EXECUTIVE SUMMARY

Indian Agricultural Statistics Research Institute (IASRI) established in 1959 was mainly responsible for promoting and conducting research and education/training in Agricultural Statistics. With the advances in information technology the institute has adapted itself to the current needs of agricultural research. In the changed scenario, the mandate of the Institute is, to undertake basic, applied and adaptive research in agricultural statistics, to assist in the development and strengthening of National Agricultural Statistics System, to conduct post graduate and in-service training courses in Agricultural Statistics and Computer Applications, to provide consultancy services, to act as a repository of information on agricultural statistics, to develop the Institute as an Advanced Centre of Excellence in education and training in Agricultural Statistics and Computer Applications and to undertake sponsored research and training of national and international organisations in these disciplines.

A number of research projects are undertaken in the different divisions of the Institute namely Sample Survey, Design of Experiments,Biometrics, Forecasting Techniques, Econometrics and Computer Applications. During the year under report, there were 22 Institute based ongoing research projects, 9 projects funded by AP Cess, 3 externally funded projects, 6 NATP projects and one revolving fund project covering the main thrust areas, like poultry meat production, inland fish catch estimation, production and area estimation, assessment and evaluation studies, remote sensing and geographic information system, development of databases, cropping system research, information system for agricultural and animal experiments, experimental designs for agricultural, animal, agro-forestry and fishery research, statistical investigations in genetics and bio-technology, forecasting techniques in agricultural system, technological change, risk and uncertainty in agriculture, and modelling for agricultural planning. In some of these studies, Institute is collaborating with various Institutes and also user organisations. The Research Coordination and Management Unit (RCMU), apart from coordination and management work, brought out Annual Report of the Institute, Quarterly IASRI News and Monitoring Progress Reports, EFC Memo for IX Plan and its mid -term appraisal, etc.

The Division of Sample Survey is mainly involved in the development of sample survey techniques for estimation of various parameters of interest relating to crops, livestock, fishery and allied fields. **Nine** research projects were taken-up covering the thrust areas like remote sensing and geographic information system, poultry meat production, inland fish catch estimation, production and area estimation, assessment and evaluation studies. Agricultural research is a vital input for planned growth and sustainable development of agriculture in the country. The Division has taken the lead in publication of Agricultural Research Data Book since 1996. The Agricultural Research Data Book 2001, which is the fifth in the series is an attempt to put together main components/indicators of the information pertaining to agricultural research, education and related aspects from different sources scattered over various types of published and unpublished records. The Division has been organising number of sponsored training programmes. Number of projects have also been prepared in the form of consultancy efforts to be funded from other agencies. The beneficiaries of these research projects, training programme as well as consultancy are spread over the Institutes in National Agricultural Research System, State Departments of Agriculture; Directorate of Economics & Statistics, Department of Animal Husbandry & Dairying in Ministry of Agriculture; Central Statistical Organisation and National Sample Survey Organisation etc. The Division organised

CAS sponsored Training Programme on **"Recent Advances in the Analysis of Survey Data"** for the Scientists / Faculty Members of National Agricultural Research System at the Institute during Feb 06 – 26, 2001. Teaching faculty was mostly from the Division. However distinguished speakers from various organisations e.g. Delhi University, ICMR, NSSO, DES, Office of Registrar General etc. were also invited for delivering the lectures. Participants of the training programme were exposed on recent advances in the field of sampling alongwith the use of computer in the analysis of sample survey data. A study tour/training programme on "Development of Crop Statistics Methodology", funded by Food and Agriculture Organisation (FAO) for two staff members from Govt. of Eritrea was planned. A **remote sensing laboratory equipped with suitable hardware and digital image processing and GIS software** has been further strengthened.

The Division of Design of Experiments has undertaken two projects (i) 'Fertilizer response ratio for different crops in India (funded by the Ministry of Agriculture) (ii) Evaluation of fatigue score card for animals (In collaboration with AICRP on utilization of increased Animal Energy with enhanced system efficiency, K.V.K., Rewari). The study of the first project basically deals with the development of suitable statistical procedures for obtaining the fertilizer response ratios for various crops in different regions of the country and to obtain fertilizer response ratios for different crops in different regions of the country based on farmers field trials. The fertilizer response-ratios for 14 major crops (6 cereals, 2 pulses, 5 oilseeds and 1 fibre) have been evaluated at regional as well as at States level. Data of on-farm trials conducted during the period 1990-97 under All India Coordinated Research Project on Cropping System Research constituted the major source for evaluating the ratios. These ratios have been evaluated for two situations of fertilizer use namely (i) when farmers adopt their own cultural and management practices (Situation-I), and (ii) when farmers adopt the improved cultural and management practices (Situation-II). These have been worked out for the composite dose of nutrients (N,P,K) by considering farmers' practice of fertilizer application as the base level and recommended dose as a higher level. Thus the response ratio indicates average increase in the yield (kg/ha) of a crop due to per kg/ha increase in the fertilizer use over farmers application of fertilizer. In the second project, methodology for development of fatigue score card for camels is finalized.

The data received from different collaborative projects under AICRP during the year were analysed with appropriate statistical techniques. The annual reports of these projects are published by their respective collaborative agencies. In order to highlight short comings observed in the conduct of experiments from statistical point of view, it was decided to prepare the Status Reports for each project. One Status Report entitled 'Planning, designing and analysis of experiments planned 'On stations' under PDCSR (1999-2000) by Rajinder Kaur and Ajit Kaur was prepared and published.

A monograph highlighting the achievements of the Division of Design of Experiments during 1990-2000 was prepared. A CD-ROM/Electronic Book was also developed.

A training programme on 'Design and Analysis of Agricultural Experiments' was organized under the aegies of centre of Advanced Studies for Agricultural Statistics and Computer Application from 15th September –5th October, 2000. The primary objective of the training programme was to expose the Scientists working in different areas of Agricultural, animal Sciences and Fisheries to latest designs, analysis of experimental data and use of software packages like SAS, SPPS etc. The training was planned in such a way that it was a blend of theory and application.

The Division of Biometrics has the mandate to conduct basic and applied statistical research in modelling and simulation techniques in biological systems with special thrust on computer simulation

studies and applications of resampling techniques, like bootstrap, Jackknife, balanced repeated replications in Agricultural Statistics, Non-linear statistical modelling of biological, ecological and economic phenomena, studies on gene action, estimation of genetic parameters and genetic merit, genetic progress and other related statistical methods, teaching and training in Agricultural statistics and Computer Applications. During the year, five research projects were in progress namely (i) Studies on growth pattern and heritability of fitness traits in Indian breeds of goats; (ii) On robust estimation of heritability; (iii) Empirical investigations on the influence of fixed effects on the estimates of heritability; (iv) Development of statistical procedures for selecting genotypes simultaneously for yield and stability (in collaboration with IARI); (v) Study of non-linear time series modelling in agriculture; and (vi) Study on data processing techniques for statistical analysis of large field variability in hilly and salt affected soil regions. (Inter Divisional project with the Division of Design of Experiments funded by NATP).

The Division of Forecasting has the mandate to develop models for obtaining pre-harvest forecast of crop production, fish production, milk production, poultry products, agrometeorological models for early warning and yield assessment and assessment of losses due to various factors. The report for the project "Use of discriminant function of weather parameters for developing forecast model on rice crop" has been brought out. The results revealed that reliable forecasts could be obtained through this methodology with 1% deviation from observed yield for Raipur district. Bayesian probability forecast model based on farmers' appraisal data on wheat crop provided forecast for Muzaffarnagar district at about 2 months before harvest. The deviations of forecasts from observed yields ranged between 2-18%. Another study on "Development of forewarning system for aphids pests on potato" in collaboration with NCIPM indicated the possibility of issuing forewarning one week / two weeks in advance through higher degree complex polynomials (using GMDH technique) and non-linear models based on weather data.

In the project entitled "Development of early warning and yield assessment models for rainfed crops based on agrometeorological indices", forecast models were developed for Rice - Raipur (Chatisgarh), Sorghum - Delhi and Parbhani (Maharashtra) and Maize – Delhi using weighted stress indices. These models provided forecast, six weeks before harvest for sorghum, four weeks before harvest for maize and five weeks before harvest for rice. The models were validated and forecasts for subsequent years 1996-97 to 2000-01 were obtained. Out of 11 cases compared in seven cases deviations of forecast from observed yield ranged between 1% to 11%, in four cases deviations were high. However, forecasts for recent years could not be compared as observed / official yields are still to be published / calculated.

Besides these projects, collaborative studies are in progress on "Forecasting fish production from ponds", "Forecasting the loss in yield due to weeds", "Development of forewarning system for major pests and insects for mango and paddy". Recently a project entitled, "Forecasting sugarcane yields using multiple markov chains" has been initiated.

The Division of Econometrics completed a research report entitled "Study of Demand for Agricultural Products and its Implications for Food Security in India". Another project on "Econometric Study of Technological Dualism in Egg Production" was initiated. During the year it is in operation in collaboration of Department of Animal Husbandry, Government of Punjab. The study will concentrate in two districts of Punjab. Another project on "Household Food and Nutritional Security in Tribal, Backward and Hilly Areas" is a Jai-Vigyan National Science and Technology Mission Project and is being financed from NATP. The project was initiated during the year and work for studying the status of agricultural production, food and nutritional security at household level was

undertaken in Ajmer, Jodhpur and Banswara districts of Rajasthan State.

A short course entitled "Economic Evaluation of Productivity Improvements and Technical Change in Agriculture Sector" was organized during 24th August to 2nd September, 2000. Twenty five teachers and researchers working in various ICAR Institutes and State Agriculture Universities participated in the course. The faculty for the course was drawn from different reputed organisations.

The Division of Computer Applications initiated programmes keeping in view the mandate of the division and developed information systems and software for its use in agricultural research. The Division continued conducting degree courses leading to M.Sc. in Computer Application in collaboration with Post Graduate School of Indian Agricultural Research Institute (IARI), New Delhi and also organised number of training programme in information technology for scientists and staff of State Agricultural Universities and ICAR Institutes. Project Information and Management System (PIMS), developed under the NATP Project" Institutionalization of Research Priority Setting, Monitoring and Evaluation and Networking of Social Scientists" has been implemented at various locations of the NATP projects. PIMS provides information on the Projects under the NATP programme and can be used for monitoring and evaluation of research projects. An Internet version of PIMS is under development. A web based on-line system NISAGENET for National Information System on Agricultural Education in India, has been designed and is being developed. The scientists of the Division participated in six Inter-Divisional research projects. An Intranet solution for IASRI has also been implemented providing useful services to the users. Seven students completed their M.Sc. degree in Computer Application from PG School of IARI. The Division organised 20 training programs, of which 18 training programs were under the Revolving Fund Scheme, one training program under CAS and one divisional training program. The Division was involved in the computerization of the 88th session of the Indian Science Congress held at New Delhi from 3-7 January 2001 and developed the website of the Indian Science Congress-2001. Keeping in view the programmes outlined in the Vision 2020, a programme under the NATP Mission Mode "Integrated National Agricultural Research Information System" (INARIS) has been initiated. The Division continued to provide computer services in the Institute and strengthened the same.

Research Coordination and Management Unit (RCMU) is responsible for documentation and dissemination of scientific output of the Institute, organisation of National Conferences of Agricultural Research Statisticians once in three years, organisation of meetings of SRC, RAC, QRT and Senior Officers of the Institute, correspondence with ICAR HQs and its Institutes, SAUs and other organisations in India and abroad from time to time, to examine the new Research Project proposals before these are considered by the SRC in respect of National importance; to monitor the progress of on-going research projects and to bring out half yearly monitoring progress reports, to prepare Annual Action Plan, Activity Milestone, EFC Memo, to maintain the Research Project Files and also their submission to ARIC (ICAR) and the Unit also provides help in Art, Photography & Reprographic Services.

The regular meetings of Research Advisory Committee, Management Committee and Staff Research Council were held and decisions taken were implemented.

Training Administration Cell (TAC) is responsible for planning, organisation and co-ordination of the entire Post-graduate teaching and training programmes of the Institute in collaboration with PG School, IARI, to provide guidance to students in their research/training programmes, ad-hoc courses on specialised topics in Agricultural Statistics & Computer Applications and training courses under the aegis of Centre of Advanced Studies in Agricultural Statistics & Computer

Applications. During the year **four** students were awarded Ph.D. (Agri. Statistics), **six** M.Sc. (Agri. Statistics), and **seven** M.Sc. (Computer Application) degree. Moreover, this year **four** students were admitted to the Ph.D. (Agri. Statistics) Course, **five** to M.Sc. (Agri. Statistics) course, and **four** to M.Sc. degree in (Computer Application)

The scientists of the Institute participated in number of workshops, seminars, summer Institutes related to the disciplines of agricultural statistics and computer applications. A number of research papers highlighting the results achieved in various studies were published by the scientists of the Institute. Consultancy was given to different organisations.

INTRODUCTION

Brief History

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 result 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 in 1945 with 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. Subsequently, in recognition of its important role as a training and research institution, the Statistical Wing was re-designated as the Institute of Agricultural Research Statistics (IARS) on 2nd of July 1959. An important landmark 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. Later, COSMOS-486 LAN Server was replaced by a PENTIUM-90 LAN Server having state-of-art technology. Computer laboratories equipped with PCs, terminals and printers, etc. had been set up in each of the six divisions as well as in Administrative Wing of the Institute. User friendly software packages like SPSS, Image Processing Software, Harvard Graphics, LOTUS, d BASE IV, MS DOS, UNIX and a few others have also been made available.

A new Multi-storeyed Training-cum-Administration Block was constructed in the Campus to meet the increasing necessity of housing its staff. The same was occupied in 1992.

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). The Institute is one of the National input centres, for adding our inputs to the System every month. The Institute provides selective information services to scientists in the ICAR Institutes and Agricultural Universities on references to documents relating to areas of their specific interest. The bibliographic databases in Biotechnology and Animal Science Research are being maintained in the Bio-Informatics Laboratory providing Selective Dissemination of Information (SDI) services on VETCD, BEASTCD and AGRICOLA databases.

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 visited the Institute for a period of four to eight weeks with a view to interacting with the scientists of the Institute, giving seminars/lectures and suggesting improvements in the research programme of the Institute. Seventeen scientists from this Institute had received training abroad, in different areas of research, extending over periods of 5-6 months each. In addition, a new course leading to M.Sc. degree in Computer Application in Agriculture was initiated from the session 1985-86 which was subsequently changed into M. Sc. (CA) from the session 1993-94.

Keeping an eye on the technological developments in the Information Technology (IT) field, the new operating systems and the large number of machines connected on the network, it was necessary to upgrade/replace the existing computer hardware and also purchase new computers. Accordingly, 4 Server with 3 Nodes, and necessary peripherals, Laser Jet Printers, Note Book Computer, Desk Jet Printer, A-4 Size Scanner, CD-Writer, two video projection equipment were procured and installed. . User friendly software packages like operating system MS Windows 95, Word Perfect, E-mail Services, SAS, Image Processing Software, SCO-UNIX, ORACLE, MS-Office Suite, Microsoft Visual Studies 97, Microsoft Office 97, Microsoft Project 98, STAR3, Norton Anti-virus packages, and a few others have also been made available. Borland Turbo C++, Geo Media Software were also purchased to keep pace with the new emerging technology. Besides this, every administration and accounts section of the Institute has been equipped with PC AT's and printers.

A lab on Remote Sensing (RS) and Geographic Information System (GIS) has been developed consisting of WINDOWS, NT Server, Two Nodes - Pentium III, venturis FX-2, 5166, Monitor 21" (Color), Ethernet Hub, Digitiser, SG V A0 size, EPSON Stylus color Printer 1520, Workstation Wipro Grafika Pentium III, Node Pentium III Wipro Mentor as hardwares and ER Mapper 5.5, PC ARC/INFO, Microstation 95, Geomedia Professional, ARC/INFO, Workstation 7.2.1, ERDAS Imagine 8.3.1 as softwares in the institute with the help of funds received through two AP Cess Fund projects.

With the advances in Information Technology and the requirements at IASRI, the new structured cabling for 65 nodes at IASRI's computer center building using the world standard AMP products was done under the ARIS programme. The 65 nodes with the transfer speed of 100 MBPS were installed and for managing all these nodes the "NETCONNECT" rack was installed where the cables from different rooms terminate and the patch cords from these are used to connect in the 24 Port Bay Networks hubs. The two new 24 port Bay Networks hubs along with the existing two 16 port managing the whole network. All the four

hubs were mounted on the rack for hubs are now cascaded and with this the Internet connection has become much faster. The existing LAN has been strengthened by extending connectivity to 68 nodes using the structured cabling. In all 202 nodes are now on the network. Email and Internet services are now available to all the scientific/administrative staff in the Institute.

In view of growing demand from various quarters, the Institute revived the Senior Certificate Course in `Agricultural Statistics and Computing' in 1997 with change in the course curriculum keeping in view the demand of well trained manpower in Agricultural Statistics alongwith adequate knowledge in Computer Application.

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.

Organisational Set-up

The Institute has the following six Divisions, one Unit and one Cell to undertake research, training, consultancy, documentation and dissemination of scientific output:-

Divisions:

- Sample Survey,
- Design of Experiments,
- Biometrics,
- Forecasting Techniques,
- Econometrics,
- Computer Applications.

