1995-96    Pages 49 to 56

1996

Ph.D (Ag St at)                Roll No

1. Niti Agarwal          — 7122

2  Prabir Kumar Das — 7537

3  V. Geetalakshmi — 7538

4. Vijayraghava Kumar — 7536

5  K. Thennarasu  — 7539

M.Sc (Ag. Stat)
1996

1. G.K. Jha             — 3597

2. Ramasubramanian V — 3598
   M.Sc (A) 1996
3  Shahid Hassan     — 3584

2  Sanjay Kumar  — 3620

3  Vasudera Shukla — 3619

4  Wilson T. Mathew — 3554

# ANNUAL REPORT
# 1995-96

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

# PREFACE

It is a matter of great pleasure for me to present this Annual Report which gives a panorama of activities and achievements of the Institute during 1995-96. The Institute continued its mission-mode research and teaching activities through its various Divisions during the year. I hope that the information presented here in 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 appreciation to the Heads of Divisions, scientists and other staff of the Institute for their whole hearted 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 Dr DL Ahuja, Head, Director's Coordination Unit and his colleagues in compiling and editing the material of the report deserve appreciation. Efforts put in by S/Sh Maharaj Swaroop, Som Dutt, OP Singh and Ishwar Datt in collecting and scrutinising the report material from all concerned also deserve appreciation. Efforts put in by Sh Mahesh Chander and Smt Rajni Gupta for preparing the manuscript on Personal Computer are also acknowledged.

BAL B. P. S. GOEL
**DIRECTOR**

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# 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 accompa-

nied 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, dBASE 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, in respect of number 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 on various aspects of agricultural statistics and computer application. Under this programme, thirteen distinguished statisticians and computer experts from abroad (19 visits; over 21.5 man months) 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 programme of the Institute. Seventeen scientists from this Institute have received training (covering 80 man months) 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 work in the field of Agricultural Statistics. A number of research workers from the Institute have served as consultants and advisors in Asian, African and Latin American countries. Also, a number of statisticians and students of the Institute are at present occupying high positions in universities and other academic and research institutions of USA, Canada and other countries.

## Heads of the Institute

| | | |
|---|---|---|
| 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 - May 1995 |
| Dr RK Pandey (Acting) | ... | Jun 1995 - Jan 1996 |
| Prof Bal BPS Goel | ... | Jan 1996 - onwards |

## Functional Set-up

The Institute has the following six Divisions, two Units and one Cell to undertake research, training, consultancy, documentation and dissemination of scientific output.

### Divisions

— Sample Survey Methodology and Analysis of Survey Data,

— Design of Experiments and Analysis of Experimental Data,

— Forecasting Techniques for Crops, Diseases and Pests,

- Bio-statistics and Statistical Genetics,
- Statistical Economics, and
- Computing Science.

*Units:*

- Director's Co-ordination
- Research Co-ordination and Management

*Cell :*

- Training Administration

## 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 meeting of the Management Committee was held on Feb 29, 1996 under the Chairmanship of Prof. Bal B.P.S. Goel, Director.

## Research Advisory Committee

The following Research Advisory Committee (RAC) for the Institute was constituted by the Council on 14.7.1994:

*Chairman*

Prof. Y.K. Alagh,
Vice-Chancellor,
Jawaharlal Nehru University,
New Delhi 110 067.

*Members*

1.  Prof Bal B P S Goel,
    Director, IASRI,
    New Delhi-110012

2.  Shri N.C. Khandekar,
    Ex-Head, Computer Centre,
    University of Delhi,
    C-3, Maurice Nagar, Delhi-110006

3.  Prof MG Sardana,
    Ex-D.G., CSO,
    A-1/26, Paschim Vihar,
    New Delhi - 110 063.

4.  Dr. G.S. Ram,
    Eco & Statistical Adviser,
    Krishi Bhavan,
    New Delhi - 110 001.

5.  Dr. M.N. Das,
    Ex-Director, IASRI,
    I-1703, Chitranjan Park,
    New Delhi

6.  Dr Mruthyunjaya,
    ADG (ES&M), ICAR,
    Krishi Bhavan,
    New Delhi - 110001

7.  Prof. S.K. Chatterjee,
    Head, Deptt. of Statistics
    Calcutta University,
    Calcutta.

8.  Sh Prem Singh,
    Village and P.O. Kulesra
    Tehsil: Dadri, Distt.
    Ghaziabad (UP)

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Research Advisory Committee Meeting
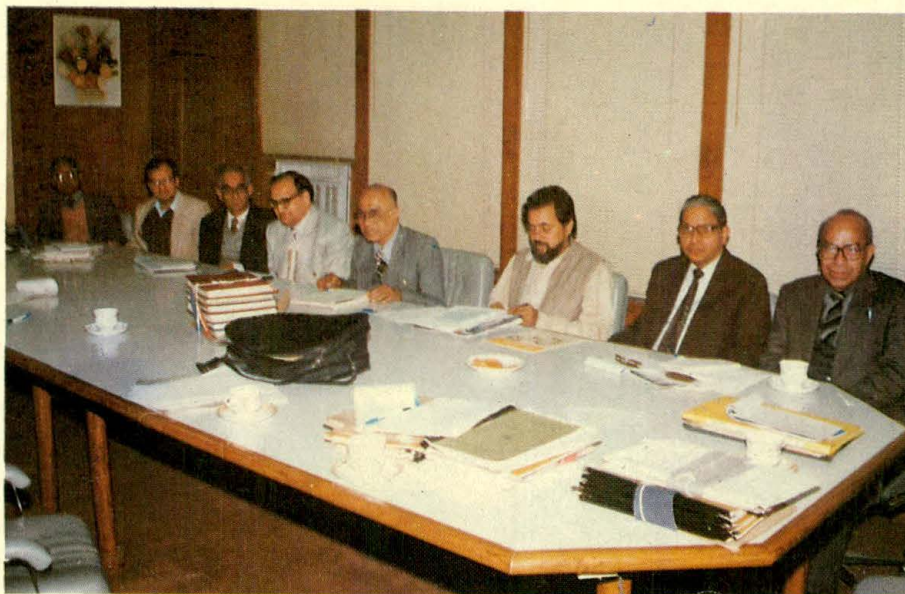


Quinquennial Review Team in deliberations

9. Sh Mathews J. Nedumpara,
   Additional Central Govt.
   Standing Counsel,
   M-7, Choice Park,
   Elamakkara, P.O. Cochin

**Member-Secretary**

Dr DL Ahuja,
Senior Scientist and
Head Director's Coordination Unit,
IASRI, New Delhi-12

The first meeting of RAC was held on March 1, 1996.

## Quinquennial Review Team

The following Quinquennial Review Team was constituted on May 16, 1995 to review the work done by the Institute during the period from 1987-94.

**Chairman**

Dr. K.C. Seal,
Retd. Director General,
Central Statistical Organisation,
D-135, Saket, New Delhi-110017.

**Members**

1. Dr. Aloke Dey,
   Head, Stat.-Math. Unit,
   Indian Statistical Institute,
   7-S.J.S., Sansanwal Marg,
   Kathwaria Sarai, New Delhi-110016.

2. Dr. Anil K. Gupta,
   Professor,
   Indian Institute of Management,
   Vastrapur,
   Ahmedabad (Gujarat)-380015.

3. Prof. J. Roy,
   71, B.T.Road,
   Narendra Nagar,
   Calcutta-700056

4*. Dr. B.B. Madan,
   Professor Computer Science &
   Engineering and Head Computer
   Services Centre,
   Indian Institute of Technology,
   Hauz Khas, New Delhi-110016.

5. Dr. J.S. Murthy,
   Deptt. of Genetics,
   Osmania University,
   Hyderabad-500007

6. Dr SN Maheshwari,
   Professor, Department of
   Computing Science,
   Indian Institute of Technology,
   Hauz Khas, New Delhi-110016

**Member-Secretary**

Dr. Mruthyunjaya,
Assistant Director General (ES&M)
I.C.A.R., Krishi Bhavan,
New Delhi-110001.

During the period under report full QRT met three times on Oct 10-12, Nov. 27-28, 1995 and Feb 2-4, 1996. In addition to above the Chairman and one or more Members of the QRT individually met the Scientists and staff of IASRI from time to time.

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* Dr BB Madan subsequently went abroad and was replaced by Dr SN Maheshwari, Professor, Department of Computing Science in I.I.T., Delhi.

## Staff Research Council

The Staff Research Council (SRC) of the Institute is an important forum to guide the scientists in the formulation of new research projects and to review the progress of on-going research projects periodically. It also, monitors the follow up action on the recommendations of the Quinquennial Review Team (QRT) in respect of technical programmes of the Institute. As per Council's guidelines, outside Subject Matter Specialists representing the major specialization of the Institute, nominated by the Council are invited to make critical examination of the new project proposals and evaluation of the on-going research projects.

Meetings of the SRC are held under the Chairmanship of the Director. During the period under report, meetings of the SRC were held on 3rd April, 1995 for consideration of new research project proposals. Dr HVL Bathla, Principal Scientist was the Secretary and on 13th and 14th March, 1996 for consideration of new research projects and review of progress of on-going research projects, Dr PC Mehrotra, Principal Scientist was the Secretary of the SRC.

## The Annual Day

The annual day of the Institute was celebrated on July 01, 1995 in which Prof Gajendra Singh, D.D.G. (Engg.) ICAR was the Chief Guest.

Dr SK Sinha, National Professor (ICAR) delivered the Fifth Nehru Memorial Lecture on "Population, Agricultural Production and sustainability - Malthus revisited."

Prof Gajendra Singh, DDG (Engg.) ICAR gave the Nehru Memorial Medal and Late (Shri) VVR Murthy award for the year 1992-94 to Shri Sree Kumar J., M.Sc. (Agricultural Statistics).

In the afternoon session symposium on "Statistical Data requirement in the context of World Trade Organisation" was held. Dr. G.S. Ram, Economics and Statistical Adviser Chaired the session.

## Research Collaboration

Inter-institutional research programmes are undertaken by the Institute in collaboration with other institutions.

The following collaborative projects were in operation during 1995-96:

| 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 |

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Presentation of Research Project Proposal at the Staff Research Council Meeting



Dr. SK Sinha, National Professor (ICAR) delivering the fifth Nehru Memorial Lecture at the Annual Day Function

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| 2. | Planning, designing and analysis of experiments planned at stations under the PDCSR | Directorate of Cropping Systems Research, Modipuram, Meerut | Apr 1986 | Continuing |
| 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 <br> (ii) Deptt. of Soils, State Agril. Universities | Jul 1985 | Continuing |
| 4. | Use of remote sensing technology in crop yield estimation surveys | Indian Institute of Remote Sensing, Dehradun | Apr 1995 | Dec 1997 |
| 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, | Nov 1992 | Oct 1996 |
| 7. | Non-linear statistical models for forecasting of inland fish production from ponds | Punjab Agriculture University, Ludhiana, Punjab | May 1995 | Apr 1997 |

## Projects of Emeritus Scientists

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

| Sl. No. | Project Title | Name of Emeritus | Date of |
|---|---|---|---|
| 1 | Statistical techniques for mid course bifurcation of experimental plots, plant yield for predicting soil nutrient status under longterm 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 |

# PROGRESS OF PROJECTS

## 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
- Studies involving repeated measurements
- Production and area estimation
- Assessment and evaluation studies
- Estimation of post production losses
- Methodological studies in complex surveys
- Remote sensing technology applications

### *Projects in operation thrust-area wise:*

| No. | Project title | Project leader and associates |
|-----|---------------|-------------------------------|
| 1 | 2 | 3 |

### Cost of Production Studies

| | | |
|---|---|---|
| 1. | Survey methodology to study economics of keeping goats. | RL Rustagi SC Agarwal |
| 2 | Pilot sample survey to study the economics of Angora rabbits. | KPS Nirman Bhagwan Dass |
| 3. | Pilot sample survey to develop a sampling methodology for estimation of poultry meat production. | MS Kaushik TB Jain |

### Statistical Modelling for Production and Growth

| | | |
|---|---|---|
| 4. | Statistical modelling for projection of bovine population and prediction of milk availability | SN Arya SC Agrawal |

### Studies Involving Repeated Measurements

| | | |
|---|---|---|
| 5. | Pilot sample survey for estimation of yield of pepper and study of cultivation practices using successive sampling | SS Shastri VK Jain PM Ramesan |

| 1 | 2 | 3 |
|---|---|---|

## Production and Area Estimation

6. 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

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

NK Ohri
PC Mehrotra
RC Gola

8. 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.

BC Saxena
KK Tyagi

9. Pilot sample survey for estimating the area under waste-land

SS Gupta
PC Mehrotra

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

SS Shastri
VK Jain
PM Ramesan

## Assessment and Evaluation Studies

11. 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

12. A sampling study on utilization of crossbred working animals vis-a-vis non-descripts

JP Goel
RS Khatri

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

BC Saxena

14. Estimation of flow and changes in dynamic population

Jagbir Singh

## Estimation of Post Production Losses

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

RS Khatri
JP Goel

## Methodological studies in complex surveys

16. Chi-square tests in survey data

Anil Rai
AK Srivastava
HC Gupta

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| 1 | 2 | 3 |
|---|---|---|
| 17. | Estimation of regression coefficients from sample survey data | UC Sud<br>Anil Rai<br>IC Sethi<br>VPN Singh |
| 18. | An analysis of yield gap for buffaloes milk | Satya Pal<br>RM Sood<br>T Rai |
| 19. | A study of variance estimation in complex surveys | VPN Singh<br>Anil Rai<br>VK Jain |

### Remote Sensing Technology Applications

| | | |
|---|---|---|
| 20. | Use of remote sensing technology in crop yield estimation surveys | Randhir Singh<br>RC Goyal<br>LM Pande (IIRS)<br>SK Shah (IIRS) |

## 1. 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.

Stratified three stage random sampling design with Tehsils as strata, panchayats as primary stage units, villages as the second stage units and households rearing goats as the third stage units was adopted for selection of sample. Survey was conducted in Mathura district of Uttar Pradesh.

The statistical analysis of data was completed. The studies on management practic-es, labour employed and characteristics of selected villages were completed. It was observed that eighty percent of goat rearers are either landless or are marginal farmers. Further studies were in progress.

## 2. Pilot 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 project report was finalised and the salient results are as under:

The total expenditure on rearing a young rabbit of either sex from birth till 6 months of age was estimated to be Rs 69 including family labour and Rs 66 excluding family labour.

Average daily expenditure for maintenance of a buck or a doe including family labour was 74 paise and excluding family labour 69 paise. The maintenance cost was minimum in rainy season due to availability of more greens.

The overall cost per kg of wool in the Kullu area during the period of enquiry was estimated to be Rs.503 ± 0.7. The market rate of wool was Rs.705 per kg during the same period.

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

Sampling methodology had been developed by IASRI for Integrated Surveys for milk, wool, meat and eggs and adopted by all the states in the country. In a meeting of committee for improvement of Animal Husbandry and dairy statistics a methodology for estimation of poultry meat production was expected from IASRI. The objectives of the study are (i) to estimate the poultry meat production through organised farms (ii) to estimate the poultry meat production through existing Integrated Sample Surveys for estimation of livestock products and (iii) to develop a suitable sampling technique for estimating the poultry meat production integrating the results obtained under (i) and (ii) above.

The field work of survey, scrutinising and coding work was in progress.

## 4. 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.

Growth curves were fitted to time series data on the category-wise bovine populations as well as on milk production. In many a case, an exponential type model was found to be a suitable one. In an alternative approach, cross-sectional data on the sex-age distribution of the 'current' population and estimates of vital rates were utilised to estimate the 'future' population with the help of population generation matrix. The results were incorporated in a report on the project.

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

The objectives of this project are (i) to develop suitable sampling technique for estimation of yield and study of cultivation practices of pepper, (ii) to estimate the changes in yield estimation, and (iii) to study the relative efficiency of yield estimates generated through different patterns of successive sampling.

The survey was conducted in Sindhudurg district of Maharashtra, Kodagu district of Karnataka and Gudalur taluk, Nilgiri district, Annamalai Hills, Coimbatore district of Tamil Nadu. Analysis of data was completed and the report was finalised.

## 6. 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

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

The 2nd phase study of the project i.e. Pilot sample survey on the basis of the sampling plan developed in the 1st phase study was started. The field work of the project was started in March, 1995 covering Alipur, Najafgarh, Mehrauli and Yamuna Khader areas of Delhi. However during rainy season only partial data could be collected in Khader area because of heavy rains and water logging due to flood. The design adopted was stratified multi-stage random sampling with tehsil/taluk as strata, 2-3 clusters of three villages were selected from each strata. Ten clusters were allocated to different strata in proportion to area under vegetables. 6-8 cultivators of each vegetable crops were selected from each cluster and a plot of 5mx5m was selected from each cultivator for recording of yield data. The crops covered were tomato, loki, brinjal, lady's finger and tori. The yield data on crop cutting was collected after an interval of 14 days for 7 days daily in each season in a proformae devised for this purpose.

## 7. 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 between grain yield, straw yield and straw to grain ratio was studied initially with the help of scatter diagrams and later on correlation and regression analysis was carried out for the complete data as also for the data classified into different yield level classes. Three different methods, to estimate the straw production, were studied and compared in terms of the precision of the estimates and recommendations made. The optimum fraction of crop cutting experiments to record straw yield was also worked out for different levels of desired precision.

The report has been finalised and is under publication.

## 8. 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.

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The project was undertaken in the district Ghaziabad (UP) during 1991-92 which aimed for developing sampling technique for estimation of area, yield and cost of cultivation of fodder crops. A three stage stratified design was adopted with villages as p.s.u, fields as s.s.u. and plots within field as ultimate stage unit of sampling. For estimation of area under fodder crops, the villages were selected with p.p.s. with sizes as area under fodder crops. In each village number of crop cutting experiments were confined to 4 fields.

As regards the estimation of area under major crops, it was found that the total area estimated during rabi season under jai was of the order of 7 thousand hectares followed by oat (1.5 thousand hectares), and barley (1.3 thousand hectares). In kharif, the total area under bajra was estimated as 2.5 thousand hectares, bajra 1.3 thousand hectares and maize 0.5 thousand hectares. The estimates of average yield of minor fodder crops during rabi such as jai was of the order of 321.3 quintal/hectare and oat of the order of 273 quintal/hectare. The average yield of other minor crops such as rizka, barley was of much lower order.

In kharif, the estimate of average yield of bajra was 234.2 quintal/hectare while that of jowar 130.4 quintal/hectare. As regards cost of cultivation of minor fodder crops the expenditure from ploughing to bunding is supposed to be not different from crop to crop both in hours and money value. Cost in respect of irrigation and harvesting was at variance for all crops. Among all the fodder crops, the cost of production of berseem was highest.

## 9. 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 was in progress. Writing of report was also taken up.

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

The survey was conducted in entire Goa consisting all the eleven taluks. Objective was to study the extent of cultivation, yield and cultivation practices of cashew. The design adopted was stratified multi-state random sampling with taluk strata, villages survey numbers and cluster of trees and trees within cluster were the further stages. From the taluk a sample of 10 per cent of the total number of cashew growing villages in the entire district was considered. Villages allotted to different taluks on the basis of their contribution of cashewnut production to the district level figures. Selection of each stage was SRSWOR. For estimation of number of trees villages were selected and complete enumeration was done. For cultivation practices villages and the survey numbers were the two stages and for yield study all the stages mentioned earlier were considered. Driage experiments were also conducted. Estimates of number of cashew trees both bearing and young, average yield, production of cashewnuts etc. were obtained with reasonable degree of precision.

## 11. Sample survey for study of constraints in transfer of new agricultural technology under field conditions

The objectives of the project are (i) to develop suitable sampling methodology for

studying the effect of new agricultural technology including high yielding/improved varieties/fertilisers, plant protection chemicals and cultural and management practices for increasing productivity of land, (ii) to determine the extent to which the potential of high yielding/improved varieties has been achieved under field conditions, and (iii) to identify and investigate constraints and limiting factors in the transfer of new agricultural technology to cultivators' fields.

The report for the full period of the survey namely 1984-85 to 1988-89 was under modification in the light of the comments of the external referee. As soon as it is cleared by the external referee the salient findings will be reported.

## 12. 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 data were collected from a representative sample using stratified two stage random sampling with tehsils as strata, villages as primary sampling units (p.s.u.) and cultivators as second stage sampling units (s.s.u.). The selection at the first stage was done with probability proportional to the number of crossbred working animals in the village with replacement and at the second stage with equal probability without replacement. A total sample of 8 villages (p.s.u.) was allocated to the different strata in proportion to the number of crossbred working

animals in each stratum. From each p.s.u. a sample of 30 cultivators was selected randomly in such a way that 9 cultivators (3 each from small, medium and large holdings) were those having atleast one crossbred working animal and the rest 21 cultivators (7 each from small, medium and large holdings) were having non-descripts only.

The study was undertaken in plain and hilly areas of the Kathua district of Jammu & Kashmir. The study revealed that the average hours of work done per day per crossbred and non-descript working animal was 5.10 and 4.38 with percentage standard errors of 5.9 and 4.1 respectively in plain area whereas the corresponding estimates in hilly area were 4.78 and 4.68 with percentage standard errors of 3.1 and 2.7 respectively. The difference in average hours of work done by crossbred and non-descript animals was found to be significant in plain area and non significant in hilly area. The number of working animals put to work were 39 and 18 percent during kharif and rabi seasons respectively to plain area and 16 and 21 percent respectively in hilly area. The bullock power per day available was 267.2 and 288.0 thousand working hours. The utilization was only 18 and 15 percent for cross bred and non-descript types of working animals respectively in plain area whereas in hilly area it was 14 and 11 percent respectively. It was observed that the animals were mainly put to work for ploughing (93 percent in kharif and 99 percent in rabi season).

## 13. 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 graz-

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ing. 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 preliminary data received from the field was under the process of scrutiny, coding and transferring on floppy for further analysis work. The statistical procedure for analysis was finalised.

## 14. Estimation of flow and changes in dynamic population

The objectives of the project are (i) to estimate the structural changes in the population due to cross-movements of units in various classes between two occasions under general developmental phenomenon; (ii) to estimate the structural changes in the population due to various casual factors, (iii) to estimate the parameter for characteristic of interest in respect of a stationary population and structural changes occurring in that population and (iv) to estimate the changes in the parameter for the characteristic on account of the structural changes occurring in the population due to cross-movements of units in various classes between two occasions.

The project has been formulated to develop an appropriate successive sampling methodology for studying the cross movements of units in various classes in a dynamic population instead of estimating the population point parameters and thereby for knowing the economic status of various classes of the farming community in the country. Because the population of agricultural operational holdings and human labour has been undergoing changes in its structure due to various casual factors affecting that popula-

tion for the past several decades. The estimates for the parameters as response indicators embodied in the above mentioned objectives would be obtained in respect of the population as well as various classes of that population. Minimum variance linear unbiased estimators of all the parameters would be developed by making use of the projective geometry approach. The review of literature was done pertaining to the estimators to be built up.

## 15. 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, villages as p.s.u and households as s.s.u. A total sample of 20 p.s.us' was allocated to different strata in proportion to the number of villages 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 halwaies 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.

