASRI. Two lectures on a Unified theory of least squares were delivered by Prof. Aloke Dey. Similarly Prof. KL Krishna, Director, Delhi

School of Economics, delivered two lectures on Qualitative Response Models. Among the other important and useful topics were regression diagnostics, Jackknifing in linear regression, measurement errors in regression models, stochastic modelling, bootstrap procedure and its application in genetic studies, regression analysis from survey data, robust experimental designs and the use of SPSS package. On the request of participants, special lectures were arranged on topics like selection of variables in regression models, Box-Jenkin's methodology, designs for making test treatments-control comparisons and linear models. Two group discussions of two hours duration each were arranged. Several important statistical problems were raised and discussed in these meetings. During these discussions a need was felt to arrange a short course, possibly of a week's duration, on regression analysis with special emphasis on analysis of residuals. The participants also visited Indian Statistical Institute, Delhi Centre

International Training Course

The VI International training course on 'Techniques of Estimation of Output of Food Crops' was organised at the Institute from Oct 18-Dec 1. The course was jointly funded by the Ministry of External Affairs under its ITEC programme and Afro Asian Rural Reconstruction Organisation (AARRO). Ten participants from 8 different Afro Asian countries, 2 each from Bangladesh and Malaysia and 1 each from Kenya, Egypt, Philippines, Sudan, Ghana and Zambia attended the training course. The training course was inaugurated by Dr. R.S. Paroda, Director General, ICAR and Secretary, DARE. The Valedictory address was delivered by Dr. B.N. Singh, former Director General, Bureau of Indian Standards, New Delhi. The training programme comprised of lectures on statistical methods, sampling methods and applications, use of PCs, storage and marketing system of foodgrain, import and export of foodgrains, food supply system in India and Agricultural scenario of India. Particular emphasis in the training course was laid on methods of area and yield estimation followed in India for estimation the production of foodgrains. The faculty for the training course was mainly drawn from the Institute and the 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, Directorate of Economics and Statistics, Central Statistical Organisation, Ministry of Agriculture and Ministry of Food. The expertise of various senior level retired officers from different statistics organisations was also utilised. Apart from delivering lectures on the subject of area and yield estimation, the participants were also taken to West Bengal and Uttar Pradesh for practical demonstration of area and yield estimation in non-land record and land record states.

Visits of Foreign Nationals

Mr Shaizad. Chief, Material Production Division and Mr Altankhyag, Statistician from State Statistical Office, Mongolia visited the Institute on Jun 14-15 for technical discussions. The Director and

Dr Aloke Dey, Professor, Stat.-Math. Unit, ISI delivering the lecture to the participants of Summer Institute on Recent Advances in Agricultural Statistics with special reference to General Linear Models and Applied Regression Analysis.

Dr RK Pandey, Director delivering his address at the Inaugural function of Summer Institute on Recent Advances in Agricultural Statistics with special reference to General Linear Models and Applied Regression Analysis.

Dr RS Paroda, Director General, ICAR and Secretary, DARE delivering the Inaugural Address at the VI International training course on Techniques of Estimation of Output of Food Crops.

Dr RK Pandey, Director delivering the Welcome Address at the Valedictory Function of VI International training course on Techniques of Estimation of Output of Food Crops.

Heads of Divisions acquainted the visitors with the activities of the Institute with particular reference to data collection. They were also taken round to the Computer Centre of the Institute.

Dr. Paul Fox, In-charge of Wheat International Nurseries Data Management, CIMMYT, MEXICO and Dr. Ian de lacy, Biometrician, Department of Crop Science, University of Queensland, Brisbane, Australia alongwith Dr Gene. E. Saari, CIMMYT Representative, Kathmandu, Nepal visited the Institute on 6th December. They were acquainted with the activities of the Institute and the role it has played in the management of agricultural experimental data in India

Training programmes organised for trainees from other organisations.

Sl. No.	Name of programme	Dates	No. of trainess	Sponsoring agency	Lecturers
1	2	3	4	5	6
1.	Jr. Certificate course in Statistics-specialised training in Agricultural Statistics	26.04.94 to 28.04.94	2	C.S.O., New Delhi	Dr HP Singh Sh SN Mathur Dr Randhir Singh Dr VK Gupta
2	M.Stat. Course of Indian Statistical Institute	23.05.94	36	,,	Dr RK Pandey Sh Balbir Singh
3.	M.Sc.(Stat.) students Chandigarh	15.12.94	26	Punjab Univ., Chandigarh	Sh SN Mathur
4.	M.Sc.(Stat.) students	08.03.95	18	Gujarat Agril Univ., Gujarat	Dr AK Srivastava Sh SN Mathur

Research Fellowships

During 1994-95, 8 M.Sc. and 16 Ph.D. students received research followships. 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 16 Ph.D. students 9 received fellowship at the rate of Rs. 1800/-p.m. each in the I and II year and 7 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 in-mates. Hostel mess is run by the students on cooperative basis. The general management of the hostels is vested in the Warden, who is assisted by Prefect and other students. The main activities included:

- Annual sports meet of students was organised.
- Annual Day of the Hostel was celebrated.
- 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.
- A Cricket match between the students and the staff members under the Captainship of Dr OP Kathuria, Director, IASRI was held on Feb 11 which was won by the staff side.

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 75 seminar 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 RS Chikara, Professor, University of Houston, Texas, Colorado, USA	Regression estimation in agricultural labour survey in U.S.A.
2.	Dr N Krishnaji, Director, Centre for Economic and Social Studies, Hyderabad	Population pressure 1891-1981 regional variations and consequences.

1	2	3
3.	Prof. Prem Narain Prof. Emeritus, (CSIR), and former Director, IASRI, New Delhi	Science and Statistics
4.	Dr OP Kathuria Director, IASRI, New Delhi	Area and yield estimation survey in Zambia

Advisory Service

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

Technical advice and guidance were 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.

Technical advice and guidance was given by Head, Division of Sample Survey Methodology and Analysis of Survey Data to

- Director of Land Records, Himachl Pradesh, Shimla regarding finalization of technical programme for conducting of survey on citrus fruits.
- Technical Committee of Direction for improvement of Animal Husbandry and Dairy Statistics for finalization of milk and egg estimates.

DISTINGUISHED VISITORS

1. Dr RS Paroda,
   Director General, ICAR and
   Secretary, DARE,
   New Delhi

2. Dr Gajender Singh,
   Dy. Director General (Engg.),
   ICAR, New Delhi

3. Dr PN Bhat,
   OSD, ICAR,
   New Delhi

4. Dr PV Dehadrai,
   DDG (AS), ICAR,
   New Delhi

5. Mr. Shaizad,
   Chief,
   Material Production Division,
   State Statistical Office,
   Mangolia

6. Mr. Altankhyag,
   Statistician,
   State Statistical Office,
   Mangolia

7. Dr Paul Fox,
   In-charge of Wheat International
   Nurseries Data Management,
   CIMMYT,
   Mexico

8. Dr Ian de Lacy,
   Biometrician, Department of
   Crop Science, University of
   Queensland, Brisbane,
   Australia

9. Dr Gene. E. Saari,
   CIMMYT, Representative,
   Kathmandu, Nepal

10. Dr RS Chikara,
    Professor,
    University of Houston,
    Texas, Colorado, USA

11. Dr. N Krishnaji,
    Director,
    Centre for Economic and
    Social Studies,
    Hyderabad

12. Prof. Prem Narain,
    Prof. Emeritus (CSIR),
    New Delhi

13. Dr SN Ray,
    Director General,
    Central Statistical Organisation,
    New Delhi

14. Dr Padam Singh,
    Director,
    Institute of Research in Medical
    Statistics, New Delhi

15. Dr Aloke Dey,
    Prof and Head (Stat.—Math. Unit)
    Indian Statistical Institute,
    New Delhi

16. Dr SS Acharya,
Chairman,
Commission for Agricultural
Costs and Prices,
New Delhi

17. Prof KL Krishna,
Director,
Delhi School of Economics,
Delhi

18. Sh GS Sahni,
Secretary,
ICAR, New Delhi

19. Mr Shyam Goswami,
FAO, Regional Project Manager,
Thailand, Bangkok

PUBLICATIONS

The major publications of the Institute comprised about 40 papers and popular articles the details of which are as follows:

Research Papers Published

1. ARYA, SN; GEORGE, B; SINGH, DP AND SINGH, BALBIR (1994). Estimates of some reproduction traits of sheep and goats in village conditions. *Indian J. Ani. Res. 28(1):68-70*

2. BHATIA, VK; JAYASANKAR, J and WAHI, SD (1994). Use of bootstrap technique for variance estimation of heritability estimators. *Ann. agri. Res.*, 15(4):476-480.