Unit:

- Research Co-ordination and Management

Cell:

- Training Administration

Financial Statement

Budget statement for the year 2000-2001

(Rs. in lakhs)

Code	Head of Account	Budget		Expenditure	
		Plan	Non-Plan	Plan	Non-Plan
02	Establishment Charges	-	857.50	-	853.25
06	Overtime Allowance	-	0.89	-	0.89
10	Travelling Expenses	2.80	2.80	2.80	2.80
15	Other Charges Incl. Equipment	23.86	60.00	23.89	59.98
20	Works	-	34.81	-	34.82
25	Fellowships/Scholarship/Award	2.55	10.00	2.55	10.01
	GRAND TOTAL	**29.21**	**966.00**	**29.24**	**961.75**

Abstract (2000-2001)

(Rupees in Lakhs)

	Budget	Expenditure
Plan	29.21	29.24
Non-Plan	966.00	961.75
TOTAL	**995.21**	**990.99**

Staff Position
(As on 31.03.2001)

Sr. No.	Manpower	No. of posts sanctioned	No. of posts filled
1.	Director	1	1
2.	Joint Director	1	1
3.	Scientific	130	105
4.	Technical	290	191
5.	Administrative	121	115
6.	Auxiliary	14	10
7.	Unclassified	1	-
8.	Supporting	98	95
	TOTAL	**656**	**518**

RESEARCH ACHIEVEMENTS

DIVISION OF SAMPLE SURVEY

Mandate	Thrust Areas
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.	• Inland fish catch estimation • Assessment and evaluation studies • Poultry meat production • Production and area estimation • Cost of Production Studies • Remote sensing and geographic information system

Thrust area-wise list of projects in operation is given in Chapter 12. The progress of the projects is given below:

Inland Fish Catch Estimation

1. Sample survey to evolve methodology for estimation of fish catch from rivers or streams of the hilly areas.

The objective of the project is to evolve suitable sampling methodology for estimation of fish catch from rivers and streams of the hilly areas.

This study was undertaken in collaboration with the state government of Himachal Pradesh. The main objective of the study was to evolve a suitable sampling methodology for estimation of fish catch from rivers and streams of the hilly areas with special reference to Himachal Pradesh. Three districts viz. Bilaspur, Kangra and Mandi were taken for the study. The Department of Fisheries, Himachal Pradesh provided field staff for data collection on fish catch. Stratified sampling technique was used in this project. The districts Bilaspur, Kangra and Mandi were sub-divided into different strata by combining the adjoining sub-divisions in the district. Further, selection of villages were made at random and all the fishermen of the selected villages were taken up for the study. The data on fish catch and various other parameters were collected by actual observation after every ten days. Information regarding the intervening period i.e. the period between the last visit and current visit was collected by enquiry on the day of visit.

In all the three districts viz. Bilaspur, Kangra and Mandi cast net is predominantly used for fishing. In Kangra district, 92.9 percent of the fishermen cover on an average a distance of 2 kms from their village for fishing, whereas, 89.5 percent fishermen in Mandi district and 57.0 percent fishermen in Bilaspur district cover a distance of upto 5 kms from their village for fishing. As regards the time spent on fishing, 65.3 percent of fishermen in Bilaspur district spend upto 4 hours on fishing. Corresponding percentage for Kangra and Mandi is 41.8 and 92.6 respectively.

In Kangra district, 99.3 percent and in Mandi district, 71.9 percent of fishermen dispose off their catch in local market. Similarly, 98.8 percent of total fish catch in Kangra district and 88.7 percent of total fish catch in Mandi district is sold in local market.

Some of the important species of fishes found in these districts of Himachal Pradesh are: Mahsheer, Gugali, Saloh, Patey & Topre, Mirror Carp, Kurka, Jabbar, Singhara, Gidd etc. Average weight of Mahsheer in Mandi district is 0.832 kg, in Kangra district it is 0.653 kg and in Bilaspur district it is 0.435 kg. Singhara is another species found in Mandi district whose average weight is 1.293 kg. Average length of Mahsheer varies from 32.90 cms

to 37.08 cms in the three districts. Average length of Singhara which is found in Mandi district is 42.65 cms.

Percent composition of different species of fish according to the weight of the fish caught shows that Mahsheer constitute 30.5 percent in Bilaspur district, 17.8 percent in Kangra district and 21.6 percent in Mandi district. Gugali is another important species constituting 58.9 percent in Mandi district. Similarly, percent composition of different species of fish as per the number of fish caught shows that Gugali constituted 62.4 percent in Mandi district and 16.7 percent in Kangra district. Gidd constitute 14.5 percent in Bilaspur district and 18.2 percent in Kangra district.

Estimate of fish catch per day corresponding to the districts of Bilaspur, Kangra and Mandi are 116.540 kg (with 19.51 percent standard error), 700.701 kg (with 5.73 percent standard error) and 317.960 kg (with 8.48 percent standard error) respectively.

Similarly, estimate of number of fishes caught per day is 1062.46 with 12.06 percent standard error for Bilaspur district, 4749.63 with 7.42 percent standard error for Kangra district and 1200.22 with 6.75 percent standard error for Mandi district.

Assessment and Evaluation Studies

2. Estimation of flow and change in dynamic populations

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.

In sample surveys often the objective is not only to estimate population parameters for a characteristic under study for a population and for each of a number of classes into which a population units may be assumed to flow but also to obtain estimates for the inter-classificatory flow of population units due to various casual factors over time. Both forward and backward mobility of units of a population between changing classes thereof over time together is defined as cross moments of units, inter-classificatory cross moments of units or flow of units within the population. For example let N, the number of agricultural workers in a population, be fixed during two years and $N_{1.}$ and $N_{2.}$ be the size of two classes of all the n employed and unemployed agricultural workers forming the population in the first year. Suppose after a period of one year it is observed N_{12} of those ($N_{1.}$) agricultural workers who were employed in the first year became unemployed in the second year retaining the N_{11} workers as employed whereas N_{21} of those ($N_{2.}$) who were unemployed became employed leaving N_{22} workers as unemployed. The distribution of flow of the N workers in two classes according to their employment status during the two years is diagrammatically depicted as follows:

I Year	II Year			
	Employment status	Employed	Unemployed	Total
	Employed	N_{11}	N_{12}	$N_{1.}$
	Unemployed	N_{21}	N_{22}	$N_{2.}$
	Total	$N_{.1}$	$N_{.2}$	N

The above distribution is also known as Flow Matrix F (=[N_{ij}]), Say $V_{i,j}$ = 1, 2.

The present study was formulated to develop estimators for flow of units in a dynamic population due to cross movements of units in various classes under general developmental phenomenon and subject to the various casual factors over h occasions. In addition to these estimators of population parameter, say mean for the characteristic under study on two occasions, change therein and average thereof for the class I sub-population, class II sub-population and this population as a whole were also aimed to be developed.

In this project estimators have been developed for compositional changes in terms of number of units in dynamic population due to cross movements of units in two classes over the two occasions under general developmental phenomenon and various casual factors by adopting the successive sampling plain and by making use of Projective Geometry approach and Transition Probability Matrix approach. The Transition Probability Matrix approach has dealt only with estimation of flow of units in various classes of the population over time. Estimators of population parameters, say, mean for the characteristic under study on two occasions, change therein and average thereof for class I sub-population, class II sub-population and this population as a whole along with their variances have been developed.

The present study could be useful in a variety of ways; for example in considering the probabilities of certain types of mating in genetics, in studying the yearly mobility of labour force, in live stock and in the field of agriculture and planning from the view point of knowing the socio-economic status o various classes of the farming community in the country.

The project report is under revision in view of the External Referee's comments.

3. Sampling procedure for selection of representative samples of fertiliser from ships– Funded through A.P. Cess Fund (Collaborative with Central Fertiliser Quality Control & Training Institute, Faridabad)

The objective of the project is to develop sampling methodology for selection of representative samples of fertilizer from ships for the purpose of quality check.

Sampling work will be carried out at one major port and one minor port. At the major port sample will be selected systematically directly from the hatches. At the minor port sampling of fertilizer will be carried out at wharf. Here also as in case of major port sample will be selected systematically. Generally, one sample will be selected from each barge. Sample size will be determined by fixing the degree of precision and level of significance.

The primary data collection work at both the major as well as minor port is completed. The analysis of data has also been completed. Report writing is in progress.

4. Study relating to formulating long term machanisation strategy for each agro-climatic zone/State - Funded by Department Of Agriculture and Cooperation, Ministry of Agriculture

Objectives of the project are:

i) To study the soil types, land topography.

ii) To study the socio-economic conditions (financial status) of the farmers and farm labourers and assess their capabilities for acquiring and adopting the needed agricultural equipment /machinery.

iii) To study the present status, ultimate potential, the gaps, highlighting critical ones; for equipment used in various agricultural operations starting right from tillage to the post-harvest operations.

iv) To study the types and utility of various agricultural equipment, both conventional and improved ones, presently in use and those

needed in future, for different crops / cropping systems in the Zones.

v) To study the impact of farm mechanisation on employment of labour.

vi) To study the cropping pattern, both agricultural and horticultural, in the Zones, yields in relation to the national average, and their growth potential.

vii) To study and assess the use of farm power per hectare, ultimate requirement, ways and means to fulfil the gaps for various farm operations.

viii) To study the infrastructural facilities for the manufacture, marketing, after sale service / repairs availability etc. of agricultural equipment.

ix) To study and assess the adequacy and the requirement of infrastructure at the central and state levels, for planning, promotion, execution and extension of the various plan programmes on agricultural mechanization.

x) To identify new/ improved farm equipment that may be needed by the farmers during next 20 years i.e. by the year 2020, for carrying out different farm operations.

xi) To formulate strategies and programmes that may be required for mechanisation of agriculture during the period 2001-2005, 2005-2010, 2010-2015, 2015-20.

The project started from 1st July, 2000. During the reported period, the work done is as under:

i) A Seminar–Cum–Group Discussion to crystallise the approach and modalities of the externally funded consultancy project entitled "study relating to Formulating Long-Term Mechanisation Strategy for each Agro-Climatic Zone/State" was organised at the Institute during July 24-25, 2000 under the chairmanship of Dr. B.S.Pathak, Director, SPRERI, Gujarat. Senior Officials from ICAR hqrs.; CIAE, Bhopal; IARI, New Delhi; NBSS&LUP, Delhi Centre along with the scientists/officials associated with the project participated in the Seminar–Cum–Group Discussion.

ii) List of districts in each State/UTs was prepared and selection of 120 districts in the sample, keeping in view the level of mechanisation was completed.

iii) List of villages for all the selected districts in various States/ UTs was obtained and random selection of 40 villages in each selected district was completed.

iv) During Nov. 2000, a group of Scientists, attended meetings with Dr. G.Singh, Director, CIAE, Bhopal and Dr. M.M. Pandey, Project Coordinator, AICRP on Farm Implement & Machinery (FIM) in connection with working out modalities of collaboration in field data collection work of the project.

v) Allocated them 120 districts to the different FIM Centre. Worked out distances of 120 districts from AICRP on FIM Centres spread all over the country.

vi) Meetings with Farm Mechanisation Experts on different aspects concerning the project.

vii) Constitution of Project Management Committee (PMC), Dr. S.D. Sharma, Director being its Chairman.

viii) During Dec. 2000, Jan. 2001 and March 2001, four meetings of the Project Management Committee (PMC) were convened under the

Chairmanship of Dr. S.D. Sharma, Director.

ix) Letters from Deputy Director General's (Engg.) side were sent to the Vice-Chancellors of all the SAUs/Directors of ICAR Institutes, where the FIM Centre are located, for rendering assistance in the field data collection work.

x) During Dec. 17-20, 2000, a group of Scientists and Field Officer visited CIAE, Bhopal in connection with imparting training to Research Engineers of 5 FIM Centers in the field data collection work relating to the project.

xi) Testing of schedules was done in the villages of Ghaziabad, Bhopal and Delhi. Good number of meetings of group of Scientists and Field Officer associated with the project were convened for finalisation of schedules.

xii) Schedules for different stages of sampling i.e. District, Village and Household were revised and finalised, keeping in view the discussions with the Research Engineers and other Experts in the area. The Instructions Manual for the Field Investigators in the filling up of different schedules was also prepared.

xiii) The topics of various status papers as well as the format were finalised. Topic-wise reports were identified for preparation of status papers and letters in this connection were sent to the experts. An editorial committee has also been constituted.

xiv) The funds for field data collection work were transferred to 19 FIM Centres located at various SAUs/ ICAR Institutes.

Poultry Meat Production

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

The study was undertaken with the objectives (i) to estimate the poultry meat production through existing integrated sample surveys for estimation of livestock products, (ii) to estimate the poultry meat production through organised farms and (iii) to develop a suitable sampling technique for estimating the poultry meat production integrating the estimates at (i) and (ii) to get estimate of total.

The rapidly increasing demand for poultry meat in the market and advancement in poultry technology the poultry husbandry have attracted more and more people in the villages and towns and broiler farming have gained a dynamic industry structure around the big cities. The poultry meat producing birds are reared either at organised commercial poultry farms or at the back yard of households in the village towns. Therefore poultry meat production is either through organised farms or through backward of households rearing poultry birds. In the present study the estimated the poultry meat production at farm level as well as a household level.

Sampling designs adopted for conducting the survey and collection of data was entirely different for each level. Sampling designs adopted for farm was stratified uni-stage random sampling where poultry farm was the first stage unit. All the poultry farms working in the district were categorized on the basis of type of birds reared i.e. boiler layers or parent stock farms. Then each category was further classified into three classes viz. small medium and large farm according to their flock strength.

For detailed inquiry of about $1/3^{rd}$ of poultry farms were randomly selected by using the technique of simple random sampling without replacement (SRSWDR) from each class of all categories of poultry farms.

Similarly sampling design adopted for backyard poultry rearing was stratified multi stage random sampling design. The primary sampling unit was the village or urban ward the second stage unit was household having poultry birds and the third stage was the poultry bird.

The results obtained in this study provide satisfactory estimates of poultry meat production through organised poultry farm. The methodology developed for estimation of poultry meat production by broiler layer and parent stock can be applied for other poultry birds like quals, turkey, goose, and bullock also. In the present study attempt have been made to estimate the other aspects of poultry husbandry dynamics of poultry population and farms and sale and purchase of poultry birds monthly, seasonally and annually.

The mortality of poultry birds at different stage of their growth have been calculated and discussed in details. The percentage of death due to various diseases and reasons have been calculated. Farm structure and management of farms including employment of home or hired labour have been discussed in detail. Type and quantity of feed given to different types and breeds of poultry birds have been given in the report.

However, types of constraints faced during survey periods were non-response, wrong information, lack of sufficient budget and non-cooperation of farms owner and departments of Haryana Government. The methodology developed and discussed in the present study will provide a satisfactory guidelines for conducting future study independent by or in collaboration with integrated sample survey for major line stock products already working in all the states for estimation of poultry meat production at state and country level.

Production and Area Estimation

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 sampling from two dimensional population 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 study was carried out in two phases. In the first phase, the problem was tackled as sampling from two dimensional populations where, in one of the dimensions selection of sampling units were considered while in the other dimension sampling was spread over time in which the selected units were observed. An approach for a variety of sampling designs associated with sampling over time was developed using the varying probability sampling methods. This method was tested on secondary data in which the different duration of time intervals on which data was to be collected and also the periodicity for the systematic sampling interval were tackled. It was found that a span of 7 days in the gap of 14 days was a suitable plan for observing partial harvest data for different vegetable crops. In the second phase, a survey was conducted in rural areas of Delhi during 1995-96 through which the methodology developed for estimation of vegetable production based on partial harvest data has been demonstrated.

During the year the project report was finalised in the light of internal as well as external referee's comments, the report is in the process of printing.Estimation procedure for obtaining yield rates and total production of vegetable crops utilizing primary data has been finalizes and are being worked out for different vegetable crops for which data has been collected.

The methodology has been developed for estimating the production of crops and commodities with multiple observations. The methodology will provide estimates based on partial harvest.

7. Pilot sample survey for estimating the area and yield rates of ginger and potato in hilly areas.

The project was undertaken during 1997-98 with the objective of developing sampling methodology for i) estimating the

area under ginger and potato and ii) estimating the yield rates of ginger and potato. The field work on potato crop was conducted in East Khasi Hills and that of ginger in East Garo Hills.

The design adopted of the survey was stratified multi-stage random sampling, the strata in each district being Community Development Blocks. Villages growing ginger/potato were the primary stage sampling units. For estimation of area , cultivators in a village growing ginger/ potato were the second stage sampling units. For estimating average yield, crop cutting experiments were conducted with cultivators and fields growing ginger/potato as the second and third stage of sampling units. From the selected fields one sub plot in case of potato crop was randomly selected from total number of sub plots in the field. At all the stages of sampling units were selected with equal probability without replacement. The ultimate size was 480 cultivators for area estimation enquiry and 120 crop cuts for yield estimation per crop.

The area under potato in East Khasi Hills was estimated as 3124 hectares during 1997-98 with a high degree of precision (S.E. 1.51%). The corresponding average yield pooled over different varieties was estimated as 6833 kg/ha with a fairly good precision (S.E. 4.6). In case of potato crop the average yield from sub plot and the area of the sub plot. While recording the length and breadth of the sub plot it was suggested to include the distance between two rows of sub plots and the distance between two sub plots in length and breadth of the sub plots.

In case of ginger the area was estimated at 1240 ha with a S.E. of 1.69 per cent during 1997-98. The average yield of ginger in East Garo Hills was estimated at 4042 kg/ha with a S.E. of 1.3%.

Cost of Production Studies

8. A pilot study on cost of production of Coconut in Kerala.– Funded from Coconut Development Board, Kochi, Kerala (Collaborative with Central Plantation Crops Research Institute, Kasargod, Kerala)

The objective of the project are i) to build reliable and efficient estimates of cost of cultivation of coconut, ii) to study the agricultural practice in Coconut and iii) to utilise the information collected in (ii) on input details to formulate more remunerative cultivation practice.

Coconut is a perennial crop with long gestation period and continuous yield for a number of years. The cost calculation will be based on both the cost of establishing the crop as well as the annual maintenance cost. The annual cost will be workout by the usual cost accounting method. It takes about 12-14 years for a coconut tree to produce stabilized yield. Thus, the entire investment spread over 12-14 years will constitute the cost of establishing the orchard. To calculate the cost of establishing the coconut orchard, the sample will be selected in such a way that it contains different age group trees. The different age groups identified are planted last year, 1-3 year old, above three years but non-bearing and bearing. On the basis of the collected data cost per nut will be worked out.

This study is being carried out in three districts of Kerala, namely, Calicut in north, Ernaculam in central and Thiruvanathapuram in southern part of Kerala. The first phase of data collection work i.e. preparation of frame for selection of ultimate units of sampling (households, in this case) has been completed. Schedules are being finalized for input-output data collection work. The input - output data collection work is to start in the month of April, 2001.