## 16. Chi-square tests in survey data

The implicit assumption of sample observations is rarely satisfied in case of survey data because of imposed sampling de-

signs for collection of data, except in case of SRSWR. It is well documented in the recent literature that due to this fact the usual chi-square test gives highly misleading inferences.

The study was initiated with three 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.

The simulation technique was adopted to achieve the above two objectives. It was found that second order corrected statistics performs well and performance of all the statistics considered in this study were highly affected by the design effect and coefficient of variation of eigen values of design effect matrix. If these two statistics are high then performance deteriorates considerably.

## 17. Estimation of regression coefficients from sample survey data

The objectives of the project are (i) to study the performance of alternative estimates of regression coefficients for survey data, (ii) to examine the problem of multi-collinearity in the context of survey data and (iii) to estimate the regression coefficients when the variables are in error.

Regression coefficients are estimated using OLS techniques. The key assumption is that observations are identically and independently distributed. This assumption is not satisfied in the context of survey data. Alternative methods of estimation of regression coefficients need to be developed keeping in view the type of data which one gets through

surveys. This project has been formulated with the purpose of suggesting new statistics which can be utilised while drawing inferences based on survey data especially to the presence of multicollinearity and also when the variables are in error.

## 18. An analysis of yield gap for buffaloes milk

The objectives of the project are (i) to identify the factors to the gap, (ii) to estimate the contribution of each factor to the gap and (iii) comparison of the different procedures through simulated data.

In this study the secondary data of the project 'development of a suitable methodology to study the effect of housing conditions and other related factors on milk production under villages conditions', will be utilised. To meet the objectives the following statistical procedures will be utilised : (i) path co-efficient analysis, (ii) multiple regression analysis and (iii) principal component analysis.

The data was taken up and critically scrutinised. The card designs framed and sample data was prepared as per the requirement of the statistical techniques to be adopted. The coding of the data was in progress.

## 19. A study of variance estimation in the complex surveys

The study was initiated (i) to examine the effect of sampling designs on variance estimators of complex surveys, (ii) to examine the relative performance of different variance estimators in complex surveys for non-linear statistics and (iii) attempt to modify above estimators for reducing higher order biases in complex surveys.

Emphasis on variance estimation in the context of complex surveys is some what recent although the problem of variance estimation has been addressed frequently in the specific sample survey situations. For example in stratified sampling collapsing of strata is adopted when single units are selected from different strata. In systematic sampling unbiased variance estimation has been a problem and various approximations as well as modifications of systematic sampling procedures have been attempted to deal with the problem of variance estimation in multistage sampling. Certain rule (Thumb rule) have been suggested to provide variance estimators for general multistage sampling design. In varying probability sampling, variance estimation of Horvitz-Thompson estimator is a problem due to frequent negative estimation of variances. In the light of above said problems various variance procedures have been suggested to tackle the problem of variance estimation.

Finite population of different sizes will be simulated following standard distributions as well as following certain models developed in accordance with the specific sampling designs. Samples of various sizes will be selected from these populations and distributional properties of various variance estimation techniques will be examined. The sampling designs of various variance estimators will be estimated. The sampling designs to be considered are SRSWOR, stratified sampling, PPS, systematic sampling etc. The statistics to be considered are mean, total, regression coefficients, coefficient of correlation etc.

## 20. Use of remote sensing technology in crop yield estimation surveys

A project on the use of the remote sensing technology in crop yield estimation surveys using satellite data for stratification of crop area based on vegetation indices has been completed very recently. The results of the study show that the use of spectral data for stratification can result in greatly improving the efficiency of the estimation of crop yield.

In order to test the results for another year and in another area of study, the project has been taken up in district Rohtak of Haryana in collaboration with Indian Institute of Remote Sensing, Dehradun. In this study the Spectral data will be used from IRS-IB Satellite and study will be carried out for two consecutive years to examine the use of previous years spectral data for stratification. Crop yield data for district Rohtak for the year 1993-94 and 1994-95 has been collected for wheat crop. The selected villages are being identified on the FCC using crop sheets so that corresponding spectral data for the selected villages can be obtained alongwith the yield data for developing improved estimators of crop yield.

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# DIVISION OF DESIGN OF EXPERIMENTS AND ANALYSIS OF EXPERIMENTAL DATA

*Mandate:*

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

*Thrust Areas*

- Cropping system research
- Information system for agri-cultural and animal experiments
- Yardsticks of additional production
- Experimental designs for agricultural, animal, agro-forestry 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 on-farm research experiments planned under Project Directorate of Cropping System Research (PDCSR) | PK Batra<br>NK Sharma<br>Mahesh Kumar |
|---|---|---|
| 2. | Planning, designing and analysis of experiments planned at Research stations under the Project Directorate of Cropping System Research | Rajinder Kaur<br>Ajit Kaur |
| 3. | Planning, designing and statistical analysis of data relating to experiments conducted under AICRP on Long Term Fertilizer Experiments | MR Vats<br>DK Sehgal<br>DK Mehta |
| 4. | Methodological investigations in predicting fertilizer responses using soil test values and other site variables | Aloke Lahiri<br>DK Mehta<br>NK Sharma |
| 5. | A study of behaviour of crop response to long term fertilizer application with reference to weather parameters | Asha Saksena<br>Ajit Kaur<br>HS Sikarwar |

## Information System for Agricultural and Animal Experiments

| 6. | Agricultural field experiments infor-mation system | RK Ghai<br>OP Khanduri<br>DC Pant |
|---|---|---|

| 1 | 2 | 3 |
|---|---|---|
| 7. | Agricultural experiments informat-<br>ion system for animal sciences | GC Chawla<br>PR Sreenath |

**Yardsticks of Additional Production**

| | | |
|---|---|---|
| 8. | Yardsticks of additional production<br>of pulses and oilseeds from the<br>combined application of fertilisers | CH Rao<br>GL Khurana<br>Seema Jaggi |

**Experimental Designs for Agricultural, Animal, Agro-forestry and Fisheries Research**

| | | |
|---|---|---|
| 9. | Methodological studies relating<br>to Agro-forestry experiments | BL Choudhary<br>JK Kapoor<br>PR Sreenath |
| 10. | Some statistical studies relating<br>to the design and analysis of experi-<br>ments involving fixed quantity of<br>inputs | PK Batra<br>Rajender Prasad<br>OP Khanduri |
| I1. | Studies on optimality of block<br>designs for making test treatment-<br>control comparisons | R Srivastava<br>VK Gupta<br>Rajender Prasad |
| 12. | A-optimality of block designs for<br>comparing two disjoint sets of<br>treatments. | Seema Jaggi<br>VK Gupta |
| 13 | Cataloguing and construction<br>of variance balanced block designs :<br>computer algorithms for construction | Rajender Prasad<br>VK Gupta<br>OP Khanduri |
| 14. | Construction of balanced incomplete<br>block designs with nested rows and<br>columns | PR Sreenath |

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

The data of about 3,000 experiments conducted during 1994-95 have been re- ceived from the various on-farm research centres under the project of cropping system research. Using suitable coding structure the data has been coded, transferred on to floppies and statistically analysed. The creation of data base of on-farm research experiments conducted during 1994-95 con-

taining complete information of the experiment has also been undertaken.

The promising crop sequences in terms of high returns are Rice-Toria-Potato/Rice-Radish-Potato in sub-mountain & lower hills of Himachal Pradesh, Groundnut-wheat in south Eastern Plateau of Bihar; Cotton-Groundnut in central Maharashtra; Soyabean-wheat in Malva plateau of Madhya Pradesh; Rice-wheat-maize (F) in Central plains of Punjab; and B.Gram-wheat and Paddy-Lentil/Gram in north eastern plains of Uttar Pradesh.

Intercropping mustard with wheat in eastern-plain zone of U.P. and Red gram with groundnut in A.P. with recommended fertilizer dose to intercrop gave additional returns of 80 to 90% as against sowing of sole main crop under farmer's practice. In south Eastern plateau of Bihar, intercrop of Groundnut with Redgram with recommended fertilizer dose provided 190 percent additional return whereas Redgram with maize and G.Gram in easter are not found profitable in North Gujarat.

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

During the year the data for about 300 complex experiments conducted during 1994-95 at 36 cropping System Research Centres were subjected to critical analysis. These experiments were planned with the objectives of (i) development of new cropping system, (ii) nutrient management in cropping systems, (iii) development of system based management practices, (iv) system based maximum yield research.

Experiments were conducted to study different water management practices to facilitate land preparation, planting and establishment of wheat in rice-wheat system at Raipur (M.P.), Chuplima (Orissa), Kalyani (West Bengal) and Rewa (M.P.). Almost at all the centres rice yield was not influenced by different water management practices adopted in wheat. In wheat, dry seeding method was significantly superior or at par to other two methods . First irrigation could be given either after 21 or 30 days of sowing wheat.

To find out the tillage requirement of different rabi crops, succeeding soyabean under rainfed conditions, experiments were conducted in Madhya Pradesh at Jabalpur, Indore and Sehore. Among tillage practices, conventional tillage was the best followed by minimum and zero tillage in rabi season. All the crops behaved more or less similarly to tillage practices.

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

Data on 10-15 characters from experiments conducted during the years 1992-93 and 1993-94 of each crop viz., (yield, plant nutrient uptake (N, P, K, Ca, Mg, S, Zn, Fe, Mn & Cu) and nutrients available in the soil) were scrutinised, coded and transferred on to the computer floppies for the subsequent statistical analyses as per the objectives of the project. The results of the statistical analysis were provided to the cooperating research centres and the Project Coordinator (LTFE).

The analysis procedure was finalised for analysing the data pertaining to one of the replications having super imposed treatments and conducted at Pant Nagar, Bhubaneswar and Ludhiana Centres. Direct, residual and cumulative yields were estimated using the covariance analysis. The yield and soil trends were up-dated using the regression procedure. The effect of various primary (N,P,K) and micronutrients uptake on the sustainability of crop yields was also studied using the multiple regression analysis at the Ludhiana Centre.

Some of the salient results obtained are as follows:

1. Addition of N at 50% of the recommended level over the original 50% NPK treatment, significantly increased the grain and straw yields of all the crops at Ludhiana Centre. Similar trend was also noticed for rice crop at Bhubaneswar Centre.

2. Reduction of fertilizer P by 50% of recommended dose in 100% NPK and 150% NPK treatments did not have any adverse effect on the yields of maize, wheat and cowpea (fodder) at Ludhiana. Similar results were also obtained at Bhubaneswar.

3. The effect of Zn addition was pronounced in maize crop only at Ludhiana Centre. Pronounced Zn deficiency occured at higher level of nutrient applications which could be arrested by timely Zn replenishment.

4. Phenomenal increase in N, P & K uptake was noticed in Ludhiana, especially on wheat recommended level under 50% NPK treatment.

5. Declining trend in available soil in plots with reduced P application, under the 100% NPK and 150% NPK treatments, to the crops was noticed at Ludhiana necessitating monitoring of available P for sustained crop yields without adverse effect on soil P fertility.

## 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 AICARP in respect of 13 district centres situated in different agro-climatic regions of the country were utilised.

A brief report of the project was given in earlier Annual Report. The Project Report has been submitted for obtaining comments of referees.

The salient results are as follows:

For Rice crop it was observed that reduction in general regional recommended doses of fertilizer is possible to the extent of 5 to 10% at Muzaffarpur and Purnea (Bihar), 6-21% at Krishna (A.P.) and 10-25% at Thiruchirapalli (T.N.) with economic gains. However, at other places though the reduction is possible but without economic gains.

For Wheat crop, in the district of Muzaffarpur and Purnea (Bihar), Amritsar and Gurdaspur (Punjab), Faizabad (U.P.) and Sundergarh (Orissa), the general rate was lower than the soil test based rate.

# 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.

Response of sorghum to eighteen fertilizer treatments applied over a period of thirteen years from 1979-80 to 1991-92 were analysed to study the extent of variation due to weather. Six weather variables at four stages of crop growth were used to classify years into five clusters of homogeneous weather years for sorghum. Yield in most favourable groups of years was much higher than the yield in less or unfavourable years. Yield increased with the increase in cluster number (representing the number of rainy days in the season) upto 3 but decreased thereafter. This indicated that the number of rainy days in groups of years forming cluster 3 was optimum. Similar pattern was observed for all treatments and control clusters accounted for more than eighty per cent variation in responses. Difference in responses of different treatments was not high in unfavourable years. 80 kg/ha was optimum dose of nitrogen. $P_2O_5$ was found to be essential nutrient in the absence of which any amount of N and $K_2O$ failed to increase the response in favourable as well as

unfavourable years. T221 (N80 P80 K40) was found to be most suitable treatment in all types of years.

Similar study was carried out for wheat crop. Association between kharif sorghum and rabi wheat was examined using Chi-square test. The same association between the yields of two successive seasons in one or more category in 11 treatments and control was observed, further analysis is 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 in respect of field experiments conducted during 1978 and onwards at different research stations in the country. Necessary software for data storage on secondary storage devises like floppies and its retrieval has been developed. For the period 1978 onwards the regional staff reported during the year, data in respect of about 2050 experiments on Index card/coding schedules prescribed for A.F.E.I.S. While about 250 experiments were reported on the prescribed proforma. Inclusive of these about

27,350 experiments on the coding schedules have so far been reported for the system. Processing and validation of data and their storage is in progress.

## 7. Agricultural experiments information system for animal sciences

The objectives of the project are to collect, compile and put in an approved format the experimental data of large number of experiments conducted at various Animal Husbandry Research Stations of ICAR/SAUs all over the country, based on the idea of viewing the present trends in research and scientific utility of the research carried out in the past in relation to present needs.

The data were collected by the personal visits of IASRI staff. Soft-ware were developed for storage and selective retrieval of information based on the queries made by the users. Work of preparation of format for presentation of results and their storage was in progress. Report of index (Vol 1: No.1) was modified and report is under printing. It is a compilation of results of all experiments on animals conducted in the country and serve as a ready reference on various aspects of Animal Science research which would facilitate selecting retrieval as per requirements of the scientists and research workers.

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

Yardsticks in terms of Kg. of additional production due to increase by one Kg. of an input in the presence of other inputs were obtained by fitting of response surfaces and taking into account the interaction effects, if

any. Data from on-farm experiments conducted during the period 1977 to 1990 in different agro-climatic regions (I to VIII) involving Nitrogen(N) and Phosphorous(P) treatments (inputs) on different oilseeds and pulse crops were utilised for the purpose. The results are summarised below:

**Red gram :** The additional production due to N was high in regions IV, V, VI, VII at 13.44, 15.76, 13.68, 11.25 Kg.per ha of nutrient respectively, at the level of 10Kg. N. The corresponding values at the 20Kg. N level were 13.11, 16.52, 14.88 and 10.72.

**Green gram :** In regions V and VI, the additional production due to application of N were high for this crop in both the seasons viz., Kharif and Rabi and at both the levels of N application i.e., 10 and 20 Kg. These figures respectively for the regions were 13.20 and 12.60 at 10 Kg. N, 11.75 and 10.77 at 20 Kg. N during Kharif; 14.08, 23.50 at 10 Kg. N, 14.33 and 23.03 at 20 Kg. N during Rabi. The interaction between the inputs was present in regions VII and VIII during kharif and in region VI in rabi season.

**Black gram :** In kharif season, the additional production due to application of N was high in regions I and VII with 11.77 and 10.52 kg. at 10 kg. N level and with 10.18 and 10.34 kg. at 20 kg. N level. In rabi it stood high for the regions IV and V (13.58 and 20.95 at 10 kg.; 12.82 and 20.40 at 20 kg.) for Nitrogen application and for the region V for phosphorous (8.13 at 20 kg. and 7.98 at 40 kg.) application. Interaction between N and P was observed in regions Iv, V and VII.

**Bengal gram :** These yardsticks due to N application during kharif were found quite high ranging from 12.83 to 19.03 at 10 Kg.

and from 11.53 to 16.43 at 20 Kg. level in the regions I, IV to VII. They were high for P in region I (17.30 at 20 kg. and 15.25 at 40 kg.) and moderate in the regions IV and VI - 8.36 and 8.90 at 20 kg.; 7.06 and 8.69 at 40 kg. The interaction was present in regions IV to VII. During *rabi* the interaction was observed and the yardsticks were high for both N and P in regions IV and VII (28.18, 20.94 at 10 N, 27.22, 20.11 at 20 N, 8.59, 8.70 at 20 P, and 7.78, 7.41 at 40 P).

**Linseed :** Yardsticks to both N and P are high in region I (11.47 at 10N, 8.16 at 20N, 4.01 at 20P, 6.71 at 40P) and low in IV and VI. The interaction is negative in VII.

**Mustard :** Under irrigated conditions, the increase in production due to increase in P was high in region III (8.10 and 6.80 at 20 and 40 kg. P) and was low due to increase in N in all the regions. Interaction is present in regions I, IV, V and VI. Irrigation improved the yardsticks to both N and P in all the regions.

**Sesamum :** The additional input of both N and P lead to low increases in the yields during both the seasons. These figures kg./kg. ranged as follows. *Kharif*: 0.10 to 0.39 at 30 kg. N, 0.41 to 2.91 at 60 kg. N, 0.81 to 6.69 at 20 Kg. P, 0.85 to 5.11 at 40 kg. P. The corresponding ranges during *rabi* were 0.54 to 1.98, 0.45 to 2.32, 0.39 to 2.67 and 0 to 2.95 respectively.

Yardsticks were obtained for an input in the presence of other inputs by fitting of response surface and taking into account the interaction effect. Data from the on-farm experiments conducted during the period 1977 to 1990 in different agro-climatic regions (I to VIII) were utilised for the purpose.

## 9. Methodological studies relating to Agro-forestry experiments

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

An interim report on the results obtained so far has been prepared.

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

The project aims are (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.

Canonical polynomial models were tried in explaining the variations in treatment responses. An attempt was also made to arrive at a suitable model with transformed explainatory variable (Sq root scale), inverse term and fitting of lower degree polynomial by collapsing of stages etc. The analysis of data reveals that the treatments chosen for experimentations are not proper. The development of suitable statistical design for such types of experiments is also being undertaken.

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

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 with unequal block sizes for test treatment - control comparisons under two way classified, fixed effects and additive homoscadastic model, (iii) to obtain optimal block designs with unequal block sizes model for test treatments-control comparisons under two way classified fixed effects and additive heteroscadastic model, and (iv) to prepare a catalogue of designs obtained under (i), (ii) and (iii).

Optimality of block designs for test treatments - control comparisons was undertaken under nearest neighbourhood model. Further work is 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 constructed and to investigate the efficiency of these designs, and (iv) to prepare a catalogue of such designs.

Results on the A-optimality of block designs with unequal block sizes were developed for comparing set of test treatments with a set of controls. Tables of all the designs obtained giving the parameters and the A-efficiencies were prepared. Project report was finalised and sent to internal referee for comments.

## 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.

Two new methods of construction of variance balanced block designs were obtained using the concept of resolvable balanced incomplete block designs and group divisible designs. Some new balanced incomplete block designs were also identified. Further work is in progress.

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

The BIBRC 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 finalised and was approved by the referees (both internal and external).

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# DIVISION OF BIO-STATISTICS AND STATISTICAL GENETICS

**Mandate:**

To conduct basic & applied statistical research in the fields of Bio-statistics and Statistical Genetics

**Thrust Areas**

- Statistical studies in animal and plant genetics
- Modelling for biological phenomena
- Studies in population biology

**Projects in operation thrust-area wise:**

| No. | Project title | Project leader and associates |
|-----|---------------|-------------------------------|

### Statistical studies in animal and plant genetics

| No. | Project title | Project leader and associates |
|-----|---------------|-------------------------------|
| 1. | Application of bootstrap techniques for studying statistical properties of genetic parameters. | SD Wahi<br>VK Bhatia<br>Lal Chand |
| 2. | Statistical Modelling for comparing genetic groups of crossbred goat for growth studies based on multiple traits. | Lal Chand<br>SD Wahi<br>VK Bhatia |
| 3. | A study to compare the performance of different methods of estimating repeatability and to assess their stability by bootstrap techniques | SP Verma<br>RK Jain |

### Modelling for biological phenomena

| No. | Project title | Project leader and associates |
|-----|---------------|-------------------------------|
| 4. | Study of contagious distributions and dynamical models for aphid population growth | Prajneshu |
| 5. | Modelling curvilinear response among crossbred dairy cows with increasing level of exotic inheritance | VT Prabhakaran<br>BS Sharma |

### Studies in population biology

| No. | Project title | Project leader and associates |
|-----|---------------|-------------------------------|
| 6. | Investigations on the properties of projection matrices in population biology | PS Rana<br>Indra Singh |

## 1. Application of bootstrap techniques for studying 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 bootstrap estimates of genetic correlation by half-sib analysis approach along with other statistics was obtained for different combination of population parameters. In almost all the cases the distribution of statistics was found to be non-normal. The confidence intervals based on percentiles and bias corrected confidence intervals were also obtained and were compared with the normal confidence intervals. The study of genetic correlation by parent-offspring method was also started and was in progress.

## 2. Statistical modelling for comparing genetic groups of crossbred goat 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.

(i) Several statistical techniques like canonical variate analysis, iterative method, Tocher's method using Mahalanois $D^2$-statistic and similarity matrix method were applied for clustering various grades into homogeneous groups with the help of the goat data. Average intra and inter-cluster $D^2$-values were obtained for comparing the different methods of clustering.

(ii) Analysis work for studies on combining ability in respect of component growth traits and growth performance index based on body weight, pin-shoulder length, growth velocity and growth rate at one month of age of the animals had been completed.

## 3. A study to compare the performance of different methods of estimating repeatability and to assess their stability by bootstrap techniques

The main objectives of the project are (i) to estimate the repeatability by four different methods for important traits of some breeds of indegenous cows; (ii) to estimate the variance of repeatability of milk yield by usual four methods and also by the new technique called bootstrap and (iii) to compare the efficiencies of different procedures and estimate the relative-variance by bootstrap to assess the stability of the estimate of variance.

Some good number of estimators are available for estimating repeatability viz. ANOVA, Principal component analysis, Structured analysis and MLE. But the precision of these estimators based on samples

are complex in form and are dependent on number of unrealised assumptions. Thus, these estimators are less trustworthy. A new technique which has been suggested by Efron (1979a) called bootstrap is very much needed in genetical experimentation. This is computer intensive technique. Its role has been emphasised in a recent conference on bootstrap held at the Michigan University in May, 1990. It will be used for comparisons of variances.

The breeding data for three indigenous breeds of cows viz., Sahiwal, Hariana and Sindhi from military farms at Agra, Meerut & Bangalore will be utilised pertaining to the period 1955 to 1979. Before going for estimating the repeatability, the data will be scrutinized and various non-genetic effects will be eliminated by Least Squares technique and their adjustment of later records will be carried out using Sander's (1927) methods. The adjusted records for different production traits like lactation yields will be utilised for estimating the genetic parameters 'repeatability' and its variance by the proposed four different methods and also by bootstrap. The efficiencies of different procedures will be judged using relative variance $(CV^2(T))$ when T is estimate of variance by bootstrap. Scrutinisation of the processed data and its transferring on floppies were accomplished.