3. BHATIA, VK and MALHOTRA, PK (1995). On some aspects of estimation and comparison of retention frames of different categories of dairy cattle. *Indian J. Dairy Sci., 48(2): 110-116*

4. CHAWLA, GC (1994). Use of mixed model for studying protein levels and litter floor densities for poultry production. *Ind. J. Anim. Res. 28(1):31-34*

5. CHAWLA, GC. Two period cross-over for animal clinical trials. *Indian J. Animal Sci., 2: 54-61*

6. CHAWLA, GC and GUPTA, VK . Two factors change-over designs based on Williams Square *Indian J. Animal Sci., 2: 26-34*

7. GOYAL, RC; CHHIKARA, RS and SINGH, RANDHIR (1994). Estimation of crop yield using post-stratification based on satellite data. *Jour. Ind. Soc. Ag. Statistics*,46(2): 210-222

8. JAIN, RC, GARG, RN; SINGH, GURCHARAN and AGARWAL, RANJANA (1994). Model to forecast yield of rice (oryza-sativa) using agro-spectral data. *Ind. J. Agril. Sciences.* 64(5): 320-323

9. NARAIN, PREM and LAL CHAND (1994). Generalised heritability and its estimation. *Jour. Indian Soc. Agril. Statist., 46(3): 318-329*

10. PRABHAKARAN, VT and SHARMA, BS (1994). On probability of heritability estimates from full-site analysis exceeding unity based on underlying theoretical distribution. *Biom. J.*, 36(3): 341-352

11. RAI, ANIL (1994). Variance estimation techniques in categorical data analysis for survey data. *J. Ind. Soc. Agril. Statistics*, 46(1): 147-155

12. RAI, T AND GARG, RN (1994). State - wise growth pattern of total foodgrain production in India. *New Botanist 21 (1): 121-124*

13. RAI, T; SATYA PAL AND GARG, RN (1994). Adopted doses of fertilizer nutrients for optimum rice production. *New Botanist 21(1): 135-138*

14. RAI, T; SATYAPAL and GARG, RN (1994). Adopted doses of fertiliser nutrients for optimum rice production. *New Botanist*, 21(1): 135-138.

15. SETHI, IC AND JAIN, JP (1994). Preliminary selection of sires on partial records in dairy cattle. *Biom. J. 36(3): 363-371*

16. SINGH, BALBIR and ARYA, SN (1994). Relationship between dentition and age of goat. *Indian J. Anim. Res., 28(2): 93-96*

17. SINGH, JAGBIR and KATHURIA, OP (1994). Sampling on two occasions with two correlated characters. *Jour. Indian Soc. Agri. Statist., 46(1): 166-174*

18. SINGH, JAGMOHAN; SINGH, BH AND KATHURIA, OP (1994). Effect of drainage system on yield of paddy crop in food prone area. *Agril. Sci. Digest 14(1):19-22*

19. WAHI, SD (1994). Estimator of repeatability for perennial crops. Jour. Ind. Soc. Agric. Stat. *46(2): 279-289*

20. WAHI, SD and MALHOTRA, PK (1994). Comparative performance of estimators of repeatability. *Ind. Jour. Dairy Sci., 47(6) : 644-649*

Research Papers Accepted for Publication

1. ARYA, SN and GEORGE, B (1994). Reasons for cattle mortality in a rural environment and the effect of category-sex classification. *Ind. J. Vet. Science*

2. ARYA, SN; GEORGE, B; SINGH DP and SINGH, BALBIR (1994). Estimates of some reproduction traits of sheep and goats in village conditions. *Ind. J. Animal Science*

3. BHATIA, AK (1995). Statistical evaluation of crop sequences. *Ann. agri. Res.*, Vol 16.

4. BHATIA, AK and SIKARWAR, HS (1995). Yield trend and economics of continuous application of balanced dose of fertilizer. *Ann. agri. Res.*, Vol 15.

5. BHATIA, DK; ARYA, SN; SINGH, SHIVTAR and MATHUR, DC. Patterns of mortality in cross-bred vis-a-vis local cattles in a hilly area of Himachal Pradesh. *Ind. J. Animal Research*

6. BHATIA, DK; SINGH SHIVTAR; ARYA, SN and SETHI, SC. Pattern of immortality in corssbred vis-a-vis local cattle in hilly areas of H.P. *Indian J. Anim. Res.*

7. BHATIA, VK; JAYASANKAR, J AND WAHI, SD. Use of bootstrap techniques for variance estimation of heritability estimators. *Annals Agri. Res.*

8. CHAWLA, GC. Two period cross over for animal clinical trials. *Ind.J. Animal Science*

9. CHAWLA, GC and GUPTA, VK. Two factor change-over design based on 'Williams' squares'. *Ind. J. Animal Science*

10. GOYAL RC; SINGH, RANDHIR and RAJ. S. CHHIKARA (1994). Estimation of crop yield using post-stratification based on satellite data. *J. Ind. Soc. Agril. Statistics*

11. JAGGI, SEEMA and AGARWAL, KN. Augmented partial diallel design for estimating combining ability of parents. *Biom. Jour.*

12. RAI, A; RAI, T; MOHANLAL and SINGH, P. Use of log linear model in census. *Annals Agri. Res.*

13. RAI, T. Wheat production in India in 2000AD, Annals of Agric. Res.

14. RANA, PS and SINGH, UP. On the use of population generation matrix ACTA CIENCIA INDICA.

15. RAO, CH and SATYA PAL. Economic efficiency of nitrogen and phosphorous fertilization in rainfed greengram (Moong) in Telangana region of A.P. *Indian Soc. Agric. Sci.*

16. SINGH, BALBIR and ARYA, SN. Relation between dentition and age of goat. *Ind. J. Animal Research.*

17. WAHI, SD. Estimators of repeatability for perennial crops. *J. Ind. Soc. Agril. Statistics.*

18. WAHI, SD and BHATIA, VK (1995). Use of bootstrap method in comparing the performance of linear discriminent functions. *Jour. Indian Soc. Agri. Statist.*

Research Project Reports Published

- Models for forecasting aphid pest of mustard crop (1992).
  by GN Bahuguna and Chandrahas

- Statistical aspects of physological kinetics in animal nutrition (1992).
  by PS Rana and Prem Narain

- Small area estimation of milk production (1993).
  by Shivtar Singh; JP Jain and DK Bhatia

- Statistical studies on nitrogen economy through organic sources (1994).
  by Rajinder Kaur; Ajit Kaur; Madan Mohan and PN Soni.

- Statistical estimation of multi-equation acreage response models under crop substitution (1994).
  by VK Sharma and Ashok Kumar

- Non-parametric estimation for determining premium in all risk crop insurance (1994).
  by JN Garg, Prem Narain and Indra Singh

- Use of imputation for missing data in census and surveys
  by Tribhuwan Rai and Randhir Singh

- Investigation in sampling methods for multiple frame surveys in two stage sampling
  by BC Saxena and AK Srivastava

- A statistical model for assessing the effect of weeds on crop yield (1994)
  by GN Bahuguna, BH Singh and Madan Mohan

- Pilot sample survey for developing a sampling methodology for estimation of livestock products on the basis of data collected as a part the normal work of field agency of Animal Husbandry Departments of States, Hoshangabad (MP) and Trichure (Kerala) (1993).
  by RS Khatri, JS Maini, KB Singh and JP Goyal

- Pilot sample survey for relative merits of the data obtained by actual weighment and those through enquiry for estimation of milk production distt. Pulwama, (J & K) (1994)
  by KB Singh, RS Khatri and JP Goyal

- Pilot sample survey for estimation of production of hides and skins district, Surat (Gujarat) (1991).
  by JS Maini, JP Goyal, KB Singh, RS Khatri and TD Khatri

Dissertations Approved

Ph.D. (Agri.Stat.)

NARANG, MS - Some studies in post-stratified design involving auxiliary information.

In many practical situations, auxiliary information is utilized for improving the efficiency of estimators. One of the approaches in this direction for certain specific problems is to resort to post-stratification. While adopting post-stratification technique, it is generally assumed that the strata weights are known. In such situations, sometimes, strata weights are in the form of strata sizes and strata means for the auxiliary character. In case they are not known, either their estimation is needed through double sampling or some approximate quessed values may be used. This problem is particularly pronounced when post-stratification is attempted in a two-stage design with stratification according to the second stage-sampling units.