Remote Sensing and Geographic Information System

9. Study of Land Use Statistics through integrated modeling using Geographic Information System (A.P. Cess Fund)

The objectives of the project are i) to obtain land use statistics with the help of

survey and remote sensing technique ii) to study the qualitative aspect of land utilisation statistics obtained through different sources i.e. census, survey and remote sensing and iii) to develop model for integration of statistics obtained through different sources.

During the period under report a new spatial sampling procedure has been proposed for selection of villages in the Lalitpur district. In this sampling design the probabilities of selection for each villages assigned by taking into account their spatial locations as well as size measure i.e. total area under important land use classes. Computer program for the same has been developed and a sample of 20 villages from the study district Lalitpur has been drawn. Copies of Khasara records and cadestral maps of these villages were obtained from district / tehsil offices. Digitization of various land use features and contours of the district from survey of India Toposheets is in progress. Creation of data bases of the revenue records of the selected villages in MS Access is in progress. Field survey started in Feb, 2001. Ground truthing has been completed for the rabi crops in Lalitpur district. Field data collection has been supervised and completed for the season. Scrutiny and coding of data is in progress.

10. Development of GIS based technique for identification of potential agro-forestry area

The objectives of the project are i) to identify the important factors responsible for growth of agro-forestry, ii) to construct the suitability index using Spatial-Analytic Hierarchy Process and iii) to compare the above mentioned index with the Composite development index.

A pilot study on agro-forestry/ social forestry has been conducted in Yamunanagar district of Haryana by the institute. In this study, exhaustive information related to agro-forestry have been collected. Villages were divided into two different categories (1) villages having common boundaries with the forest and (2) rest of the villages. The data are available from each category of the villages. Additional data in respect of different factors correlated with the factors responsible for growth of agro-forestry will be obtained from population census, livestock census, land use statistics etc. This data will be suitably analysed to identify the major factors affecting the growth of agro-forestry.

Technological advances in computation have fulfilled the need for computers in integrating data from a variety of sources, in manipulation and analyzing data in providing output which could be used as part of a decision-making process. The need of classified information has given birth to the specilaised branch of information system like Geographic Information System (GIS) which is the demand of today's society. Once, the important factors responsible for growth of agro-forestry are identified, an analytic environment provided by GIS and a decision-making method provided by Analytic Hierarchy Process (AHP) will be used for identifying potential agro-forestry areas. Attempts will also be made to compare the suitability index developed using Spatial-AHP for each village of the district with the composite development index of the village.

It is expected that the methodology developed in this project will help in identifying the potential zones of agro-forestry systems. This study will develop a reliable and speedy technique/tool for the planning, management and development of agro-forestry with the help of recently available computer technology.

The database of available data from earlier survey related to agro-forestry with respect to Yamunanagar district of Haryana has been created. The data with respect to other factors affecting growth of agro-forestry has been obtained from Census data of Yamunanager at Pushpa Bhavan, New Delhi. The data from earlier survey and the Census data have been linked together. Data analysis for identification of factors responsible for growth of agro-forestry is at final stage. Tracing and Digitisation of thematic maps are in progress. Methodological development such as development of Spatial – Analytic

Hierarchy Process and data analysis is also in progress.

11. Agricultural Research Data Book 2001

Agricultural research is a vital input for planned growth and sustainable development of agriculture in the country. Indian Council of Agricultural Research being an apex scientific organisation at national level, plays a crucial role in promoting the accelerating use of science and technology programme relating to agricultural research and education. It also provides assistance and support in demonstrating the use of new technologies in agriculture.

Information pertaining to agricultural research, education and related aspects available from different sources is scattered over various types of published and unpublished records. The Agricultural Research Data Book 2001, which is fifth in the series is an attempt to put together main components / indicators of such information. The Data Book comprising of 160 Tables, is organized, for the purpose of convenience of the users into eleven sections namely, Natural Resources, Environment, Agricultural Inputs, Fisheries, Horticulture, Production and Productivity,, Produce Management, Export & Import, Indian Position in World Agriculture, Investment in Agricultural Research & Education and Human Resources under National Agricultural Research System (NARS). It also contains at the end, list of important National and International Institutions associated with agricultural research and education along-with their addresses and contact persons.

The Data Book has been compiled through the joint efforts of the Indian Agricultural Statistics Research Institute (IASRI) and the Computer Centre of the Indian Council of Agricultural Research (ICAR). It is the fifth edition and contains the latest information/ data as available in the country at the end of October, 2000. The first edition of the Data Book had the information up to the end of 1995, the second edition had the information up to July, 1997, the third edition contained the information up to October, 1998 while the fourth edition contained the information up to October, 1999. It is hoped that the information presented in this Data Book will be interesting and useful for a variety of readers.

DIVISION OF DESIGN OF EXPERIMENTS

Mandate	Thrust Areas
To develop statistical designs and methodologies for analysis of data relating to field and laboratory experimentation in agricultural and animal sciences.	• Cropping systems research • Information system for agricultural and animal experiments • Experimental designs for agricultural, animal, agro-forestry and fisheries research

Thrust area-wise list of projects in operation is given in Chapter 12. The progress of the projects is given below:

Cropping Systems Research

1. Planning, designing and analysis of experiments planned on stations under the Project Directorate for Cropping Systems Research

The objectives of the project are (i) to identify the suitable statistical designs for conduct of experiments according to the technical programme formulated of the project, (ii) to develop suitable method of analysis for the identified designs and (iii) to statistically analyse the data of experiments conduced at 37 Cropping Systems Research centers.

Designs adopted for conduct of experiments were RBD, Split plot, Strip plot, Factorial RBD, Split- Split plot, 3^2 x 2 partially confounded, BIBD and balanced confounded $4x2^2$. The data of about 280 experiments pertaining to 1999-2000 crop year were received during 2000-2001 and analysed as per the design adopted. Deeper statistical analysis over years was also taken up for concluding experiments. Annual Report for 1999-2000 pertaining to the data of 1998-99 is under publication.

The experiments are planned and conducted under four types of research programmes (i) development of new cropping systems (ii) nutrient management in cropping systems (iii) development of system based management practices (iv) maximum yield research.

For first type of research programme, cropping sequences comprising of varieties of crops were compared in terms of monetary returns which were generally calculated by subtracting the fertilizer cost from gross return of grain yield only. Data of cost of cultivation on various agricultural inputs and operations as well as straw yield were made available from the three centres namely Navsari, S.K. Nagar and Junagadh. The economics of crop sequences was worked out based firstly on the method previously used and secondly by using the data of cost of cultivation and straw yield. The analysis indicated that order of performance of different crop sequences in terms of monetary returns differs when net returns were calculated after taking care of cost of cultivation, grain and return from grain and straw yield instead of cost of fertilizer input only and return from grain yield.

Besides the Annual Report published by project Directorate for Cropping Systems Research, first Status Report (1999-2000) was prepared highlighting the shortcomings in designing and layout of experiments and reporting of data and analysis for some typical type of experiments. The report was discussed in the workshop of the project held at MPKV, Rahuri with DDG(NRM), Director(PDCSR), ADG(Agronomy) and all concerned chief agronomists. The efforts were appreciated and it was suggested that preparation of status report

should be a continuing feature and must be presented in every workshop. Preparation of status report (2000-2001) is in progress.

2. Planning, designing and analysis of "ON FARM' research experiments planned under Project Directorate for Cropping Systems Research.

Under the IASRI CRP on CSR, new technical programme have been finalized for on farm trials and all research centres are required to conduct the following three types of field experiments in system mode.

(i) Response of nutrients (N,P and K) on farmer's field.
(ii) Agronomic management practices for sustainable production system
(iii) Intensification and diversification of the existing Cropping system.

For each of the types of experimentation, proforma for recording of the information has been developed in consultation with PI(OFR) Modipuram.

- the data in respect of 2724 trials (1998-99) and 2091 trials (1999-2000) were received and statistically analysed.

- The final tables of the results of the trials (1998-99) were prepared and sent to the Project Director, PDCSR for the inclusion in the Annual Report (1999-2000) of the project.

The salient results of the experiments on response of nutrients conducted at farmer's field in selected zones are given below:

In rice-wheat cropping system at Bundelkhand (UP) , nutrient response was 14.35 kg grain/kg N, 18.69 kg grain/kg P_2O_5 over N and 7.12 kg grain/kg K $_2O$ over N applied during kharif and the corresponding figures during rabi were 6.03, 14.6 and 6.01 kg grain/kg nutrient applied respectively. At Faizabad (UP) for the same cropping sequence, NPK response observed were 14.7 kg grain/ kg N, 9.4 kg grain/kg P_2O_5 over N and 10.5 kg grain/kg K over N of rice crop in kharif and these figures for wheat were 9.5, 9.4 and 7.5 kg grain / kg nutrient applied respectively.

At Junagadh (Gj) in bajra-mustard cropping system. response to nutrients were observed to the tune of 11.7, 12.2 and 11.5 kg/grain kg N, P_2O_5 and K_2 application during kharif and 3.7, 2.2 and 9.5 kg grain/kg nutrient applied during rabi respectively.

The sustainability factor addressed at Bundelkhand (UP) for Urad-Wheat system was improved variety and weed control measures and these have shown enhancement in the productivity of the tune of 80% in kharif crop and 40% in subsequent wheat crop.

For G Nut. – wheat cropping system at Junagadh (Gj.), the improved varieties along with improved management practices have shown 20% increase in productivity in kharif crop and no significant change in wheat crop.

3. Planning, designing and analysis of data relating to experiments conducted under AICRP on Long-Term fertilizer experiments

The objectives of the project are (i) to plan and design long term fertilizer experiments, (ii) to try alternative approaches for analysis of data, and (iii) to Co-ordinate the work relating to statistical aspects of the project and also to provide necessary information to the Project Coordinator (LTFE) and ICAR

In order to study the effect of Complete stoppage of phosphorus application on yield sustainability in plots showing its huge build up in soils over years, a planned change was introduced in the experiment at Ludhiana from the year 1999-2000, splitting one more treatment, NPK (-S) to superimpose new set of treatments. As such the analysis procedure was modified by omitting the dummy plots of the unsplitted treatments under nested two-way design.

The statistical analysis of superimposed treatments over years revealed that:

- No significant reduction in crop yields at Ludhiana was observed without phosphorus over its optimal application alongwith optimal doses of nitrogen and potassium. The requirement of phosphorus for crops was met through the native source of soil.

- Reduction of phosphorus application by 50% over its optimum level consistently gave sustainable yields without affecting the soil fertility.

- Addition of zinc/FYM alongwith reduced or no phosphorus application enhanced the yield levels of crops.

Treatment-wise yield and available soil nutrient data were subjected to regression analysis to study their trends over years. Crop-wise yield summarisation over years were also carried out using three factor interaction model. Some of the salient results obtained are as follows :

- Upto a number of years (10-13) the responses to the treatment optimal NPK + FYM (@ 10-15t ha $^{-1}$ yr $^{-1}$ were found to be as good as NPK alone either at optimum or super optimal levels, whereas beyond these years continuous application of inorganic NPK at these levels resulted in less response than to NPK+FYM treatment over years as some secondary or micronutrients like S and Zn in the soil became yield limiting factors while FYM helped in sustaining the yield over years due to its conditioning effect on the soil fertility.

- Fertilizer responses were observed in the order of NPK >NP>N but the degree of response to individual nutrients varied with location. Continuous application of optimum dose of N alone recorded greatest decline at most of the centres particularly in acid soils deficient in both P and K nutrients

Information System for Agricultural and Animal Experiments

4. Agricultural Field Experiments Information system(AFEIS)

The objectives of project are (i) to collect the data in respect of Agricultural field experiments conducted at various agricultural research stations in the country, and (ii) to create a data base of the informed experiments

The experimental data is collected by the net work of regional staff especially posted for this purpose. The data is transformed to electronic from using standard data preparation sheets. The software for the storage and retrieval has been developed using Dbase IV/Fox-pro. Validation of data is done using computer software as well as manual checking.

During the year data of 2,247 experiments have been collected from 8 regional centres. The data has been updated with 1500 new experiments and now contains details of 14,500 experiments. Validation of 5,500 experiments from states U.P. and Orissa has been completed. Pamphlet has been prepared for creating awareness among the research community regarding the existence of data base. The retrieval of experimental data has been done for the two Institutional projects entitled : (i) statistical investigation on fertilizer use efficiency in relation of cultural practices (ii) Diagnostic study for the design and analysis of field experiments.

To redesign the data base on the principle of Relational data base management system and make the information system on line. It is also planned to prepare regional and commodity base data bases.

Experimental designs for Agricultural, Animal, Agroforestry and Fisheries Research : -

5. A statistical investigation on the long term effect of fertilizers on productivity of cereal crop sequences

The objectives of the project are (i)

to estimate the overall fertilizer treatment effects for each crop sequence, (ii) to study the effect of long-term fertilizer use on the yield of different crops, (iii) to develop methodology for (a) determining economically optimal fertilization practice for each of the crop sequences, and (b) estimation of average annual net returns and variance of net returns for the crop sequences, and (iv) to develop yield prediction models for crops included in different sequences.

The analysis of variance was carried out to decompose the total sum of squares (SS) into SS due to various effects viz. treatment, year, replication, treatment x year, year x replication and treatment x replication interaction under a linear fixed effect model. The expected value of the mean squares indicated that error mean square is an appropriate divisor for testing significance of various effects. Effect of long term fertilizer use on the yield of crops was studied using regression analysis. An unbiased estimator of the returns over the fertilizer cost (per hectare per annum) for each treatment was obtained under a specific error structure along with its variance and the variance estimator. Yield prediction models have also been developed.

Four centres namely, Akola, Pantnagar, Navsari and Rajendranagar were included in the study. Results showed that for Akola centre with sorghum-wheat crop sequence, treatment T_6 (50% recommended NPK dose through fertilizers + 50% N through FYM to sorghum crop and 100% recommended NPK dose through fertilizers to wheat) was the appropriate fertilizer treatment in giving the highest grain yield of the sequence. However, at the considered prices, maximum returns could be realized from the Treatment T_5 (100% recommended NPK dose through fertilizers applied to both the crops). At Pantnagar and Navsari centres where rice-wheat crop sequence has been adopted, treatment T_5 gave the highest yield and monetary returns whereas treatment T_{10} (50% recommended NPK dose through fertilizers + 50% N through green manure to rice crop and 100% recommended NPK dose through fertilizers to wheat) was found to be the second best. At Rajendranagar centre where rice-rice crop sequence is practised, the treatment T_{10} gave the highest yields of rice in both the seasons which were at par with the yields obtained under treatment T_5. The report finalization is in progress.

6. A Diagnostic Survey of Design and analysis of Field Experiments

The objectives of the project are (i) to conduct a diagnostic survey of several experiments for identifying different experimental situations so as to provide appropriate methods of analysis of data for each possible situation as well as to develop methodology for data analysis where appropriate methods of analysis are not available or suitable, (ii) to evolve appropriate and modified methods of combined analysis of data from experiments conducted at different locations and/or years by using the concept of nested models, (iii) to use the concept of multivariate analysis of variance to analyze the data of experiments with multiple responses, and (iv) to develop an appropriate but exact method of estimation of variance components from an unbalanced data obtained from block designs with possibly unequal block sizes and varying replications.

The experiments with mixtures methodology has been applied to the quality evaluation of mixed fruit juices for Ready to Serve (RTS) beverage. The optimum production of different fruit juices has also been obtained. The above analysis has been carried out in collaboration with Division of Fruits and Horticultural Technology, IARI, New Delhi.

In one of the permanent plot experiments on rice-rice sequence conducted at Siruguppa Research Station under AICRP of On Station Experiments in one of the years, instead of using the same variety in all the replications, the experimenter changed the variety in two of the replications i.e. in two replications the variety was kept as same as previous years and in two replications the variety was changed. To see the effect of treatments on yield is same for the two varieties or not,

the data available on yield was analysed by considering that the data is obtained from two separate experiments each conducted with 2 replications. The results indicate that the performance of both the varieties is similar under a given set of treatments. t-statistic indicated that the difference of treatment means from two sets were non-significantly different. Multiple linear regression equations were fitted using grain yield as dependent variable and other auxiliary characters such as number of seeds/panicle, test weight and length of panicle for the two sets of data separately. The two regressions equations were found to be homogeneous.

A data pertaining to an experiment related to varietal response to fruit development and storage in Brinjal (*Solanum melongena* L.) has been analysed using the procedure of groups of experiments. In this study, the harvesting stages were considered as artificially created environments. This analysis is based on the data of a M.Sc. Student of Division of Vegetable Crops, IARI, New Delhi.

For the crop sequence experiments where the two sets of treatments are applied, the treatments belonging to one set are applied to one of the crops, say Kharif and another set of treatments are being applied to another crop, say Rabi, the extended group divisible designs have been recommended in place of the usual split plot designs used in these experimental situations. The expressions of efficiencies of the various factorial effects have been obtained. These designs are useful for the situations even when the treatments in both or any one crop have the factorial structure. However, these designs take care of the residual effects of the first order effects only. The details of the recommended designs are given below:

Extended group divisible design with 20 (5×4) treatments have been suggested to a Ph.D. student of Division of Agronomy, IARI, New Delhi. The details of the experiment are as follows.

It is an experiment on crop sequences, 5 herbicidal treatments were to be applied to the Kharif crop and 4 herbicidal treatments to the Rabi crop. The experimenter is interested in comparing the direct effects of Kharif and Rabi Treatments residual effects of Kharif treatments and interaction between the residual effects of Kharif treatments and direct effects of Rabi treatments.