## 4. Study of contagious distributions and dynamical models for aphid population growth

Aphids are recognised as serious pests of cereals, oilseeds, pulses and vegetable crops. One objective of the project is to study various contagious distributions with a view to better understanding of the phenomenon of their spatial spread. Another objective is to develop appropriate dynamical population growth models to describe the underlying dynamics of an aphid population.

A critical review of the various contagious distributions available in the literature had been carried out. Attempts have been made to fit Neyman Type A, Neyman Type B, and Thomas distributions to aphid population data by the method of moments.

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

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

Most of the investigations on production traits of crossbred dairy cattle have established a curvilinearity in response to the level of exotic inheritance. For instance, milk yield increases upto 50% of exotic inheritance beyond which there is little improvement or there is a decline. No serious attempt has ever been made to study the mechanisms behind this curvilinearity. Accordingly, this investigation has sought to provide possible explanations for the curvilinear response frequently observed in dairy cows with increasing level of exotic inheritance. The fitness reversal and genotype-environment interaction models were considered for statistical testing in the investigation.

For studying the fitness reversal effect, if any, the ratio of realised selection differential to the expected differential is examined for each grade and its presence confirmed

by showing that the role of natural selection is much insignificant in half-breds as compared to the higher grades. In other words, if the ratio of selection differential is nearly unity in half-breds while it deviates from unity in other grades, this can be interpreted to mean that natural selection is antagonistic to artificial selection. To discover whether genotype-environment interaction has influenced the response, it will be sufficient to carry out an appropriate analysis of variance, providing the break up of the total variance into components attributable to the main effects and interactions.

The ANOVA revealed that the grade x farm interaction contributed little to the variability in lactation yield. Also, the curvilinearity persists even when the response of different grades is averaged over the other factors, suggesting that grade x farm or other similar interactions have nothing to do with curvilinearity. The empirical testing of fitness reversal model was carried out as follows: For every grade the realised and expected selection differential are worked out by considering initially a 25% sample of the highest yielding cows. The 30%, 35% and 40% samples are subsequently considered and selection differentials worked out for these sizes. All these samples carried the same message in so far as the joint role of artificial and natural selection are concerned. In the case of 1/2-bred and 5/8-bred the ratio between realised and expected selection differentials is close to unity suggesting that these grades are almost unaffected by natural selection, but in other grades below and above 50% of exotic inheritance the ratios are always less than unity, suggesting that natural selection in these grades operates antagonistically to artificial selection. It is also observed that in the 3/4-bred even a

small amount of resistance from natural selection is sufficient to cause greater depression in milk yield than in other grades. The results indicate a negative correlation between production and fitness and hence supports the adequacy of the fitness reversal model. The confirmation of the fitness reversal effect makes the development of new breeds from suitable crossbred bases, satisfying the requirements of the tropical conditions for better performance all the more relevant and important.

The formation of a synthetic effecting the amalgamation of desirable qualities of two exotic breeds and a promising indigenous breed seems to be a potential strategy for cattle development in the country. The operational advantages of this system (c-system) alongwith the genetic implications of the three breed gene pool are sufficient to justify this. The system which ultimately leads to the formation of an interbreeding population becomes, in due course of time, operationally much simpler because selective breeding can be practised by the average farmer and, unlike crisscross or rotational breeding programmes, no manipulation of multiple types are involved. The superior production efficiency of the population created by the c-system is quite natural because under this system the level of exotic inheritance at the population is at a desirable level. Moreover this system has slight advantage in terms of adaptability characteristics as well.

If hybrid vigour is not important, formation of a synthetic may provide a better alternative to simple crossbreeding programme. It has been observed that compared with the parental breeds the greater initial hetrozygosity of a new synthetic breed

unless lost through early inbreeding should mean both higher initial performance levels and greater genetic variability for possibly enhanced response to further selection. Thus new breed development is indicated even when heterosis is important, if unfavourable recombination effects are negligible. However for the success of the breeding programme the effective population size should remain reasonably large to avoid inbreeding.

## 6. Investigations on the properties of projection matrices in population biology

The project aims: (i) to study the properties of the projection matrix with special reference to stable population structure; (ii) to arrive at a stable population structure using the findings of the first objective; and

(iii) to study the behaviour of projection matrices and their limit properties when the matrix elements are non-stationary over time and stochastic in nature.

The project is to arrive at some suitable stochastic forms of the projection matrix which are widely used in population biology to project the state of population at different points of time as an attempt to forecast the population dynamics or as a way to evaluate life history hypothesis. The asymptotic properties of projection matrices are very helpful in biological interpretations.

Different population structures have been identified for examining the behaviour of proportionality factor used in obtaining the stable herd strength. The values of proportionality factors were also obtained. It was found that these values follow Pearson type I distribution.

# DIVISION OF FORECASTING TECHNIQUES FOR CROPS, DISEASES AND PESTS

## Mandate:

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

## Thrust Areas:

- Crop yield forecast models

## Projects in operation thrust-area wise:

| No. | Project Title | Project leader and associates |
|-----|---------------|-------------------------------|

### Crop Yield Forecast Models

| No. | Project Title | Project leader and associates |
|-----|---------------|-------------------------------|
| 1. | Integrated yield forecast model using biometrical characters, agricultural inputs, weather and remotely sensed data | Ranjana Agrawal<br>Gurcharan Singh (IARI)<br>BC Panda (IARI)<br>RC Jain<br>RN Garg (IARI) |
| 2. | Composite forecast of sugarcane yield | SC Mehta<br>Chandrahas |
| 3. | Yield forecast based on weather variables and agricultural inputs on agro-climatic zone basis | Ranjana Agarwal<br>RC Jain<br>SC Mehta |
| 4. | Non-linear statistical models for pre-harvest forecasting of inland fish production from ponds | SS Walia<br>RC Jain<br>RS Sehdev (PAU) |
| 5. | Study to develop models for assessing the effects of floods on yield of crops | Jagmohan Singh<br>BH Singh<br>Ranjana Agrawal |

## 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.

The study has been taken up in collaboration with Agricultural Physics Division, IARI, New Delhi to develop integrated yield forecast model based on plant characters, agrometerological variables, agricultural inputs and spectral data, etc. The experiment was conducted on wheat crop. Different levels of irrigation, fertilizers and dates of sowing were used in different plots to introduce variability on account of weather and inputs. The experiment has been conducted for 3 years (1992-95) and fortnightly observations were taken on number of tillers/plot, plant height, length and breadth of flag leaf, length and weight of earhead, leaf area index, dry matter, soil moisture, canopy temperature and crop reflectances and grain yield. Analysis work 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 study was undertaken to develop a methodology for obtaining composite forecast of sugarcane yield by combining the forecasts obtained from the models based on the cross-sectional data on biometrical observations recorded at various stages of crop growth in a pilot survey in Kohlapur district of Maharashtra during 1977-80 and time series data on various weather characters for the period 1951-80. Using the technique of growth indices by utilising the data on biocharacters for the periods - third and fourth, the model on district-level was developed and then the taluka(s)-wise forecasts were computed which deviated from the observed ones by less than 10-12% in most of the cases. From the weather-model, developed on district-level, the deviation of the forecast yield ranged from 5-15% in number of taluka(s) leaving aside few. The composite forecast for the district was worked out on the basis of three strategies - equal weights, weights proportional to inverse of the variances and the weights depending on variances and co-variances. The composite forecast yield appears to have deviated from the observed yield by less than 7% and 12% in 1978-79 and 1979-80 respectively. An important outcome from the results based on the three strategies was that the variation in per cent deviation in forecast yield obtained by using different strategies are almost same except in the cases where the variances of

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the forecasts based on bio-data and weather data differed significantly.

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

Results revealed that suitable model could be developed at agro-climatic zone level but certain inconsistencies were observed in the results due to inadequate data. Now five more years data are available for the period 1985-1990. With the inclusion of these five years data, the data series is expected to be adequate for the study. Accordingly correspondence was made with IMD and efforts were made to procure more data.

## 4. Non-linear statistical models for pre-harvest forecasting of inland fish production from ponds

The study aims to develop suitable non-linear model for pre-harvest forecasting of inland fish production from ponds.

In this study growth models are to be fitted for studying growth of fish weight/length. The growth models are generally non-linear in nature. These models describe the growth behaviour over time. The secondary data required for this study has been taken from an experiment conducted at Punjab Agricultural University, Ludhiana (Punjab). Plots of growth of fish weight/length over time have indicated non-linear relationship.

Logistic model fitted well to the data. Further study is in progress to develop the model to forecast fish weight at different points of time using partial data.

## 5. Study to develop models for assessing the effects of floods on yield of crops

The objective of the study is to develop suitable models for assessing the losses due to flood on kharif crops and its effect on Rabi crops.

During the period under report, the secondary data on various crops for 1980-81 and 1981-82 for two districts namely Faizabad and Ballia of Uttar Pradesh were procured from the scientists associated with the project, 'Pilot sample survey to study the impact of flood on agricultural production' in a region of Uttar Pradesh under sample survey division of the Institute. The data for 3 main crops (paddy, sugarcane and arhar) were scrutinized for two tehsils Tanda (Faizabad) and Bansdhi (Ballia) and transferred on floppies and preliminary analysis has been carried out.

# DIVISION OF STATISTICAL ECONOMICS

**Mandate:**

To develop appropriate stochastic models and methods for quantification of economic phenomena related to agri-culture

**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. | Implications of technological change for input use and output mix in crop production | RK Pandey Shanti Sarup |
| | **Resource Use Efficiency in Agriculture** | |
| 2. | 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 |
| 3. | Study of Production Efficiency and Resource use in Poultry Production. | S.P. Bhardwaj V.K. Mahajan R.K. Pandey |
| | **Farm Planning Under Risk and Uncertainty** | |
| 4. | 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** | |
| 5. | Estimation of demand for agricultural credit and its effect on Farm Income and Employment | UN Dixit A Kumar Ant Ram |

## 1. Implications of technological change for input use and output mix in crop production

The project aims (i) to examine the extent and nature of technological change in rice crop, and (ii) to make a quantitative assessment of the change on factor shares and its implications on the perspective input use and output of the crop.

The study has been undertaken in the five agro-economic regions of the state of Uttar Pradesh. The study is based on secondary data available from published sources as well as cross sectional data available from the Directorate of Economics and Statistics, Ministry of Agriculture. Compound growth rates of output and input factors used in rice production were computed for the green revolution period (1967-68 to 1978-79) and post-green revolution period (1980-81 to 1992-93) at the regional level and difference in the growth rates of various factors over the two periods were tested for significance. In order to determine the extent of technological change as a causual factor in the production process over two different periods, an analysis of the structural break in production relatives was done to test the change in the crop production technology. Productivity equations for examining the nature of technological change using cost of cultivation data were also estimated. The results were also utilized for estimating factor shares of the selected inputs. Productivity levels and levels of input use were also examined for the state as a whole. Future productivity of crop on the basis of projected level of input use was estimated under usual assumptions.

The analysis revealed that the introduction of HYV caused a significant change in the cropping scenario of different regions of the state in different manner. In almost all regions rice crop has been benefitted by the technological change. However, in the western, central and eastern regions of the state, the technological change was significant. These regions witnessed growth in productivity levels as well as area under the crop.

## 2. 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 measure mean technical efficiency of sample farm and, (iv) to estimate mean technical efficiency of sample forms, and (v) to estimate the technical efficiency of individual farms.

## 3. Study of Production Efficiency and Resource use in Poultry Production.

Objectives of the project are: (i) to study the pattern of poultry production and level of investment and capital requirement in poultry enterprises. (ii) to study the pattern of resource use and its efficiency in poultry production (iii) to examine the profitability of poultry enterprises and (iv) to study the constraints faced by poultry producers. The project was initiated in July 1995.

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

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

The analysis carried out from the collected data revealed the following facts:

The determinants of the attitude towards risk in the study are identified as age and education of the decision maker, holding size, family size, number of earners in the family and number of dependents in the family. In some cases these socio-economic characters bring about singificant changes in the risk-averse behaviour of the farmers. The optimum crop plans obtained for different categories of farmers in the two districts suggested that farmers can maximize their profits by allocating large area to wheat and mustard crops while similar land area may be allocated to gram and barley crop on all categories of farms in Alwar district.

The optimal crop plan for the small and medium cultivators in the district of Ghaziabad suggests that about 90 percent of the area may be allocated to wheat crops for maximization of profit and the remaining land may be allocated to mustard, gram and other crops. While in case of large cultivators the optimal crop plan indicated that crop barley may be preferred over wheat, mustard and rapeseed crops.

## 5. 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.

Primary and secondary data was collected by periodically visiting each of the selected farmers in Muzaffarnagar district for 1992-93 and 1993-94. In addition to estimation of production functions linear programming was also used to estimae the demand for credit. Gini coefficients were used to study the inequalities in use of credit. Net returns show significant increase on borrowing the credit in comparison to otherwise situation for both adopted and recommended level of technologies.

# DIVISION OF COMPUTING SCIENCE

## Mandate:

— To develop computer software based on modern statistical methods for the analysis of agricultural and animal scieces research data

— To undertake teaching of computer applications in agriculture research

- To conduct adhoc training courses on use of computers in agricultural research

— To provide scientific support in research data analysis to agricultural research workers and animal sciences

## Thrust Areas

- Development of software for agricultural research 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 |

## 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 package is ready and data can be analysed for five characters and ten effects, three regressors and three two-factor inter-actions in such a way that the matrix to be inverted is at the most of size 50.

The package has seven modules and can analyse multi-trait as well as single trait data. Mixed model analysis for multi-trait models can be done under three situations, namely

(i) Unrestricted mixed-models,

(ii) Restricted mixed-models with equality constraints, and

(iii) Restricted mixed-models with inequality constraints.

Attempt has been made to make the package as user friendly as possible so that users do not find it difficult to use the package for analyses related to Animal breeding data.

## Software Developments

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

Software for "Management Information System for Post Graduate School of I.A.R.I."

Software for the "Design of Sprinkler Irrigation System" Software for "Development of an Information System, on Agricultural Education in India" and Software for

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"Development of a Computerised Management Information System for Research Farms"

## Training Activities

The Division organised various 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/Headquarters (for details please see on Post-Graduate Training and Extension).

## Scientific Support

### A. In Research Data Analysis

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

- No. of Ph.D. Scholars : 11
- No. of M.Sc. students : 9
- No. of other research workers : 2
- Bioinformatic centre
  - (a) No. of requests received : 88
  - (b) Abstracts given : 84,330 references
  - (c) No. of E-Mail received : 268
  - (d) No. of E-Mail send : 97
  - (e) No. of Fax received : 10
  - (f) No. of Fax send : 7

### B. In providing software package "SPAR1"

During the year 19 (nineteen) sets of the system SPAR1 "Statistical Package for Agricultural Research" data analysis have been provided to various ICAR Institutes and Agricultural Universities on payment basis.

## Computer Utilization

For all the regular and ad-hoc training programs for computer application, conducted by IASRI, P.C.s were used for practical classes and demonstration purposes as per the details given below:

### A. P.C. System

| No. of visits | P.C. user's | No. of hours utilized |
|---|---|---|
| UNIX - Lab | 2136 | 3633 |
| XT - Lab | 3746 | 9252 |
| TERMINAL-Lab | 901 | 1244 |
| GRAPHICS-Lab | 915 | 2115 |
| TOTAL | 7698 | 16244 |

### B. Data Entry Unit

1. No. of batches created for recording : 151
2. No. of Data records created : 1.36 lacs
3. No. of records printed : 22,750
4. Total records corrected : 23,644
5. Books Information coded : 3,725

## Establishment of an advanced computer Lab:

One new advanced computer Lab has been established in the Division having 21 PC-486 DX2 computers along with latest software and uninterrupted power supply for organising training courses in computer application.

## New Software packages acquired:

For use in research and training the following packages have been procured and the same are being made available for scientists. (i) SAS (iii) GLIM (ii) GENSTAT (iv) SIGMA-PLOT

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# Teaching in progress
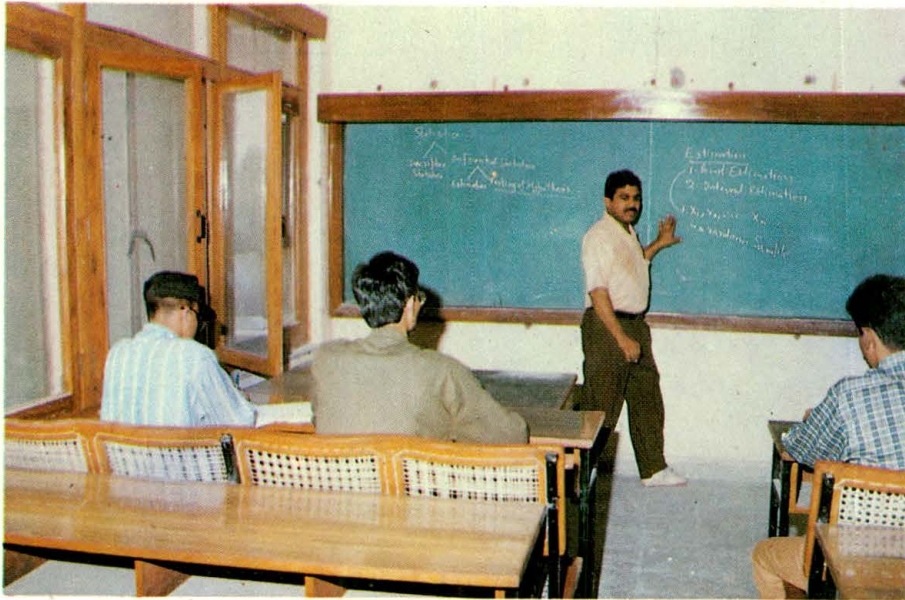
# POST-GRADUATE TRAINING AND EXTENSION

## Degree Courses

The Institute continued to conduct the following degree courses in collaboration with P.G. School of Indian Agricultural Research Institute (IARI), New Delhi which enjoys the status of Deemed University:

i)   M.Sc. (Agricultural Statistics)
ii)  Ph.D. (Agricultural Statistics)
iii) M.Sc. (Computer Application)

Both M.Sc and Ph.D. students are required to do courses not only in mathematics and statistics but also in Agricultural Sciences like Genetics, Agronomy, Agricultural Economics etc. All courses in Mathematics, Statistics and Computer Sciences etc. are offered at this Institute while the courses in Agricultural Sciences are offered at the IARI. The essential qualifications for admission to M.Sc. course are a graduate degree in Science with Mathematics/Statistics or a graduate degree with Agriculture and for Ph.D. programme are Master of Science in Agricultural Statistics or Statistics or Mathematical Statistics or Professional Statisticians Certificate Course (PSCC) from IASRI (Formerly IARS).

During 1995-96, 11 students were admitted to various courses and same number of students have completed their degree programmes.

### *M.Sc. (Agricultural Statistics)*

Two students were admitted and two students have completed M.Sc. (Agricultural Statistics).

### *Ph.D. (Agricultural Statistics)*

Five students were admitted and five students have completed Ph.D. (Agricultural Statistics).

### *M.Sc. (Computer Application)*

Four students were admitted and four students have completed M.Sc. (Computer Application).

## Regular Training Courses

The following regular training courses were undertaken:

### *i) Refresher Course in Statistics for Agricultural Scientists*

The Refresher Course in Agricultural Statistics was organised for the benefit of agricultural scientists and other personnel working in ICAR Institutes and Agricultural Universities.

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

– Statistical Methods
– Data Processing and Computer Programming
– Design of Experiments
– Survey Sampling
– Statistical Genetics
– Econometric Theory

The Seventh Refresher Course in Statistics for agricultural scientists was organised at the Institute from Jan 8 to March 30, 1996. The orientation programme of the course was held on Jan 8. It was attended by 6 participants. The Valedictory Function was held on March 30 in which Prof Bal BPS Goel, Director delivered the valedictory address and distributed the certificates to the participants.

### ii) Certificate Course in Statistics and Computing

The second certificate course in statistics and computing was organised at the Institute during July 3 - December 30, 1995. This was attended by 4 participants. The course covered:

— Advanced Statistical Methods
— Advanced Applied Statistics
— Computer Organisation & Programming Languages
— Computer Methods & Statistical Packages

The Valedictory Function for the course was held on December 30 in which Dr RK Pandey, Director delivered the valedictory address and distributed the certificates to the participants.

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

The XXVII short-term training course on "Use of Computer in Agricultural Research" was organised during April 1 - 15, 1995 for scientific and technical personnel of various ICAR Institutes and State Agricultural Universities. This was attended by sixteen participants. The various topics covered are DOS operations, data base management systems dBASE IV, the statistical package SPSS and SPAR1, the text processing package WP and the graphics package HARDVARDGRAPHICS (HG).

The Valedictory function of XXVII short term course was held on April 15, 1995. Dr OP Kathuria, Director, IASRI, New Delhi delivered the valedictory address and distributed certificates to the participants.

The XXVIII and XXIX short-term training courses on "Use of Computer in Agricultural Research" were organised during July 3 - 15, and July 17-29, respectively. The XXVIII Course was for scientific/technical personnel from ICAR Institutions located in Delhi. This was attended by 16 scientists/technical personnel. The XXIX Course was for participants from ICAR Institutes (outside Delhi) and State Agricultural Universities. This was attended by 21 participants. The main emphasis in the training was given on practical aspects of using micro computers, features of MS-DOS, WP, HG, SPSS, SPAR1 and dBASE IV plus application packages. Adequate practical work on PCs was provided to the trainees. A Valedictory Function for XXVIII course and XXIX course were held on 15 Jul 1995 and 29 Jul 1995 respectively. Dr. RK Pandey, Director of the Institute delivered the Valedictory address and distributed certificates to the participants.

The XXX short-term training course on "Use of Computers in Agricultural Research" was organised during September 1 - 15, 1995. The course was for scientific and technical personnel of ICAR Institutes located in Delhi. This was attended by twenty participants. The XXXI Course was organised from September 18-30, 1995 and it was for

participants from ICAR Institutes (outside Delhi) and State Agricultural Universities. This was attended by 16 participants. The various topics covered included DOS operations, data base management systems dBASEIV, the statistical package SPAR1 and SPSS, the text processing package WP and the graphics package HARDVARD GRAPHICS.

A Valedictory Function for XXX and XXXI courses were held on 15 Sep 1995 and 30 Sep 1995 respectively. Dr. RK Pandey, Director of the Institute delivered the Valedictory address and distributed certificates to the participants.

The XXXII short-term training course on "Use of Computers in Agricultural Research" was organised during March 16 - 30, 1996. The course was for scientific and technical personnel of ICAR Institutes located in Delhi. This was attended by seventeen participants.

A Valedictory Function for XXXII and VII Refresher course in Statistics for Agricultural Scientists were jointly held on 30 March 1996. Prof.Bal BPS Goel, Director of the Institute delivered the Valedictory address and distributed certificates to the participants.

### iv) Short term training course on 'Use of Computer in Administration'

The second short term training course on use of computer in administration was organised from Oct 30-Nov 10 at the Institute. This was attended by 10 participants. The course coverage comprised of computer fundamentals, DOS operating system and text processing package WORDSTAR.