In the present thesis, this problem has been investigated under different sampling situations - one, estimation of population parameters in a two-stage design with post-stratification on the basis of ultimate stage sampling units utilizing auxiliary information through a ratio estimator at the ultimate stage when the auxiliary information is available secondly, when auxiliary information is not available. Attempted the second situation of the problem in two different schemes:

Scheme I: When main sample is drawn as sub-sample of the preliminary (large) sample.

Scheme II: When main sample is taken independently of the initial large sample (preliminary sample).

And under each of the above two schemes three different cases studied are:

i) When strata means are known but strata sizes are not known,

ii) When strata sizes are known but strata means are not known,

iii) Neither strata means nor strata sizes are known.

The methodology developed is of immense use in practical situations often encountered in many fields of activity like agriculture, social studies etc.

(Guide: Dr PC Mehrotra)

M.Sc. (Ag. Stat.)

SREEKUMAR, J - Studies on genetics gain on deleting and restricting variance traits in different selection strategies.

In selection experiments based on multiples traits, the contribution of individual character on genetic gain plays an important role for formulating future breeding plans. In addition to this, breeders are also interested in those selection strategies where the character of interest get improved and traits, which are of little importance may either be restricted for genetic improvement or for zero/no genetic change. Finally it is also of interest to combine several indices generally based on simplified notions into a composite index for the subsequent use of flexible economic weights. Keeping this in mind, following Cunningham (1969), the theory of reduced indices in the case of phenotypic index has been developed and then, this is used for identifying the important variables. The effect of restriction on a trait upon the overall genetic change and the effect of different proportion of restriction on the weighing factors of other characters in the selection index also have been examined.

For illustration purpose, the breeding data of Sahiwal breed of cattle belonging to different military diary farms have been used. The percentage reduction in efficiency of the reduced index on dropping a trait in comparison to original index for all characters has been worked out and the maximum value is due to the character weight at calving with value as 17.48 percent. The percentage reduction in dropping two or three traits at a time have also been obtained. In the case of phenotypic index the reduction in efficiency by dropping various auxiliary traits has been worked out. It is also visualised for all characters a linear relationship of weighing factors and proportion of restriction. It is concluded from this linear trend that any change in restriction will bring about same change in all other characters.

In the end the usefulness of the composite index is highlighted by working out constituent indices under simple notions. By employing constituent indices, and various flexible economic weights, the optimum selection strategy can be visualised without much of computational problems.

(Guide: Dr VK Bhatia)

M.Sc. (CA)

SHASHI BUSHAN LAL - Software development for the design of drip irrigation system.

A User-friendly software designing Drip Irrigation System has been developed using the languge, Turbo-BASIC, which runs on the most common operating system called DOS (Disk Operating System). The Blasius formula for Turbulent flow in a smooth pipe could be used. But, the most frequently used Williams-Hazen formula has been used, considering maximum headloss in the longest lateral in the field of any shape. The operating pressure head for an emitter has been taken as 10 m. Maximum allowable headlosses of 20% and 10% have been assumed for lateral and submain design respectively. If a field has its main line laid in such a way that the headloss in the longest lateral becomes more than 2 m., then the design is rejected. In that situation, the main pipe laying in an alternative way, is a solution to the problem. Another solution is to lay more than one main line in the field.

Since, the flow through a lateral or submain is a steady and spatially varied flow, the Williams-Hazen formula changes the value of its constant. The new value of constant has been suggested for a lateral or submain with more than 20 outlets. In case of less than 20 outlets for laterl or submain design the Williams-Hazen equation with the old constant has been used.

Conclusion:

- The Software should be developed for a condition wherein the headloss through the longest lateral goes beyond 2 m., by laying more than one main pipe in the field.
- The slope of the field should also be considered.
- There must be actual value of percent area wetted or a method to calculate this for all the crop for which the design has been carried.
- The operational schedule should be determined by considering different stages of all the individual crops.
- The system cost should be optimized.

(Guide : Sh Mahesh Kumar)

SEMINARS/SYMPOSIA/WORKSHOPS/CONFERENCES ATTENDED BY THE SCIENTISTS

Sl No.	Name	Programme Title	Place	Period
1.	Dr RK Pandey Dr Shivtar Singh	Seminar on 'Livestock for sustainable Rural Employment and Income Generation'	NDRI, Karnal	Apr 06-07
2.	Dr RK Pandey	National workshop on 'Improvement of Statistics on Gender Issues' organised by Central Statistical Organisation	Vigyan Bhavan, New Delhi	Apr 28-29
3.	Dr OP Kathuria* Dr PR Sreenath Dr AK Srivastava** Dr VK Bhatia Sh Jagmohan Singh Sh DC Mathur Sh SC Sethi Sh Madan Mohan Sh Satya Pal	The 48th Annual Conference of Indian Society of Agricultural Statistics	K.A.U., Mannuthy, Trichur	Dec 15-17

* i) Chairman of the Symposium on 'Utilisation of available data in Agricultural Research', and

ii) Convenor of the Symposium on 'Plantation crops and their Role in New Economic Scenario' held during the Conference.

** Convenor of Technical Session of Symposium on 'Utilisation of available data in Agricultural Research' held during the Conference.

Sl No.	Name	Programme Title	Place	Period
4.	Dr OP Kathuria Dr RK Pandey Dr VK Sharma	Policy Seminar on Future Growth in Indian Agriculture	I.A.R.I., New Delhi	Dec 19
5.	Dr RK Pandey	Workshop on 'Issues and Problems re-lating to research in crops'	NCAP, New Delhi	Dec 21-22
6.	Dr PS Rana	Second International Triennial Symposium on "Probability and Statistics"	Calcutta University, Calcutta	Dec 30-Jan 02
7.	Dr OP Kathuria Dr Prajneshu Dr HVL Bathla Dr VK Bhatia Dr GC Chawla Sh SD Wahi Sh SP Bhardwaj Sh T Rai Sh VK Jain	National Symposium on "Agriculture in relation to Environment" organised by ISAS.	IARI, New Delhi	Jan 16-18
8.	Dr RK Pandey	Seminar on 'Structural Changes in the Economic Policy and Perspective to Rural Development	NIRD, Hyderabd	Feb 23-25
9.	Sh RS Khatri	The 26th Dairy Industry Conference organised by Indian Dairy Association	Vigyan Bhavan, New Delhi	Feb 25-26
10.	Dr Anil Rai	Workshop on 'Geographic Information System and Economic Development' organised by SCADA, Computer Centre, Patna.	Patna, Bihar	Feb 09-11

PAPERS PRESENTED AT SEMINARS/ SYMPOSIA/ WORKSHOPS/ CONFERENCES

Author(s)	Paper Title	Programme Title	Venue	Period
Pandey, RK Singh, Shivtar	Extent of labour employment in livestock keeping	Seminar on Livestock for sustainable Rural Emloyment and Income Generation	NDRI Karnal	Apr 06
Ahmad, T Kathuria, OP	Comparative study of farmer's eye estimate and crop cut estimate by fitting models	48th Annual Conference of Indian Society of Agricultural Statistics	K.A.U., Mannuthy, Trichur	Dec 15-17
Arya, SN Singh, Shivtar	Structure of ovine population in a district of Tamil Nadu	,,	,,	,,
Bahuguna, GN Singh, BH Mohan, Madan	Models of assessing the effect of weeds on wheat yield	,,	,,	,,
Chugh, K Pal, Satya	Trends in onion production	,,	,,	,,
Jaggi, Seema Shukla, RK Agarwal, KN	Estimation of combining ability of parents through augmented partial diallel cross design	,,	,,	,,
Kumar, Vijayaraghava Sreenath, PR	Some combinatorial properties of designs for neighbour effects and correspondence of these designs to directed graphs	,,	,,	,,

Author(s)	Paper Title	Programme Title	Venue	Period
Mathur, DC Walia, SS Kathuria, OP	An appropriate forecast model for production of stick lac in major lac growing states of India	,,	,,	,,
Nirman, KPS Arya, SN Singh, Shivtar	Estimation of annual broiler meat production in an area: methodology and results	,,	,,	,,
Rao, A Ramakrishna Prabhakaran, VT	On some useful inter-relationships among common stability parameters	,,	,,	,,
Satyapal	Yield gap analysis in buffalo milk in a rural area	,,	,,	,,
Sethi, SC Singh, Jagmohan Bhatia, DK	Impact of farmer contact programme on yield of wheat in Haryana	,,	,,	,,
Singh, BH Singh, Jagmohan Sethi, SC	Preharvest forecast model for prediction of groundnut yield	,,	,,	,,
Shukla, RK Prabhakaran, VT	Probability of obtaining negative estimates of heritability from full-sib analysis	,,	,,	,,
Singh, Jagmohan Singh, BH	Impact of occurrence of flood on yield of paddy at various stages of crop growth	,,	,,	,,
Singh, KN Singh, Randhir	The effect of response errors and non-response errors on variance estimation	,,	,,	,,