If we denote the Kharif treatments as 1, 2, 3, 4, 5 and Rabi treatments as a, b, c, d. Then the layout of the design is given as

Block 1	1a	2a	3a	4a	5a	1b	2b	3b	4b	5b
Block 2	1a	2a	3a	4a	5a	1c	2c	3c	4c	5c
Block 3	1a	2a	3a	4a	5a	1d	2d	3d	4d	5d
Block 4	1b	2b	3b	4b	5b	1c	2c	3c	4c	5c
Block 5	1b	2b	3b	4b	5b	1d	2d	3d	4d	5d
Block 6	1c	2c	3c	4c	5c	1d	2d	3d	4d	5d

The parameters of the design are $v = 5 \times 4 = 20, b = 6,\ r = 3,\ k = 10,$ $\lambda_{01} = 3,\ \lambda_{10} = 1,\ \lambda_{11} = 1$ and the efficiencies of different factorial effects as compared to the randomized block design are respectively.

The above analysis will be performed utilizing the block designs with factorial structure.

In rice hybridization programme, it is necessary that the flowering in male and female parents is synchronized. In some cases, it has been observed that there is a difference of 15 to 20 days in flowering dates of male and female parents. Therefore, it is needed that the flowering period of these male and female parents is synchronized. Division of Seed Technology planned an experiment to

study the effect of 8 chemical treatments (4 chemicals each at two doses) and one treatment combinations is $(8\times4)+1=33$. The major interest is in comparing the 32 treatment combinations with the control. Also it is expected that the effect of stages will be more prominent. The experimenter is also interested in main effects of chemical treatments, stages of application and their interactions. A group divisible treatment design obtained by adding the control treatment once to each of the blocks control applied at different four stages of crop growth. The total number of of singular group divisible design $v=32\ (8\times4), b=6,\ r=2,\ k=17,$ $\lambda_1=3, \lambda_2=1,\ m=4,\ n=8$ was suggested.

If we denote the chemical treatments by 1 to 8, stages as S_1, S_2, S_3 and S_4 and control as c, the layout of the design is given as

Block 1	$1S_1$	$2S_1$	$3S_1$	$4S_1$	$5S_1$	$6S_1$	$7S_1$	$8S_1$	$1S_2$	$2S_2$	$3S_2$	$4S_2$	$5S_2$	$6S_2$	$7S_2$	$8S_2$	c
Block 2	$1S_3$	$2S_3$	$3S_3$	$4S_3$	$5S_3$	$6S_3$	$7S_3$	$8S_3$	$1S_4$	$2S_4$	$3S_4$	$4S_4$	$5S_4$	$6S_4$	$7S_4$	$8S_4$	c
Block 3	$1S_1$	$2S_1$	$3S_1$	$4S_1$	$5S_1$	$6S_1$	$7S_1$	$8S_1$	$1S_3$	$2S_3$	$3S_3$	$4S_3$	$5S_3$	$6S_3$	$7S_3$	$8S_3$	c
Block 4	$1S_2$	$2S_2$	$3S_2$	$4S_2$	$5S_2$	$6S_2$	$7S_2$	$8S_2$	$1S_4$	$2S_4$	$3S_4$	$4S_4$	$5S_4$	$6S_4$	$7S_4$	$8S_4$	c
Block 5	$1S_1$	$2S_1$	$3S_1$	$4S_1$	$5S_1$	$6S_1$	$7S_1$	$8S_1$	$1S_4$	$2S_4$	$3S_4$	$4S_4$	$5S_4$	$6S_4$	$7S_4$	$8S_4$	c
Block 6	$1S_2$	$2S_2$	$3S_2$	$4S_2$	$5S_2$	$6S_2$	$7S_2$	$8S_2$	$1S_3$	$2S_3$	$3S_3$	$4S_3$	$5S_3$	$6S_3$	$7S_3$	$8S_3$	c

A balanced confounded factorial experiment 4 x 2^2 in 8 plots per block in three replication have been recommended to a Ph.D. student of Division of Agronomy, IARI, New Delhi. Each of the blocks were reinforced by one block of a BIB design (4,6,3,2,1) in 4 extra treatments without water and with the complementary BIB design in 4 treatments with water. The further details of the experiment are as follows:

The experimenter was interested in studying the main-effects and interactions of biofertilisers, Phosphorus and method of application of Phosphorus. The levels of the various factors are given in the table

Factors	Levels
Biofertiliser	Control, PSB, VAM, PSB+VAM
Phosphorus	30, 60 kg/ha
Method of application	Deep placement and fertigation

Besides the above factors, the experimenter was also interested in taking 4 more treatments *i.e.* the levels of the biofertilisers in the absence of application of phosphorus. These 4 treatments were to be applied without water and with water (amount equivalent to that required by fertigation), therefore, in effect there were two sets of 4 treatments each. The experimenter was interested in comparing the effect of the four treatments (without water) among themselves and with rest of the 16 treatments and similar comparisons were of interest with 4 treatments with water. The comparisons of treatments with and without water were also of interest.

Let us denote the levels of biofertilizers as 1, 2,3, 4 and levels of other two factors as 1 and 2 and A1, B1, C1, D1 are the four biofertilser levels applied without water and A2, B2, C2 and D2 are the four biofertiliser levels applied with water. The layout of the design given as

Replication-I						Replication-II						Replication-III					
Blk-1			Blk-2			Blk-3			Blk-4			Blk-5			Blk-6		
1	1	1	1	1	2	1	1	1	1	1	2	1	1	1	1	1	2
1	2	2	1	2	1	1	2	2	1	2	1	1	2	2	1	2	1
2	1	1	2	1	2	2	1	2	2	1	1	2	1	2	2	1	1
2	2	2	2	2	1	2	2	1	2	2	2	2	2	1	2	2	2
3	1	2	3	1	1	3	1	2	3	1	1	3	1	1	3	1	2
3	2	1	3	2	2	3	2	1	3	2	2	3	2	2	3	2	1
4	1	2	4	1	1	4	1	1	4	1	2	4	1	2	4	1	1
4	2	1	4	2	2	4	2	2	4	2	1	4	2	1	4	2	2
A1			C1			A1			B1			A1			B1		
B1			D1			C1			D1			D1			C1		
C2			A2			B2			A2			B2			A2		
D2			B2			D2			C2			C2			D21		

7. Fertilizer response ratios for different crops in India (Funded by the Ministry of Agriculture)

The objectives of the project are (i) to devise suitable statistical procedure for obtaining the fertilizer response ratios of various crops in different regions of the country, and (ii) to obtain fertilizer response ratios for different crops in different regions of the country based on farmers field trials.

Developed methodology for working out the fertilizer response ratios at the regional level for different crops.

The fertilizer response-ratios for 14 major crops (6 cereals, 2 pulses, 5 oilseeds and 1 fibre) have been evaluated at regional (Planning Commission), national as well as at States level. Data of on-farm trials conducted during the period 1990-97 under All India Coordinated Research Project on Cropping System Research constituted the major source for evaluating the ratios. These ratios have been evaluated for two situations of fertilizer use namely, (i) when farmers adopt their own cultural and management practices (Situation-I), and (ii) when farmers adopt the improved cultural and management practices (Situation-II). These have been worked out for the composite dose of nutrients (N,P,K) by considering farmers' practice of fertilizer application as the base level and recommended dose as a higher level. Thus the response ratio indicates average increase in the yield (kg/ha) of a crop due to per kg/ha increase in the fertilizer use over farmers application of fertilizer. Fertilizer response-ratios for cereal crops at the all India level vary from 2.36 (jowar) to 12.96 (ragi) in Situation-I. Exactly the same pattern is observed in Situation-II, minimum being 3.74 for jowar and maximum 15.25 for ragi. The response ratios for rice and wheat under Situation-I (Situation-II) were observed to be 6.38 (9.82) and 5.09 (7.49), respectively. Among the two considered pulse crops, gram shows higher response ratios of 5.64 and 6.60 in Situation-I and II, respectively relative to tur for which these ratios are 2.37 and 4.76. Amongst oilseed crops, highest response ratio of 4.71 is observed for the mustard crop and the lowest of 1.80 for sunflower under Situation-I whereas the maximum ratio of 10.55 is observed for groundnut and minimum of 3.14 for sesamum under Situation-II. The response ratios for cotton crop are found to be 6.51 and 7.20 for situation I and II, respectively. Pooled response ratio for all the crops put together (excluding cotton) at the national level is seen to remain between 5.18 and 7.68 depending upon the proportion of acreage under situations I and II respectively. The average response ratio for foodgrains is observed to be 6.50 when acreage under the two situations (Situation-I and Situation-II) has the composition of 50% each. The final report was submitted to the Ministry of Agriculture.

8. Statistical investigation of the fertilizer use efficiency in relation of cultural practices

The objectives of the project are (i) to carry out the combined analysis of cultural cum manurial trials over years for various crops, (ii) to develop fertilizer model based on cultural cum manurial trials, and (iii) to obtain output-input ratios at various levels of cultural practices for various crops.

The data of 927 cultural cum manurial experiments at various crops have been taken up from the project A.F.E.I.S. The data were critically examined in respect of design adopted, treatments applied, duration of experiment, raw data of un analysed experiments and results of analyzed experiments. It was observed that the percentage of experiments with respect of R.B.D. Factorial R.B.D., Split plot and Split – Split plot are 17.76 , 43.15 38.08 and 1.51 respectively. Individual analysis of these experiments is in progress. The analysed results are being checked with respect to conversion factor of yield data etc., the significance of various main effects & interactions from ANOVA table of analyzed results are being examined and marked to individual experiments by F values (Variance ratio tables)

9. Three-associate partially balanced incomplete block designs and their application in partial diallel crosses

The objectives of the project are (i) to obtain some methods of construction of three associate class partially balanced incomplete block designs and to prepare a catalogue of the available PBIB(3) designs along with those constructed, (ii) to develop a computer module to catalogue, generate and analyze three associate class partially balanced incomplete block designs, and (iii) to identify the efficient plans for partial diallel crosses obtained through three associate class association schemes and to develop computer modules for generation of these plans along with their analysis in complete and / or incomplete block settings.

A critical review of sone literature available on higher associate class PBIB designs was made. Attempts were made to obtain some new designs based on higher associate classes. A catalogue of some classes of PBIB(3) designs has been prepared.

A three-associate association scheme has been defined for $v = 2\,l\,s$ ($s \geq 2, l \geq 2$). Parameters of the scheme are

$n_1 = s - 1$

$n_2 = (l - 1)s$

$n_3 = ls$

$$\mathbf{P}_1 = \begin{bmatrix} s-2 & 0 & 0 \\ 0 & (l-1)s & 0 \\ 0 & 0 & ls \end{bmatrix}$$

$$\mathbf{P}_2 = \begin{bmatrix} 0 & s-1 & 0 \\ s-1 & (l-2)s & 0 \\ 0 & 0 & ls \end{bmatrix}$$

$$\mathbf{P}_3 = \begin{bmatrix} 0 & 0 & s-1 \\ 0 & 0 & (l-1)s \\ s-1 & s(l-1) & 0 \end{bmatrix}$$

A method of constructing PBIB(3) designs with $v = 2ls$, $b = l^2$, $r = l$, $k = 2s$, $\lambda_1 = l$, $\lambda_2 = 0$, $\lambda_3 = 1$, based on the above scheme has been obtained. The association scheme has been generalized to $v = nls$ ($n \geq 2$) treatments and a method for constructing the PBIB(3) designs based on them has also been obtained. Cataloguing of some of the PBIB(3) designs like rectangular, cubic, extended triangular and circular is in progress.

10. Designs for Fitting Response surface in Agricultural Experiments (AP – Cess fund , ICAR)

The objectives of the project are (i) to obtain response surface designs for response optimization and slope estimation when various factors are with equi-spaced levels and/or have unequal dose ranges for both symmetrical as well as asymmetrical factorials, (ii) to obtain response surface designs for qualitative-cum-quantitative factors, (iii) to study the robustness aspects of response surface designs against non-availability of data on some point(s), (iv) to prepare a catalogue of response surface designs suitable for agricultural experiments, and (v) to develop a computer software for the analysis of the designs

obtained and catalogued and to illustrate empirically.

A catalogue of modified and/or rotatable second order response surface designs for slope estimation when various factors are with equi-spaced doses has been prepared. This catalogue consists of the designs that are obtainable from BIB designs.

The robustness aspects of central composite designs have been studied against one missing observation using information contained in an observation and ratio of increase in variance of predicted response to that of original variance of the predicted response.

A step by step procedure have been developed for fitting of second order response surfaces, determination of co-ordinates of the stationary point, canonical equation of the second order response surfaces and to explore the response surface in the vicinity of the stationary point, if the stationary point is a saddle point. A code has also been written in SPSS for exploring the response surface in the vicinity of saddle point.

A second order rotatable response surface design for 3 factors each at 5 equi-spaced levels in 28 design points was recommended to one M.V.Sc. student of I.V.R.I., Izatnagar, Bareilly. The experiment was related to production of low fat meat products using fat replaces. The factors and levels are given below:

S.No.	Factor	Levels
1.	Whey protein	2%, 3%, 4%, 5% and 6%
2.	Guar Gum	0.50%, 0.75%, 1.00%, 1.25% and 1.50%.
3.	Starch	2.0%, 2.5%, 3.0%, 3.5% and 4.0%.

11. Planning, designing and analysis of experiments relating to AICRP on STCR.

The objectives of the project are (i) to improve the existing methodology for analysis of on-going STCR experiments, (ii) to Carryout planning and designing for the conduct of new set of experiments and subsequently to carryout the analysis of data, and (iii) to develop a database for STCR experiments.

The project was started on 01-03-2000. During the period under report, the project leader alongwith one of the associates visited Indian Institute of soil Sciences, Bhopal and discussed the status of the project of soil test crop response correlation which is in operation since 1967. The package with which they have been analysing data have been provided to us . The P.C. agreed to introduce us to the various corporating centres under him by writing a letter to the incharge of all centres (17 in all). He also agreed to ask them to send data directly to IASRI for analysed and creation of database. Till-date we have received data from 8 centres viz. Kalyani (W.B.), Vallanikkara (Kerala), Jabalpur (M.P.) , Barrackpore (W.B.), Palampur (H.P.), Ludhiana (Pb.) , Raipur (Chhatisgarh) and Coimbatore (T.N.) for only one & two years. On scrutiny of data, number of dicrepacies have been observed for which clarifications have been sought from respective centres. A tentative schedule for recording the ancillary information of the conducted experiments along with yield data has been fabricated and sent to the incharge of various centres including the Project Coordinator. The data are being analysed by Response surface Methodology, General Linear Models and Multiple regression (Backward elimination) etc. Also efforts are on to standardize the STCR Package. the mechanism of design which is presently followed by the corporating is being looked into.

Planning and designing of new set of experiments at different locations would be carried out with the help of the project Coordinator .

12. Designs and Analysis of agro-forestry experiments

The objectives of the project are (i) to evolve and document general methodologies for the statistical analysis

of data already generated through agro-forestry experiments, (ii) to obtain appropriate designs along with the layout plans and methodology for the analysis of the experiments under agro-forestry system to be suggested to the collaborative centre(s), and (iii) to study the relationship among the various components (trees and crops) in agro-forestry system.

The experiment on "Evaluation of fodder trees with and without crops under rainfed arable farming for semi-arid conditions" has been conducted at IGFRI, Jhansi with 14 treatments, consisting of combinations as well as sole tree and sole crop of 4 fodder trees and 2 crops.

The crop analysis has been done considering factors replication, tree, location, direction and distance in the model with relevant interactions in factorial set up.

For comparing the effect of tree on crop, two way classified analysis was done with 8 observation per cell and contrast analysis were performed.

In tree, the analysis, of different parameters like Height, DBH, Collar Diameter, Crown Diameter etc. was done by usual RBD analysis. Further to compare the tree with crop and without crop, the contrast analysis was performed for comparing within and between four tree species.

Under the experiment on "Establishment and growth of fruit tree and their effect on crop growth and production"

i) The path analysis was applied to study the effect of different biometrical characters like plant height, plant population, number of effective tillers per plant, grain weight per ear head and number of tillers on yield of wheat crops under different fruit trees.

ii) The analysis of biometrical characters for plant height, plant population, number of effective tillers and number of tillers per meter of row of wheat crop from the above experiment using the model consisting of replication, spacing, trees and distance has been done.

The experiment on "Evaluation of fodder trees with and without crops under rainfed arable farming for semi-arid conditions" is being conducted at IGFRI, Jhansi with 14 treatments, consisting of combinations of 4 fodder trees and 2 crops as well as sole tree and sole crop.

There are 4 trees of same species in a plot. The barley crop was harvested from both north and south direction of the tree in eight rows. The data of two rows were pooled, that resulted in total 4 rows (50cm, 1m, 1.5m and 2m) on both sides of the tree. The data has been analysed considering the factors replications, tree, location, direction and rows (distances) in the model along with the relevant interactions. The coefficient of variation of the experiment was obtained as 10.59 with R^2 =82.62.The effects which were significant are trees, distance, direction x distance, tree x direction x distance and location x direction x distance. Contrast analysis was performed for one factor distance which was found to be significant. Further it was split into single degree of freedom and it was found that only first row distance was significant, indicating that tree has its impact on nearest row of the crop. The behaviour of the crop in the presence and absence of tree was also significantly different. The detailed study is in progress.

The data received on crude protein, foliage yield, fuel yield, height and crown diameter of trees has been analysed. The result related to crude protein contents of the trees were found to be highly significant. Further contrast analysis was performed and it was observed that the contrast pertaining to sole Babul, Babul + Barley and Babul + gram were highly significant indicating the effect of crop in the crude protein of Babul tree. Similar trend has been observed in the analysis of other characters of the trees.

The data on height and crown diameter of the tree before sowing of the crop and after the crop was harvested and

was analysed as a two-way classified data with interaction. The two factors being treatments and stages. The analysis shows a significant interaction between the treatment and the stage in case of crown diameter.

The data on the crops Gram and Barley were analysed separately by considering 5 treatments (4 treatments of the crop with tree +1 without tree) in 3 replications. It is seen that the treatments in comparison to the control were significantly different from the data on barley (dry fodder), Gram (Grain and straw) indicating the positive effect of tree on crop.