## Adhoc Training Courses

### i) NARP Training Programs

Sixth training course on "Use of computers in agricultural research" for National Agricultural Research Projects (NARP) scientists was organised from June 12- 27, 1995 at IASRI. Thirteen participants attended the course. The course comprised lectures and practical classes on the operating system MSDOS, the spread sheet package LOTUS 1-2-3, the text processing package WORDSTAR 6.0 and WordPerfect, the graphics package HARVARD GRAPHICS, the statistical package MSTAT-C, MICROSTAT, SPSS and SPAR1. Dr RB Singh, Director, IARI distributed certificates to the NARP Scientists and delivered the Valedictory Address.

The seventh training course on 'Use of Computer in Agricultural Research' for NARP scientists was organised at the Institute from November 20 - December 6, 1995 which was attended by 9 participants. The Course was inaugurated by Dr RK Pandey, Director, IASRI on Nov 20, 1995. Dr SL Mehta, DDG (Education) delivered the Valedictory address on Dec 6, 1995 and distributed certificates to the participants.

The eighth training course on 'Use of Computer in Agricultural Research' for NARP scientists was organised from Dec 11-27. Dr RK Pandey, Director, IASRI delivered the Orientation Talk. The course was attended by 10 participants. Dr GB Singh, DDG(SA & AF) delivered the Valedictory address and distributed certificates to the participants.

The course coverage comprised of lectures and practical training on Operating

system MSDOS , Text processing package WORDSTAR, Word Perfect, the graphics package and introduction to statistical packages SPSS and SPAR1 and the spread sheet package LOTUS 1-2-3.

### ii) Training Programmes on Computers for ICAR Headquarter Staff

Twelve training programmes viz. six for senior/middle level officers and six for Junior level staff of ICAR Headquarters were organised at the Institute. These courses were attended by 44 senior/middle level officers and 77 junior staff of the ICAR headquarter. The various topics covered include MS-DOS operation, Data Base Management Systems dBASEIV, Text Processing Package WS and Word Perfect and Nortern Editor (NE), etc.

### iii) Training Course on 'Use of Computers for Key Punch Operators'

The second short term training course on use of computer for KPOs was organised from Mar 22- Apr 22 at the Institute. This was attended by 14 participants.

### iv) Training Course under Centre of Advanced Studies

The first training course on "Advances in Experimental Designs" under the aegis of `Centre of Advanced Studies in Agricultural Statistics and Computer Application' was organised in the Institute during March 11-27, 1996. The training course was inaugurated by Prof SL Mehta, DDG (Edn.), ICAR on March 11, 1996. This course was attended by 17 participants. Dr VK Gupta, National Fellow acted as the Course Director of this training programme. The Valedictory Func-

tion was held on March 27, 1996 and Professor AL Choudhary, Chairman, Agricultural Scientists Recruitment Board, ICAR delivered the Valedictory Address and distributed certificates to the participants.

## International Training Course

### The VII International training course on 'Techniques of Estimation of Output of Food Crops'

The VII International training course on 'Techniques of Estimation of Output of Food Crops' was organised at the Institute from Feb 26-Apr 10, 1996. The course was jointly funded by the Ministry of External Affairs under its ITEC programme and Afro Asian Rural Reconstruction Organisation (AARRO). Six participants from 5 different Afro Asian countries, 1 each from Malaysia, Sudan, Ghana and Zambia and 2 from Egypt attended the training course. The training course was inaugurated by His Excellency Shri Ahmed A Khalil, Secretary General, AARRO. The Valedictory address was delivered by Prof Gajendra Singh, Deputy Director General (Engg.), ICAR. 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 security system and Agricultural scenario of India. Particular emphasis in the training course was laid on methods of area and yield estimation followed in India for estimating the production of foodgrains. The faculty for the training course was mainly drawn from the Institute and 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 Re-

# First Training Course on "Advances in Experimental Designs"



Prof SL Mehta, DDG (Edn.), proceeding for Inaugural Function



Professor AL Choudhary, Chairman ASRB, ICAR delivering the Valedictory address

# The VII International Training Course on Techniques of Estimation of Output of Food Crops



H.E. Ahmed A Khalil, Secretary General, AARRO, delivering the Inaugural Address



Prof Gajendra Singh, DDG (Engg.) delivering the Valedictory Address

search 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 statistical 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.

## Training programmes organised for trainees from other organisations

| Sl. No. | Name of programme | Dates | No. of trainees | Sponsoring agency | Lecturers |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1. | International Statistics Education Centre, Calcutta. | Oct 20 | 15 | Central Statistical Organisation, New Delhi | Dr PR Sreenath Dr AK Srivastava Dr (Smt) R Agarwal Sh SN Mathur |
| 2. | M.Sc. (Stat) students. | Dec 11 | 34 | Punjab University, Chandigarh | Dr Prajneshu Sh SN Mathur |

## Research Fellowships

During 1995-96, 16 M.Sc. and 29 Ph.D. students received research fellowships. 5 M.Sc. students received fellowship at the rate of Rs.1200/- p.m. and contingent grant. 11 M.Sc. students received fellowship at the rate of Rs.1800/- p.m. each besides Rs.3000/- per annum as contingent grant. Out of the 29 Ph.D. students 5 received fellowship at the rate of Rs.1800/- p.m. in I year and 12 received fellowship at the rate of Rs.2500/- p.m. in I, II year and 12 received fellowship at the rate of Rs.2800/- in III and IV 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 the other students. The main activities included are as follows:

– A General Body meeting of IASRI hostel inmates was held on 12.09.1995 under the Chairmanship of Shri RS Khatri, Warden. For smooth functioning of the hostel activities Shri AR Rao was elected as Prefect alongwith other Executive Body members.

– Prof. Bal BPS Goel was falicitated by the students of IASRI in Sukhatme Hostel on his taking over as Director, IASRI, New Delhi.

– Diwali and Holi was celebrated with pomp and gaiety. Prof. Bal BPS Goel, Director gave party on the occasion of holi festival to the students, trainees of Afro-Asian Rural Reconstruction Organisation (AARRO) an International training programme, trainees of the refresher course on Agricultural Statistics and Computer Applications and the scientists/staff members residing in the campus.

– Students of IASRI receiving M.Sc. and Ph.D. degrees were falicitated jointy by the Director and faculty members of the Institute and a party was arranged in student's hostel.

– Boarding facilities have been provided to the participants of the training course on advances in design of experiments organised by the Institute under Centre for Advance Studies in Computer Application and Agricultural Statistics during March 11-27, 1996.

– A cricket match between the students and the staff members of IASRI was held on 31st March, 1996 in which staff side led by Prof. Bal BPS Goel won the match.

In addition to above boarding and lodging arrangement were made in Panse Hostel (Guest House) for the participants of various training programmes organised in the Institute during the period under report. Similar arrangements were made for the guests who stayed in Guest House from different departments/organisations.

## 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 104 seminars were organised. Out of which 64 seminars were delivered by the students of PG School, IARI, 27 by the scientists of the Institute, one by Dr AS Arya, Emeritus Scientist and 12 were delivered by eminent guest speakers. Out of 27 seminars delivered by the scientists of the Institute, 2 were delivered in Hindi. Besides the above, one day seminar on "Improvement of productivity and quality in the work of the Institute" was also arranged on Feb 16. Name(s) and topics of the research seminars delivered by eminent scientists are as follows:

## SEMINARS BY GUEST SPEAKERS

| Sl.No. | Speaker | Topic |
|---|---|---|
| 1 | 2 | 3 |
| 1. | Prof AK Nigam Director, Institute of Applied Statistics & Development Studies, B-16/1, Rajaji Puram, Lucknow - 226017 | Survey Techniques for development research |

Dr. Murari Singh, Sr Biometrician, ICARDA, Syria, delivering a seminar



Retired scientists revisiting the Institute

| 1 | 2 | 3 |
| --- | --- | --- |
| 2. | Dr Bhagawan Dass<br>Professor & Head,<br>Department of Statistics,<br>Devi Ahilya Vishwa Vidalaya,<br>Indore (M.P.) | Robust Designs |
| 3. | Dr Murari Singh<br>Senior Biometraician<br>ICARDA, Syria | Intersite-transferability of crop variety-another approach to analyse multilocation trials. |
| 4. | Dr Ashish Das, Asstt. Professor<br>ISI, Calcutta presently on a<br>visiting assignment at Ohio<br>University Columbus, Ohio, USA | i) Optimal minimally connected designs.<br><br>ii) Some recent results on optimal block designs. |
| 5. | Prof. S.D. Peddada,<br>University of Virginia Charlettes,<br>Ville, U.S.A. | Confidence Interval Estimation. |
| 6. | Prof JH Matis<br>University of Texas<br>A & M University,<br>Texas, U.S.A. | i) Predicting the data of first catch of the corn ear worm in Central U.S.A.<br>ii) Describing the population dynamics of Africanized honey bees using birth-death- migration models - An application of mathematical modelling in population biology. |
| 7. | Dr Samuel Huda,<br>University of Western Sydney,<br>Hawkesbury, Australia | Management strategies to minimize climatic risk in Agriculture |
| 8. | Prof J Roy,<br>Research Professor Emeritus,<br>ISI, Calcutta. | What computers can and can't do? |
| 9. | Prof BK Sinha,<br>Division of Theoretical<br>Statistics, ISI, Calcutta. | Alice in Dice land |
| 10. | Sh SC Rai, | Estimation of level of socio economic development- A case study in U.P. |

## Advisory Service

The Institute continued its advisory service 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 were given by the Head of the Division of Sample survey Methodology and Analysis of Survey Data to:

— Commissioner of state Government of Tamil Nadu regarding estimation of production of coconut and arcanut in Tamil Nadu on Sep. 22.

— Joint Secretary, Ministry of Agriculture, Department of Animal Husbandry and Dairing regarding conduct of livestock surveys on Sep. 28.

— Deputy Director, Government of Meghalaya regarding estimation of production of Potato and Ginger in the State.

— Jt. Commissioner, Ministry of Food regarding estimation of post harvest losses of food grains at national level on Nov. 08.

— Joint Agricultural Marketing Advisor, Ministry of Rural Development regarding post harvest losses of food grains and marketable surplus on Nov. 13.

— Commissioner of State, Tamil Nadu and Dy. Director (Stat) Government of Tamil Nadu regarding estimation of production of coconut and arcanut in their state from Nov 28-30.

# DISTINGUISHED VISITORS

## INDIAN

1. Prof RS Paroda,
   Secretary, DARE &
   Director General, ICAR,
   Krishi Bhawan, New Delhi-110001

2. Prof AL Choudary,
   Chairman, ASRB,
   Krishianusandhan Bhawan,
   New Delhi - 110012.

3. Prof Gajendra Singh,
   DDG (Engg.),
   Krishi Bhawan,
   New Delhi - 110001.

4. Dr SK Sinha,
   National Professor,
   ICAR, New Delhi - 110001.

5. Dr SL Mehta,
   DDG (Edn.), ICAR,
   New Delhi

6. Dr GB Singh,
   DDG (SA & AF), ICAR,
   New Delhi

7. Dr RB Singh,
   Director, IARI,
   New Delhi-110012.

8. Dr PN Bhat,
   Officer on Special Duty,
   Krishianusandan Bhawan,
   New Delhi - 110012.

9. Dr JS Murthy,
   Deptt. of Genetics,
   Osmania University,
   Hyderabad-500007

10. Prof YK Alagh,
    Vice-Chancellor,
    Jawaharlal Nehru University,
    New Delhi-110 067.

11. Shri NC Khandekar,
    Ex-Head, Computer Centre,
    University of Delhi,
    C-3 Maurice Nagar, Delhi

12. Prof AK Nigam
    Director, Instt. of Applied
    Statistics & Development
    Studies, B-16/1
    (First Floor) Rajajipuram,
    Lucknow-226017

13. Prof MG Sardana,
    Ex-DG, CSO,
    A-1/26, Paschim Vihar,
    New Delhi - 110 063.

14. Dr Bhagawan Dass
    Professor & Head,
    Department of Statistics,
    Devi Ahilya Vishwa Vidalaya, Indore (MP)

15. Dr MN Das,
    Ex-Director, IASRI,
    I-1703, Chitranjan Park,
    New Delhi.

16. Prof J Roy,
    Research Professor Emeritus,
    ISI, Calcutta.

17. Prof SK Chatterjee,
    Head, Deptt. of Statistics,
    Calcutta University, Calcutta.

18. Prof BK Sinha,
    Division of Theoretical
    Statistics,
    Indian Statistical Institute,
    Calcutta

19. Sh Mathews J. Nedumpara,
    Additional Central Govt.
    Standing Counsel,
    M-7, Choice Park,
    Elamakkara, P.O. Cochin

20. Sh SC Rai,
    Principal Scientist,
    IASRI (Retd.)

21. Dr GS Ram,
    Eco. & Statistical Adviser,
    Krishi Bhavan,
    New Delhi - 110 001.

22. Dr Ashish Das, Asstt. Prof.
    ISI, Calcutta presently on a
    visiting assignment at Ohio
    University Columbus, Ohio, USA

23. Dr Mruthyunjaya,
    ADG (ES&M),
    ICAR, Krishi Bhavan,
    New Delhi-110001

24. Dr KC Seal,
    Retd. Director General,
    Central Statistical Organisation,
    D-135, Saket, New Delhi-110017.

25. Dr Anil K Gupta,
    Professor,
    Indian Institute of Management,
    Vastrapur,
    Ahmedabad (Gujarat)-380015.

26. Dr Aloke Dey,
    Head, Stat.-Math. Unit,
    Indian Statistical Institute,
    7-S.J.S., Sansanwal Marg,
    Kathwaria Sarai,
    New Delhi-110016

27. Dr SN Maheshwari,
    Professor,
    Dept. of Computing Science,
    Indian Institute of Technology
    Hauz Khas, New Delhi-110016

28. Prof J Roy,
    71, B.T.Road,
    Narendra Nagar,
    Calcutta-700056

# FOREIGN

1.  Prof. S.D. Peddada,
    University of Virginia
    Charlettes,
    Ville, U.S.A.

2.  Sh Ahmed A Khalil,
    Secretary General,
    AARRO.

3.  Prof JH Matis
    University of Texas
    A & M University,
    Texas, U.S.A.

4.  Dr Samuel Huda,
    University of Western Sydney,
    Hawkesbury, Australia.

5.  Dr Murari Singh,
    Senior Biometraician,
    ICARDA, Syria.

    *The following foreign visitors from Egyptian International Centre of Agriculture (EICA)*

*also visited the Institute under study visit programme on 21 November, 1995.*

6.  Eng. Alaa Eldin Elhami Shaker Hassan,
    Manager, Technical & Secretariat Office,
    Office of the Director General,
    Egyptian International Centre for Agriculture (EICA), Dokki, Egypt.

7.  Eng. Mahmoud Ahmed El-Rafie Ali,
    Head, Soil & Water Division,
    Egyptian International Centre for Agriculture (EICA), Dokki (Egypt)

8.  Eng.Mohamed Zakaria Abdel-Khalik,
    Assistant Researcher,
    Agricultural Extension and Rural Development Research Institute,
    Ministry of Agriculture,
    Government of Arab Republic of Egypt,
    CAIRO (EGYPT)

# DISSERTATIONS APPROVED

## Ph.D (Agricultural Statistics)

(i). AGARWAL, NITI - *Studies on block designs with nested rows and columns for test treatment control comparisons.*

This thesis is concerned with certain combinatorial and optimality aspects of incomplete block designs for comparing a set of treatments (called test treatments) with control treatment(s), Experimental designs in which experimental units are arranged in b blocks, each with $p$ rows and $q$ columns are considered for making these comparisons. An appropriate additive, homoscedastic, fixed effects linear model has been considered.

A brief review of various aspects of block designs with nested rows and columns, various optimality criteria followed by a detailed review on test treatments versus control treatment(s) comparisons is presented alongwith the work done on obtaining optimal block designs for such comparisons. The concept of Balanced Test Treatment Incomplete Block (BTIB) designs is extended to Balanced Test Treatment Incomplete Block Designs with nested rows and columns (BTIB-RC designs). The number of rows in each block ($p$) is assumed to be at most equal to the number of test treatments ($v$) and also number of columns in each block, ($q$). For fixed control replications in a block, when test treatment replications within a block are divisible by $p$, a design in which test treatments occur equally frequently in all rows and binary in columns within a block with respect to test treatments is always better than any other design which does not satisfy these conditions in a given class of competing designs. A sufficient condition to establish the A-optimality aspects of BTIB-RC designs in which test treatments occur equally frequently in rows and binarily in columns within a block with $p \leq v$ and $p \leq q$ is given. A necessary condition in terms of design parameters for the A-optimality of binary BTIB-RC designs is mentioned.

A balanced block design with nested rows and columns (BN-RC design), when reinforced with a row and column of control treatments, in each of its blocks, is A-optimal in the class of connected block designs with nested rows and columns which have one row and one column of control treatment in each of the blocks. A similar result for the case of Balanced Incomplete Block Designs with nested rows and columns (BIB-RC designs) to establish the A-optimality in the class of binary incomplete block designs with nested rows and columns is obtained.

Some general methods of construction of BTIB-RC designs are presented using BIB designs, BIB-RC designs, BTIB designs, orthogonal latin squares, Youden squares, etc. The designs obtained using these methods are checked for A-optimality and their A-efficiencies are computed and catalogued when $b \leq 200$: $p=2$ and $q=2, 3$. The concept of BCB-RC designs is also extended to Balanced Test Treatment Complete Block Designs with nested rows and columns (BTCB-RC designs) and some general methods of construction of these designs are also given. Adding a row (column) of control treatments to a connected incomplete (complete) block design with nested rows and columns in only test treatments results into a disconnected design.

Balanced Bipartite Incomplete (complete) Block Designs with Nested Rows and Columns (i.e. BBPIB-RC, BBPCB-RC designs) are defined based on the concept of balanced bipartite block designs. General methods of their construction making use of BIB designs, resolvable BIB designs, technique of merging of treatments, etc. are presented.

*# 1996*

(Guide: Dr PR Sreenath)

(ii). DAS, PRABIR KUMAR - *Nonlinear Statistical Models for Studying Acreage, Production and Productivity of Wheat in India*

In this investigation, various nonlinear statistical models viz. monomolecular, logistic, Gompertz, mixed influence and Richards are considered for developing appropriate models for studying production, productivity, total area, area under HYVs and adoption of HYVs of wheat in various states of India as well as at the all-India level. Parameters of these models are estimated using nonlinear estimation procedure by employing Levenberg-Marquardt method. Initial selection of models, which resulted in two or three competing models for a particular data set, is done based on different goodness of fit statistics viz.. $R^2$, RMSE, MAE, MSE and OSAF. Examination of residuals is carried out to test the assumptions of randomness and normality of residuals. Final selection of model, out of a few competing models, is made based on measures of nonlinearity viz. intrinsic, parameter effects and Box's bias. A model is considered to be the best for which values of these measures are within acceptable limit. Parameter estimates of such a model have desirable statistical properties of being unbiased, minimum variance and normally distributed. As an illustration, for modelling production of wheat, logistic and

Gompertz models come put to be the most appropriate for the states of Haryana and Madhya Pradesh. Monomolecular model is found to be the best model for describing the adoption path of HYVs of wheat for the states of Punjab, Rajasthan, Bihar and also at the all-India level.

For a few data sets no model is found suitable. Therefore, there is a need to make refinements in the various models. To this end, the deterministic models are first generalized by incorporating the aspect of distributed time delay. After that the fluctuations in the system are modelled by adding a delta-correlated Gaussian Stochastic process on the right hand side of the model. The probability density function of the process is obtained in terms of a Gaussian stochastic process. Finally, the explicit expressions for the mean-value function and second moments for various cases are worked out.

(Guide : Dr. Prajneshu)

*# 1996*

(iii). GEETHALAKSHMI, V - *Robustness studies in survey sampling.*

In sample survey data, when outliers occur, it is important that an outlier-robust estimation of the finite population under consideration is carried out. A sampling unit may be influential with respect to an auxiliary variable X or with respect to a set of $k$ auxiliary variables and hence a model-based approach to outlier-robust estimation would be more appropriate. Often the selection of the sample is based on a design variable Z which is not used in the model utilized for the regression analysis. In such situations, the usual OLS estimator of the regression coefficient $\beta$ of the study variable Y on the auxiliary variable X, is biased and hence it is important to obtain a model-robust estimator of $\beta$. Some estimators have been construct-

ed for the population total which are both outliers-robust and model-robust under specific situations. These are based on some unbiased, model-free estimators of $\beta$ which incorporate design information through $\pi$-weights. Through simulation studies, the performance of the proposed estimators was compared with outlier-robust estimators based on an M-estimator $b_n$ of $\beta$ and a real-valued function which down-weights outliers. The study was conducted for seven sampling designs using two forms of the $\Psi$-function and the comparison was done on the basis of bias and root mean square error (RMSE). The results of the simulation study revealed that, in general, the proposed estimators perform well in comparison with the outlier-robust estimator, with respect to RMSE. In particular, for designs based on pps sampling the performance of the proposed estimators was considerably good with respect to RMSE, through the bias of these estimators was more in comparison with other estimators. Therefore, the incorporation of the design information through $\pi$-weights makes the estimator robust against model violations.

The problem of discordancy testing of outliers from survey samples was studied through extensive simulation studies. The behaviour of some standard testing procedures for testing discordancy of outliers from infinite population samples when applied in testing discordancy of outliers from survey samples was investigated. It was found that even if we are sure about the distribution from which samples (of a finite population S) have arisen, there exist no unique set of critical values usable in testing discordancy of outliers from finite population samples. The estimated critical values obtained through simulation corresponding to extreme studentized deviate test statistic used to test a single outlier from Normal samples was compared with the tabulated critical values. For samples of size more than 50, there was a sharp difference between the estimated and tabulated critical values. A small correction has been suggested for this anomaly. Through further simulation studies, it was confirmed that the variation in critical values is due to the finiteness of the population and not due to the approximations due to simulations. A careful analysis of the result obtained regarding the discordancy testing of outliers from survey samples reveal that instead of seeking an unique critical value corresponding to each sample size a range of critical values can be sought after.

(Guide : Dr AK Srivastava)

# 1996

(iv). KUMAR, VIJAYARAGHAVA - *Design and analysis of experiments for investigating competition effects among neighbouring units.*

The present study is a statistical investigation of the practically important problem of interference or competition among neighbouring test treatments occuring in various type of field and laboratory experiments. The design and analysis of experiments permitting comparison of competition effects in a set of 's' competing test treatments is the major objective of this study. The thesis begins with the introduction of the topic and the review of literature covering work on both agricultural and statistical aspects.

The statistical concepts and assumptions regarding designs for competition experiments are discussed. A model in which the effect of a treatment applied to a plot expressed as the sum of a direct effect, a left effect and a right effect is assumed. Idea of ordered pairs and triplets, of the treatments are studied and methods of formation of

sequences are introduced. The $s^3$ treatment triplets obtained from s competing units were arranged into five disjoint classes and combinability of triplets in these classes to form sequences are studied. Estimability of various effects by making use of the groups of these triplet classes are also investigated. Two types of designs, the simple neighbour balanced (SNB) and exact negihbour balanced (ENB) designs are defined and are illustrated by using suitable examples.