Author(s)	Paper Title	Programme Title	Venue	Period
Sreekumar,J Bhatia, VK	Studies on genetic gain in deleting various traits in different selection strategies	,,	,,	,,
Bhatia, VK	Exploratory data analysis approach for studying retention times in dairy cattle	Symposium on Utilisation of available data in Agricultural Research organised during the above conference	,,	,,
Srivastava, AK	Use of available information in agricultural surveys	,,	,,	,,
Rana, PS	The queue with heterogeneous groups of channels and departure dependent service rate	Second International Triennial Symposium on "Probability and Statistics"	Calcutta University, Calcutta	Dec 30-Jan 02
Kathuria, OP Bathla, HVL	Database for monitoring environment in relation to agriculture	National Symposium on "Agriculture in relation to Environment" organised by ISAS	IARI, New Delhi	Jan 16-18
Bhatia, VK Narain, Prem	Environmental Modelling by spatio-temporal data analysis	,,	,,	,,

Author(s)	Paper Title	Programme Title	Venue	Period
Rai, A Srivastava, AK	Role of agricultural surveys in geographic information system.	Workshop on "Geographic Information System and Economic Development" organised by SCADA, Computer Centre. Patna.	Patna, Bihar	Feb 09-11
Pandey, RK Ashok Kumar	Implication of structural changes In economic policy for agriculture	Seminar on New Economic Policy and Perspective to Rural Development.	NIRD, Hyderabad	Feb 23-25

OTHER INFORMATION ABOUT SCIENTISTS

Membership of Scientific Societies

-International Association of Survey Statisticians

Dr OP Kathuria

-Indian Society of Agricultural Economics, Bombay

Dr RK Pandey, Sh TB Jain and Sh SP Bhardwaj

-Indian Society of Agricultural Statistics, New Delhi

Dr OP Kathuria, Dr Prajneshu, Dr AK Srivstava, Dr PC Mehrotra, Sh R Gopalan, Dr Randhir Singh, Dr BS Sharma, Dr (Mrs) Ranjana Agrawal, Dr HVL Bathla, Dr VK Gupta, Sh TB Jain, Dr SS Shastri, Dr RC Jain, Sh Shanti Sarup, Dr Basant Lal Choudhary, Sh RL Rustagi, Dr GC Chawla, Dr VK Bhatia, Dr PK Malhotra, Sh MS Batra, Dr DL Ahuja, Sh SN Arya, Dr KK Tyagi, Sh SD Wahi, Sh KPS Nirman, Sh Lal Chand, Sh Jagmohan Singh, Dr PS Rana, Sh RS Khatri, Sh DC Mathur, Sh GL Khurana, Sh Balbir Singh, Dr Jagbir Singh, Sh BH Singh, Sh JP Goyal, Smt Rajinder Kaur, Sh DK Bhatia, Sh SC Sethi, Dr MS Narang, Mrs Ajit Kaur Bhatia, Sh Madan Mohan, Sh HO Agarwal, Sh T Rai, Sh Satya Pal, Sh VK Jain, Sh K Chugh, Dr Anil Rai, Dr (Km.) Seema Jaggi and Dr Rajendra Prasad

-Computer Society of India, Bombay

Sh SN Mathur, Sh Mahesh Kumar and Dr PK Malhotra

-Indian Association of Statistics and Applied Research, Hisar

Sh RS Khatri

-Biometric Society, Washington, USA

Dr BS Sharma

-Indian Econometric Society, Delhi

Dr VK Sharma

-International Statistical Institute, Netherlands

Dr VK Gupta

-Indian Society of Agricultural Science, New Delhi

Dr GC Chawla, Dr VK Bhatia, Mrs Ajit Kaur Bhatia, Sh T Rai, Sh Satya Pal, Sh VK Jain and Dr Rajendra Prasad

-Society for Information Sciences, New Delhi

Sh Mahesh Kumar

-Indian Academy of Social Sciences, Allahabad

Sh Shanti Sarup

-Indian National Science Academy, New Delhi

Dr PK Batra

-Federation of Agricultural and Allied Services Association, New Delhi

Sh SN Arya

-Acta Cincia Indica

Dr PS Rana

-Indian Dairy Association

Sh RS Khatri

-Indian Society for Medical Statistics, New Delhi

Dr Jagbir Singh

-Indian Economic Association

Sh SP Bhardwaj

Offices in Professional Societies

-Honorary Secretary, Indian Society of Agricultural Statistics, New Delhi

Dr OP Kathuria

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

Dr RK Pandey

-Honorary Joint Secretary, Indian Society of Agricultural Statistics, New Delhi

Dr PR Sreenath and Dr VK Bhatia

-Member Executive Council, Indian Society of Agricultural Statistics, New Delhi

Dr AK Srivastava

-Joint Secretary, Indian Society of Agricultural Sciences, New Delhi

Dr VK Bhatia

Membership/Offices of Committees/ Panels/Working Groups

-PG Faculty Members of PG School, IARI, New Delhi

Dr OP Kathuria, Dr RK Pandey, Dr PR Sreenath, Dr Prajneshu, Sh SN Mathur, Dr AK Srivastava, Dr HVL Bathla Sh R Gopalan, Dr Randhir Singh, Dr PC Mehrotra, Dr BS Sharma, Dr VK Sharma, Dr(Mrs.)Ranjana Agrawal, Dr VK Gupta, Dr VT Prabhakaran, Dr BC Saxena, Dr RC Jain, Sh Mahesh Kumar, Dr VK Bhatia, Sh OP Dutta, Dr PK Malhotra, Dr R Srivastava, Sh SD Wahi, Dr GC Chawla, Dr PS Rana and Sh BH Singh

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

Dr RK Pandey

-Members Management Committee of IASRI

Dr PR Sreenath, DR AK Srivastava, Dr VK Gupta and Dr UN Dixit

-Editorial Board, Journal of ISAS, New Delhi.

Dr AK Srivastava

-Academic Council of PG School of IARI, New Delhi

Dr Randhir Singh and Sh Mahesh Kumar

-Standing Commitee on Courses, Curricula and Academic Affairs, PG School, IARI, New Delhi

Dr Randhir Singh

-Secretary, Staff Research Council, IASRI, New Delhi

Dr HVL Bathla

-Indian Science Congress Association, Calcutta

Dr RC Jain and Dr Rajendra Prasad

-Technical Committee Member on Progeny Testing Programme in Maharashtra

Dr VK Bhatia

SPECIAL LECTURES, TRAINING AND MEETING

Dr PN Bhat

- Chaired

* Tenth Meeting of Task Force on Animal Biotechnology, Veterinary Science, Animal Husbandry and Leather Biotechnology of the Department of Biotechnology, Ministry of Science & Technology, Government of India from Jul 28-29

* Management Committee meeting of the Institute on Aug 2

- Attended the meeting of Academic Council at IARI, New Delhi on Jun 18

Dr OP Kathuria

- Chaired

* The Institute Joint Staff Council meeting on Aug 17

* Staff Research Council meeting on Aug 23

* The meeting of the Institute Joint Staff Council on Jan 11.

* The meeting of the Grievance Committee of the Institute on Jan 21.

* The meeting of the Library Committee of the Institute on Jan 23.

* The meeting of the Staff Research Council of the Institute held on Jan 27-28.

* Meeting of the Management Committee of the Institute held on Mar 27.

* The meeting of the Hindi Coordination Committee of the Institute held on Mar 28.

- Attended

* The Academic Council meeting of P.G. School, I.A.R.I., New Delhi on Aug 31

* The meetings of Board of Studies for the disciplines of Agricultural Statistics and Computer Application in Agriculture at P.G. School, IARI, New Delhi on Sep 27

* Meeting of the Academic Council of P.G. School, IARI, New Delhi on Nov 2

* The Annual Meeting of Directors of ICAR Research Institute held at IARI, New Delhi on Nov 7-8.

* As Secretary in the meeting of the Executive Council of the Indian Society of Agricultural Statistics on Jan 9.

* The meeting of the Academic Council of IARI on Jan 28.

* The meeting of the Research Advisory Committee of NARP-II Project on Animal Production held at NDRI, Karnal on Feb 18.

* The meeting of High Level Coordination Committee of the Directorate of Economics and Statistics, Karnataka held at Bangalore on Feb 28.