The experiment on "Establishment and growth of fruit tree and their effect on crop growth and production" has been conducted at NRCAF Jhansi with 3 spacing (4x2,6x2 and 10x2) as main plot, 4 tree species Guava, Ber, Anar and Kinnow in subplot and 4 crop rotations sorghum-Wheat, Sorghum-Gram, Groundnut-Wheat, Groundnut-Gram in sub-sub plot having a Double split plot design with 4 replications.

Under this experiment, the method of path analysis was used to study the effect of different biometrical characters like plant height, plant population, number of effective tillers per plant, grain weight per ear head and number of tillers on yield of wheat crops under different fruit trees. It has been concluded that plant height is the main component of crop that has maximum direct effect on yield under all the four tree species of agro-forestry system.

From the analysis of biometrical characters of wheat crop from the above experiment using the model consisting of replication, spacing, trees and distance, it has been observed that row distance has significant impact on the character, plant height, plant population, number of effective tillers and number of tillers per meter of row.

From the analysis of the data on green and dry yield of Barley (2001) it was observed that, there were significant differences in dry and green yield barley under the 4 tree species (Siris), Neam, Shisham and Babul). The other factors which were found to be significant were location, direction, distance, tree x location and tree x direction. The maximum green yield (125 q/ha) and dry yield (38.81 q/ha) were found under the Siris tree and minimum were under Babul tree. There were significant differences in the yield of crop with tree and without tree, indicating the positive effect of tree on the yield of barley crop.

The experimenter can use the methodology for the analysis of agro-forestry experiments and can plan his experiments based on the results achieved from it for increasing his production from per unit of land.

DIVISION OF BIOMETRICS

Mandate	Thrust Area
To conduct basic and applied statistical research in Biometrics	• Computer simulation studies and applications of re-sampling techniques, like bootstrap, Jackknife, balanced repeated replications in Agricultural Statistics. • Studies on gene action, estimation of genetic parameters and genetic merit, genetic progress and other related statistical methods. • Non-linear statistical modelling of biological, ecological and economic phenomena

Thrust area-wise list of projects in operation is given in Chapter 12. The progress of the projects is given below:

Computer simulation studies and applications of re-sampling techniques like bootstrap, Jackknife, balanced repeated replications in Agricultural Statistics

1. Development of statistical procedures for selecting genotypes simultaneously for yield and stability

The objectives of the project are: (i) to construct new indices for selecting genotypes simultaneously for both yield and stability, (ii) to make comparison among the indices developed, based on standard statistical techniques and on techniques involving simulation, and (iii) to develop a computer program for judging desirable genotypes.

A number of new indices for selecting genotypes simultaneously for yield and stability will be constructed by combining different stability measures and yield indicators. Necessary theoretical basis for determining the weights for yield and stability in these indices will be arrived at. A comparison among the indices so developed will be made so as to judge the superiority of one index over another. This comparison will be based not only on standard statistical techniques but also on techniques involving simulation. In some cases the merit of indices will be judged on the basis of convergence of observed Type 1 error and power of the tests involved. An IBM-PC compatible program for selecting varieties simultaneously for yield and stability, based on developed indices, will be made. Initially the developed indices will be tested on some cereal crops data and depending on the trend obtained the procedures may be extended to other crop situations. For rice crop, the data will be used from All India Coordinated trials conducted by Directorate of Rice Research, Hyderabad. The genotypes included are the promising lines or elite breeding lines which are at different stages of testing in the coordinated project.

Appropriate data sets on varieties x locations x years have been procured from All India Coordinated Rice Improvement Programme, Directorate of Rice Research, Hyderabad. They are 28x6x3 (1993, 94, 95) for zone 1, 19x4x3 (1993, 94, 95) for zone 2, 19x5x3 (1994, 95, 96) for zone 1, 18x5x3 (1994, 95, 96) for zone 2, 11x5x4 (1994, 95, 96, 97) for zone 1, 9x5x4 (1994, 95, 96, 97) for zone 2. The procured data was transferred on to excel worksheets. The genotypes considered for analysis are the test cultivators of advance varietal trials. The construction of indices for

simultaneous selection is in progress. We are studying the properties of different measures for their inclusion in the composite index. Efforts are also on, in collecting information on local checks for comparison purpose.

Composite index will be constructed to select genotypes simultaneously for yield and stability. Programs will be developed for computer simulation and related varietal selection techniques. Some criteria will be developed to assign relative weights to yield and stability indicators. For evaluating varietal selection indices necessary, programs will be written. Further, the developed indices will be compared from the point of view of statistical properties and through simulation techniques.

2. Studies on data processing techniques for statistical analysis of large field variability in hilly and salt affected soil regions

The objectives of the project are: (i) to consolidate in a comprehensive manner the data processing techniques for statistical quantification of the large field variability in hilly and salt affected soils, (ii) to finalise the algorithms and develop software for computerised data processing of the natural variability present in the plantations carried out in uncultivable lands, (iii) to develop computerised techniques for the construction of the fertility gradient maps of the examined soil characteristic field variability obtained by using different concepts of statistical methodology, and (iv) to formulate computerised data processing technology for correlating the plant growth trait performance with that of soil characteristics

The theory of geo-statistics, ANOVA for repeated measures and generalised ANOVA in the presence of spatial patterns will be used to examine the field variability in hilly and salt affected soil regions. The data of one experiment conducted at CSWRTI, Dehradun has been received and analysis of it is in progress. The analysis has been carried out by using various techniques of analysis of variance, repeated measured analysis, residual analysis and multivariate analysis. The information of the covariates has also been included in the analysis so as to arrive at the right conclusions about the differences in the treatments under consideration. Efforts are also initiated for procurement of more data sets of experiments conducted in hilly areas and salt affected soil regions.

The theory of repeated measures will be explored further for the case of unbalanced situation and incorporating the trend analysis in it.

Studies on gene action, estimation of genetic parameters and genetic merit, genetic progress and other related statistical methods

3. On some robust estimation of heritability

The objectives of the project are: (i) to examine the influence of non-normality and other assumptions on the estimation of heritability, (ii) to study the effect of aberrant values on the estimation of heritability, and (iii) to identify and develop procedures for robust estimation of heritability.

The methods of maximum likelihood, ANOVA,REML,MINQUE will be employed to obtain robust estimates of variance components and subsequently the estimates of heritability. These methodologies will be modified to solve the problems of aberrant values and for obtaining robust estimation.

The work is in progress for studying the influence of aberrant values on the estimation of the variance components in general and heritability in particular. This is being carried out by employing both Bayesian and traditional statistical techniques. Both the techniques exhibit significant role of aberrant values on the estimates of heritability. However, Bayesian techniques too, at many occasions gave estimates far from the true parametric values. The attempts are initiated for the application of Bayesian techniques on the

different situations involving various types of prior distributions of the variance components.

The concept of Bayesian techniques will be employed to obtain the robust estimates of variance components. This will be attempted by using the information of different priors.

4. Empirical investigations on the influence of fixed effects on the estimates of heritability

The objectives of the project are: (i) to study the effect of non-genetic factors on the estimation of heritability and it's precision, (ii) to compare the different methods of correction of data by applying the method of fitting constants, and (iii) to compare mixed model technique with the above methods for estimation of variance components and consequently heritability.

The data was simulated for different values of heritability by half-sib model for single fixed effect. The method of fitting constants by Harvey (1966) was used for correction of fixed effect. The corrected and uncorrected data were analyzed by half-sib analysis.

The data under half-sib for different family structures were simulated from populations with low, moderate and high heritability for different sample sizes. Single fixed effect with four levels was introduced in the data and heritability estimates were obtained from raw data both before and after the introduction of fixed effect. Subsequently the data was corrected for fixed effect by method of fitting constants and the heritability estimates were obtained from the corrected data. The data simulation with two fixed effects is in progress.

The data under half-sib model for different sample sizes and family structures will be simulated from population with different levels of heritability with two fixed effects. The data will be analysed both before and after the correction of fixed effects and heritability estimates will be obtained along with its standard error.

5. Studies on growth pattern and heritability of fitness traits in Indian breeds of goats

The objectives of the project are: (i) to compare different methods of estimation of heritability of fitness traits, and (ii) to compare the adequacy of different non-linear models utilized for studying growth pattern.

Breeding data of goats in respect of fitness traits such as type of birth and stayability at different stages of age of animals was transferred by applying arcsine transformation. These records were used to obtain heritability estimates by Half-sib correlation method for both sexes separately. Heritability estimates for fitness traits were also obtained by Heterogeneity chi-square method.

Statistical analysis to obtain heritability estimates for fitness traits, such as type of birth, stayability at different stages of age of animals by Half-sib correlation method as well as by Heterogeneity chi-square method for both the sexes separately in respect of each genetic groups of goats (16 genetic groups) was carried out. Analysis work to study the behaviour of reproductive traits such as number of reproductive cycles, completed, number of kidding, etc. was also, undertaken.

Growth data for effects, like season, period and type of birth, will be adjusted by least square technique. These adjusted records will be utilized to study the growth pattern of goats for different genetic groups and in respect of each sex separately. Suitability of different fitted models will be examined by using various criteria of testing the adequacy of goodness of fit, such as R^2, error mean square, etc.

Non-linear statistical modelling of biological, ecological and economic phenomena

6. Study of non-linear time series modelling in agriculture

The objectives of the project are:

(i) to study relative merits and demerits of various tests for testing of linearity, (ii) to investigate properties of auto-regressive conditional heteroscedastic, self-exciting threshold autoregressive and bilinear models from the family of parametric nonlinear time series models, and (iii) to develop relevant computer programs for fitting of above models and to apply these to real data from the fields of entomology, fishery, agricultural economics, etc.

Second order index of linearity will be computed to detect non-linearity. The estimated regression function $m_j(n)$ will be used to identify the possible value of delay parameter in SETAR model. Number of tests both in time domain and frequency domain will be performed.

Efforts will be made to fit the data by AR(p)-ARCH(q) model where the squared error will be autocorrelated. SETAR model will be taken into account for modelling data related to population cycle under food limitation.

By reference to a preliminary analysis of the Australian blowfly data, the question of 'when' ,'how' and 'what' in nonlinear time series modelling has been widely investigated. The above biological/ecological discussion strongly suggests that a conventional linear time series model which is based on the Gaussianity of the error random variables and the linear relationship among the observations (i.e. linear conditional mean), will be wide off the mark because it completely ignores the two crucial features:

i) threshold due to food limitation

ii) delay due to development time

Along with the likelihood ratio test for testing of linearity, three other tests for non-linearity on the two subsets of data have been performed which has established the non-linearity in the data. The statistically identified time delay of 8 units of time in the piecewise linear model fits in quite well with the observed time to emergence between 10 to 16 days. The threshold parameter estimates of 3.05 might be ecologically meaningful to investigate the implications in terms of food utilization, random crowding effect, etc.

DIVISION OF FORECASTING TECHNIQUES

Mandate	Thrust Areas
To develop models for obtaining pre-harvest forecast of crop production, fish production, milk production, poultry products, agrometeoro-logical models for early warning and yield assessment and assessment of losses due to various factors.	• Forecasting techniques in Agricultural System.

Thrust area-wise list of projects in operation is given in Chapter 12. The progress of the projects is given below:

Forecasting Techniques in Agricultural System

1. Pilot study for developing Bayesian probability forecast model based on farmers' appraisal data on wheat crop

The study was conducted with two objectives viz. (i) to develop the Bayesian probability model for forecasting the wheat crop yield and (ii) to enlist the factors affecting the crop yield based on farmers' appraisal.

The methodology consisted of conducting a survey at the district level following a stratified multistage random sampling design. Taking tehsils as stratum, villages as first stage units and farmers as experts, a random sample of 90 farmers was selected. The expert opinion data are collected in a number of rounds by interviewing the selected farmers regarding their assessments about the likely crop production and chances of occurrences. In the first round a requisite information was collected for establishing an approximate distribution of crop yield. After summarising the responses in various yield classes, each farmer was asked in round two to estimate the chances in favour of getting yield in various classes. From these responses average prior probabilities were computed. At harvest, wheat yield data was obtained by enquiring the selected farmers. Actual harvest yield and farmers' appraisal data on yield from the previous year(s) are taken into account to obtain the posterior probabilities which are used for obtaining Bayesian forecast of crop yield for the current year.

Using the proposed methodology, Bayesian forecast of wheat yield for Muzaffarnagar district is obtained about 2 months before harvest. Wheat yield forecast for the year 1997-98 is found 35.96 q/ha as against the actual mean yield of 30.54 q/ha. by using the 1996-97 likelihoods. Based on the likelihood for the year 1997-98, yield forecast for the year 1998-99 is found 31.32 q/ha. as against the actual mean yield of 33.84 q/ha. And it is found 34.47 q/ha when posterior probabilities are obtained on the basis of likelihood for the year 1996-97. The past survey data of actual yield and farmers' forecast are taken into account for making the Bayesian forecast for the current year. This ensures a continuous flow of data for updating of likelihood used in issuing forecast for the current year. The significant advantage of the Bayesian approach is that it provides forecast representing the composite thinking of a number of farmers actually engaged in cultivation of the crop.

To ascertain factors that affect wheat production, farmers were asked to state the effect of several factors in terms of increase / decrease in yield. Based on the farmer's appraisal it is found that sugarcane, wheat, groundnut and potato as the previous crops to the wheat sowing has a favourable effect on wheat production. Jowar crop has an adverse effect on wheat yield as reported by 64% of the farmers. Deeper method of ploughing through tractor and basal dose of fertilizer has a

positive effect. Irrigation before sowing of wheat is necessary for higher wheat yield. Method of sowing through broadcasting is considered to be adverse as compared to the sowing through drilling and dibbling. Spacing between plants did not find much importance in the opinion of farmers. Chemically treated seeds are found better as compared to untreated seeds. About 66% opinions are in favour of removing weeds for higher yield. In all 95% farmers are of the view that for obtaining higher yield better management of the crop is desirable. A majority of the farmers are of the opinion that timely and moderate rainfall has a favourable effect on wheat production. However, if the rainfall is at the time of sowing or it is heavy before tillering, it adversely affects the productivity. Similar is the effect of temperature if it decreases below the normal minimum temperature of the season. Wind velocity also affects adversely to the crop.

The limitation of the present study is that the results are based on small sample of farmers so the methodology proposed needs to be tested on a larger scale before it is recommended for operational use. The findings of the project were presented in an open seminar.

2. Pilot study on forecasting of brood-lac yield from Butea monosperma (Palas).

The objective of the project are (i) to identify the factors affecting yield of broodlac, and (ii) to develop models for forecasting the yield of broodlac from palas tree.

This is a cess fund project of Indian Lac Research Institute, Ranchi in our Institute collaboration. The data collection work in respect of various factors and cultivation operations during lac insect growth period was carried out at 3 places viz. (i) Village – Lachanpur, District Bilaspur (Chattisgarh), (ii) Village – Putidih, District Purulia (W.B.) and (iii) ILRI Farm, Namkum, District Ranchi (Jharkhand). The analysis for the first year data have been taken up. The data collection for the second year is in progress.

3. Development of forewarning system for aphids, *myzus persicae* (sulzer) on potato.

The objective of the project is to develop forewarning technique to identify aphid free/low period and area for seed production.

The project report was finalized. Two types of prediction models-higher degree complex polynomials (using GMDH technique) and non-linear models were developed for the centres Pantnagar (UP), Deesa (Gujarat) and Kalyani(WB). Week-wise models were fitted between the aphid population and suitably identified one / two-week lagged weather variables – maximum temperature, minimum temperature, maximum relative humidity, minimum relative humidity and rainfall. Fitting and validation results of these models were satisfactory. The aphid population in a particular week can be predicted by incorporating the values of the concerned one / two weeks lagged values of the variables into the fitted models. Thus the study reveals that forewarning may be issued one / two weeks in advance.

4. Development of early warning and yield assessment models for rainfed crops based on agro-meteorological indices.

The objectives of the project are (i) to prepare agro-meteorological indices for early warning and yield assessment of rainfed crops, (ii) to develop models using agro-meteorological indices for early warning and yield assessment, and (iii) to validate the models and provide early yield assessment.

Forecast models were developed for Rice - Raipur (Chatisgarh), Sorghum - Delhi and Parbhani (Maharashtra) and Maize – Delhi using weighted stress indices. These models provided forecast, six weeks before harvest for sorghum, four weeks before harvest for maize and five weeks before harvest for rice. The models were validated and forecasts for subsequent

years 1996-97 to 2000-01 were obtained. Out of 11 cases compared in seven cases deviations of forecast from observed yield ranged between 1% to 11%, in four cases deviations were high. However, forecasts for recent years could not be compared as observed / official yields are still to be published/calculated.

5. Forecasting the loss in yield due to weeds.

The objectives of the project are (i) to investigate the intensity and growth pattern of different weeds, (ii) to find out the relationship between crop yield and weed parameters, (iii) to develop methodology for forecasting the loss in yield due to weeds, and (iv) to compare the economics of different weed control methods.

The experiments for the second year on the Soyabean and wheat during respective season of kharif and rabi were laid out at the agronomy field of IARI. The observations were recorded on weed counts, dry matter accumulation and leaf area for all the treatments at weekly interval after emergence of weeds. The actual yield of the crop was also recorded at harvest. The part of observations were recorded on weed parameters after emergence of weeds for wheat crop in Rabi season. Statistical analysis of first year data for Soyabean crop has been carried out and for wheat data is in progress.

6. Forecasting fish production from ponds

The objective of the project is to develop appropriate methodology for forecasting fish production from ponds and to determine the optimum time of forecasting.

The study consists of two phases. In the first phase, methodology was to be developed for cemented ponds whereas in the second phase, models for natural ponds are to be attempted. The first phase of the study has been completed based on secondary data collected from cemented ponds in Ludhiana. Linear multiple regression was fitted taking fish weight at harvest as dependent variable and fish weight at seventh month, dissolved oxygen, free carbondioxide, pH value and water temperature as independent variables. Stepwise regression was used to obtain significant variables. Results revealed that none of the variables except fish weight at seventh month was significant. Correlation analysis also confirmed this fact. Thus, use of inputs for development of forecast models is not feasible for cemented ponds and models developed earlier using fish weight data only ('Non-linear models for forecasting fish production from ponds' by Walia, S.S. et al., IASRI Publication, 1997) can be used for cemented ponds. However, the results may be different for natural ponds. For the second phase, one set of secondary data collected from natural ponds has been received. Analysis of these data is in progress.