Correspondence between directed graphs and triplet sequences used in competition designs is attempted and the use of complete symmetric digraph (CSD) in developing sequences giving all left and right neighbour effects is illustrated. A number of theorems and results are developed in this connection, to provide a basis for the existence and construction of sequences that can be used for developing designs for competition experiments.

The randomization of experimental units within a block is always involved in competition designs. Four methods of randomization using isomorphic digraphs, circular permutation of sequences, interchange of internal circuits and by using Hamiltonian circuits are suggested in this regard. Construction of various type of complete and incomplete block designs are also attempted. Three methods for constructing designs in complete blocks and five methods for constructing of designs in incomplete blocks are illustrated.

Analysis of the designs developed is given in the last part of the thesis. The general analysis using fitting of constants and computing reduction in sum of squares can be attempted for all these designs. But individual formulae for analysis are presented for all the three cases of complete block designs. The method of analysis is explained using simulated data also. Two special cases viz. (i) the structure of competition designs under the assumption of equal left and right neighbour effects and (ii) situation in which there is no competition effect for a treatment with itself are also discussed towards the end of the thesis. The thesis ends with a summary and the list of references used.

(Guide : Dr PR Sreenath)

#1996

(v) THENNARASU, K. - *On certain nonparametric procedures for studying genotype-environment interactions and yield stability*

This dissertation deals with a detailed investigation on the non-parametric analysis of GE interaction based on ranks and the geometrical representation of interaction and response structure through principal coordinate analysis. The introductory chapter of the thesis provides the motivation for taking up the present investigation on monoparametric analysis of GE interaction which also contains essential concepts and definitions related to GE interactions. In Chapter II a critical review of past work in the area of GE interaction and stability parameters has been made to gain insight into the existing gaps.

Four new stability measure ($P_{1i}$, $P_{2i}$, $P_{3i}$, $P_{4i}$) are introduced in Chapter III alongwith their test of significance procedure based on normal distribution. The required expectation and variance for first stability measure for the test of significance have been derived in terms of incomplete beta functions. For the remaining stability measures these are obtained through simulation on computer. The adequacy of normal distribution of the stability measures has been examined by

computing probability of type I error ( ). The measure $P_{2i}$ and $P_{1i}$, are found to be better than the remaining measures in terms of the normal approximation. The power of the test has been computed with respect to different combinations of genotype (K) and environments (N) for six different levels of a namely 0.25, 0.10, 0.05, 0.025, 0.21 and 0.005. This has been computed for different GE interaction values to find out the change in power efficiency. The related stability assessment using live data on pearl millet has also been considered in the very chapter.

The test chapter deals with graphical representation of GE interaction pattern. This has been achieved by providing a new similarity measure for the principal coordinate analysis. Graphs have been obtained for the GE interaction as well as the yield response pattern from the live data used for the study. The dissertation is concluded with a summary.

(Guide : Dr. HP Singh)

## Ph.D. (Agricultural Economics)

MAHENDRAN K. - *An economic study of farm mechanisation in South Arcot District of Tamil Nadu*

The study was undertaken in South Arcot District, as this represents a typical farm mechanised area of Tamil Nadu state. The analysis indicated that the incomes were the highest on tractor operated farms followed by bullock plus tractor operated farms and bullock operated farms. The study indicated expansion in the machinery and implement use during the last decade. There was a shift in preference of farmers for tractor operated implements. The study indicated a positive impact of mechanisation on farm labour employment. The first infrastructural facili-

ties available at district north and village level are not adequate. Credit facilities should be provided for purchase of small machinery and farm equipment.

(Guide Dr. R.K. Pandey)

## M.Sc. (Agricultural Statistics)

# 1996

(i). JHA, G.K. - *Statistical investigation in the adoption of HYVs of Maize*

On the basis of secondary data from 1966-67 to 1992-93 pattern of adoption of HYVs of maize in the major growing states has been analysed. The states were classified into four zones. Bihar and Orissa were included in the East Zone while North Zone comprised of Haryana, Himachal Pradesh, Jammu and Kashmir, Punjab, and Uttar Pradesh. Andhra Pradesh formed the South zone and the states of Madhya Pradesh, Maharashtra, Gujarat and Rajasthan constituted the West Zone. Besides resource availability, demonstration effect was found to play an important role in the adoption of HUVs. By the large, Bihar, Andhra Pradesh and Maharashtra were the leading states in their respective zones, however, in the north zone Punjab could emerge as a leading state in the adoption of HYVs only after seventies. Among all the states, Andhra Pradesh has been the leading state covering eighty-eight percent of its maize acreage with HYVs while Rajasthan remained the most backward state covering only three percent upto 1992-93. Adoption level remained below fifty percent in the major contributing states of Madhya Pradesh, Rajasthan and Uttar Pradesh. East and South zones exhibited better performance in adoption of HYVs as compared to the North and West Zones. Sine the former zones cover much less maize area in relation to the latter zones, emphasis has to be laid on the improvement of the infrastructure

including extension services as also on the breeding of new location specific HYVs for the states in these zones iun order to improve their productivity.

(Guide: Dr VK Sharma)

# 1996

(ii). RAMASUBRAMANIAN, *V. - Markov chain approach to forecast sugarcane yield.*

The importance for pre-harvest forecasting of crop yields need hardly be emphasized. In this study, models to forecast sugarcane yield have been developed. Most of the earlier studies carried out for forecasting crop yields utilise regression models. But the regression models are very much affected by the presence of outliers and extreme values in the data. Multi-collinearity may also cause serious problems in estimation, prediction and interpretation. An alternative approach to crop-yield forecasting is the probability model based on Markov Chain theory. This method overcomes some of the drawbacks of the regression model. So far one stage data at a time have been used by earlier workers in developing Markov Chain model for forecasting of crop yields. Hence an attempt has been made to develop Markov Chain model that utilises two stages data at a time, achieving the same directly and also through growth indices of the explanatory variables. It was assumed that future depends on present as well as on the recent past. The Markov Chain model has the advantage of providing non-parametric interval estimates and is robust against outliers/extreme values. Two years data (1977-78 and 1978-79) were taken from the project "Pilot Studies on Pre-harvest Forecasting of Yield of Sugarcane in Meerut District (U.P.)" (1976-77 to 1978-79) carried out by IASRI, New Delhi. A Markov Chain Model was constructed by defining a set of states, which describe the average condition of a group of plants at specified times within the stages. The growth process of the crop was divided into stages. Individual states were defined on the basis of quantiles of the selected variables, in different stages of crop growth. Yield distributions were made on the basis of quantitative intervals of yield. The observed frequencies of the plants moving from one condition state of a composite stage to different condition classes of the next composite stage were utilised to calculate various transition probabilities which gave rise to the transition probability matrices. Using these matrices a final forecast matrix was formed, each of whose row gave predicted yield distribution for a given stage and state. Each of the forecast yield distributions were then analysed to get the predicted mean and standard error of the forecasts. The results obtained were compared with those obtained from regression model and also with those results from Markov Chain model which uses one stage data at a time. In most of the cases, Markov Chain approach using two stages data was found slightly better in terms of forecasts and their standard errors over the existing methods. Also it was possible to forecast yield 4-5 months before harvest. Thus this study revealed that Markov Chain model with two stages data used at a time can be used in crop yield forecasting.

(Guide : Dr RC Jain)

# 1996

## M.Sc.(Computer Application)

(i). HASSAN, SHAHID - *Software for the Design of Sprinkler Irrigation System (SIS)*

Sprinkler Irrigation holds the way for a better water management system in the years to come. Computers come in handy at the designing stage of such advanced irrigation

systems in the form of aiding one to prepare an user-friendly software. A "SPRINSOFT" software has been developed to design the Sprinkler Irrigation System. To develop the "SPRINSOFT" ORACLE has been used. "SPRINSOFT" is encoded in C language and SQL (structured query language) on an AT-compatible personal computer. SPRINSOFT is a screen based software where all the inputs are taken from the screen and output is generated on the screen as well as on the printer. The software is made menu driven with pick and point techniques. Throughout this software, selection of various options is made by bringing the cursor through Up and Down arrow keys, or by the first letter of the option or by the number of the option. In SPRINSOFT user has been given facility to use his own data for designing and standard data stored in database. The basic hardware and software required to execute the SPRINSOFT are 1. PC-AT(80386) 2. UNIX operating system 3. ORACLE 4. data, dmp (datafile).

(Guide: Sh SN Mathur)

#1996

(ii). KUMAR, SANJAY - *Development of a computerised management information system for research-farms.*

Information system is an organised collection of records that is generally referred as a database. The goal of every information system is to transform the raw data into useful information. The continuously increasing sophistication and accessibility of microcomputer hardware and software is bringing management information system within the reach of small business, individuals and agricultural farm sector. Therefore the information system is continuously used in the context of agricultural systems. They are concerned in the varied applications such as farm management, decision support system etc. The present work has been done to show the feasibility of developing an information system for research farm. Every year a number of crop experiments are conducted in the research-farms of IARI. The farms are managed by the farm manager. His function is normally limited to supervising and handling day-to-day routines of the farms. The development of a Management Information system for Research-farms will help in giving accurate information about the various activities of the farm and efficient utilisation of farm resources such as water, labour, machinery, equipments, fertilisers etc. This will also help in quick retrieval of information and generation of various reports for planning and management from time to time.

Having studied the present system of Research-farm management in detail the Database was designed using Normalisation theory. Database has been generated using SQL Data Defination Language. The software (FARMSOFT) operates on the base tables created in the Database. Fourth generation language i.e. SQL is used in data manipulation. The pro*C module of Oracle has been used for preparing the software, which makes use of these base tables. The software is developed in modular fashion.

#1996 (Guide : Sh SN Mathur)

(iii) SHUKLA, VANDANA - *Development of an Information System on Agricultural Education in India.*

In the past three decades, a new and dynamic activity has developed in agricultural research - design, operation and management of Computer Based Information Systems.

Agriculture is one of the most vital sectors in the economy of our country. Hence, the future of agriculture will depend largely on our agricultural universities, institutes and colleges. Hence, an information system on higher agricultural education in universities all over India needs to be developed which will provide basic information about these agricultural universities. Hence, in this research work computer based information system on agricultural education in India has been developed. The research work was conducted with the underlying objectives:

(a) studying the information requirements, input needs and sources of input to the IS

(b) designing a suitable database for the IS.

(c) developing a software for operations on the database.

A software package entitled "Development of an Information System on Agricultural Education in India" has been developed using Oracle 6.0 RDBMS package and in UNIX environment. In this package tables have been created using SQL *Plus and for other applications C programming language has been used. The software is menu driven. A large number of queries have been formulated to access the databases. These queries in general are specific to a particular university. The IS has been made as useful as possible through various operations. The software package is made user friendly and care is taken to document it as far as possible.

This information system is intended to provide basic information about various agricultural universities in India.

This software package is expected to facilitate:

a) retrieval of information about various agricultural universities

b) database maintenance

c) database access services

d) answering single response and multi response queries.

(Guide: Sh Mahesh Kumar)

# 1996

(iv). WILSON, T. MATHEW - *Management Information System for Post Graduate School of IARI.*

An attempt has been made to develop a user friendly information system for the Post Graduate School of IARI, New Delhi. The software developed will cater to the information needs of academic and administrative activities of the PG School. Besides personal and other ancillary information, it considers registration of courses, entry of grade, calculation of G.P.A. and O.G.P.A., issue of registration card and trimester grade card and details of courses taken by students in trimester wise and course wise in various disciplines. It can also be used to retrieve the information regarding the academic progress of students at any time during the course period. Advisory committee and thesis information of students can also be obtained with this software. It has been developed in Foxbase Plus. It is user friendly in the sense that one need not know programming to use this package. The software consists of several menus and screen displays that will help the user to retrieve the requisite information.

(Guide : Sh OP Datta)

# SEMINARS/SYMPOSIA/WORKSHOPS/
# CONFERENCES ATTENDED BY THE SCIENTISTS

| Sl.No. | Name | Programme Title | Place | Period |
|--------|------|-----------------|-------|--------|
| 1. | Sh SN Mathur | Workshop on 'Computer Networking | National Centre for Software Technology, Bombay | Apr 06-08 |
| 2. | Sh TB Jain<br>Sh DK Bhatia | Third National Seminar on 'Sheep and Goat Production and Utiliza-tion' | CSWRI, Avikanagar | Apr 08-19 |
| 3. | Dr RK Pandey<br>Dr AK Srivastava<br>Dr BS Sharma<br>Dr VK Sharma<br>Dr HVL Bathla<br>Dr(Smt)Ranjana Agrawal<br>Dr Chandrahas<br>Dr NK Ohri<br>Dr KK Tyagi<br>Sh RS Khatri<br>Sh JP Goyal | All India Workshop for Upgradation of Skill of the Technical Personnel in Economics and Statist-ics' organised by Direc-torate of Economics and Statistics, Ministry of Agriculture | IASRI, New Delhi | Apr 10-12 |
| 4. | Dr RK Pandey<br>Dr VK Sharma*<br>Sh RS Khatri | National Workshop on 'Small Farm Diversifi-cation Prospects and Problems' organised by NCAP | NCAP, New Delhi | May 22-23 |
| 5. | Dr AK Srivastava<br>Dr Prajneshu<br>Sh SN Mathur | The Conference on 'Informatics for Sustai-nable Agricultural Development' organised by NIC | Vigyan Bhavan, New Delhi | May 24-25 |
| 6. | Sh JK Kapoor | Seminar on 'Agro forestry for higher crop biomass and Soil productivity for Bundelkhand regions' | NRCAF, Jhansi | Jun 26-27 |
| 7. | Dr BS Sharma | Workshop on 'Human Resource Development for Agriculture' Teaching, Training and Research Needs' under the auspices of XV International Genetics Congress Trust | IARI, New Delhi | Aug 04-05 |

| Sl.No. | Name | Programme Title | Place | Period |
|--------|------|-----------------|-------|--------|
| 8. | XI National Conference of Agricultural Research Statisticians held at HPKV, Palampur (H.P.) during Oct 16-18 | | | |

Dr RK Pandey+                 Dr VK Gupta+++
Dr PR Sreenath+++            Sh Mahesh Kumar+++
Dr AK Srivastava+++   Dr RC Jain++
Dr Prajneshu+++                Dr DL Ahuja+++
Sh R Gopalan+++                Dr R Srivastava++
Dr Randhir Singh+++   Dr Rajendra Parsad++
Dr VK Sharma++

| Sl.No. | Name | Programme Title | Place | Period |
|--------|------|-----------------|-------|--------|
| 9. | Dr Jagbir Singh | 13th Annual Conference of Indian Society for Medical Statistics | Institute for Research in Medical Statistics, Madras | Nov 20-24 |
| 10. | Dr RK Pandey | 55th Annual Conference of Indian Society of Agricultural Economics | Anand, Gujarat | Nov 23-25 |
| 11. | Dr GC Chawla | Seminar on 'Efficient Block Design in presence of trends'. | ISI, Delhi | Dec 07 |
| 12. | Dr BC Saxena | Third International Workshop on "Optimization and Statistics". | AMU, Aligarh, U.P. | Dec 19-24 |
| 13. | Dr Rajendra Parsad | 83rd Session of Indian Science Congress Association | Punjabi University, Patiala | Jan 03-08 |
| 14. | International Conference on 'The new institutioal approach to development achieving India's full potential' jointly organised by N.C.A.E.R. and the Centre for institutional reform and the informal sector at the University of Maryland, College Park, Hotel Taj Place, New Delhi during Jan 09-10 | | | |

Dr VK Sharma

| Sl.No. | Name | Programme Title | Place | Period |
|--------|------|-----------------|-------|--------|
| 15. | Dr RK Pandey | 9th National Conference of Agricultural marketing | Bhubaneshwar Orissa | Feb 15-17 |
| 16. | Dr Anil Rai | Workshop on 'Approach to GIS in developing countries organised by SCADA, Computer Centre, Patna | Patna Bihar | Feb 15-17 |

| Sl.No. | Name | Programme Title | Place | Period |
|---|---|---|---|---|
| 17. | 49th Annual Confernece of Indian Society of Agricultural Statistics held at Lucknow, Uttar Pradesh during Feb 22-23 | | | |

Prof Bal BPSGoel#                          Dr Jagbir Singh
Dr RK Pandey##                             Sh DK Bhatia
Dr PR Sreenath#                            Sh DC Mathur
Dr AK Srivastava@                          Mrs Rajinder Kaur
Dr Prajneshu                              Mrs AK Bhatia
Dr VK Sharma                              Sh K Chug
Dr VK Bhatia                              Sh Satya Pal
Dr Chandrahas                             Sh Madan Mohan
Sh TB Jain                                Sh T Rai
Sh Jagmohan Singh                         Dr Anil Rai
Sh SD Wahi                                Dr Seema Jaggi$

| Sl.No. | Name | Programme Title | Place | Period |
|---|---|---|---|---|
| 18. | Dr Prajneshu | National Workshop on planning and management of agricultural extensi-on and training organi-sed by Directorate of Extension, Ministry of Agriculture | Vigyan Bhawan, New Delhi | Mar 01-03 |
| 19. | Dr Randhir Singh | 6th User Interaction workshop with special emphasis on IRS-IC | NRSA Data Centre, Hyderabad | Mar 14 |
| 20. | Dr Randhir Singh | 6th User Interaction workshop organised by NDC, Hyderabad | Hyderabad | Mar 14 |

| * | Rapporteur in the Session 'Interventions by the Government for diversification' |
|---|---|
| + | Delivered the Keynote Address and chaired a Technical Session and the Plenary Session |
| ++ | Presented Discussion Paper in a Technical Session |
| +++ | Acted as Rapporteur in a Technical Session |
| # | Acted as a Judge in ISAS Young Scientists Award for Best Paper Presentation |
| ## | Convener of Symposium on "Research Priorities in Agricultural Statistics to meet future challenges |
| @ | Convener of Symposium on "Role of Statistics in Land Use Planning |
| $ | Received the ISAS Young Scientist Award |

# PAPERS PRESENTED AT SEMINARS/SYMPOSIA/ WORKSHOPS/CONFERENCES

| SI. No. | Author(s) | Paper Title | Programme Title | Venue | Period |
|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 |
| 1. | Arya,SN Bhatia, DK | Some parameters of reproduction and health management' in Sheep and Goats: A statist- ical study | Third National Seminar on Sheep Production and Utilization | CSWRI, Avika- nagar | Apr 08-10 |
| 2. | Jain, TB Rawat, PS* Riyazuddin* Sharma, SC* | Cost of maintenance of sheep and goats under stationary conditions | " | " | " |
| 3. | Kumar, Avinish Mathur SN | A decision support system for micro nutrients management in crops | Conference on 'Informatics for Sustainable Agricultural Development' | Vigyan Bhawan, New Delhi | May 24-25 |

**XI National Conference of Agricultural Research Statisticians held at HPKV, Palampur (H.P.) during Oct 16-18**

| | | | | | |
|---|---|---|---|---|---|
| 4. | Gopalan R Mahesh Kumar | Division of Computing Science at IASRI - A Perspective Plan | | | |
| 5. | Gupta, VK Pandey, RK | Future Research Programmes in Agricultural Statistics and Computer Application | | | |
| 6. | Jain, RC | Crop forecasting methodology-status and current research findings | | | |
| 7. | Mahesh Kumar Gopalan R | Teaching and Training Programme in Computer Application | | | |
| 8. | Prajneshu | A review of non-linear statistical models in agriculture | | | |
| 9. | Rajendra Parsad Srivastava, R | Current Status in Design of Experiments | | | |
| 10. | Sharma, VK | Recent Trend in statistical economics research with particular reference to Indian Agriculture | | | |

*CSWRI, Avikanagar

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 11. | Singh, Randhir | Use of Remote sensing technology for agricultural statis tics | | | | |
| 12. | Sreenath, PR | Teaching and training programmes in agricultural Statistics for Human Resources Development | | | | |
| 13. | Srivastava, AK | Current status of sample survey research relating to agricultural surveys | | | | |

**55th Annual Conference of Indian Society of Agricultural Economics held at Anand, Gujarat from Nov 23-25**

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 14. | Bhardwaj, SP Pandey, RK Mahajan, VK | Growth and development of poultry in India - Regional Study | | | | |
| 15. | Pandey, RK Ashok Kumar | New Economic policy and Indian agriculture - An over view | | | | |
| 16. | Jain, TB Rawat, PS Riayazuddin Sharma, SC | Cost and Reforms from Sheep rearing under stationary conditons | | | | |
| 17. | Saxena, BC Srivastava,AK | Another estimation approach in multiple frame surveys | Third international workshop on "Optimization and statistics" | AMU, Aligarh, U.P. | Dec 19-21 | |
| 18. | Rajendra Parsad | A-optimal design for comparing two disjoint sets of treatments | 83rd Session of Indian Congress Association | Punjabi Univer- sity, Patiala | Jan 03-08 | |
| 19. | Bhardwaj, SP Mahajan, VK Pandey, RK | Study of cost behaviour and marketing margins in poultry products. A case study of broilers | 9th Annual Confer- ence of Agricultu- ral Marketing | Bhubne- shwar | Feb 15-17 | |
| 20. | Rai, Anil Srivastava, AK Jaggi, Seema | Some statistical aspects of data analysis using GIS system | Workshop on approach to Geographic Infor- mation System in developing countries | SCADA, Computer Centre, Patna | Feb 15-17 | |

**The 49th Annual Conference of Indian Society of Agricultural Statistics held at Lucknow from Feb 22-23**

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 21. | Batra, PK Sreenath, PR Rajendra Parsad | Robustness of block designs against the exchange of a treatment | | | | |

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|

22. Bhatia, DK — Distribution wise estimation of egg production in UP

23. Chandrahas
    Rai, T — Effect of errors of measurement on estimates of parameters of forecast models

24. Chandrahas
    Bahuguna, GN — Models for forecasting Aphid-Pest of Mustard crop

25. Chugh, K
    Satya Pal — Trends, Fluctuation and Variability in Area and Production of Pulses in India

26. Jaggi Seema — A - efficient block designs with unequal block sizes for comparing two sets of treatments

27. Jain, TB
    Rawat, PS
    Riyazuddin
    Sharma, SC — Costs and Returns from Sheep rearing Under Stationary Conditions

28. Jha, GK
    Sharma, VK — Pattern of adoptions of HYVs of maize in different states

28. Lal Chand
    Wahi, SD
    Bhatia, VK — Growth performance index in crossbred goats

29. Madan Mohan — Statistical Studies on nitrogen economy through Azolla in rice

30. Madan Mohan
    Singh, BH — Pre-harvest forecast models for prediction of yield in Groundnut (Rabi)

31. Prajneshu
    Das, PK — Non-linear statistical models for describing state-wise wheat production data in post greeen - revolution era