- Had Group Discussion with

* The trainees of 4th National Agricultural Research Project (NARP) training course on Aug 10

* The trainees of 5th National Agricultural Research Project (NARP) training course on Aug 30

* The trainees of 24th Short Term Training Course on Use of Computer in Agriculture Research on Sep 15

* The trainees of 25th Short Term Training Course on Use of Computer in Agriculture Research on Sep 30

Dr RK Pandey

- Attended the Mid-term Meeting of the Correlative Group on International Research at Vigyan Bhawan on May 23

Dr AK Srivastava

- Delivered a lecture to ISS officers at CSO on Multistage sampling and systematic sampling on Oct 19.

Dr RC Jain

- Delivered a lecture on 'Crop yield forecasting' at Indian Institute of Management, Ahmedabad on Aug 2.

Dr VK Bhatia

- Attended as a member the 6th Technical Committee Meeting on Progeny testing programme at Pune in Maharashtra State on Mar 20

Miscellaneous Information

Dr PN Bhat

- Joined as Director of the Institute on Jun 6

Dr OP Kathuria

- Acted as Chief Supervisor of the Agricultural Research Service Examination, 1994 of the Agricultural Scientists Recruitment Board at Delhi Centre during Oct 14-16.

- Attended

  * The Inaugural Function of the FAI Annual Seminar 1994 "Challenges of liberalization in the Fertilizer and Agriculture Sectors" at New Delhi on Dec 8.

  *Attended the Plenary Session of the 2nd meeting of Agricultural Economists held at National Centre of Agricultural Economics and Policy Research (NCAP), New Delhi on Dec 22.

- Chief Guest at the Valedictory Function of Tenth Training Course on "Data Processing Techniques for PGR documentation" at National Bureau of Plant Genetic Resources, New Delhi on Aug 27

- Attended the Seminar delivered by Dr Pinstrap Anderson, Director General, IFPRI, Washington, D.C., USA at Krishi Bhavan, New Delhi on Mar 31.

- Held discussion with Mr. Shyam Gangwani, FAO Regional Project Manager, Thailand, Bangkok during his visit to the Institute on Mar 23.

- Delivered a Seminar on "Research Perspective for the Institute-Changing scenario" at IASRI on\\ Feb 3.

Dr Randhir Singh

- Visited

- IIRS, Dehradun to discuss about the cooperation/collaboration in the project 'Use of Remote Sensing Technology in Crop Yield estimation surveys-II' during Mar 23-24

- Space Application Center, Ahmedabad for discussion on the 'Use of Satellite data in crop yield Estimation Surveys and the availability of Satellite data' during Mar 26-30

Dr UN Dixit

- Convenor, Institute Sports Committee

- Secretary, Institute Recreation and Welfare Club

Dr Chandrahas

- Attended third Winter School on Remote Sensing in Agriculture with special emphasis on Watershed Development during Dec 5-30, 1994 at Agricultural Physics Division, IARI, New Delhi.

Dr KK Tyagi

- Deputed as Chef-de-Mission of IASRI Sports Contingent at the IX ICAR Inter Zonal Sports Meet organised by IGFRI, Jhansi during Oct 4-7. The team won the Championship Trophy for the Institute.

Dr PS Rana

- Deputed as a participant in the National Training Programme Inter-Regional Communication by NIC-Network for Agril and Forestry Research from Aug 22-26 at HGIIREPD, Bakoli, Alipur, Delhi

Sh SS Srivastava

- Deputed as a Deputy Director (Library Services), SAARC AGRICULTURAL INFORMATION CENTRE (SAIC), DHAKA, Bangladesh from Aug 20, 1994 to Aug 19, 1997 (3 Years)

Dr GC Chawla, Dr UC Sud, Sh GL Khurana, Sh Aloke Lahiri, Sh DK Mehta, Sh HO Agrawal and Dr Anil Rai

- Attended the training course on 'Optimality and Robustness of Designs' held at IASRI during Apr 25-29

Sh DK Sehgal, Sh NK Sharma and Sh Satyapal

- Attended the Summer Institute on 'Advances in agricultural statistics with special reference to general linear models and applied regression analysis' held at IASRI during May 16-Jun 04

Sh TB Jain, Dr GC Chawla, Dr KK Tyagi, Sh Jagmohan Singh, Sh T Rai, Sh VK Jain and Sh BH Singh

- Attended the concluding function of Diamond Jubilee celebrations of the Indian National Science Academy at Vigyan Bhawan, New Delhi on Jan 7.

Foreign Assignment

Dr OP Kathuria

- Deputed to Zambia as FAO Consultant under TCDC agreement for Area and Yield Estimation Surveys from Nov 8-Dec 5.

Awards

Dr VK Gupta

- National Fellow of the Indian Council of Agricultural Research to work at IASRI, New Delhi for a period of five years w.e.f. January, 1995. The Fellowship is offered to work on the Project "Studies on Optimality of Designs Useful in Agricultural and Animal Experiments".

Dr Anil Rai

- Jawahar Lal Nehru Award of ICAR for outstanding Post Graduate Research contribution in the field of Social Science including Home Science for 1993.

Dr VK Bhatia and Dr PK Malhotra

- Awarded Best Paper award during the 48th Annual Conference of Indian Society of Agricultural Statistics held at K.A.U., Mannuthy, Trichur in applied section for the paper entitled 'Genetic parameters of stability of different categories of dairy animals' by VK Bhatia, Prem Narain and PK Malhotra published in the Journal of Indian Society of Agricultural Statistics, 44(2), 1992.

Indian Society for Training and Development, New Delhi

- Material for inclusion in the Directory of Trainers and Training Institutions.

Institute of Applied Manpower Research, New Delhi

- Information regarding pilot project on 'National Science Manpower Information System'.

Indian National Science Academy, New Delhi

- Material for inclusion in the Directory of 'Agricultural Research Workers in India'.

Indian Bibliographic Centre, Varanasi

- Data base for their Directory.

United Nations Economic Commission for Africa, Addis Ababa - Ethiopia

- Material for inclusion in the Directory of Statistical Training Centres and Associate Centres participating in the Statistical Training Programme for Africa.

Gale Research Inc., Michigan, USA

- Material for inclusion in the Directory of International Research Centres.

MONITORING CELL

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

- Information regarding Development of Scientific Manpower as per IcAR Proformae was collected and complied and sent to ICAR
- RPFs for the different Division for the year 1993 and pending for earlier year were sent to ARIC(ICAR)
- Annual Plan of IASRI for 1995-96 was prepared and sent to ICAR
- Material regarding 'Project Based Budgeting" was revised as per ICAR guidelines and sent to ICAR
- Information regarding 'Status of Industry sponsored research programmes' during 1989-90 to 1993-94 was prepared and sent to National Research Development Corporation, New Delhi
- Information on research project and teaching/guidance undertaken/ proposed during 1993-94 to 1995-96 by the Scientists at the Institute was being collected
- Information on Mid-Term Appraisal of the VIII Plan for IASRI as per ICAR proformae was prepared and sent to ICAR
- Material for additional requirement of budget under TA/DA and contingencies for the year 1994-95 was prepared and submitted to Director for onward transmission to DDG(AS), ICAR.

COORDINATION AND MONITORING CELLS

COORDINATION CELL

This cell is responsible for documentation and dissemination of scientific output of the Institute through IASRI Newsletters, Annual Report, etc. It also organises National Conference of Agricultural Research Statisticians and also conducts meetings of Heads of Division and Principal Scientistsofthe Institute from time to time.

Report/Newsletters Published

- Annual Report, 1993-94
- IASRI Newsletter, Jan-Mar, 1994
- IASRI Newsletter, Apr-Jun, 1994
- IASRI Newsletter, Jul-Sep, 1994
- IASRI Newsletter, Oct-Dec, 1994

Communication of Research Material

ICAR

- Material for
  - i) Inclusion in Annual Report of ICAR for the year 1993-94
  - ii) Updating the Institute-wise data base in the ICAR Computer Cell
  - iii) Inclusion in the Directory of ICAR - Scientists regarding Additional information for Col No. 7.
  - iv) The Institute since inception for ready reference of DDG(AS)
  - vi) The Institute for ready reference of DDG(E)
  - vii) Audio-visual presentation for DG,ICAR in the 66th Annual General Meeting of the ICAR Society with slides.
  - viii) Inclusion in the directory entitled, 'Six monthly programme of Conferences/Seminars/Symposia/ Workshops/ Meetings etc. proposed to be held' during the periods July - December, 1994 and January - June, 1995

CSO, New Delhi

- Material for inclusion in the Statistical Newsletters of Central Statistical Organisation.