7. Studies on bioecology and population dynamics of major pests of mango (hoppers, fruitfly, leaf webber and inflorescence midge) and guava (fruit borer)

The objective is to develop forewarning system for outbreak of fruitfly/mango hopper in mango crop.

The methodology for development of the forewarning system was finalised. It includes identification of the underlying law the fruitfly follows in natural way of its own and establishment of the relationship between fruitfly population adjusted for natural cycle with various relevant lag weather variables by way of fitting appropriate models. Processing of weekly data on fruitfly population and corresponding weather parameters for the period 1993-94 to 1998-99 was in progress. The rational function of the form $Y = (a+bx) / (1+cx +dx^2)$ was found to be appropriate model for representing the natural cycle of fruitfly. Selection of relevant independent variables from a long list of various 2,3,4 lag weather variables and fitting of suitable functions between adjusted fruitfly population and each selected independent weather variable separately is over. Development of final model using individual functions identified

is in progress. It has also been planned to apply an alternative approach to identify the natural cycle of fruitfly population by using some transformation and then accordingly readjustment of the entire data will be required. The selection of suitable transformation is also in progress.

8. Development of model for forewarning about infestation of the insects of paddy crop

The objective of the project is to develop model for forewarning about infestation of insects of paddy crop.

Data files have been prepared. Identification of time series components such as trend, cyclic pattern, seasonality etc. were done by considering a single pest of paddy crop. Forecasting methods, which utilize basic time series concepts like moving averages, decomposition, smoothing etc. have been tried. Comparisons of the different methods has been done using different accuracy measures like mean absolute per cent error, ACF etc. These comparisons revealed that for the data, exponential smoothing came out to be better than moving averages for forecasting purposes.

9. Epidemiology and forecasting to powdery mildew and anthracnose.

The objective of the project is to develop forewarning techniques for incidence of powdery mildew in mango.

Logistic regression models have been developed to describe the relationship of weather parameters upon epidemic status of powdery mildew in mango. Weather data in Kakori and Malihabad mango belt of U.P. have been used to fit these models and validated using recent data. The forewarning system thus obtained proved effective with the results obtained comparing well with the observed responses. Further refinement of the model will be taken up.

10. Forecasting sugarcane yields using multiple markov chains.

The objectives of the project are (i) to develop models for forecasting sugarcane yields based on higher order Markov Chains, (ii) to explore the feasibility of use of data of more than one point of time through growth indices and principal component analysis, (iii) to investigate the usage of lumpable Markov chains in forecast models, (iv) to investigate the behaviour of the proposed and also the existing models for forecasting sugarcane yields after increasing the size of the baseline data set through simulation, and (v) to forecast the sugarcane yields from the developed models and compare them with those obtained from the existing methods.

The project was initiated in January, 2001. The review of literature has been done and development of computer programs for obtaining transition probability matrices of Markov chains has been taken up. Exploration of data is in progress.

Higher order Markov chains will be utilised to develop models for forecasting sugarcane yields. The data upon biometrical characters for different stages of crop growth will be used to construct growth indices and principal components. Development of lumpable markov chain models will also be done. Also the behaviour of the proposed methods will be studied upon a large database generated from the existing data.

DIVISION OF ECONOMETRICS

Mandate	Thrust Area
To undertake the work relating to models for agricultural planning, non-linear economic models, study of technological change and its diffusion, study of risk and uncertainty in agriculture and agricultural development and poverty alleviation.	• Study of Technological Change, Risk and Uncertainty in Agriculture. • Modelling for Agricultural Planning.

Thrust area-wise list of projects in operation is given in Chapter 12. The progress of the projects is given below:

Study of Technological change, risk and Uncertainty in agriculture

1. An Econometric Study of Technological Dualism in Egg. Production

The objectives of the project are (i) to study the extent of technological dualism and technological change in egg production, (ii) to study the effect of technological dualism, (iii) to examine effects of technological change on functional income distribution, and (iv) to examine allocative efficiency under different levels of technology.

The project was initiated in October 2000 and is in operation in collaboration with the Department of Animal Husbandry, Govt. of Punjab, Chandigarh, Moga and Ludhiana districts have been selected for detailed investigation. Schedules for primary data collection have been prepared and tested. Formal discussion was carried out with the state Govt. officials to sort out operational difficulties

Modelling for Agricultural Planning

2. Study of demand for agricultural products and its implication for food security in India.

The objectives of the project are (i) to study the consumption pattern of foodgrains in rural and urban areas. (ii) to estimate demand functions and engel elasticity for these items, and (iii) to study the implications for consumption pattern of poorer section of population for food security.

The study indicated that during the year 1983, in rural areas, the income elasticity for rice for the country as a whole was 0.657. The income elasticity was greater than 1 in Himachal Pradesh and Jammu and Kashmir. During 1987-88 in rural areas, wheat had shown income elastic demand in the states of Tamil Nadu, Andhra Pradesh, Karnataka, Kerala and Orissa while it was inelastic in other states. During the same year in urban area, the values of elasticities for rice was smaller in almost all states. The states of Kerala and Orissa had elastic demand pattern for pulses. During the year 1993-94, in rural areas, most of the rice producing states of Uttar Pradesh, Bihar, Orissa, West Bengal, Tamil Nadu, Andhra Pradesh and Assam had witnessed smaller income elasticities indicating that this commodity is a necessity in the consumption basket of people in these states.

The demand, for cereals such as rice, wheat, jowar bajra and maize, for human consumption alone was projected. These commodities would be demanded to the tune of 183.23 million tonnes and 215.67 million tonnes respectively for the year 2010 and 2020.

3. Jai-Vigyan National Science and Technology Mission on Household Food and Nutritional Security for Tribal, Backward and Hilly Areas.

The Objectives of the project are (i) to document socio-economic conditions

and food security status of the targeted population, (ii) to assess cost of differential technological interventions in various target domains, (iii) to identify possible constraints for diversification and wider adoption of improved life support crop species and allied enterprises, (iv) to quantify the potential benefits of improved technologies and diversification on poverty alleviation, food security, income and sustainability of resource base in the target domain, (v) to assess implications of improved technology interventions on gender related issues, and (vi) to examine role of government intervention through on-going programs for wider adoption and larger impact of improved technologies in tribal, backward and hilly areas.

The project started in April 2000. There are six cooperating centres and IASRI is one of these centres. The work for examining the status of agricultural production and food and nutritional security at household level has been undertaken in Ajmer, Jodhpur and Banswara districts of Rajasthan.

DIVISION OF COMPUTER APPLICATIONS

Mandate	Thrust Areas
To develop databases and information systems for agricultural research, to conduct post-graduate teaching and ad-hoc training courses in computer application, to provide advisory and consultancy services in electronic data processing, and to provide computer services in the Institute	• Development of databases and information system for National Agricultural Research System. • Conduct Post - Graduate teaching and ad-hoc training courses in Information Technology.

I. Development of databases and information system for National Agricultural Research System (NARS)

(a) Program under NATP:

Institutionalization of Research Priority Setting, Monitoring and Evaluation and Networking of Social Scientists

The objectives of the project are (i) to development of monitoring mechanism, (ii) to development of monitoring indicators at different operative levels, (iii) to development of Project Information and Management System (PIMS) and linking it with Internet, (iv) training and workshops on monitoring and PIMS, and (v) to establishing network of agricultural statisticians and economists.

The development of standalone version of PIMS has been completed. The system's testing and debugging was done with the real project data of the Irrigated Agro-Eco-System. The software package is available on a CD along with a users reference manual. For implementation of PIMS, onsite-training workshops were organised by the scientists of IASRI at the Agro-Eco-System directorates and production system level scientist offices. PIMS was installed in their respective locations for data entry of the projects. PIMS software package on CD's was made available to each center. Necessary technical support was provided for the queries and problems faced at different centers in entering their project's data in PIMS. PIMSNET, the online version of PIMS is under development. The furnishing of the NATP laboratory has been completed.

Program under Centre of Advanced Studies in Agricultural Statistics and Computer Applications

National Information System on Agricultural Education on Internet (NISAGENET)

Keeping in view the immense potential of Internet in transfer of Information Technology, the NISAGE on INTERNET, that is the web based on-line databases for National Information System on Agricultural Education in India, has been designed and is being developed.

The IASRI (ICAR) had taken up lead to develop a web based on-line information system for National Information System on Agricultural Education in India with the usual facilities of updating, retrieval and dissemination of information at the national level. The system will be capable of maintaining an up-to- agricultural education data bank and providing answers to assessment of agricultural education related queries covering all important aspects like characteristics of agricultural universities/institutions, colleges under different universities, teaching programmes offered, infrastructure facilities available in different universities, manpower in agricultural universities like cadre-wise manpower, function-wise manpower

distribution, sex-wise and grade-wise distribution of faculty and R&D information like university research funding, university-wise distribution of projects, technologies developed, SAUs achievements, SAUs publications etc.

NISAGENET has been designed and is being developed in six modules that contain information on:

- Academic Information of the Universities
- Infrastructure facilities available
- Budget Information
- Manpower of the Universities
- Personal Information of the faculty members
- Achievements and highlights (R&D)

As a first report publication from NISAGE, the directory of Agricultural Universities was published and was released by the Minister of Agriculture at the inaugural session of the Vice-Chancellor's Conference and Exhibition on 'Agricultural Education in the next millennium' held during 16-17th September, 1998 in the Auditorium of the NBPGR, New Delhi. The capabilities of NISAGE were also presented and discussed in the conference.

A reference Manual on National Information System on Agricultural Education (NISAGE) were compiled for effective implementation of the software package in State Agricultural Universities for timely updation, queries and reporting.

The NISAGENET will be useful to academicians, planners, policy makers, scientists and technologists, students for undergoing higher education in agriculture, and other related individuals and institutions.

Inter-Institutional Project

(i) Network of Social Scientists

Lead Institute: National Centre for Agricultural Economics and Policy Research, New Delhi

The immediate objectives of the project are:

- To design a framework for networking of social scientists.
- To design and develop a database of social scientists in ICAR and SAUs.
- To implement the design using the Internet technologies
- To design user interface and frame work for the website
- To develop the website
- To launch the website on the INTERNET for WWW

The long-term objectives of the project are:

- To use Internet Technologies for strengthening social science research particularly Agricultural Economics.
- To improve the scientific productivity of the Social Scientists by identifying their problems and constraints.

Progress:

- Website for networking of economist launched at NIC.
- Site is available under address : http://agrieconet.nic.in

(ii) NATP Project "Development of Pesticide Residue Free IPM Package for Some Major Vegetables".

Lead Institute: Indian Institute of Horticulture, Bangalore

The objectives of the project are:

- To develop IPM packages with already available information of insect and disease management for residue free produce in chillies, tomatoes and cabbages.
- To conduct research against gaps identified in the IPM for major pests and diseases of chilli, tomato and cabbage.
- Refinement of the IPMs by incorporating results of the gap studies.

- Evaluation of the IPM packages in different locations and hot spots.
- Developing multimedia packages and popularization of the above packages through extension methods.

Progress:

The data analyses of the project for 2000-2001 was undertaken and a prototype of an information system for IPM has been developed.

II. Conducting Post Graduate teaching and ad-hoc training courses in Information Technology

(a) Teaching and Guidance in the PG Programme in Computer Applications

Third Trimester courses for the year 1999-2000 and 1st and 2nd Trimester courses for the year 2000-2001 for M.Sc.(Computer Applications) were offered. These were attended by students of M.Sc.(CA) and Ph.D/ M.Sc. students of P.G. School IARI. Seven students completed their M.Sc. programme during 2000-2001.

(b) Ad-hoc Training Programmes

The division organised one training programme under Centre of Advanced Studies, one for PIMS for its immediate implementation and 18 training programs under the Revolving Fund Scheme. In all 202 participants from ICAR Institutes and various SAU's attended the courses. The courses include Windows 97, MS-Office, MS-Project, Statistical Packages SAS, SPSS, GENSTAT and SPAR1, Internet, Email, Visual Basic Programming, Web Page Designing and Object Oriented Programming etc.

III. Advisory and consultancy services in data processing

(a) Consultancy in Agricultural Research Data Processing

Eleven M.Sc./Ph.D./research workers were provided help in data processing and interpretation of results as per details given below:

1. Sh. Amit Kumar , J.V.College, Baraut (Meerut)
2. Sh. Shailender Kumar , J.V.College, Baraut (Meerut)
3. Sh. Ajay Panjgotra, J.V.College, Baraut (Meerut)
4. Sh. Shiv Kumar, J.V.College, Baraut (Meerut)
5. Sh. Amit Kumar, J.V.College, Baraut (Meerut)
6. Sh. S.K.Pandey, CSAU, Kanpur
7. Sh. Malik Farooq , Banglore
8. Sh. Sundeep Kumar, Allahabad
9. Dr. Preeti Mediretta, College of Vet. Sci. & A.H., Mhow
10. Dr. P.N.Shrivastava, College of Vet. Sci. & A.H., Jabalpur
11. Dr. R.N.Sahoo, College of Vet. Sci. & A.H., Jabalpur

IV. Computer Services

(a) Selective Dissemination of Information

Bioinformatics Centre provided services to Scientists in the NARS in terms searching from the bibliographic databases and to the scientists of the Institute for colour output of certificates, cover pages and laser out puts for various documents. It received 9 requests from other institutes of ICAR and output of 18,637 abstracts were provided to them

(b) Data Entry

Personal Computers in the division were used to prepare data records on floppies as under:

Total jobs	80
Total records created	69065

(c) New Computing Facilities Provided in the Institute

(i) Purchase of Computers Hardware and other Peripherals

Keeping eye on the technological developments in the IT field, it was necessary to upgrade/replace the existing computer hardware and also purchase new computers. Accordingly the following computer hardware and related equipment has been procured and installed:

Equipment	Qty.
Pentium Work Station	1
Pentium PC	1
UPS	1

(ii) Software Packages

Few new software packages were purchased in this year. These new packages are necessary so as to keep pace with new emerging technologies:

(a) E-view
(b) Akshar Upgrade
(c) MS-Back Office
(d) MS-Office
(e) SAS Upgrade

(iii) NATP Laboratory

An NATP Laboratory has been set up in Room No. 112, Computer Centre Building with a cabin for NATP Cell and facility for 11 users.

Training Conducted under the Revolving Fund Scheme (RFS)

Short Term Training Programs In Information Technology

In view of the mandate of division to conduct training in the area of information technology for human resources development, this project has been taken with the following objectives:

i) To train manpower in the field of Information Technology.
ii) To expose the Scientists of NARS to latest developments in Information technology.

18 training programmes were organised on MS-Office-97(I), MS-Office-97 (II), Web Programming & Internet Technologies, Relation Database Management System & Access-97, Object Oriented Programming using C++, SPSS, Java Programming, Visual Basic, Web Designing and Building MIS using Visual Basic during the year 2000-2001 in which 162 participants were trained. The details of these training programmes are as follows:

1. " MS-Office-2000(I)" from 3-4-00 to 8-4-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Seven participants attended the training programme. The topics included were Windows 98, MS-WORD, MS-PowerPoint and E-mail.

2. " MS-Office-2000(II)" from 10-4-00 to 15-4-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Nine participants attended the training programme. The topics included were Windows 98, MS-Excel, MS-Access and E-mail.

3. "Basic Computer Concepts & Operating Systems" from 8-5-00 to 13-5-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Six participants attended the training programme.

4. "Training programme on Visual Basic" from 22-5-00 to 3-6-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Eight participants attended the training programme. The topics included were Visual Basic Programming, Visual Basic IDE, Visual Basic Language Directives, Visual Basic Objects and Controls, Database Access Objects and Active X Components.

5. "Web Programming & Internet Technologies" from 19-6-00 to 1-7-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Ninteen participants attended the training programme. The topics included were concepts of Internet, Intranet, Extranet, Internet Explorer and Netscape Navigator, HTML and VB scripts, Active X control Pad and Active Server Pages etc.

6. " Building MIS using Visual Basic & Access" from 10-7-00 to 22-7-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Three participants attended the training programme.

7. " MS-Office-2000(I)" from 31-7-00 to 5-8-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Twenty Five participants attended the training programme. The topics included were Windows 98, MS-WORD, MS-PowerPoint and E-mail.

8. " MS-Office-2000(II)" from 7-8-00 to 12-8-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Five participants attended the training programme. The topics included were Windows 98, MS-Excel, MS-Access and E-mail.
9. "SPSS" from 21-8-00 to 26-8-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Six participants attended the training programme.

10. " Web Programming and Internet Technologies " from 9-10-2000 to 21-10-2000 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Six participants attended the training programme.

11. " RDBMS & MS Access" from 30-10-2000 to 4-11-2000 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Four participants attended the training programme.

12. "MS-Office-2000(I) " from 13-11-00 to 18-11-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Five participants attended the training programme. The topics included were Windows 98, MS-Excel, MS-Access and E-mail.

13. "MS-Office-2000 (I) & (II)" from 13-11-00 to 25-11-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Twenty one participants attended the training programme. The topics included were Windows 98, MS-Word, MS-Excel, MS-Access and E-mail.

14. "Java Programming" from 4-12-00 to 16-12-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Eight participants attended the training programme.

15. "MS-Office-2000(I)" from 8-12-00 to 23-12-00 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Twenty participants attended the training programme. The topics included were Windows 98, MS-Excel, MS-Access and E-mail.

16. "Web Designing (HTML Front Page, Dreamweaver)" from 26-2-2001 to 3-3-2001 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Four participants attended the training programme.

17. "Visual Basic Programming" from 12-3-2001 to 24-3-2001 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Three participants attended the training programme.
18. "MS-Office-2000(I)" 26-3-2001 to 31-3-2001 for officials of ICAR Institutes was conducted under Revolving Fund Scheme. Seven participants attended the training programme. The topics included were Windows 98, MS-Excel, MS-Access and E-mail.