32. Rai, T — Identification of significant contribution of inputs for optimum production of total foodgrain in India

33. Rajinder Kumar — A study on differential effect of sources of phosperous in rice-wheat crops sequence

34. Saxena, Asha
    Bhatia, AK — A study of effect of weather on long term fertilizer application through cluster analysis

35. Sethi, SC
    Singh, Jagmohan — Role of holding size in cultivation of paddy crop

36. Sharma, VK
    Ashok Kumar — Estimation of seemingly unrelated regression equating when explanatory variables are subject to error

37. Singh, Jagbir
    Gupta, HC
    Kathuria, OP — Estimating seasonal fluctuations

38. Singh,
    Jagmohan,
    Singh, BH — A study on yield of rabi crops in flood prone areas of U.P.

| | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 39. | Singh, Jagmohan Narang, MS Mehrotra,PC | Measurement of adoption rate and impact of development programmes | | | | |
| 40. | Verma, SP Srivastava, AK Saxena, BC | An extension of balanced repeated replication (BRR) for resource estimation of non-linear estimator | | | | |
| 41. | Vijayaraghava Kumar Sreenath, PR | The design and analysis of competition experiments used in factorial structure of treatments | | | | |
| 42. | Wahi, SD | Estimation of variance of repeatability estimators for perennial crops | | | | |
| 43. | Wahi, SD Bhatia, VK Lal Chand | Study of statistical properties of genetic correlations | | | | |

**Symposium on Research priorities in Agricultural Statistics to meet future challenges' organised in the above Conference held at Lucknow from Feb 22-23**

| | | | | | | |
|---|---|---|---|---|---|---|
| 44. | Bhatia, VK | Scenario of frontier research problems in Agricultural Statistics | | | | |

**Symposium on 'Role of Statistics in land use planning' organised in the above Conference**

| | | | | | | |
|---|---|---|---|---|---|---|
| 45. | Rai, Anil Srivastava, AK | Some statistical aspects of land use planning | | | | |

**Symposium organised in the above Conference**

| | | | | | | |
|---|---|---|---|---|---|---|
| 46. | Gupta, VK Pandey, R.K. | Research prioritiesin agriculture statistics and computer application to meet future challanges | | | | |

**National Symposium 'Nature Farming for Sustainable agriculture' held at Dalima Research and Health Care Sansthan, Pillani, Rajasthan from Mar 09-10**

| | | | | | | |
|---|---|---|---|---|---|---|
| 47. | Narang, MS Ved Prakash Mehrotra, PC Ashok Kumar | An approach for maintaining ecological balance with special reference to agriculture | | | | |
| 48. | Vashist, AK Ved Prakash Narang, MS | Role of sequential sampling in integrated pest management | | | | |
| 49. | Ashok Kumar Ved Prakash Narang, MS | Sustainable and productive agriculture - An over view | | | | |

# OTHER INFORMATION ABOUT SCIENTISTS

## Membership of Scientific Societies

### Indian Society of Agricultural Economics, Bombay

Dr RK Pandey          Vice President

Sh TB Jain, Dr PK Batra and Sh SP Bhardwaj          Members

### Indian Society of Agricultural Statistics, New Delhi

#### *Honorary Secretary*

Dr OP Kathuria (upto May), Dr PR Sreenath (upto Feb) and
Prof Bal BPS Goel (from Mar - till date)

#### Joint Secretaries

Dr PR Sreenath, Dr AK Srivastava and Dr VK Bhatia
#### *Executive Council*

Dr Prajneshu and Dr VK Gupta          Members

#### *Editorial Board, members, Journal of ISAS, New Delhi*

Prof Bal BPS Goel, Dr AK Srivastava, Dr VK Gupta and Dr VK Bhatia

#### *Members*

| | | |
|---|---|---|
| Prof Bal BPS Goel | Dr PC Mehrotra | Dr VPN Singh |
| Dr (Mrs) Ranjana Agrawal | Sh HC Gupta | Sh Lal Mani Verma |
| Dr DL Ahuja | Sh DC Mathur | Sh VK Jain |
| Sh SN Arya | Dr PK Malhotra | Sh Satya Pal |
| Dr NK Ohri | Sh RL Rustagi | Dr MS Narang |
| Sh Hari Om Agarwal | Dr AK Srivastava | Sh Madan Mohan |
| Sh RS Khatri | Dr SS Shastri | Dr PR Sreenath |
| Sh MS Batra | Dr BS Sharma | Dr VT Prabhakaran |
| Dr HVL Bathla | Sh RK Singh | Mrs Ajit Kaur Bhatia |
| Dr VK Bhatia | Sh SC Sethi | Mrs Rajinder Kaur |
| Dr PK Batra | Sh BH Singh | Sh GL Khurana |
| Sh DK Bhatia | Sh Balbir Singh | Sh Vishnu Hari Gupta |
| Dr GC Chawla | Dr KK Tyagi | Dr Jagbir Singh |
| Dr Seema Jaggi | Dr SP Verma | Dr Prajneshu |
| Dr BL Chaudhary | Sh SD Wahi | Dr Rajender Prasad |
| Sh AS Gupta | Dr Anil Rai | Sh TB Jain |
| Sh R Gopalan | Sh Lal Chand | Dr PS Rana |

Sh JP Goyal          Sh SK Mahajan          Sh KPS Nirman

| Sh JP Goyal | Sh SK Mahajan | Sh KPS Nirman |
|---|---|---|
| Dr VK Gupta | Dr VK Mahajan | Sh K Chugh |
| Dr RC Jain | Dr Randhir Singh | Sh Shanti Sarup |
| Sh Jagmohan Singh | Sh Tribhuwan Rai | Sh CH Rao |
| Dr OP Kathuria | Sh PM Ramesan | Sh Anil Garg |
| Dr RK Pandey | Dr DP Handa | Dr UC Sud |
| Sh HC Gupta | | |

## Computer Society of India, Bombay

Sh SN Mathur, Sh Mahesh Kumar and Dr PK Malhotra     Members

## Indian Association of Statistics and Applied Research, Hisar

Sh RS Khatri          Member

## Society of Mathematical Sciences, Delhi University, Delhi

Dr Prajneshu          Member

## International Biometric Society, Washington, USA

Dr BS Sharma          Member

## Indian Econometric Society, Delhi

Dr VK Sharma          Member

## International Statistical Institute, Netherlands

Prof Bal BPS Goel          Member
Dr VK Gupta          Member

## Indian Society of Agricultural Sciences, New Delhi

Dr VK Bhatia          Joint Secretary

### *Members*

| Sh JP Goyal | Sh SK Mahajan | Sh KPS Nirman |
|---|---|---|
| Dr VK Sharma, | Sh CH Rao, | Sh VK Jain, |
| Dr GC Chawla, | Mrs Rajinder Kaur, | |
| Dr VK Bhatia, | Mrs Ajit Kaur Bhatia, | Dr Anil Rai and |
| Dr Chandrahas, | Sh T Rai, | Sh HS Sikarwar |
| Sh GL Khurana, | Sh Satya Pal, | |

## Society for Information Sciences, New Delhi

Sh Mahesh Kumar          Member

## Indian Academy of Social Sciences, Allahabad

Sh Shanti Sarup          Member

**Federation of Agricultural and Allied Services Association, New Delhi**

Sh SN Arya                     Member

**Acta Cincia Indica**

Dr PS Rana                     Member

**Indian Dairy Association**

Sh RS Khatri                   Member

**Indian Society for Medical Statistics, New Delhi**

Dr Jagbir Singh                Member

**Indian Economic Association**

Sh SP Bhardwaj                 Member

# Membership/Offices of Committees/Panels/Working Groups

**PG School, IARI, New Delhi**

### *PG Faculty Members*

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

**Academic Council**

Dr Prajneshu and        Sh Mahesh Kumar        Members

**Standing Commitee on Courses, curricula and Academic Affairs, PG School, IARI, New Delhi**

Dr Prajneshu            Member

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

Dr RK Pandey            Member

**Management Committe of IASRI**

### *Members*

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

66

Sub-group to study in depth and formulation of plans and strategies for development of Animal Husbandry Sciences and information during 9th Plan

Dr AK Srivastava          - Member

**Indian Science Congress Association, Calcutta**

Prof Bal BPS Goel, Dr RC Jain and  Dr Rajendra Prasad

**Steering Committee on Agricultural Census**

Dr AK Srivastava          - Member

**Task Force (sub-group) on supply projection of working group on Demand and Supply Projections and improvement of Agricultural Statistics for the formulation of Ninth Plan, Directorate of Economics and Statistics, Ministry of Agriculture, Government of India**

Dr VK Sharma          - Member

**Technical Committee on Progeny Testing Programme in Maharashtra**

Dr VK Bhatia          - Member

# Special Lectures, Trainings and Meetings

### Prof Bal BPS Goel

-Chaired
   *The  meeting of the Management Committee of the Institute on Feb 29
   *The meeting of Institute Joint Staff Council on Mar 06
   *The meetings of the Staff Research Council on Mar 13-14

*The meeting of the Sub-Group on Improvement ofAgricultural Statistics of the Working Group on Demand and Supply Projec tions and Improvement of Agricultural Statistics for the formulation of Ninth Five Year Plan of the Ministry ofAgri culture on Mar 21

-Attended

*The Seminar on "An economic evoluation of brakish water acqua-culture systems in India" at NCAP, New Delhi on Jan 23

*The XXXIV Convocation of the IARI on Feb 9

*Themeeting of the Sub-Group on Socio-Economic and Policy Issues under the chairmanship of Dr SS Johl at NCAP, New Delhi on Feb 16

*The Directors' Meet of ICAR Institutes on Feb 27-28 at Krishi  Anusandhan Bhavan, New Delhi

*The joint meeting of Directors of ICAR Institutes with Vice Chancellors of State Agricultural Universities on Feb 29. The  meeting was chaired by Hon'ble Agriculture Minister

*The Research Advisory Committee meeting of the Institute on  Mar 1 under the Chairmanship of Prof YK Alagh

*The meetings of Board of Studies of Agricultural Statistics and Computer Application on Mar 6

*The meeting of the Executive Council of the Indian Society of  Agricultural Statistics on Mar 15

*The meeting of the IARI Academic Council on Mar 19

### Dr RK Pandey

-Attended

    * The meeting of Executive Council of Agricultural Statistics at IASRI on June 8.

    * The Seminar of Computer System on Data Base - File - Media organised by Silicon Graphics in New Delhi on Jul. 25.

    * The meeting of Management committee of National Centre for  Agricultural Economics and Policy Research on Aug. 25.

- Delivered

A lecture on the "Study of Technological change in Agriculture in training course on Agril. Research Evaluation and Impact Assessment" organised by Centre of Advanced study, Division of Agril. Economics, IARI on Feb 13

**Dr PR Sreenath**

*Attended the meeting of the state high level coordination committee of Govt. of Karnataka on Feb 26

**Dr Prajneshu**

- Delivered

*Two invited lectures on 'Ecological Modelling at the workshop Training course on "Quantitative Methods in Ecology" held at Department of Zoology, University of Delhi, during Dec 28-29

**Dr AK Srivastava**

*Attended the meeting of Steering Committee on agricultural Census 1995-96 and input survey 1996-97

**Dr VK Sharma**

Delivered

*A lecture on 'Economic models' on Nov 29 to the participants of the training course on 'Quantitative Techniques for Policy Analysis in Agricultural Economics' organised by Centre of Advanced Studies in Agricultural Economics, IARI, New Delhi during Nov 27 - Dec 9

*A lecture on 'Qualitative variables and non-parametric tests on Dec 2 to the participants of the training course on 'Quantitative Techniques for Policy Analysis in Agricultural Economics' organised by Centre of Advanced Studies in Agricultural Economics, IARI, New Delhi during Nov 27 - Dec 9

**Dr Randhir Singh**

*Attended the high level coordination committee for agricultural Statistics meeting held at Shimla, Himachal Pradesh on Feb 2

**Dr HVL Bathla**

*Attended a seminar on 'Over view of brackish water acquaculture system in India' on Jan 23 at NCAP, New Delhi

**Dr Rajendra Parsad**

*Delivered three lectures on concept of factorial experiments and confounding in general and $2^n$ series in particular Jour nal at Indian Council of Forestry Research and Education, Dehradun during Feb 13-14

**Dr (Miss) Seema Jaggi**

*Delivered three lectures at Indian Council of forestry Research and Education, Dehradun on $3^B$ factorial experiments and confounding techniques during Feb 13-14

## Miscellaneous Information

**Dr RK Pandey**

- Worked as a Director, IASRI, New Delhi with effect from Jun 1, 1995 - Jan 11, 1996

Attended

*The Inaugural function of Training Course on Use of Computer in Agricultural Research for NARP Scientists on June 12.

*The Valedictory function of 6th Training Course for Use of Computers for NARP Scientists on June 27.

## Dr AK Srivastava

*Acted as course director in 7th International training course on techniques of estimation of output of food crops during Feb 26 - April 10

## Dr Randhir Singh

*Visited IIRS, Dehradun, during Jul 11-12 to hold the discussions with Prof FM Pandey, Head, Directorate of Agriculture and Remote Sensing Technology in Cropestimation surveys (Soils) regarding plan of work of the prefect and availability of special data and other facilities at IIRS, Dehradun

## Dr HVL Bathla

*Organised a seminar on improvement of productivity and quality in the work of the Institute on Feb 16 for celebration of Productivity Week

## Dr RK Pandey, Dr AK Srivastava, Dr(Smt.)Ranjana Agrawal, Sh KPS Nirman, Sh SN Arya, Sh RL Rustagi, Sh RS Khatri and Sh JP Goyal

Attended the meeting of Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics organised by Department of Animal Husbandry at IASRI on April 6 and 7.

## Sh DC Pant

Delivered a lecture to Social Scientists on the Application of Computers in Social Sciences at the Institute of Public-Cooperation and Child Welfare.

## Awards

### Dr Rajendra Parsad

*Awarded merit certificate by Indian Science Congress Association under 15 young Scientists Programme during 83rd Session held at Punjab University, Patiala for presenting the paper 'A-optimal designs for comparing two design sets of treatments

### Dr (Miss) Seema Jaggi

*Received young Scientist award for the year 1995 for presenting a paper entitled 'A-efficient block design with unequal block sizes for comparing two sets of treatments at the 49th Annual Conference of ISAS held at Lucknow during Feb 22-23

### Dr SS Kataula

*Reviewed a book entitled 'Systems approaches for agricultural development' F.W.T. Penning - de Vries, Paul Teng - and Klaas Metselaar, Kluwer Academic Publishers, Dor Drecht, The Netherlands in cooperation with the International Rice Research Institute, Phillipines, 1993 pp. XIII, 542 $13.00 and Vol.50, No.2, April, June 1995, pp.233-235.

## HUMAN RESOURCE DEVELOPMENT

- Dr PK Malhotra, Dr RC Goyal and Dr VK Bhatia have been trained abroad in UNIX administrtion, computer communication and network, statistical computing, database development, and software engineering. This training was organised at Western Michigan University, Kalamazoo, Michigan, USA during June 19 to August 18, 1995 under the NARP II project. Sh Balbir Singh has also been trained in the above project during July 14 to Sep. 9, 1995.

**Training programmes attended by different personnel of the Institutte are detailed below:**

– Short term courses on use of computer in Agricultural Research at IASRI.

| Name | Course No. | Period |
|---|---|---|
| Sh Lakshmi Chand | XXVIII | Jul 03-15 |
| Sh KK Tyagi, Sh. V.P. Singh | XXX | Sep. 01-15 |
| S/Sh. Bhagwan Das, Sh SC Mehta, Sh Satya Pal Singh | XXXII | Mar. 16-30 |

– II Short term training course on Use of computer in Administration at IASRI from Oct 30 - Nov 10 .

| | |
|---|---|
| Shri Nika Ram | Sh. Satbir Singh |
| Shri Keshav Charan | Sh Anish Wadhwa |
| Shri Prabhu Dayal | Sh Trilok Saini |
| Smt Kamlesh Vij | Smt Chander Kala |
| Smt Laxmi | Smt Sarita Mehendru |

– Advanced training course on "Advances in experimental designs" during Mar 11-27

Sh MR Vats, Sh GL Kurana, Sh Rajendra Kumar, Sh HS Sikarwar

– UGC refresher course held at ISI, Calcutta during Oct 30 - Nov 18

Dr UC Sud

- Training course on Data Communication and Networking from Dec 04-08

| Name of the Candidate | Trained at |
|---|---|
| Sh Mahesh Kumar | Computer Maintenance Corporation |
| Sh Mahendar Singh Verma, | NIC |
| Sh MS Kumar | Tata Information Systems Limited |

Training course on PC Trouble Shooting from Dec 11-15

| Name of the Candidate | Trained at |
|---|---|
| Sh SK Mahajan | YSL Infotech., New Delhi |
| Sh DC Pant | NIC |
| Sh Mahendar Singh Verma | ,, |
| Shri RK Saini | ,, |

- Training course on Micro-soft Windows from Dec 18-22 and Feb 12-16

| Name of the Candidate | Trained at |
|---|---|
| Sh OP Khanduri | TISL |
| Sh KC Gupta | CMC |
| Sh DC Pant | NIC |
| Dr Chandrahas | NIC at IASRI |
| Sh PM Rameshan | ,, |

- Training course on E-Mail from Dec 26-29 and Jan 22-25

| Name of the Candidate | Trained at |
|---|---|
| Sh Surendra Singh | YSL Infotech., New Delhi |
| Sh Pratap Singh | ,, |
| Sh DC Pant | CMC |
| Sh Mahendar Singh Verma | NIC |
| Sh Narain Singh | ,, |
| Sh Devendra Kumar | ,, |

Training course on Computer Networking from Jan 08-12

| Name of the Candidate | Trained at |
| --- | --- |
| *Dr VK Mahajan* | NIC |
| *Sh Balraj Singh* | ,, |

Training Programmes on Computers for ICAR Headquarters Staff

Sh VR Srinivasan, Sh HL Meena and Sh DN Kharbanda

Short-term training course on Use of Computer for KPO's from Mar 22 - Apr 22

| | |
| --- | --- |
| Smt KK Nath | Smt Saroj Tandon |
| Sh Sohan Lal | Smt Usha Alhuwalia |
| Smt Pushpa Marwha | Sh Khem Chand |
| Smt Shanta Raghwan | Mr ML Piplani |
| Mrs Usha Rani | Smt HK Saluja |
| Mr Ram Kumar | Miss Santosh Gupta |
| Smt Renu Dutta | Smt Kamla Bagga |
| Smt KR Duggal | |

## CONSULTANCY WORK

The Division of Computing Science has completed the consultancy work of computerisation of applications for ARS-95 Examination and Open Competitive Examination for Section Officer and Assistants held during October and December, 1995.

This included production of admission cards for all the candidates on the computer and also marksheets for all the candidates who appeared in the examinations.

The Division has also taken up consultancy work for computerisation of the scientists' personal information to be collected in five different questionnaires belonging to the scientists of Central Arid zone Research Institute, Jodhpur. This involves formation of a data-base and creation of various tables and reports.

The Institute also conducted the following examinations for Agricultural Scientists Recruitment Board as given below:

–   ARS/SRF/MET 1995 examinations for Scientists from Oct 05-07 in which 1700 candidates appeared at 3 different centres in Delhi

–   Section Officers/Assistants examinations from Dec 27-29 in which 4800 candidates appeared at 7 different centres

–   Supplementary examinations on Dec 11 in which 52 candidates appeared at IASRI

# DIRECTOR'S COORDINATION UNIT & RESEARCH COORDINATION MANAGEMENT UNIT

## DIRECTOR'S COORDINATION UNIT

The Unit is responsible for organisation of National Conferences of Agricultural Research Statisticians. It also conducts meetings of Heads of Division and Principal Scientists of the Institute from time to time. This Unit also assists the QRT and is responsible for correspondence with ICAR, ICAR Institutes, SAUs and other organisations in India and abroad. During the year under report following main activities were undertaken by the Unit.

### Publications

– Annual Report of the Institute for the year 1994-95

– Perspective Plan of the Institute upto 2020 AD

– IASRI Newsletters, Volume XXI, Nos 1-3, 1995

– The proceedings of Eleventh National Conference of Agricultural Research Statisticians held at HPKV, Palampur (H.P.) during Oct 16-18, 1995

– Statement on Action Taken on the recommendations made at the Tenth National Conference of Agricultural Research Statisticians held at IVRI, Izatnagar during Nov 2-4, 1992

– Working paper on Coordination Cell for the period 1987-94 supplied to QRT of the Institute

– Background material of the Institute for the period 1987-94 supplied to QRT of the Institute

– Statement on Role of IASRI in Agricultural Statistics system/Agricultural Statistics Research supplied to QRT

### Communication of Research Material

#### TO ICAR

– Material for

i) Inclusion in Annual Reports of ICAR for the years 1994-95 and 1995-96

ii) Inclusion in ICAR Newsletters ( A quarterly publication of ICAR)

iii) Major achievements since inception with their impact

iv) Divisional brochure projecting the achievements and future thrust of the Institute and projects under the Division of Agricultural Engineering

v) Working Group on Agricultural Research and Education for 9th Five Year Plan - Sub-Group on Socio-economic and Policy Issues

vi) Programme and sub-programme-wise list of on-going research projects of IASRI

vii) Brochure on policy and perspective planning

viii) The directory entitled,'Six monthly programme of Conferences/Seminars/Symposia/Workshops/ Meetings etc. proposed to be held' during the periods July - December, 1995 and January - June, 1996

*CSO, New Delhi*

– Directory of Statistical Officers in India, 1995

– Material for the Statistical Newsletters of Central Statis tical Organisation.

*United Nations Economic Commission for Africa, Addis Ababa - Ethiopia*

– Material for the Directory of Statistical Training Centres and Associate Centres participating in the Statistical Training Programme for Africa Sixth edition.

*M/s. Economy A Trade, New Delhi*

– Profile of the Institute for inclusion in Trade and Technology Directory of India

## Conference Organised

### National Conference of Agricultural Research Statisticians

Eleventh National Conference of Agricultural Research Statisticians was held at *Himachal Pradesh Krishi Vishvavidyalaya, Palampur, (H.P.)* from October 16-18, 1995. The main theme of the Conference was "Improvement in Research, Teaching and Training in Agricultural Statistics and Computer Application in Agriculture."

In the Inaugural Function, Prof. BL Kaistha, Dean, HPKV, Palampur gave the Welcome Remarks and Dr RK Pandey, Director, IASRI delivered the Key Note Address. Prof HR Kalia, Ex-Vice Chancellor, HPKV, Palampur was the Chief Guest and inaugurated the Conference. Dr BN Singh, Ex. Director General, BIS, New Delhi presided over the Inaugural Function and delivered Presidential Remarks and chaired two technical sessions also. Apart from the inaugural session, a special session on action taken on the recommendations made during the last conference and plenary session, there were following five Technical Sessions:

**Session I** : Assessment of the status of the existing statistical methodologies and current research findings.

**Session II** : Teaching and training programmes in agricultural statistics (including course curriculum on quality of data) and statistical computing for human resource development.

**Session III** : Assessment of the status of computer hardware, software, peripherals and other related equipments vis-a-vis agricultural research.