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 1994-95 edition

LIBRARY AND DOCUMENTATION SERVICES

Resource Building

As a part of its important activities the Library continued its resource collection programme as under:

Total number of publications

Books	—	22843
Journals	—	5546
Reports	—	6894

Number of publications added

Books	-	112
Journals	—	503 issues
ReportS	—	222

Journals subscribed

Indian	—	20
Foreign	—	78

Bulletin / Newsletters received orgratis/ exchange : 150

Procured latest version of the CDS/ ISIS software package for library computerisation

Library Usages

Number of publications issued from the Library : 20263

Library Users

Number of bonafide library members : 375

Number of students (regular) members : 20

Number of adhoc trainee users : 75

Library Services

Number of documents borrowed or lent out on Inter Library Loan : 85

Library Management

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

Art and Photography Unit

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

Photographic jobs including exposing, processing and printing of about 600 photographs taken on various important occasions and of important research and extension activities of the Institute were

executed. In addition, enlargement of good number of photographs were also done.

The charts and graphs were up-dated 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.

The meeting of Joint Staff Council was held on Aug 17 under the Chairmanship of Dr OP Kathuria, Director of the Institute. Various issues as per agenda were discussed.

Another meeting of the Institute's Joint Staff Council was held on January 11 under the Chairmanship of Director, IASRI. Various issues as per agenda were discussed.

Election of the new Joint Staff Council was held on March 7 and the following representatives of various groups were elected for a period of 3 years w.e.f. March 13, 1995.

Scientific Group

1. Shri A.K Gupta, Experimental Scientist

Technical Group

1. Sh. RK Singh, Technical Officer
2. Sh. Narayan Singh, Technical Officer
3. Sh. Jarnail Singh, Field Investigator
4. Sh. Ghasi Ram, Technical Assistant

Administrative/Auxiliary Group

1. Sh. PS Rai, Assistant
2. Sh. AK Bhalla, Sr Clerk

Supporting Staff

1. Sh. Gabbar Singh Rana, SS Grade-II
2. Sh. Bhagwat Rai, SS Grade-III

GRIVANCE 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.

Grievance Committee of the Institute was constituted under the Chairmanship of the Director, Dr OP Kathuria with the following as Members

Official Side	Staff Representative
1. Dr RK Pandey	1. Dr DL Ahuja, Scientific Group
2. Sh Chironji Lal	2. Sh RD Garg, Technical Group
3. Sh VR Srinivasan	3. Sh Anand Prakash Verma, Administrative Group
4. Sh JK Kasotia, Member-Secretary	4. Sh RC Nagpal, Auxiliary Group

A meeting of Grievance Committee was held on Jan 21.

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. 1260/- was collected in the account of Benevolent Fund contribution from April 1, 1994 to March 31, 1995.

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, 1995 was 506. The General Body meeting of the society was held on June 1, 1994 in which the accounts for the year 1992-93 were presented and passed.

The election of new Managing Committee was held on Jan 20, 1995. Prior to this the Managing Committee elected on Aug 20, 1993 was responsible for the work during the year 1993-94. During the accounting year 1993-94 the society advanced Rs.2606800/- as loan to its members.

During the financial year 1994-95 an amount of Rs.101/- was given as gift to each of the 14 members on their retirement from the Institute.

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 and 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, 1995 was 457.

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 recreation of its members. The Club also organized sports tournament at the Institute level for different games/events.

SPORTS

ICAR Inter Zonal Sports Meet was organised by IGFRI, Jhansi during Oct 4-7, 1994. The Institute Table Tennis Team comprising of Dr KK Tyagi (Captain / Chef-de-mission), Sh. GM Pathak, Sh SK Upadhaya and Sh Parveen Saxena won the Championship Trophy.

हिन्दी के प्रगामी प्रयोग में प्रगति

अप्रैल 1994 से मार्च 1995 के दौरान संस्थान में राजभाषा के प्रयोग को गति प्रदान करने के लिए निम्नोक्त मदों के अन्तर्गत विभिन्न निर्णय लिये गए तथा गतिविधिया एवं आयोजनादि हुए:

निदेशक महोदय की अध्यक्षता में संस्थान की राजभाषा कार्यान्वयन समिति की तीन बैठकें हुई जिनमें अनके महत्वपूर्ण विषयों पर विचार-विमर्श हुआ और निर्णय लिये गये। राजभाषा नीति के कार्यान्वयन के लिये गृहमंत्रालय के राजभाषा विभाग द्वारा तैयार वर्ष 1994-96 के वार्षिक कार्यक्रम पर विचार-विमर्श करने के पश्चात कार्यक्रम में निर्धारित लक्ष्यों को प्रचारित करना व उनको पूरा करने की दिशा में ठोस कदम उठाना। इस दिशा में कदम उठाने के लिये विभिन्न अनुभागों/प्रभागों से कहा गया है कि वे "क" एवं "ख" क्षेत्र में स्थित कार्यालयों के साथ हिन्दी में ही पत्र व्यवहार करें और कार्यालय में विभिन्न अनुभागों/प्रभागों के बीच जो पत्राचार किया जाए उसमें भी हिन्दी का अधिकाधिक प्रयोग करें।

संस्थान में हिन्दी सप्ताह के दौरान हिन्दी प्रचार-प्रसार के अलावा अनेकों प्रतियोगिताओं का आयोजन किया गया। दिनांक 19 सितम्बर से 24 सितम्बर 1994 तक निम्न प्रतियोगिताओं का सफल आयोजन हुआ :

1. हिन्दी लेख एवं निबन्ध प्रतियोगिता
2. हिन्दी अनुवाद प्रतियोगिता
3. हिन्दी टिप्पण एवं प्रारुपण प्रतियोगिता
4. हिन्दी काव्य पाठ प्रतियोगिता
5. वाद-विवाद प्रतियोगिता
6. अन्ताक्षरी प्रतियोगिता
7. प्रश्न-मंच प्रतियोगिता
8. हिन्दी टंकण एवं आशुलिपि प्रतियोगिता
9. हिन्दी व्यवहार प्रतियोगिता (सामूहिक)
10. हिन्दी व्यवहार प्रतियोगिता (वैयक्तिक)

दिनांक 19 सितम्बर से 24 सितम्बर 1994 तक उपरोक्त कार्यदिवतों में हिन्दी प्रतियोगिताओं का आयोजन किया गया जिसके दौरान संस्थान के सभी प्रभागानुभागादि के अधिकारियों एवं कर्मचारियों से अपना अधिकाधिक कार्य हिन्दी में करने की अपील की गयी और इस दौरान किये गये हिन्दी कार्यों का निरीक्षण संस्थान की पुनग्रठित निरीक्षण उप समिति ने दिनांक 26 सितम्बर 1994 को किया जिसके आधार पर अपना अधिकांश कार्य हिन्दी में करने पर रख-रखाव और प्रशासन-III अनुभाग को संयुक्त रूप से चलशील्ड एवं उत्साही तथा हिन्दी में अच्छा कार्य करने वाले कर्मचारियों को व्यक्तिगत तौर पर पुरस्कृत किया गया।

तदोपरान्त दिनांक 29 सितम्बर 1994 को संस्थान में हिन्दी वार्षिकोत्सव समारोह मनाया गया। इस अवसर पर श्री अखिलेन्द्र पाल सिंह ने मुख्य अतिथि डा० ओम प्रकाश कथूरिया निदेशक का स्वागत किया तथा हिन्दी

गतिविधियों की जानकारी दी। तत्पश्चात "डा० दरोगा सिहं तृतीय स्मारक व्याख्यानमाला'' का आयोजन किया गया जिसमें मुख्य वक्ता भा.कृ.आ. संस्थान के प्रमुख वैज्ञानिक (विस्तार) डा० आर.पी. सिंह ने अपने व्याख्यान से उपस्थित समूह को हिन्दी के प्रति उत्साहित किया। लगभग 50 सफल प्रतियोगिताओं को और मुख्य वक्ता को मुख्य अतिथि ने अपने करकमलों से पुरस्कृत किया मुख्य अतिथि संस्थान के निदेशक डा० ओम प्रकाश कथुरिया ने संस्थान में हो रही हिन्दी कार्यों के लिए संस्थान के हिन्दी अनुभाग के कर्मचारियों को बधाई दी और सभी उपस्थित अधिकारियों/कर्मचारियों को आह्वान किया कि सरकारी कामकाज में हिन्दी का प्रयोग सभी को अपना नैतिक दायित्व समझते हुए करना चाहिए। डा० कथूरिया जी का कहना था कि भारत की राजभाषा के रूप में हिन्दी का अधिकाधिक प्रयोग स्वप्रेरणा और देश भक्ति की भावना से करना चाहिए।