Computerization of Registration for the 88th Session of the Indian Science Congress (ISC)- 2001

The Division was actively involved in the registration process for Indian Science Congress 2001 held at New Delhi from 3-7 January 2001. Software was developed for computerization of all the activities related to registration.

Website Development for 88th Session of the Indian Science Congress (ISC)- 2001

On this occasion, a Website was designed and maintained for Indian Science Congress 2001. The Web site of the ISC-2001 was developed and maintained by the scientists of the Division. The web site displayed various activities that included Introduction, Theme, Vision, Invitation, ISCA, Features, Venue, Hosts, President, Committees, Programme, Exhibition, Membership, Abstracts, Awards, Registration, Accommodation, Deadlines etc. of the Science Congress. The site was available at www.isc2001.nic.in .

The opening page of the site is presented below —

LIBRARY AND DOCUMENTATION SERVICES

Library and Information Services plays an important role in serving the Institute's information needs as a Center for Scientific resource base as per Institute's mandate. The Library of the IASRI is a rich resource centre in the whole ICAR system as well as country, specialised in Agricultural Statistics and Computer Application and allied fields. The Library System of the Institute provides documentation and information services to in house scientists, students and researchers as well as users from ICAR Institutes and Agricultural Universities.

The Library Advisory Committee plays a advisory role in the management of the Library and cleared all proposals relating to enrichment of resource base of the Library, such as scientific books, journals, equipment's and library renovation etc. The Library Advisory Committee for the year 2000-2001 has been as under.

1. Dr. S.D. Sharma Chairman
2. Dr. A.K. Srivastava Member
3. Dr. V.K. Gupta Member
4. Dr. P.K. Malhotra Member
5. Dr. Prajneshu Member
6. Dr. H.V.L. Bathla Member
7. Dr. R.K. Pandey Member
8. Dr. Ranjna Agarwal Member
9. Dr. V.K. Sharma Member
10. Dr. D.K. Agarwal Member
11. Shri Mahesh Kumar Member
12. Sh. Chironji Lal Member
13. Sh. S.K. Samadar Member
14. Dr. P.K. Batra BOS Member
15. Dr. L.M. Bhar BOS Member
16. Sh. Ravi Chandran Student Representative
17. Dr. S.S. Srivastava Member Secretary

Library Information Services:

The following documentation services are provided by the Library System.

1. Reprographic Services
2. Current Content Service
3. Current Book Review
4. Current Awareness Service
5. Select Bibliography
6. CD searches

Library Renovation Plan: First Phase of the Library renovation has been completed successfully.

Library has started creating a Library books data base using CDS/ISIS window version. So far 3500 books, bibliographical and other details are computerised.

Brief Statistics

No. of Books added	:	128
1) No. of Grey Information material added	:	396
2) No. of Indian & Foreign Journals subscribed	:	110
3) No. of Publications issued from the Library	:	12500
4) No. of Publications borrowed or lent out on ILL	:	50
5) No. of readers who visited the Library	:	11200
6) No. of Issues of Current Contents brought out	:	12
7) No. of pages of scientific & technical nature reprographed	:	32816
8) No. of Indian Newsletters received on complimentary basis	:	120

Miscellaneous

The Library has been venue for Display of Post Session for "Statistics" and "Mathematics" during Indian Science Congress during 3-7 January, 2001

TECHNOLOGY ASSESSED AND TRANSFERRED

- An approach for crop yield estimation based on small area estimation techniques was suggested for National Agriculrure Insurance Scheme (NAIS). In the earlier Comprehensive Crop Insurance Scheme (CCIS) the notified area units were CD Block whereas in NAIS, Gram Panchayat (GP) are the notified area units. As such, crop yield estimates are needed at GP level. In the traditional approach based on crop cutting experiments the number of experiments needed for developing GP level estimates would have been enormous and rather cost prohibitive. The proposed approach takes advantages of farmer's estimates in developing crop yield estimates. In this approach, estimates developed through General Crop Estimation Scheme (GCES) at block/ districts is taken as a benchmark and is scaled down to GP level utilizing farmer's estimates as a correction factor. A special feature of the approach is that the number of crop cutting experiments need not be enhanced in order to get GP level estimates for crop yield. The approach is being tried on a pilot basis in selected districts of various States throughout the country through Ministry of Agriculture, GIC and NSSO. The Institute has played an important role in suggesting the methodology as well as in the conduct of the pilot study.

- Provided comments/ suggestions on the project entitled 'Modeling of Environmental Contributions of India's Livestock submitted in IASRI, New Delhi by Dr. S.N. Mishra, Chairman, Society for Economic and Social Research, Delhi. The aforesaid Live stock's environmental contribution oriented study seems to be enthusiastic and revolutionary one but it should be supported and demonstrated by the realistic data collection on all the relevant aspects being tackled under the study

EDUCATION AND TRAINING

Degree Courses

The Institute continued to conduct the following degree courses in collaboration with Post Graduate School of Indian Agricultural Research Institute (IARI) which has the status of a Deemed University:

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

Both Ph.D. and M.Sc. students are required to do courses not only in Mathematics and Agricultural Statistics but also in Agricultural Sciences like Genetics, Agronomy, Agricultural Economics, etc.. All courses in Mathematics, Agricultural Statistics and Computer Application, etc. are offered at this Institute while the courses in Agricultural Sciences are offered at the I.A.R.I.

The eligibility qualification for admission to Master's degree in Agricultural Statistics is a Bachelor's degree in Agriculture / Horticulture / Forestry / Agroforestry / Sericulture / Agricultural Marketing OR B.Sc. (10+2+3 system). For admission to Master's degree in Computer Application, the eligibility qualification is a Bachelor's degree in Agriculture / Computer Science / Agricultural Engineering / B.Sc. (Horticulture), Vety Science, Home Science, B.Sc. (Forestry) or B.Sc. with Maths/Statistics/ Physics or B.Sc. (10+2+3 System)

Further for admission to Doctor's degree in Agricultural Statistics the eligibility qualification is a Master's degree in Agricultural Statistics OR statistics OR Mathematical Statistics OR Bio-Statistics of IVRI OR Professional Statisticians' Certificate Course (PSCC) from IASRI

Number of students admitted / Completed various courses during 2000-01 is as follows:

(a) Ph.D. (Agricultural Statistics)

Four students were admitted and four students have completed Ph.D. (Agricultural Statistics).

(b) M.Sc. (Agricultural Statistics)

Five students were admitted and six students have completed M.Sc. (Agricultural Statistics).

(c) M.Sc. (Computer Application)

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

NATIONAL TRAINING PROGRAMME

Senior Certificate Course in Agricultural Statistics and Computing .

The Senior Certificate Course in Agricultural Statistics and Computing was organised for the benefit of research workers engaged in handling statistical data collection, processing, interpretation and employed in research Institutes of the Council, State Agricultural Universites and State Government Departments of Agriculture, Animal Husbandry and Fisheries etc. The main objective of the course was to impart the latest statistical techniques as well use of computers and software packages. The course has been modified from this year and organised during the period July10,2000 to Dec.,29,2000. The course comprises of two independent modules of three months duration each. One participant has attended the module -I and another participant has attended module-II of the course whereas 13 participants including 3 departmental have attended both the modules. 12 participants including 2 departmental were awarded the course certificate after successfully completing both the modules. The course covered under both the modules

included Statistical Methods and Official Agricultural Statistics, Use of Computers in Agricultural Research, Sampling Techniques, Econometrics & Forecasting Techniques, Design of Experiments and Statistical Genetics.The course concluded with a valedictory function on December 29, 2000 during which Sh.D.K.Trehan, Economic & Statistical Advisor, Ministry of Agriculture distributed the certificates to the successful participants.

TRAINING PROGRAMME UNDER REVOLVING FUND PROJECT

18 training programmes were organised for officials of SAUs and ICAR Institutes. The details of these programmes is given under the Division of Computer Application chapter.

TRAINING PROGRAMMES UNDER CENTRE OF ADVANCED STUDIES (CAS)

Sl No	Title	Period	No. of participants
1.	Design and Analysis of Agricultural Experiments	15.9.2000 to 5.10.2000	14
2.	Development of Database and Information System	10.1.2001 to 31.1.2001	20
3.	Recent Advances in the Analysis of Survey Data	06.2.2001 to 26.2.2001	17

OTHER TRAINING PROGRAMMES

Sl. No.	Type of Training	Title	Period	No. of participants
1.	Training programme on PIMS for its immediate implementation at various Centres located in Delhi	Project Data Entry on Computer System and its Management	07.06.2000 to 08.06.2000	20
2.	Training programme sponsored by ICAR, New Delhi	Economic Evaluation of Productivity Improvement and Technical change in Agricultural Sector	24.08.2000 to 02.09.2000	25
3.	Training programme for officials of SAUs, ICAR Institutes and State Govt. Deptts. Of Agriculture/Animal Husbandry & Fisheries	Senior Certificate Course in Agricultural Statistics & Computing	10.07.2000 to 29.12.2000	14

In addition to the above a specialised training programme on 'Official Statistics and Related Methodology' for the 26 participants of International Statistics Education Centre (ISEC), Calcutta sponsored by Central Statistical Organisation, New Delhi was organised in the Institute on Sept. 18, 2000. Twenty Eight students of M.Stat course of Indian Statistical Institute, New Delhi/Calcutta/ Balglore visited this Institute on June 9, 2000 . The students were exposed to the recent developments in statistics and research activities of the Institute including Biometrics, Sample Surveys, Design of Experiments, Crop Forecasting, Econometrics, Computer Application etc.

Training programme for B.Sc. (Agril.) and M.Sc. (Stat.) students of college of Agriculture, Mandya, Karanataka, Annamalai University, Tamil Nadu and Panjab University, Chandigarh were also organised during the year.

NATIONAL TECHNOLOGY DAY

The National Technology day was celebrated on 11th May, 2000. Professor A.Alam, D.D.G. (Engg.), ICAR graced the occasion as the Chief Guest. A debate contest for students held in the afternoon session. The topic of the contest was ' Technology and Human Welfare'. Dr.D.K.Agarwal, Sr.Scientist and Scientist Incharge (TAC) was the convenor.

RESEARCH FELLOWSHIPS

During 2000-01, Nineteen M.Sc. and Eleven Ph.D. students received research fellowship, Thirteen M.Sc. students received Junior Research Fellowship @ Rs.3600/= p.m. each besides Rs.6000/= per annum as contingencies grant. Six M.Sc. students received IARI Junior Scholarship @ Rs.3200/= p.m. each besides Rs.6000/= per annum as contingencies grant. Eleven Ph.D. students received IARI Senior Scholarship @ Rs.4400/= p.m. in addition to Rs.10,000/= per annum as contingencies grant.

FACULTY MEMBERS OF P.G. SCHOOL, IARI IN AGRICULTURAL STATISTICS

1. Dr.A.K.Srivastava, Joint Director
2. Dr.V.K.Sharma, Professor (Agricultural Statistics)
3. Dr.Prajneshu, Principal Scientist
4. Dr.H.V.L.Bathla, Principal Scientist
5. Dr.Randhir Singh, Principal Scientist
6. Dr.Ranjana Agarwal, Principal Scientist
7. Dr.V.T.Prabhakaran, Principal Scientist
8. Dr.V.K.Gupta, H.D.(DE)
9. Dr.B.C.Saxena, Senior Scientist
10. Dr.D.P.Handa, Senior Scientist
11. Dr.V.K.Bhatia, Senior Scientist
12. Mrs.Asha Saxena, Senior Scientist
13. Dr.D.L.Ahuja, Senior Scientist
14. Dr.U.C.Sud, Senior Scientist
15. Dr.Chandrahas, Senior Scientist
16. Sh.S.D.Wahi, Senior Scientist
17. Dr.K.K.Tyagi, Senior Scientist
18. Dr.P.K.Batra, Senior Scientist
19. Dr.P.S.Rana, Senior Scientist
20. Dr.R.Srivastava, Senior Scientist
22. Dr.Jagbir Singh, Senior Scientist
23. Dr.M.S.Narang, Senior Scientist
24. Dr.Aloke Lahiri, Scientist (Sr.Scale)
25. Dr.Anil Rai, Sr.Scientist
26. Dr.Seema Jaggi, Scientist (Sr. Scale)
27. Dr.Rajender Parsad, Scientist(Sr. Sc.)
28. Dr.Lal Mohan Bhar, Scientist
29. Dr. Amrit Kumar Paul, Scientist
30. Dr. Tauqueer Ahmed, Scientist
31. Dr. A.R.Rao, Scientist
32. Dr.Cini Varghese, Scientist
33. Dr.Ramasubramanian V., Scientist
34. Dr.Girish Kumar Jha, Scientist

FACULTY MEMBERS OF P.G. SCHOOL, IARI IN COMPUTER APPLICATION

1. Dr.S.D.Sharma, Director
2. Dr.P.K.Malhotra, H.D.& Professor (Computer Application)
3. Dr. R.C.Goyal, Principal Scientist
4. Sh.Mahesh Kumar, Senior Scientist
5 Dr.I.C.Sethi, Senior Scientist
6. Dr.V.K.Mahajan, Senior Scientist
7. Dr.D.K.Agarwal, Senior Scientist
8. Dr. R.K. Jain , Senior Scientist
8. Sh.Harnam Singh Sikarwar, Scientist. (Sr. Scale)

FACULTY MEMBER OF P.G. SCHOOL, IARI IN AGRICULTURAL ECONOMICS

Dr.R.K.Pandey, Principal Scientist

AWARDS AND RECOGNITIONS

AWARDS

- Dr. Prajneshu received "Best Teacher Award–2000" from Post Graduate School, Indian Agricultural Research Institute, New Delhi for outstanding contribution to teaching and research guidance.

- The paper entitled "A nonlinear statistical model for aphid population growth" by Dr. Prajneshu was adjudged as the "Best Paper" among the papers published in the field of Applied Statistics in the Journal of the Indian Society of Agricultural Statistics during the years 1997 to 1999.`

- Dr. Rajender Parsad, Scientist (SS) received Young Scientist Award for Social Sciences from National Academy of Agricultural Sciences for the years 1999-2000. The award consists of *a citation, a medal and a cheque of Rs. 25,000/-* and will be presented in the inaugural session of the 5th Agricultural Science Congress to be held at Assam Agricultural University, Guwahati during April 4-7, 2001.

- Dr. Rajender Parsad received appreciation letter from Dean, P.G.School, and I.A.R.I. for Excellent Teacher 2000, in the discipline of Agricultural Statistics.

- Dr T Ahmad, Scientist received appreciation letter from Dean, P.G. School, IARI, New Delhi to be one among the excellent teacher in CA discipline in 2000. He also received a letter from Registrar, PG School. IARI, New Delhi mentioning that he has been short-listed by the PG School for consideration for the Best Teacher Award - 2000.

- The paper entitled" *Robustness of Block Designs against Interchange of Treatments*" by Dr. P.K.Batra, Dr. P.R.Sreenath and Dr. Rajender Parsad was adjudged the "Best" among the papers in the field of Design of Experiments published in the Journal of Indian Society of Agricultural Statistics during the years 1997 and 1998

RECOGNITIONS

(a) Membership of Scientific Societies

Indian Society of Agricultural Statistics, New Delhi

Prof SD Sharma
Dr AK Srivastava
Dr RK Pandey
Dr Prajneshu
Dr VK Gupta
Dr HVL Bathla
Dr PK Malhotra
Dr VK Sharma
Dr Randhir Singh
Dr(Smt)Ranjana Agrwal
Dr VK Bhatia
Sh Lal Chand
Sh SD Wahi
Dr SP Bhardwaj
Dr VK Mahajan
Dr Chandrahas,
Dr DL Ahuja
Dr KK Tyagi
Dr UC Sud
Sh RS Khatri
Dr VT Prabhakaran
Sh AS Gupta
Dr Jagbir Singh
Dr DP Handa
Sh. JK Kapoor
Dr R Srivastava
Dr PK Batra
Dr MS Narang
Dr Aloke Lahiri
Dr. GK Jha
Sh JP Goyal
Sh DC Mathur
Smt Rajinder Kaur
Sh SC Mehta
Sh Madan Mohan
Sh Tribhuwan Rai
Sh SC Sethi
Sh Satya Pal
Sh VK Jain
Sh SK Mahajan
Sh GL Khurana
Smt. Ajit Kaur Bhatia
Sh. NK Sharma
Sh Balbir Singh
Dr Rajender Parsad
Dr Seema Jaggi
Dr LM Bhar
Dr AK Paul
Dr AR Rao
Dr Ramasubramanian V
Dr Cini Varghese
Ms Mini KG
Sh VH Gupta
Sh Rajendra Kumar
Sh KK Kher
Sh RM Sood
Dr Anil Rai
Dr Tauqeer Ahmed
Sh AK Gupta
Sh AK Mogha
Sh Parveen Arya
Sh Sanjay Panwar
Sh LM Verma
Dr SMG Saran

Society of Statistics, Computer and Applications, New Delhi

Prof SD Sharma
Dr VK Gupta
Dr VK Sharma
Dr (Mrs) Ranjana Agrawal
Smt Asha Saksena
Dr Aloke Lahiri
Sh MR Vats
Dr Rajender Parsad
Dr Seema Jaggi
Dr Ramasubramanian V
Dr AR Rao
Dr Cini Varghese
Ms Sonali Das
Dr R Srivastava
Dr Anil Kumar
Ms Anshu Dixit

Indian Society of Agricultural Sciences, New Delhi

Dr VK Bhatia
Dr Chandrahas
JK Kapoor
DK Sehgal
Anil Kumar
Sh T Rai
Sh Satya Pal
Sh VK Jain
Sh GL Khurana
Smt. Ajit Kaur Bhatia
Sh HS Sikarwar
Dr Rajender Parsad
Sh Rajendra Kumar
Dr AK Paul
Sh H Ghosh