**Session IV** : Improvement of quality of agricultural statistics.

**Session V** : Identification of problems for future research.

Dr DS Hooda, Professor, HAU, Hisar and Sh Rajeev Mehta, Deputy Director, NSSO attended the conference and chaired/co-chaired different sessions. About 50 Statisticians from ICAR Institutes and State Agricultural Universities participated in the deliberations of Conference.

The recommendations of the Eleventh Conference are as under:

1. Research in the areas such as regression analysis and categorical data analysis in the context of agricultural surveys; Small area estimation techniques and their applications; Statistical applications of Geographical Information System (GIS) and remote sensing; should be intensified.

   (Action: IASRI, ICAR Institutes and SAUs)

2. An integrated approach using Satellite data alongwith survey data may be at-

tempted for crop acreage and crop yield estimation as also crop yield modelling.

(Action: IASRI, ICAR Institutes and SAUs)

3. Use of Satellite data for statistics on Land use/Land cover, Waste land mapping etc. may be operationally adopted.

(Action: IASRI)

4. Studies on (i) robustness and optimality of block designs with nested rows and columns, proximity designs, factorial experiments and bio-assays, (ii) Designing and analysis of incomplete multiresponse experiments, competition experiments and multiphase experiments may be taken up vigorously .

(Action: IASRI, ICAR Institutes and SAUs)

5. Development of expert systems and interactive software including aspects on catalogueing, layout and analysis of various experimental designs may be attempted.

(Action: IASRI, ICAR Institutes and SAUs)

6. Emphasis should be laid on diagnostic procedures while analysing data collected under AFEIS and AICARP on cropping systems research.

(Action: IASRI and AICRPs)

7. Studies on the application of non-linear statistical models in agriculture should be pursued vigorously.

(Action: IASRI, ICAR Institutes and SAUs)

8. For estimation of genetic parameters, computer intensive techniques such as jacknifing, bootstrapping etc. should be further explored.

(Action: IASRI, ICAR Institutes and SAUs)

9. Statistical application to problems relating to bio-technologies should be investigated.

(Action: IASRI, ICAR Institutes and SAUs)

10. Crop forecasting methodology developed so far at IASRI may be validated with crop cutting surveys in collaboration with State Departments of Agriculture.

(Action: IASRI)

11. Methodological studies on specific statistical/ economic problems of current and topical interest in agriculture may be taken up.

(Action: IASRI, ICAR Institutes and SAUs)

12. Reappraisal of existing statistical methodologies for Agricultural research and development, in view of changing scenario may be attempted.

(Action: IASRI, ICAR Institutes and SAUs)

13. Use of systems approach in simulating various agricultural phenomena like crop growth, crop production, forecasting, agro ecological donation, etc. may be attempted.

(Action: IASRI, ICAR Institutes and SAUs)

14. Quality assessment should be an integral part of any data generation exercise and data validation should be as important as data collection.

(Action: IASRI, ICAR Institutes and SAUs)

15. ICAR may continue with its policy of associating atleast one Scientist (Statistics) at appropriate level with every AICRPs. The existing cadre strength of Agricultural Statistics may be suitably increased to meet the future demands.

(Action: ICAR, IASRI)

16. Development of computer software for use in agricultural research may be pursued vigorously.

(Action: IASRI, ICAR Institutes and SAUs)

17. Development of computer network, agricultural research databases and information management and communication systems may be taken up.

(Action: IASRI, ICAR Institutes and SAUs)

18. IASRI should become nodal agency for documentation of research work in agricultural statistics and computer application.

(Action: IASRI)

19. A number of statistical packages (latest versions) and expert systems may be procured by a nodal centre like IASRI.

(Action: IASRI and other Nodal Centres)

20. With the availability of variety of computer systems, software packages and new techniques of data acquisition and analysis, agricultural statisticians may use them profitably in their research work.

(Action: IASRI, ICAR Institutes and SAUs)

21. IASRI may take up consultancy work related to the fields of Agricultural Statistics as well as Computer application in agriculture.

(Action: IASRI)

22. Computer centre infrastructure at all ICAR institutes and SAUs may be strengthened and their assistance may be obtained for developing office automation.

(Action: ICAR, ICAR Institutes and SAUs)

23. There should be uniformity in the syllabi for M.Sc. degree courses in Agricultural Statistics including Bio-statistics and Fishery Statistics as also in Computer Applications conducted by different Deemed Universities and State Agricultural Universities. A suitable committee of members drawn from IASRI, SAUs and ICAR Institutes may be set up for drawing the syllabi both under Semester & Trimester systems. It should also look into such uniformity for the subject offered as minor. They may also look into the aspect of strengthening the courses in Mathematics for the degree programmes. Statistical aspects of Agricultural Marketing may also form a part of course curriculum.

(Action: ICAR, Deemed Universities and SAUs)

24. Scope for specialisation in Agricultural Statistics at undergraduate level with a uniform syllabus may also be explored.

    (Action: SAUs)

25. The courses in Agricultural Statistics (Computer Application) should be listed under the discipline of Agricultural Statistics (Computer Application) and taught only by the Agricultural Statistics (Computer Application) faculty.

    (Action: Deemed Universities – and SAUs)

26. Agricultural Courses for students from the general stream should include all the aspects of Agriculture viz., Agricultural, Animal, Fisheries and allied sciences.

    (Action: Deemed Universities and SAUs)

27. More courses in Agricultural Statistics and Computer Application may be introduced at UG and PG levels. The concept of minor from other disciplines may be given due consideration in finalising the course curricula.

    (Action: Deemed Universities and SAUs)

28. Course curriculum should be revised from time to time, specially for P.G. courses, to keep pace with the latest developments. It should give due emphasis on applicational aspects in agriculture.

    (Action: Deemed Universities and SAUs)

29. Training programmes should be at different levels for different groups of personnel. Teachers' Training programmes should be arranged, both in-house and at national level.

    (Action: Deemed Universities and SAUs)

30. Keeping in view the need for trained scientists in the field of Agricultural Statistics, SAU's and IASRI may introduce courses similar to erstwhile Senior and Junior Certificate Courses at IASRI for in-service personnel.

    (Action: IASRI and SAUs)

31. The concept of major field of specialisation at the Ph.D. level in the discipline of Agricultural Statistics may be reexamined.

    (Action: IASRI)

32. Each syllabus may exist in 2 formats (i) a short version as approved by the academic authorities and printed in the Calendar and (ii) an extended version providing a detailed interpretation of what is to be included but that can be readily changed in the light of experience.

    (Action: Deemed Universities and SAUs)

33. One credit course on 'Recent developments in Agricultural Statistics' may be included for degree courses in Agricultural Statistics.

    (Action: Deemed Universities and SAUs)

34. For quality of data aspects as a part of course curriculum, the cooperation of other organisations like NSSO may be sought.

    (Action: Deemed Universities and SAUs)

35. An element of external examination for

the Agricultural Statistics Courses may be introduced for improving the quality in HRD. Examination papers may contain fewer questions on work done in the class and more questions involving problems to be solved.

(Action: Deemed University and SAUs)

36. Development of self instructional kits such as computer assisted instruction may be attempted. Scope for introducing correspondence courses on specialised topics in Agricultural Statistics for in-service candidates may be explored by IASRI.

(Action: Deemed Universities and SAUs)

37. A separate Department/Division of Agricultural Statistics may be set up at all the SAU's and the existing infrastructure strengthened.

(Action: SAUs)

38. Knowledge acquired through new researches should be disseminated through pamphlets/text books/popular articles.

(Action: IASRI, ICAR Institutes and SAUs)

**Recommendations from the previous Conference(s) which need to be attended to :**

1. Development of survey sampling methodology for estimation of area and production of field crops in hilly areas.

(Action: IASRI)

2. Work relating to development and standardisation of sampling procedures for serological tests and estimation of quantity of organism in different animal products may be taken up.

(Action: NDRI and IVRI)

3. Development of appropriate methodologies in the area of "Surveillance of important animal diseases" for adjustment for time lag in case reporting; imputation of non-observations, detection of changes in patterns of occurrence in the incidence of disease, description of disease trends over time. Identifying aberrations in the occurrence of disease and for assessing the impact of health programmes

(Action: All ICAR Institutes and SAUs)

4. Study of the response to selection in finite populations and the effect of linkage on homozygosity of a population under various inbreeding systems through simulation approach.

(Action: IASRI)

5. Development of methodology for estimation of optimum stocking rate of animals for the rangelands of Western Rajasthan.

(Action NDRI and CAZRI)

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

(Action: IVRI and NDRI)

7. A workshop on DBMS may be organised by IASRI.

   (Action: IASRI)

8. Best teacher's award in Agricultural Universities be limited to those teachers who are devoting at least two-thirds time for teaching. •

   (Action: SAUs)

The Discussion Papers & Proceedings of the 11th National Conference of Agricultural Research Statisticians have been published under the Title 'Discussion Papers & Proceedings' and has been distributed during Jan.-March, 1996.

## Meeting organised

— Various meetings of QRT for the Institute

— Research Advisory Committee meeting of the Institute on Mar 1.

— Meetings of Heads and Principal Scientists

# RESEARCH COORDINATION MANAGEMENT UNIT

A Research Coordination and Management Unit (RCMU) was constituted by readjustment of the staff of the erstwhile Coordination Cell, Monitoring Cell and other staff of the Institute. Simultaneously, a Director's Coordination Unit was also created.

The main function of this unit are: to examine the new Research Projects before these are considered by the SRC in respect of its importance of problems, its design and final requirements; to monitor the progress of on-going research projects and bring out half yearly monitoring reports; to prepare Annual Action Plan, Activity Milestone, EFC Memo, to maintain the Research Project Files and also their submission to ARIC (ICAR). The following activities were undertaken by the Unit during the year under report were:

i) RPF's from the different Divisions for the year 1994 and pending RPF's for earlier years were sent to ARIC (ICAR).

ii) Annual Plan of IASRI for 1996-97 was prepared and sent to ICAR

iii) Monitoring Progress Reports for the six months periods April, 1994 to September 1994 and October, 1994 to 31st March, 1995 were prepared and distributed among the concerned. The Monitoring Progress Report for the six months period April, 1995 to September, 1995 was under finalization.

iv) Information as required by the QRT regarding the RCM Unit was prepared and submitted.

v) Material for State Annual Plan was prepared and sent to ICAR.
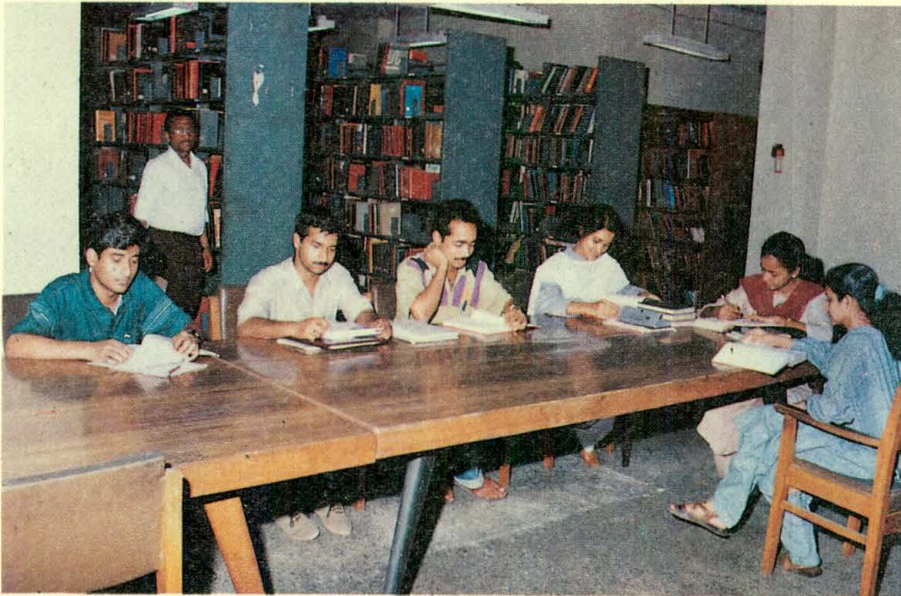
Scholars in the Library
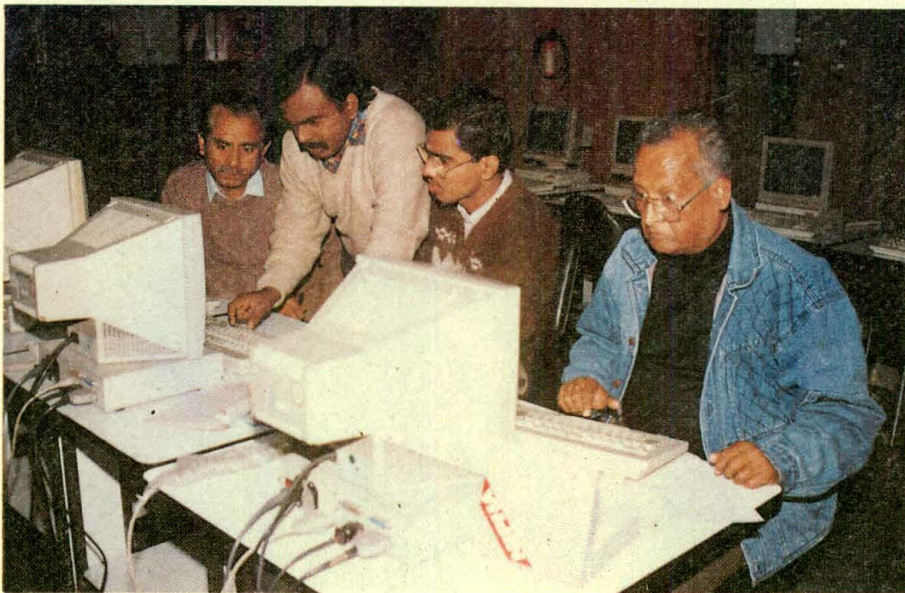


Computerization of research activities

# LIBRARY AND DOCUMENTATION ACTIVITIES

The Library System of the Institute continued to provide documentation and reference services to students and researchers in the Institute and sister Institutions within the country.

Total volumes available

| | | |
|---|---|---|
| Books | — | 22961 |
| Journals | — | 5819 |
| Reports | — | 7050 |

Number of publications added

| | | |
|---|---|---|
| Books | — | 118 |
| Journals | — | 725 (issues) |
| Reports | — | 156 |

Journals subscribed

| | | |
|---|---|---|
| Indian | — | 65 |
| Foreign | — | 74 |

Bulletin / Newsletters received or gratis / exchange : 300

## Computerisation of Library Facilities

Computerised information system on theses of students of IASRI and of IARI in the field of Agricultural Statistics and Computer Application has been developed and users can search the required information by Title, Author, Key words, Guide name etc. Creation of library database of books has been started.

## Library Usages

Number of publications issued from the Library : 9247

## Library Users

Working hours 9.30 a.m. to 4.30 p.m.

| | | |
|---|---|---|
| Number of bonafide library members | : | 300 |
| Number of student (regular) members | : | 20 |
| Number of adhoc trainee users : | | 80 |
| Number of other readers | : | 17615 |

Number of Publications issued from the library : 19247

## Library Services

| | | |
|---|---|---|
| Number of documents borrowed or lent out on Inter Library Loan | : | 45 |
| Number of pages (Scientific & Technical) reprographed | : | 23331 |
| Number of issues of current content service brought out | : | 20 |

## 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 scientists in preparing diagrams, charts, histograms and maps for research publications and 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 was 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 IJSC was reconstituted for a further period of 3 years from March 13, 1995. The official side will be represented by the following Scientists..

1.  Dr AK Srivastava, Principal Scientist
2.  Shri RS Khatri, Scientist (SG)
3.  Shri Ant Ram, Scientist (SG)
4.  Dr Jagbir Singh, Scientist (SG), Secretary (official side)
    CAO and F and AO shall be Ex-officio members of the IJSC.

The meetings of Institute Joint Staff Council were held on Aug 21 ,1995 and Mar 6, 1996 under the Chairmanship of Director of the Institute.   In these meetings various issues were discussed.

## GRIEVANCE COMMITTEE

·   The Grievance Committee of the Institute (constituted as per ICAR rules) provides the employees a forum to ventilate their grievances relating to official matters and for taking remedial measures.

Grievance Committee of the Institute was constituted under the Chairmanship of the Director 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, |
| 4. Sh RS Rana, *Member-Secretary Administrative Group* | 4. Sh RC Nagpal, Auxiliary Group |
| 5. Sh Ram Paras, Supporting Group | |

The meetings of Grievance Committee were held on Sep 25 and Oct 31.

## 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 condition.   An amount of Rs.1254/= was collected in the

account of Benevolent Fund contribution from April 1, 1995 to March 31, 1996.

## COOPERATIVE THRIFT AND CREDIT SOCIETY

The Society is registered with the Registrar, Cooperative Societies, Delhi Administration, Delhi and continued its activities as in 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, 1996 was 530.

During the accounting year 1994-95 the society advanced Rs.26,35,600/- as loan to its members.

During the financial year 1995-96 an account of Rs.101/- was given as gift to each of the 10 members on their retirement from the Institute. Financial help was extended from the member welfare fund to the tune of Rs.2000/- to the bereaved family of one member.

## 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, 1996 was 451.

## 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. Shri DC Dahiya, Technical Officer (T-5) was elected as the Honorary Secretary of the club, where as Prof Bal BPS Goel, Director was the Chairman of the club.

## SPORTS

ICAR Inter Institutional Sports Meet was organised by CS & WCR&TI, Dehradun during November 5-11, 1995. The Institute's Table Tennis Team won the runners up position in the tournament.

Shri Dev Raj, Superintendent, Cash Section was the Chef-de-mission.

# हिन्दी के प्रगामी प्रयोग में प्रगति

प्रतिवेदनाधीन वर्ष के दौरान वार्षिक कार्यक्रम में निर्धारित लक्ष्यों की समुचित जानकारी देने के लिये विभिन्न अनुभागों/प्रभागों में वार्षिक कार्यक्रम की प्रतियां वितरित की गईं और व्यक्तिगत सम्पर्क एवं प्रभाव के माध्यम से विभिन्न अनुभागों/प्रभागों में कार्यरत अधिकारियों/कर्मचारियों से अनुरोध किया गया कि इन निर्धारित लक्ष्यों की प्राप्ति के लिये निष्ठा पूर्वक प्रयास किए जाएं । साथ ही यह कहा गया कि तिमाही रिपोर्ट सही रूप से भरकर समय से हिन्दी अनुभाग को भेजी जाये । तिमाही रिपोर्ट का प्रपत्र काफी उलझा हुआ और बड़ा था जिसकी शिकायत लगभग साभी अनुभागों एवं प्रभागों से प्राप्त हुई थी । प्रतिवेदनाधीन वर्ष के दौरान इस शिकायत को दूर किया गया और प्रपत्र को संक्षिप्त एवं सरल बनाया गया है ।

प्रतिवेदनाधीन वर्ष के दौरान गत दो वर्ष से लम्बित पड़े हिन्दी प्रसारिका के अंक को वैज्ञानिक विशेषांक के रूप में निकालने का निर्णय लिया गया और उस पर त्वरित कार्रवाई के फलस्वरूप अधिकांश लेखों को पी.सी. पर टाईप कर लिया गया है और यह प्रकाशन के दौर से गुजर रहा है । परन्तु निदेशक महोदय का आदेश हुआ कि संकलित लेखों की समीक्षा के लिए पुनः संपादक मण्डल के पास भेजा जाए ताकि पुराने लेखों का आज के संदर्भ में औचित्य का पता लगाया जा सके और जिन लेखों की अब उपयोगिता नहीं रह गई है, के स्थान पर नये लेख आमंत्रित किये जा सकें ।

प्रतिवेदनाधीन वर्ष के दौरान संस्थान में दूरभाष पर चल रही हिन्दी सेवा के अन्तर्गत हिन्दी अनुभाग में प्राप्त होने वाले फोनों की संख्या में उत्तरोत्तर वृद्धि हुई है । इससे पता चलता है कि संस्थान के अधिकारी/कर्मचारी दूरभाष पर हिन्दी सेवा का अधिक से अधिक लाभ प्राप्त कर रहे हैं । इसके अलावा, नियमित रूप से "आज का शब्द" लिखा जाता है ।

निदेशक महोदय की अध्यक्षता में दिनांक 16 अगस्त 1995 को संस्थान की राजभाषा कार्यान्वयन समिति की बैठक हुई । जिसमें हिन्दी दिवस मनाने का निर्णय किया गया । साथ ही संस्थान में हिन्दी सप्ताह मनाने और पखवाड़े के दौरान (जो 1 सितम्बर 1995 से 8 सितम्बर 1995 तक मनाया गया) निम्न प्रतियोगिताएँ आयोजित करने का निर्णय लिया गया :

1.  हिन्दी व्यवहार प्रतियोगिता (व्यक्तिगत)
2.  हिन्दी व्यवहार प्रतियोगिता (सामूहिक)
3.  हिन्दी काव्यपाठ
4.  हिन्दी लेख एवं निबन्ध
5.  हिन्दी अनुवाद
6.  हिन्दी टिप्पण एवं प्रारूपण
7.  वाद-विवाद (हिन्दी)
8.  प्रश्न मंच
9.  हिन्दी टंकण एवं आशुलिपि
10. वैज्ञानिक विषय पर सेमिनार (हिन्दी)

उक्त प्रतियोगिताओं में सफल प्रतियोगियों को हिन्दी वार्षिकोत्सव के अवसर पर पुरस्कृत किया गया । हिन्दी वार्षिकोत्सव 28 सितम्बर, 1995 को आयोजित किया गया । इस अवसर पर डॉ. पी. एन. भट्ट मुख्य अतिथि थे । मुख्य अतिथि महोदय ने सफल प्रतियोगियों को पुरस्कृत किया और अपने भाषण में कहा कि संस्थान में इस समय हिन्दी का प्रयोग हो रहा है उसी से संतुष्ट नहीं हो जाना चाहिए अपितु सभी अधिकारियों/कर्मचारियों के साथ-साथ वैज्ञानिकों को भी अपना अधिक से अधिक दैनिक काम-काज राजभाषा हिन्दी में ही करना चाहिए । खासकर

XI National Conference of Agricultural Research Statisticians held at HPKV, Palampur (H.P.)