समारोह के अन्त में श्री अखिलेन्द्र पाल सिंह ने धन्यवाद प्रस्ताव के माध्यम से मुख्य अतिथि मुख्य वक्ता एवं उपस्थित जनों और आयोजकों की सफल भूमिका एवं योगदान की प्रशंसा की।

संसदीय राजभाषा निरीक्षण समिति की दूसरी उप समिति ने दिनांक 23 नवम्बर 1994 को संस्थान का निरीक्षण दौरा किया। इस दौरान संस्थान निदेशक व उच्च अधिकारियों के साथ संसदीय राजभाषा समिति के सदस्यों की बैठक में समिति सदस्यों ने संस्थान में हो रहे हिन्दी के काम-काज की व्यापक समीक्षा की और कई सुझाव दिये। संसदीय समिति ने विशेषरूप से जोर दिया कि संस्थान में 80 प्रतिशत से अधिक अधिकारी एवं कर्मचारी हिन्दी का कार्यसाधक ज्ञान रखते हैं तो संस्थान को भारत सरकार के गजट में अधिसूचित करा दिया जाय। निदेशक महोदय ने बताया कि संस्थान को अधिसूचित कराने के लिये परिषद को पत्र लिख दिया गया है। संसदीय समिति के सदस्यों यह भी कहना था कि राजभाषा अधिनियम की धारा 3 (3) का समुचित रूप से पालन किया जाये।

संस्थान के लिये हर्ष का विषय है कि हमारा संस्थान भारत सरकार के गजट में अधिसूचित हो गया है जिसकी अधिसूचना निदेशक महोदय द्वारा जारी कर संस्थान के सभी अनुभागों/प्रभागों/एकक/कक्ष आदि एवं सम्बन्धित अन्य विभागों को भेज दिया गया है और संस्थान पर राजभाषा नियम का नियम 8 (4) लागू हो गया है जिससे संस्थान में हिन्दी के प्रयोग में तीव्र प्रगति होने की पूर्ण आशा है।

Joint Staff Council of the Institute in Session.

डा. ओम प्रकाश कथूरिया, निदेशक मुख्य अतिथि के रूप में हिन्दी में अधिकाधिक कार्य करने हेतु रख– रखाव अनुभाग के प्रभारी श्री देव राज (मध्य में) को चल शील्ड प्रदान करते हुए।

APPENDIX—I

IASRI PERSONNEL
(As on 31.03.1995)

Dr OP Kathuria, Director

Division of Design of Experiments and Analysis of Experimental Data

Dr RR Sreenath,
Principal Scientist and Head

National Fellow (ICAR)
Dr. VK Gupta

Sr. Scientists/Scientist s (SG)
Dr Basant Lal
Smt. Asha Seksena
Shri RK Ghai
Shri JK Kapoor
Dr GC Chawla
Dr Ravindra Srivastava
Dr PK Batra

Scientists (Sr. Scale)

Smt Rajinder Kaur
Shri Onkar Swarup
Shri Ch Rao
Shri DK Mehta
Shri GL Khurana
Shri MR Vats
Srhi DK Sehgal
Shri Aloke Lahiri
Shri NK Sharma
Smt Ajit Kaur Bhatia

Scientists

Dr (Km) Seema Jaggi
Dr Rajendra Prasad

Division of Sample Survey Methodology and Analysis of Survey Data

Dr. AK Srivastava,
Principal Scientist and Head

Principal Scientists

Dr HVL Bathla
Dr PC Mehrotra
Dr Randhir Singh

Sr. Scientists/Scientists (SG)

Dr BC Sexena
Shri SS Gupta
Shri TB Jain
Dr SS Shastri
Dr NK Ohri
Shri RL Rustagi
Shri MS Batra
Dr DL Ahuja
Shri KPS Nirman
Shri GS Bassi
Shri AS Gupta
Dr KK Tyagi
Shri RS Khatri
Dr UC Sud

Scientists (Sr. Scale)

Shri JP Goyal
Shri HC Gupta
Shri DC Mathur
Shri Mahander Singh
Shri RC Gola
Dr Jagbir Singh
Shri SC Agarwal
Shir SC Sethi
Shri Bhagwan Dass
Dr MS Narang
Shri Satya Pal
Shri KK Kher
Shri T Rai
Shri VK Jain
Shri RM Sood
Shri K Chugh

Scientists

Dr Anil Rai
Shri PM Ramesan

Division of Bio-Statistics and Statistical Genetics

Dr Pranjeshu,
Principal Scientist and Head

Principal Scientist

Dr BS Sharma

Sr. Scientists/Scientists (SG)

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

Scientists (Sr. Scale)

Shri RK Jain
Shri Indra Singh

Division of Forecasting Techniques for Crops, Diseases and Pests

Dr (Smt) Ranjana Agrawal,
Principal Scientist and Head

Sr. Scientists/Scientists (SG)

Dr RC Jain
Shri GN Bahuguna
Dr Chandrahas
Shri Jagmohan Singh

Scientists (Sr. Scale)

Shri SC Mehta
Shri Bh Singh
Shri SS Walia

Division of Statistical Economics

Dr RK Pandey,
Principal Scientist and Head

Principal Scientist

Dr VK Sharma

Sr. Scientists/Scientists (SG)

Shri Shanti Sarup
Dr UN Dixit
Dr VK Mahajan

Scientists (Sr. Scale)

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

Division of Computing Science

Sh SN Mathur,
Principal Scientist and Head

Principal Scientist

Shri R Gopalan

Sr. Scientists/Scientists (SG)

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

Scientists (Sr. Scale)

Shri HO Aggarwal
Shri Balbir Singh

Training Administration Cell

Dr PR Sreenath,
Professor (Ag. Stat.) and Head

Shri Mahesh Kumar,
Professor (CAA)

Coordination Cell

Shri TB Jain,
Scientist (SG) and Head

Monitoring Cell

Dr PC Mehrotra,
Principal Scientist and Head

Technical Officers

Shri SK Sublania, MTO
Shri Amar Ranjan Paul, Sr Artist
Shri SK Suri, Field Officer (On leave)
Shri SD Sharma, Field Officer
Shri Man Singh, Field Officer
Shri SK Mahajan, Technical Officer
Shri DC Pant, Technical Officer
Shri HR Meena, Librarian

Administration

Shri Chironji Lal, Chief Administrative Officer
Shri Panna Lal, Senior Administrative Officer
Shri VR Srinivasan, Finance & Accounts Officer

APPENDIX—II

SANCTIONED AND FILLED-UP POSTS

(As on 31-03-95)

S.No.	Designation	Scale of Pay (Rs.)	No of Posts Sanctioned	Filled	No. of SC/ST Employees SC	ST
1	2	3	4	5	6	7
1.	Director	4500-7300	1	1	-	-
2.	Joint Director	4500-7300	1	-	-	-
3.	Principal Scientist	4500-7300	22	12	-	-
4.	Sr. Scientist	3700-5700		20	12	-
5.	Scientist (SG)	3700-5700		23	-	-
6.	Scientist (Sr. Scale)	3000-4500	129	41	3	-
7.	Scientist	2200-4000		4	-	-
8.	Experimental Scientist	1740-3000		6	-	-
9.	Chief Admn. Officer	3000-4500	1	1	-	-
10.	Sr. Admn. Officer	3000-4500	1	1	1	-
11.	Finance and Accounts officer	2200-4000	1	1	-	-
12.	Field Officer	2200-4000	3	3	-	-
13.	Mech Tabu. Officer	2200-4000	1	1	1	-
14.	Librarian (T-6)	2200-4000	2	2	-	1
15.	Tech Officer (T-6)	2200-4000	3	2	-	-

1	2	3	4	5	6	7
16.	Sr Artist (T-6)	2200-4000	1	1	-	-
17.	Asstt Field Officer (T-5)	2000-3500	1	-	-	-
18.	Asstt Engineere (T-5)	2000-3500	1	1	-	-
19.	Asstt Adm. Officer	2000-3500	3	3	1	1
20.	Hindi Officer	2000-3500	1	-	-	-
21.	*Security Officer	2000-3500	1	-	-	-
22.	E.C.G. (T-4)	1640-2900	8	-	-	-
23.	Artist (T-4)	1640-2900	1	1	-	-
24.	Superintendent	1640-2900	8	7	1	1
25.	Sr. Personal Asstt.	1640-2900	1	1	-	-
26.	Photographer (T-II-3)	1400-2300	1	1	-	-
27.	Tech. Asstt. (Stat) (T-II-3)	1400-2300	155	113	18	1
28.	Tech. Asstt. (Eco) (T-II-3)	1400-2300	8	8	-	-
29.	Tech. Asstt. (Lib.) (T-II-3)	1400-2300	2	2	-	-
30.	A.E.C. Operator (T-II-3)	1400-2300	6	3	-	-
31.	Field Inspector (T-II-3)	1400-2300	2	-	-	-
32.	Hindi Translator (T-II-3)	1400-2300	1	1	-	-
33.	*Hindi Translator	1400-2300	1	1	-	1
34.	Assistant	1400-2300	25	25	7	1
35.	Stenographer	1400-2600	11	11	1	-
36.	Jr. Stenographer	1200-2040	16	15	2	-
37.	Sr. Clerk	1200-2040	16	15	2	-
38.	Field Supervisor (T-2)	1200-2040	6	2	-	-

1	2	3	4	5	6	7
39.	Punch Supervisor (T-2)	1200-2040	3	3	1	-
40.	Card Librarian (T-2)	1200-2040	1	-	-	-
41.	*Manager	1200-1800	1	1	-	-
42.	Electrician (T-1)	975-1540	1	1	-	-
43.	Key Punch Operator (T-1)	975-1540	43	39	4	1
44.	Field Investigator (T-1)	975-1540	30	28	5	-
45.	Coders (T-1)	975-1540	10	4	-	-
46.	Reference Asstt. (T-1)	975-1540	1	1	1	-
47.	Counter Asstt. (T-1)	975-1540	1	1	-	-
48.	Telephone Operator (T-1)	975-1540	3	3	-	-
49.	Tubewell Operator (T-1)	975-1540	2	2	-	-
50.	*Tubewell Operator	950-1500	1	-	-	-
51.	*Asstt. Manager Cum-Store Keeper	950-1500	1	-	-	-
52.	*Sr. Gestentner Operator	950-1400	1	1	-	-
53.	*Carpenter	950-1400	1	1	-	-
54.	Driver (T-1)	975-1540	2	2	2	-
55.	*Driver	950-1500	3	1	-	-
56.	Driver (Heavy Vehicle)	1150-1500	1	1	-	-
57.	*Zerox Operator	950-1500	1	1	-	-
58.	Jr. Clerk	950-1500	38	32	6	2
59.	*Halwai	950-1200	1	1	-	-
60.	*Jr. Gestt. Operator	800-1150	1	-	-	-

1	2	3	4	5	6	7
61.	*Counter Clerk/Coupon Clerk	825-1200	2	1	-	-
62.	*Cook	825-1200	1	1	-	-
63.	*Coffee/Tea Maker	750-940	1	1	-	-
64.	*Bearer	750-940	5	5	3	-
65.	*Wash Boy/*Dish Cleaner	750-940	1	1	-	-
66.	*Sweeper	750-940	1	-	-	-
67.	Supporting Staff					
	Grade-I	750-940	54	43	15	-
	Grade-II	775-1025	27	27	5	1
	Grade-III	800-1150	14	14	6	1
	Grade-IV	825-1200	7	7	4	1

* Auxillary Post

APPENDIX-III

APPOINTMENTS, PROMOTIONS, TRANSFERS AND RETIREMENTS

Appointments

	Name	Designation	Grade (Rs.)	w.e.f.
1.	Dr OP Kathuria	Director	4500-7300	04.08.94
2	Sh HR Meena	Librarian (T-6)	2200-4000	08.12.94
3.	Smt. Sunita	Jr. Steno	1200-2040	27.08.94
4.	Smt. Suman Khanna	Jr. Steno	1200-2040	31.08.94
5	Sh. Fabian Minz	Jr. Clerk	950-1500	19.07.94
6.	Sh. Anish Wadhwa	Jr. Clerk	950-1500	19.07.94
7.	Sh. Basant Kumar	Jr. Clerk	950.1500	19.07.94
8.	Sh. Raj Kumar Verma	Jr. Clerk	950-1500	21.07.94
9.	Sh. Trilok Saini	Jr. Clerk	950-1500	26.07.94
10.	Sh. Vishal Lakhanpal	Jr. Clerk	950-1500	05.08.94

Promotions

	Name	Designation	Grade (Rs.)	w.e.f.
1.	Dr HVL Bathla	Principal Scientist	4500-7300	01.01.86
2.	Sh Bal Raj Singh	Tech. Officer(T-5)	2000-3500	01-01-93
3.	Sh DP Singh	"	2000-3500	01-01-93

	Name	Designation	Grade (Rs.)	w.e.f.
4.	Smt Shashi Gupta	"	2000-3500	01-01-93
5.	Smt CK Grover	"	2000-3500	01-07-93
6.	Smt Kusum Gupta	"	2000-3500	01-07-93
7.	Sh Surender Singh	"	2000-3500	01-07-93
8.	Sh AK Mogha	"	2000-3500	01-01-94
9.	Sh Arun Kumar Sondhi	"	2000-3500	01-01-94
10.	Sh Asha Ram Sharma	"	2000-3500	01-01-94
11.	Sh GM Pathak	"	2000-3500	01-01-94
12.	Sh Narayan Singh	"	2000-3500	01-01-94
13.	Mrs PR Verma	"	2000-3500	01-01-94
14.	Sh Panna Lal Gupta	"	2000-3500	01-01-94
15.	Smt. Flora Xess	A.A.O.	2000-3500	07.11.94
16.	Sh VPN Singh	Expl.Scientist	1740-3000	16.12.75
17.	Sh VH Gupta	Expl.Scientist	1740-3000	20.12.75
18.	Sh HS Sikarwar	Expl.Scientist	1740-3000	05.12.75
19.	Sh AK Gupta	Expl.Scientist	1740-3000	23.12.75
20.	Sh Rajinder Kumar-II	Expl.Scientist	1740-3000	10.12.75
21.	Sh Chait Ram	Tech..Asstt.(T-4)	1640-2900	01-07-83
22.	Sh Brahmjeet Gahlot	"	1640-2900	01-07-92
23.	Sh Davi Parsad	"	1640-2900	01-07-92
24.	Sh OP Singh	"	1640-2900	01-07-92
25.	Sh Ram Shay	"	1640-2900	01-07-92
26.	Sh Sheoraj Singh	"	1640-2900	01-07-92
27.	Sh Shri Pal Singh	"	1640-2900	01-07-92
28.	Sh Gyan Singh	"	1640-2900	01-01-93

	Name	Designation	Grade (Rs.)	w.e.f.
29.	Sh Ram Naresh	"	1640-2900	01-01-93
30.	Sh RK Saini	"	1640-2900	01-01-93
31.	Sh V Radhakrishanan Nair	"	1640-2900	01-07-93
32.	Sh Dev Raj	Superintendent	1640-2900	14.09.94
33.	Sh Anil Kumar Sharma	Assistant	1400-2300	14.09.94
34.	Smt. Alka Nayyar	Jr. Steno	1200-2040	20.08.94
35.	Sh Chander Vallabh	U.D.C.	1200-2040	14.09.94
36.	Sh. Satyavir Singh	Jr. Clerk	950-1500	15.09.94

Transfers

(a) On transfer from other Institutes/ICAR

	Name	Designation	Grade (Rs.)	From	Date of joining
1.	Dr PN Bhat	Director	Rs 7600/- (Fixed)	ICAR	06.06.94
2.	Sh Panna Lal	Sr.A.O.	3000-4500	CSWRI, Avikanagar	25.07.94

(b) On transfer from this Institute:

	Name	Designation	Grade (Rs.)	Place of joining	Date of relieving
1.	Dr PN Bhat	Director	7600/- (Fixed)	ICAR	04.08.94
2.	Sh Narander Kumar	A.A.O.	2000-3500	NCAP	15.2.94

Retirements

	Name	Designation	Grade	Date of Retirement
1.	Dr HP Singh	Principal Scientist	4500-7300	31.07.94
2.	Dr Shivtar Singh	Principal Scientist	4500-7300	31.07.94
3.	Sh Anand Prakash	Scientist (SG)	3700-5700	31.08.94
4.	Sh KC Bhatnagar	Scientist (SG)	3700-5700	30.09.94
5.	Sh KC Kakkar	Field Inspector	2000-3500	30.06.94
6.	Sh SBL Rustogi	Assistant	1400-2300	31.07.94
7.	Sh MG Parikh	Field Investigator	1400-2300	30.09.94
8.	Sh Mangal Singh	Card Librarian	1200-2040	31.10.94
9.	Sh RG Patel	Field Supervisor	1400-2300	30.06.94

Printed at Yugantar Press, WH-23, Mayapuri, Phase-I, New Delhi.