Hindi Annual Day and Sports Day- Prize Distribution

# FINANCE

Budget statement for the financial year 1995-96

| Head | Non-Plan | | Plan | |
|---|---|---|---|---|
| | Funds (Rs in Lakhs) | Expenditure (Rs.) in Lakhs) | Funds (Rs. | Expenditure (Rs.) |
| Pay and Allowances | 425.00 | 4,26,27,816 | - | - |
| OTA | 0.39 | - | - | |
| Travelling Allowances | 2.80 | 1,49,152 | 2.00 | 1,30,905 |
| **Other Charges*** | **55.31** | | **90.00** | |
| i)   Assets required | | 1,13,523 | - | 65,28,368 |
| ii)  Maintenance of Buildings etc. (including electric, water and property tax) | | 21,90,652 | - | |
| iii) Other expenditure | | 75,033 | - | 4,77,802 |
| iv)  Office contingen-cies | | 22,78,545 | - | 15,87,404 |
| v)   Fellowship | | 8,16,466 | - | - |
| vi)  Works | 3.00 | 2,47,533 | 23.00 | 22,97,306 |
| Grand Total | 486.50 | 4,84,98,720 | 115.00 | 1,10,21,785 |

*Includes items (i) to (iv)

## Abstract (1995-96)

| | Funds (Rs. in Lakhs) | Expenditure (Rs. in Lakhs) |
|---|---|---|
| Non-Plan | 486.50 | 484.99 |
| Plan | 115.00 | 110.22 |
| Total | 601.50 | 595.21 |

# PUBLICATIONS

### (i). Research Papers Published by the Scientist of the Institute

1. ARYA, SN and GEORGE, B (1995). Reasons for cattle mortality in a rural environment and the effect of category, sex classification. *Ind. J. Vet. Science,* 72 (6) :626-628

2. BATRA, MS; RAI, T; MOHAN LAL and GARG, RD (1995). Kela Utpadan Ka Arthik Vishleshan *Bhartiya Krishi Anusandhan Patrika,* 10(1): 16-18

3. BHARDWAJ, SP; MAHAJAN, VK and PANDEY, RK (1995). Economic Study of International Trade with Special Reference to Agriculture. *Bihar Journal of Agri. Marketing,* 3(1): 17-23

4. BHATIA, AK and SIKARWAR, HS (1995) Yield trends and economics of continuous application of balanced dose of fertilizer in sorghum wheat sequence. *Annals of Agril. Research,*16 (1): 6-11

5. BHATIA, DK; ARYA, SN; SINGH, SHIVTAR; MATHUR, DC and SETHI, SC (1995). Pattern of mortality in cross-bred vis-a-vis local cattle in hilly areas of Himachal Pradesh. *Ind. J. Animal Research,* 29(1): 67-71

6. GOUR, D; CHHIKARA, RS; GOPIKRISHNA, G and DUTTA, OP (1995). Multivariate analysis in different strains of Angora Rabbits and their crosses-Body weights and body surface area. *International J. Animal Science,* 10: 135-138

7. JAGGI, SEEMA AND AGARWAL, KN (1995): Augmented partial diallel design for estimating combining ability of parents. *Biom., J.,* 37(7): 879-887

8. JAGGI, SEEMA AND SHUKLA, RK (1996). Comparison of Augmented partial diallel cross to complete diallel cross. *Ind. J. of Genet. Plant Breeding,* 56(3): 339-347

9. KIRESUR, V; PANDEY, RK and MRUTHUNJAYA (1995). Technological change in Sorghum Production: An Econometric Study of Dharwad farms in Karnataka.' *Ind. J. Agri. Econ.,* 50(2): 185-192

10. MAHAJAN, V; GUPTA, AS AND PATEL, CS. (1992): Path co-efficient analysis on varying plant densities in maize. *J. of Hill Research,* 5(1): 44-49

11. NARAIN, P; RAI, SC AND SHANTI SARUP (1995): Regional desparities in the levels of development in Uttar Pradesh. *J. Indi. Soc. Agri. Stat.,* 47(3): 288-304

12. PANDEY, RK AND SARUP, SHANTI (1992-94). On farm investigation into yield gaps and constraints in crop productivity. Artha. Vikas J. of Eco. Development, 28-30, 1- 10

13. RAI, ANIL; RAI, T; MOHAN LAL and SINGH, PHOOL (1995). Use of long linear models in sensus. *Annal of Agril. Research,* 16(2)

14. RAJENDRA KUMAR and SONI, PN (1993); On estimation of composite yardsticks of additional production from the use of crop improvement measures. Annal of *Agri. Research,* 14(3): 297-301

15. RAJENDER PARSAD AND GUPTA, VK (1994). Optimalblock designs with unequal block sizes for making test treatments-control comparisons under A Heteroscedastic model. Sankhya-B, 56 (3), 449-461

16. RAJENDER PARSAD; GUPTA, VK and NSG, PRASAD (1995): On construction of A-efficient balanced test treatment incomplete block designs *Utilitas Mathematica,* 47: 185-190

17. RAJENDER PARSAD and JAIN, RC (1995). Yield forecast using curvilinear study of yield and biometrical characters. *J. Ind. Soc. Agri. Stat.,* 47(3): 253-261

18. RANA, PS (1995): Compartment models with stochastic, turnover rates. *Acta Sciencia Indica,* 21: 285-287

19. SINGH, M; SHARMA, BK, SINGH, G and GUPTA, AS (1993). Stability analysis of dry bean under mild altitudes of Meghalaya. *J. of Hill Research,* 6(2): 125-127

20. WAHI, SD and BHATIA, VK (1995). Use of bootstrap method in comparing the performance of linear discriminent functions. *J. Ind. Soc. Agri. Stat.,* 47(1) : 12-20

**(ii). Research Papers Accepted for Publication**

1. BHATIA, AK. Statistical evaluation of crop sequences. *Annals of Agril. Research,* 16(2): 184-187

2. DEY, A; CHAWLA, GC and BALACHANDRAN, G. Cyclic change over Design. *J. Ind. Statistical Association.*

3. JAGGI, S; GUPTA, VK and PARSAD, R. An efficient block designs for comparing two disjoint sets of treatments. Communications-in-Statistics:*Theory & Methods, 25(5).*

4. PANDEY, RK; SARUP, SHANTI and MAHAJAN, VK. Analysis of supply and job opportunity of scientific manpower in agriculture. *Manpower J.*

5.  RAJENDRA KUMAR and SONI, PN.  An approach to study single and composite yardsticks of additional production from the use of crop inputs *Annals of Agri. Research* 17

6.  RANA, PS and SINGH, UP. On the use of population generation matrix. *Acta Sciencia Indica*

7.  RAO, CH  and SATYA, PAL. Fertilization in rainfed Greengram (Mong) in Telangana region of Andhra Pradesh. *J. Ind. Soc. Agri. Sciences.*

8.  SINGH, BH; and MADAN MOHAN. Use of biometrical characters in forecasting the yield of groundnut. *Agri. Sci. Digest, Karnal,*

9.  गुप्ता, हरीश चन्द्र । कटाई के समय फसलों की क्षति, **खेती, अप्रेल अंक**

## (iii). Research Project Reports Published

— A statistical model to assess the effect of moisture stress on yield (1995)
by Asha Saksena and PN Bhargava

— Sample survey to evolve suitable methodology for estimation of inland fishery resources and fish catch (1995)
by HVL Bathla, OP Kathuria and SS Walia.

— Statistical modelling for forecasting of marine fish catch (1995)
by SS Walia and Balbir Singh

— Estimation of cost of production of sheep and wool
by TB Jain, PS Rawat*, JP Jain, Ruyazuddin* and SC Sharma (1995) *- CSWRI, Avikanagar

— Sample survey for study of constraints in transfer of new agricultural technology under field condition.  Summary of results 1985-86 (1995).
by PC Mehrotra, VS Rustogi, SK Raheja, NK Ohri, SS Gupta, GS Bassi, SS Shastri, RC Goyal and MS Narang

— Proceedings of XI National Conference of Agricultural Research Statisticians held at HPKV, Palampur during Oct 16-18, 1995 (1996)
by DL Ahuja, PP Singh and J Srinivasan

— Yardsticks of additional production of cereal crops from the use of fertilizers (1996)
by KC Bhatnagar, CH Rao and Onkar Sarup

— The economic study of new farm technology with special reference to yield gap and associated factors for ORP areas (1995)
by RK Pandey and Shanti Sarup

# IASRI PERSONNEL
# (As on 31.03.1996)

Prof. Bal BPS Goel, **Director**

**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 Saxena | Shri KPS Nirman |
| Shri SS Gupta | Shri GS Bassi |
| Shri TB Jain | Shri AS Gupta |
| Dr SS Shastri | Dr KK Tyagi |
| Dr NK Ohri | Shri RS Khatri |
| Shri RL Rustagi | Dr UC Sud |
| Shri SN Arya | Sh SRS Arya |
| Dr DL Ahuja | |

*Scientists (Sr. Scale)*

| | |
|---|---|
| Shri JP Goyal | Shri Bhagwan Dass |
| Shri HC Gupta | Dr MS Narang |
| Shri DC Mathur | Shri Satya Pal |
| Shri Mahender Singh | Shri KK Kher |
| Shri RC Gola | Shri VK Jain |
| Dr Jagbir Singh | Sh PM Ramesan |
| Shri SC Agarwal | Shri RM Sood |
| Shri DK Bhatia | Shri K Chug |
| Shri SC Sethi | |

*Scientists*

| | |
|---|---|
| Dr Anil Rai | Dr VPN Singh |

*Expl. Scientists*

| | |
|---|---|
| Sh AK Gupta | Sh RM Bhasin |

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

Dr PR Sreenath, Principal Scientist and **Head**

*Sr. Scientists / Scientists (SG)*

| | |
|---|---|
| Dr Basant Lal | Dr DP Handa |
| Shri RK Ghai | Dr Ravindra Srivastava |
| Shri JK Kapoor | Dr PK Batra |
| Dr GC Chawla | |

*Scientists (Sr.Scale)*

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

*Scientists*

Dr (Km) Seema Jaggi, Dr Rajendra Prasad, Sh HS Sikarwar

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

Dr Prajneshu, Principal Scientist and **Head**

*Principal Scientist*

Dr BS Sharma

**Sr. Scientists / Scientists (SG)**

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

*Scientists (Sr. Scale)*

Shri RK Jain               Shri Indra Singh

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

Dr RC Jain, **Head**

Dr (Smt) Ranjana Agrawal, *Principal Scientist*

### Sr. Scientists / Scientists (SG)

Dr Chandrahas Smt Asha Saksena, Shri Jagmohan Singh

### Scientists (Sr. Scale)

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

## Division of Statistical Economics

Dr RK Pandey, Principal Scientist and **Head**

**Principal Scientist**
Dr VK Sharma

### Sr. Scientists / Scientists (SG)

Shri Shanti Sarup          Dr SP Bhardwaj
Dr UN Dixit                Dr SS Kutaula
Dr VK Mahajan

### Scientists (Sr. Scale)

Shri Ant Ram, Shri Ashok Kumar, Smt Sushila Kaul

## Divison of Computing Science

Shri SN Mathur, Principal Scientist and **Head**

Shri R Gopalan, *Principal Scientist*

**Sr. Scientists / Scientists (SG)**

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

### Scientists (Sr. Scale)

Shri HO Aggarwal           Shri OP Khanduri
Shri Balbir Singh          Shri VH Gupta
Dr VK Gupta National Fellow (ICAR)

**Training Administration Cell**
Dr Prajneshu, *Professor (Ag. Stat.) &* **Head**
Shri Mahesh Kumar, *Professor (CA)*

**Director's Coordination Unit**
Dr DL Ahuja, *Sr Scientist and* **Head**

**Research Coordination Management Unit**

Dr PC Mehrotra, *Principal Scientist &* **Head**

### Technical Officers

Shri SK Sublania, MTO
Shri SK Mahajan
Shri Amar Ranjan Paul, Sr Artist
Shri DC Pant
Shri SD Sharma, Field Officer
Shri HR Meena, Librarian
Shri Man Singh, Field Officer

## Administration

Shri MR Wadhwa, Chief Administrative Officer
Shri HL Meena, Senior Administrative Officer
Shri VR Srinivasan, Finance & Accounts Officer

# SANCTIONED AND FILLED-UP POSTS
## (As on 31-03-96)

| S.No. | Designation | Scale of Pay (Rs.) | No. of Posts Sanctioned | No. of Posts Filled | No. of SC/ST Employees SC | No. of SC/ST Employees ST |
|---|---|---|---|---|---|---|
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | Director | 4500-7300 | 1 | 1 | - | - |
| 2. | Joint Director | -do- | 1 | - | - | - |
| 3. | Principal Scientist | -do- | 18 | 12 | - | - |
| 4. | Sr. Scientist | 3700-5700 | 32 | 22 | - | - |
| 5. | Scientist (SG) | -do- | | 22 | | |
| 6. | Scientist (Sr.Scale) | 3000-50o0 | 80 | 39 | 3 | - |
| 6. | Scientist | 2200-4000 | | 5 | - | - |
| 7. | Experimental Scientist | 1740-3000 | | 4 | - | - |
| 8. | Chief Admn Officer | 3000-5000 | 1 | 1 | - | - |
| 9. | Sr Admn Office | 3000-4500 | 1 | 1 | - | 1 |
| 10. | Finance and Accounts Officer | 2200-4000 | 1 | 1 | - | - |
| 11. | Field Officer | -do- | 3 | 2 | - | - |
| 12. | Mech Tabu. Officer | -do | 1 | 1 | 1 | - |
| 13. | Librarian(T-6) | -do- | 2 | 2 | - | 1 |
| 14. | Tech Officer(T-6) | -do- | 3 | 2 | - | - |
| 15. | Sr Artist(T-6) | -do- | 1 | 1 | - | - |
| 16. | Asstt Field Officer(T-5) | 2000-3500 | 1 | - | - | - |
| 17. | Asstt Engineer(T-5) | -do- | 1 | 1 | - | - |
| 18. | Asstt Admn Officer | -do- | 3 | 3 | - | 1 |
| 19. | Hindi Officer | -do- | 1 | - | - | - |
| 20. | Security Officer | -do- | 1 | - | - | - |
| 21. | Artist(T-4) | 1640-2900 | 1 | 1 | - | - |
| 22. | Superintendent | -do- | 8 | 8 | 3 | - |
| 23. | Sr. Steno | -do- | 7 | 7 | - | - |
| 24. | Photographer(T-II-3) | 1400-2300 | 1 | 1 | - | - |
| 25. | Tech Asstt(Stat)(T-II-3) | -do- | 155 | 112 | 9 | 5 |
| 26. | Tech Asstt (Eco)(T-II-3) | -do- | 8 | 8 | - | - |
| 27. | Tech Asstt (Lib)(T-II-3) | -do- | 2 | 2 | - | - |
| 28. | A.E.C. Operator(T-II-3) | -do- | 14 | 3 | - | - |
| 29. | Field Inspector(T-II-3) | -do- | 2 | - | - | - |
| 30. | Hindi Translator(T-II-3) | -do- | 1 | 1 | - | - |
| 31. | Hindi Transalator | -do- | 1 | 1 | - | - |
| 32. | Assistant | -do- | 25 | 25 | 8 | 1 |
| 33. | Stenographer | 1400-2600 | 14 | 14 | 1 | - |
| 34. | Jr Stenographer | 1200-2040 | 6 | 6 | 2 | - |

| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
|---|---|---|---|---|---|---|
| 35. | Sr Clerk | -do- | 21 | 21 | 2 | 1 |
| 36. | Field Supervisor (T-2) | -do- | 6 | 4 | - | - |
| 37. | Punch Supervisor (T-2) | -do- | 3 | 3 | - | - |
| -do-1 | | - | | - | | |
| 39. | Manager+ | 1200-1800 | 1 | 1 | - | - |
| 40. | Electrician (T-1) | 975-1540 | 1 | 1 | - | - |
| 41. | Key Punch Operator (T-1) | -do- | 39 | 39 | - | - |
| 42. | Field Investigator (T-1) | 975-1540 | 30 | 29 | 5 | - |
| 43. | Coders (T-1) | -do- | 4 | 4 | - | - |
| 44. | Reference Asstt (T-1) | -do- | 1 | 1 | 1 | - |
| 45. | Counter Asstt (T-1) | -do- | 1 | 1 | - | - |
| 46. | Telephone Operator (T-1) | -do- | 3 | 3 | - | - |
| 47. | Tubewell Operator (T-1) | -do- | 2 | 2 | - | - |
| 48. | Tubewell Operator | 950-1500 | 1 | - | - | - |
| 49. | Asstt. Manager -cum-Store Keeper+ | -do- | 1 | - | - | - |
| 50. | Sr Gestetner-Operator | 950-1400 | 1 | 1 | - | - |
| 51. | Carpenter | -do- | 1 | 1 | - | - |
| 52. | Driver (T-1) | 975-1540 | 1 | 1 | 2 | - |
| 53. | Driver | 950-1500 | 4 | 1 | - | - |
| 54. | Driver (heavy vehicle) | 1150-1500 | 1 | 1 | | |
| 55. | Zerox Operator | 950-1500 | 1 | - | - | - |
| 56. | Jr Clerk | -do- | 35 | 29 | 5 | 1 |
| 57. | Halwai+ | 950-1200 | 1 | 1 | - | - |
| 58. | Jr. Gestt. Operator | 800-1150 | 1 | 1 | - | - |
| 59. | Counter clerk/ Coupon clerk+ | 825-1200 | 2 | 1 | - | - |
| 60. | Cook+ | -do- | 1 | 1 | - | - |
| 61. | Coffee/Tea Maker+ | 750-940 | 1 | - | - | - |
| 62. | Bearer+ | -do- | 5 | 5 | 3 | - |
| 63. | Wash Boy/ Dish Cleaner+ | -do- | 1 | 1 | - | - |
| 64. | Sweeper+ | -do- | 1 | - | - | - |
| 65. | Supporting Staff | | | | | |
| | Grade-I | 750-940 | 49 | 43 | 15 | - |
| | Grade-II | 775-1025 | 27 | 26 | 5 | 1 |
| | Grade-III | 800-1150 | 14 | 14 | 6 | 1 |
| | Grade-IV | 825-1200 | 7 | 6 | 4 | 1 |
| | *Auxiliary Post | | | | | |
| | **Unclassified post | | | | | |

# APPOINTMENTS, PROMOTIONS, UPGRADATIONS, TRANSFERS RETIREMENTS AND OBITUARY

## Appointment

| Name | Designation | Grade (Rs.) | w.e.f. |
|------|-------------|-------------|--------|
| Prof Bal BPS Goel | Director | 4500-7300 Fixed at 7100/- | 12.01.96 |

## Promotions

| Sl | Name | Designation | Grade (Rs.) | w.e.f. |
|----|------|-------------|-------------|--------|
| 1. | Dr RC Jain | Head,FTCD&P | 4500-7300 | 05.01.96 |
| 2. | Dr SS Kutaula | Sr. Scientist | 3700-5700 | 01.07.94 |
| 3. | Dr SP Bhardwaj | Sr. Scientist | 3700-5700 | 23.12.94 |
| 4. | Sh PM Ramesan | Scientist (Sr Scale) | 3000-5000 | 01.01.94 |
| 5. | Sh Dharamvir Singh | AAO | 2000-3500 | 23.02.96 |
| 6. | Sh KS Mishra | Superintendant | 1640-2900 | 05.04.95 |
| 7. | Sh Chandra Sekar | Superintendant | 1640-2900 | 23.02.96 |
| 8. | Sh Prabhu Dayal | Assistant | 1400-2300 | 21.10.95 |
| 9. | Sh Sudershan Sharma | Assistant | 1400-2300 | 23.02.96 |
| 10. | Sh G.P. Pal | Assistant | 1400-2300 | 23.02.96 |
| 11. | Sh DG Khapekhar | Sr. Clerk | 1200-2040 | 13.11.95 |
| 12. | Sh KB Sharma | Sr Clerk | 1200-2040 | 23.02.96 |
| 13. | Sh Vinod Kumar | Sr Clerk | 1200-2040 | 23.02.96 |
| 14. | Sh Elash Chander | Jr. Gestetner Operator | 800-1150 | 04.10.95 |

## Upgradations

| Sl | Name | Designation | Grade (Rs.) | w.e.f. |
|----|------|-------------|-------------|--------|
| 1. | Smt. Sushma Banati | Sr. Steno | 1640-2900 | 19.12.95 |
| 2. | Sh Raj Kumar | Sr. Steno | 1640-2900 | 19.12.95 |
| 3. | Smt. Usha Ahuja | Sr. Steno | 1640-2900 | 19.12.95 |
| 4. | Sh Manjit Singh | Sr. Steno | 1640-2900 | 19.12.95 |
| 5. | Sh Prem Parkash. | Sr. Steno | 1640-2900 | 19.12.95 |
| 6. | Smt. Shakuntala Arora | Sr. Steno | 1640-2900 | 19.12.95 |
| 7. | Miss Dolly Dass | Steno | 1400-2600 | 19.12.95 |
| 8. | Smt. Anita Kohli | Steno | 1400-2600 | 19.12.95 |
| 9. | Smt. Vijay Laxmi Murthy | Steno | 1400-2600 | 19.12.95 |
| 10. | Smt. Renuka Ahuja | Steno | 1400-2600 | 19.12.95 |
| 11. | Smt. Neelam Negi | Steno | 1400-2600 | 19.12.95 |
| 12. | Smt. Sunil Bharihoke | Steno | 1400-2600 | 19.12.95 |
| 13. | Smt. Sushma Nigam | Steno | 1400-2600 | 19.12.95 |
| 14. | Smt. Meenu Kohli | Steno | 1400-2600 | 19.12.95 |
| 15. | Smt. Sudesh Arora | Steno | 1400-2600 | 19.12.95 |

## Transfers

### (A) From other Institutes/ICAR to IASRI.

| | Name | Designation | Grade (Rs.) | From | Date of Joining |
|---|---|---|---|---|---|
| 1. | Dr DP Handa | Sr Scientist | 3700-5700 | IGFRI Jhansi | 22.08.95 |
| 2. | Sh SRS Arya | Scientist(SG) | 3700-5700 | ICAR | 12.03.96 |
| 3. | Sh MR Wadhwa | C.A.O. | 3000-5000 | IARI | 30.11.95 |
| 4. | Sh HL Meena | Sr. A.O. | 3000-4500 | IARI | 21.10.95 |

### (B) From IASRI:

| | Name | Designation | Grade (Rs.) | From | Date of Joining |
|---|---|---|---|---|---|
| 1. | Sh Chironji Lal | C.A.O. | 3000-5000 | IARI | 30.11.95 |
| 2. | Sh Panna Lal | Sr.A.O. | 3000-4500 | IARI | 21.10.95 |
| 3. | Sh Balbir Singh | Scientist (Sr.Scale) | 3000-5000 | ICAR | 12.03.96 |
| 4. | Sh JK Kasotia | A.A.O. | 2000-3500 | NCIPM, | 31.07.95 |

### (C) Retirements

| | Name | Designation | Grade (Rs.) | Date of retirement |
|---|---|---|---|---|
| 1. | Dr OP Kathuria | Director | 4500-7300 | 31.05.95 |
| 2. | Dr PC Mehrotra | Principal Scientist | 4500-7300 | 31.03.96 |
| 3. | Sh MS Batra | Scientist (SG) | 3700-5700 | 31.07.95 |
| 4. | Sh GN Bahuguna | Scientist (SG) | 3700-5700 | 30.09.95 |
| 5. | Sh RS Chauhan | Assistant | 1400-2300 | 31.05.95 |
| 6. | Dasondhi Ram | SS Grade IV | 825-1200 | 31.10.95 |

### Obituary

| | Name | Designation | Grade (Rs.) | Date of expire |
|---|---|---|---|---|
| 1. | Sh SK Suri | Field Officer | 2200-4000 | 08.12.95 |
| 2. | Sh Rattan Singh | Driver | 950-1500 | 27.11.95 |