Indian Science Congress Association, Calcutta

Prof SD Sharma
Dr AK Srivastava
Dr HVL Bathla
Dr PK Malhotra
Dr Randhir Singh
Dr(Smt)Ranjana Agrawal
Dr DK Agarwal
Dr KK Tyagi
Dr BC Saxena
Dr GC Chawla
Dr Rajender Parsad
Dr Seema Jaggi
Dr DL Ahuja
Sh RS Khatri
Sh AS Gupta
Dr Jagbir Singh
Dr MS Narang
Sh JP Goyal
Sh DC Mathur
Sh SC Agarwal

Sh Bhagwan Das
Sh RC Gola
Sh Satya Pal
Sh VK Jain
Sh SC Sethi
Sh RM Sood
Sh AK Gupta
Dr T Ahmad
Dr GK Jha
Sh AK Mogha
Dr VK Gupta
Dr VK Sharma
Dr DP Handa
Dr R Srivastava
Dr PK Batra
JK Kapoor
Aloke Lahiri
Rajinder kaur
GL Khurana
MR Vats
DK Mehta
DK Sehgal
Ajit Kaur
NK Sharma
Cini Varghest
Rajendra Kumar
Anil Kumar
Dr VK Bhatia
Dr PS Rana
Sh Indra Singh
Dr AK Paul
Dr AR Rao
Sh H Ghosh
Smt Asha Saksena
SS Walia
SC Mehta
Dr Ramasubramanian V
Dr RC Goyal
Dr IC Sethi
Sh. Mahesh Kumar
Dr VK Mahajan
Sh KC Gupta
Sh RK Jain
Dr Anil Rai
Sh OP Khanduri
Sh. Balbir Singh
Sh HO Agarwal
Sh HS Sikarwar
Ms Alka Arora
Ms Sonali Das
Sh VH Gupta
Ms Sashi Narwal
Sh MS Farooqui
Sh Pal Singh
Sh Sudeep
Ms Sangeeta Ahuja
Sh Saurabh Prakash
Sh KK Chaturvedi
Sh VK.Dubey
Ms Anshu Dixit
Sh S Islam

Institute of Applied Statistics and Development Studies, Lucknow

Dr. AK Srivastava

Indian Dairy Association (IDA)

Sh RS Khatri

Indian Society of Agricultural Economics, Bombay

Mrs Sushila Kaul

Indian Society of Agricultural Marketing, Nagpur

Dr RK Pandey
Mrs Sushila Kaul

Computer Society of India, , Bombay

Prof SD Sharma
Dr PK Malhotra
Sh Mahesh Kumar
Dr RC Goyal
Dr VK Mahajan

Indian Statistical Association, Pune

Dr VK Gupta
Dr GC Chawla

Indian Econometric Society, New Delhi

Dr VK Sharma

Indian Society for Medical Statistics, New Delhi

Dr Jagbir Singh

Society of Mathematical Sciences, Delhi

Dr Prajneshu

Farming System Research and Development Association , Modipuram , Meerut

Smt Rajinder Kaur
Smt Ajit Kaur Bhatia
Dr PK Batra
Dr NK Sharma
Dr Anil Kumar

Indian Society of Genetics and Plant Breeding

Dr VT Prabhakaran
Dr AR Rao

Andaman Science Association

Dr Anil Kumar

Indian Society of Agroforestry

Dr DP Handa

Soil conservation Society of India

Dr DP Handa

(b) Offices in Professional Societies

Indian Society of Agricultural Statistics, New Delhi	
Prof. SD Sharma	Secretary, Executive Council, Member, Editorial Board
Dr AK Srivastava	Joint Secretary, Executive Council, Member, Editorial Board
Dr HVL Bathla	Member, Executive Council
Dr VK Gupta	Member, Executive Council, Member, Editorial Board
Dr Prajneshu	Member, Editorial Board
Dr PK Malhotra	Member, Executive Council, Member, Editorial Board
Dr VK Sharma	Member, Executive Council
Dr VK Bhatia	Joint Secretary, Executive Council, Member, Editorial Board
Dr Randhir Singh	Member, Editorial Board
Sh RS Khatri	Joint Secretary, Executive Council, Member, Editorial Board
Society of Statistics, Computer and Applications, New Delhi	
Prof SD Sharma	(i) Vice President (ii) Member of the Executive Council
Dr VK Gupta	(i) Managing Editor (ii) Member of the Executive Council.
Dr Aloke Lahiri	Joint Secretary
Indian Society of Agricultural Marketing, Nagpur	
Dr RK Pandey	Vice President
Aligarh Journal of Statistics	
Dr BC Saxena	Executive member of Editorial Board
Farming Systems Research and Development Association	
Sh Anil Kumar	Joint Secretary of Executive Council
Indian Scoeity of Agricultural Science	
Dr Rajender Parsad	Member, Editorial Board, Basic Sciences for Annals of Agricultural Research
CCS University, Meerut, UP	
Sh Anil Kumar	External Examiner
Brassica News, Mustard Research and Promotion Consotium (PRPC), New Delhi	
Dr Seema Jaggi	Member, Editorial Board
Indian Society of Genetics and Plant Breeding	
Dr VT Prabhakaran	Member, Editorial

(C) Membership/Offices in Committees/Panels/Working Groups

Dr SD Sharma	i)	Chairman of the Rajbhasha Implementation Committee of the Institute.
	ii)	Chairman of the meetings of the Grievance Committee of the Institute.
	iii)	Chairman of the Senior Officers Meetings of the Institute.
	iv)	Chairman of the Institute Joint Staff Council.
	v)	Chairman of the Institute Staff Research Council meetings.
	vi)	Chairman of the meetings of the Institute Management Committee.
	vii)	Chairman of the meeting of the Library Advisory Committee of the Institute.
	viii)	Chairman of the General Body meetings of the IASRI Co-operative Thrift and Credit Society.
	ix)	Chairman of General Body meetings of the ICAR (IASRI) Co-operative Store.
Dr AK Srivastava	i)	Chairman of working group of Experts for reviewing Agricultural Census Operations in the country and for Planning of Agricultural Census 2000-2001.
	ii)	Member of the sub-group to review the improvement of crop statistics (ICS) programme with reference to survey design, constituted by National Statistical Commission
	iii)	Member of the Programme Advisory Committee (PAC), National Science and Technology Management Information System (NSTMIS) Scheme constituted by Department of Science and Technology, New Delhi.
	iv)	Member of the committee to review the contents of the compendium of Environmental Statistics being brought out by Central Statistical Organisation.
	v)	Member of the Expert Consultation group on Global Resource Survey constituted by Forest Survey of India (FSI).
	vi)	Member (alternate) of the Management and Productivity Sectional Committee MSD 3 and 4, Bureau of Indian Standards.
	vii)	Member of the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics.
	viii)	Member of Technical Advisory Committee, Education Surveys, NCERT.
	ix)	Member of Technical Advisory Committee on Sample Surveys of Registered Small Scale Industries (SSI) Units constituted by Ministry of Industries.
	x)	Member of a sub-group for improvement of agricultural statistics constituted by NSSO. In this sub group feasibility of Remote Sensing Applications in conjunction with Improvement of Crop Estimation Scheme (ICS) is being examined.
Dr VK Gupta	i)	Chairman of contributed paper session on Design of Experiments of 54th Conference of Indian Society of Agricultural Statistics
	ii)	Convenor for one session on `Design of Experiments of International Conference on Recent Developments inStatistics and Probability and their Applications held at India International Centre

Dr PK Malhotra	i)	Coordinator of the Subject Matter Committee of Statistical Sciences set up by ICAR for revision of PG courses and other related issues
	ii)	Member Secretary of the Core Committee for modification of syllabus in the discipline of Computer Applications for ARS Examination set up by ASRB
	iii)	Member Core Committee for Registration and Computerisation of the 88th Session of Indian Science Congress held at IARI, New Delhi
	iv)	Chairman of the Website Development and updalting committee for the 88th Session of Indian Science Congress held at IARI, New Delhi
Dr HVL Bathla	i)	Member-Secretary, Research Advisory Committee of the Institute
	ii)	Course Director of the training programme on `Recent Advances in the Analysis of Survey Data' organised in the Division during Feb 06-26, 2000
	iii)	Nominated by the Expert Committee of specifications of imported fertilisers as member of the committee to review the existing methodology of drawal of samples from urea vessels at ports and suggest improvements
	iv)	Special Invitee, Consultancy Processing Cell
	v)	Nominated as member of Indigenous Technical Knowledge Information Committee in connection with NATP mission mode
Dr Randhir Singh	i)	Member of `Committee of experts to examine the use of remote sensing technology in detection of spread of diseases on crops including cotton' constituted by Ministry of Agriculture and Cooperation, Govt. of India
	ii)	Advisor for Personality test Board of ISS Examination of 1999 of UPSC during Aug 01-03, 20001
	iii)	Examiner for M.Sc./Ph.D. thesis and examinations from the following universities, University of Rajasthan, Jaipur, Meerut University, Meerut and HAU Hissar
Dr VK Sharma	i)	Local Secretary of the Statistics Section of 88th Annual Conference of the Indian Science Congress
	ii)	Member of the Executive Council of the PG School of IARI and also member of the Standing Committee on Faculty and Discipline
Dr VK Bhatia	i)	Convenor of a symposium on `Advances in Statistical Methods for Animal and Plant Genetic Improvement Programme' during the conference of IISA 2000-2001 India JSM at New Delhi from Dec 30 to Jan 02, 2001
	ii)	Chairman, the symposium on `Advances in Statistical Methods for Animal and Plant Genetic Improvement Programme' held during the conference of IISA 2000 held at New Delhi from Dec 30 to Jan 02, 2001
	iii)	Chairman, the fourth meeting of Food Analysis and Nutrition Sectional Committee, FAD 58 to Mar 15, 2001 at Bureau of India Standards, New Delhi
Dr DK Agarwal	i)	Member Secretary, SRC
	ii)	Nodal Officer of IPR
	iii)	Nodal Officer regarding the study on deployment of research resources to be carried out by Dr DN Jha, National Professor
	iv)	Member, Consultancy Processing Cell

	v)	Member Secretary, Senior Officers Meeting
	vi)	Member Secetrary, Placement Cell constituted at the Institute
	vii)	Cenvenor of Declamation Contests of the Annual Day Function
	viii)	Incharge, Project Management and Evaluation Cell
Dr BC Saxena		Secretary, Seminar Association of the Institute
Dr KK Tyagi	i)	Associate Course Director of the training programme on `Recent Advances in the Analysis of Survey Data' organised in the Division during Feb 06-26, 2001
	ii)	Member `Central Examination Committee' at the Institute
	iii)	Member, Works & Maintenance Committee of the Institute
		Vice-President, IASRI Recreation & Welfare Club
	iv)	Member, lnstitute Sports Committee
	v)	
Sh Mahesh Kumar		Member of Subject Matter Committee Aof Statistical Science set up by ICAR for revision of PG Courses and other related issues
Sh KC Gupta		Member, Sampadak mandal, Sansthan Raajbhasha Karyanvayan Samiti
Dr Rajender Parsad		Convenor for two sessions on `Design of Experiments of International Conference on Recent Developments in Statistics and Probability and their Applications held at India International Centre

LINKAGES AND COLLABORATION IN INDIA AND ABROAD INCLUDING EXTERNALLY FUNDED PROJECTS

Sl. No.	Title	Collaborative Agency	Start	Completion
1.	Sample survey to evolve methodology for estimation of fish catch from rivers and streams especially of the hilly areas.	Department of Fisheries, Himachal Pradesh	01.11.1997	30.06.2000
2.	Pilot sample survey for estimating the area and yield rates of ginger and potato in hilly areas.	Directorate of Economics & Statistics, Meghalaya, Shillong.	01.01.1997	30.06.2000
3.	Study of land use statistics through integrated modelling using geographic information system. (A.P. Cess Fund)	AIS & LUS, Ministry of Agriculture	01.09.1999	31.08.2002
4.	Sampling procedure for selection of representative samples of fertiliser from ships. (A.P. Cess Fund)	Central Fertiliser Quality Control & Training Institute, Faridabad	01.05.2000	30.04.2000
5.	A study relating to formulating long term machanisation strategy for each agro-climatic zone/State (Funded from Department of Agriculture and Cooperation, Ministry of Agriculture)	Department of Agriculture and Cooperation, Ministry of Agriculture	01.07.2000	30.06.2003
6.	A pilot study on cost of production of Coconut in Kerala. (Funded from Coconut Development Board, Kochi, Kerala)	Central Plantation Crops Research Institute, Kasaragod (Kerala)	01.08.2000	31.07.2002
7.	Assessment of harvest and post-harvest losses. (To be funded under NATP Mission Mode Programme).		01.04.2001	31.12.2003
8.	Integrated National Agricultural Resources Information System (NATP project)		01.04.2001	31.12.2003
9.	Estimation of wool production - emerging data needs and a methodological reappraisal. (A.P. Cess Fund)	CSWRI, Avikanagar (Rajasthan)	Approved	
10.	Crop yield estimation of smaller area level using farmers' estimates (A small study taken in district Karnal).	Department of Agriculture, Haryana		
11.	Designs for fitting response surfaces in Agricultural Experiments. (A.P.Cess Fund)		01.02.1999	31.05.2001
12.	Planning, designing and statistical analysis of data relating to experiments conducted under AICRP on Long-Term Fertilizer Experiments	Project Coordinator (LTFE) and State Agricultural Universities	April, 1997	Continuing
13.	Planning, designing and analysis of on-farm research experiments planned under the PDCSR	Directorate of Cropping Systems Research, Modipuram, Meerut	April, 1997	Continuing

Sl. No.	Title	Collaborative Agency	Start	Completion
14.	Planning, designing and analysis of experiments planned on stations under the PDCSR	Directorate of Cropping Systems Research, Modipuram, Meerut	April, 1997	Continuing
15.	Planning, designing and analysis of experiments relating to AICRP on Soil test crop response correlation	Project Coordinator (STCR), Indian Institute of Soil Science (ICAR), Bhopal	March, 2000	Feb., 2003
16.	Design and analysis of Agroforestry Experiments	IGFRI, Jhansi	March, 2000	Feb., 2002
17.	Fertilizer response ratio for different crops in India	Sponsored by Ministry of Agriculture	June, 2000	Feb., 2002
18.	Evaluation of Fatigue score card for animals (AICRP on increased utilization of Animal Energy with enhanced system efficiency)	K.V.K., Rawari		
19.	Development of Statistical procedures for selecting genotypes simultaneously for yield and stability.	I.A.R.I., New Delhi	01.04.2000	31.03.2003
20.	Pilot study on forecasting of brood-lac yield from Butea, Monosperma (palas).	I.L.R.I, Ranchi,	16.08.1999	15.08.2002
21.	Development of forewarning system for aphids, myzus persicae (sulzer) on potato.	NCIPM, New Delhi & AICPIP, Shimla	May, 1996	April, 2000
22.	Forecasting the loss in yield due to weeds.	IARI, New Delhi	May, 1999	Oct., 2002
23.	Forecasting of fish production from ponds.	CIFA, Bhubaneshwar	Aug., 1999	July, 2002
24.	Studies on bioecology and population dynamics of major pests of mango (hoppers, fruitfly, leaf webber and inflorescence midge) and guava (fruit borer).	CISH, Lucknow	Oct., 1999	March, 2004
25.	Epidemiology and forecasting of powdery mildew and anthracnose.	CISH, Lucknow	Oct., 1999	March, 2004
26.	To develop model of forewarning about infestation of insects for paddy crop.	N. D. Univ. of Agri. & Tech., Kumarganj, Faizabad	1.11.1999	Oct., 2002
27.	NATP project on Institutionalization of Research Priority Setting, Monitoring and Evaluation and Networking of Social Scientists	i) Dte. of Maize Res., IARI, New Delhi ii) NCAP, New Delhi iii) CAZRI, Jodhpur iv) NAARM, Hyderabad v) CSWCR &TI, Dehradun vi) CRIDA, Hyderabad vii) Indian Institute of Pulses Research, Kanpur (U.P.) viii) NRC on Mithun, Medziphema, Nagaland	June, 1999	Nov., 2002

Sl. No.	Title	Collaborative Agency	Start	Completion
		ix) NRC on Oil Palm, Eluru Pedavegi-534003 (A.P.) x) CICR, Nagpur-440010 xi) PDCSR, Modipuram, Meerut-250110 (U.P.) xii) Facilitator (cotton based), PAU, Ludhiana – 141004 (Punjab) xiii) Indian Institute of Sugarcane Research, Lucknow- 226002 (U.P.) xiv) Central Institute far Brackish Water Aquaculture (CIBA), 101, Mahalingapuram, main road, Chennai- 600034 xv) Central Rice Research Institute (CRRI), Cuttack – 753006 (Orissa) xvi) Directorate of Oilseed Research, Hyderabad – 500030 (A.P.)		
28.	NATP Project on 'Development of Pesticide Residue Free IPM Package for some Major Vegetables'	Division of Agri. Chemistry, IARI, New Delhi	August, 1999	Nov., 2003
29.	NATP Project on, 'Expert System in Extension'	IARI, New Delhi		
30	The Development of NISAGENET	All SAUs		
31.	Project Management Information System Development and GIS	CIMMYT, Mexico		
32.	Development of PIMS	IAC, Wageningen, The Netherlands		

(a) National Institutes and Agricultural Universities

The Division has collaborated with CAZRI, Jodhpur and provided consultancy and a Personnel Information System for CAZRI, Jodhpur was developed.

(b) Extension and Development Agencies

Directorate of Extension, Govt. of India, New Delhi.

RESEARCH COORDINATION AND MANAGEMENT UNIT

Research Coordination and Management Unit (RCMU) is responsible for documentation and dissemination of scientific output of the Institute through IASRI News and Annual Report etc. It also organises National Conferences of Agricultural Research Statisticians once in three years and conducts meetings of Heads of Divisions and Principal Scientists of the Institute from time to time. The Unit also assists the QRT and is responsible for correspondence with ICAR, ICAR Institutes, SAUs and other organisations in India and abroad. The other functions of the unit are: to examine the new Research Project proposals before these are considered by the SRC in respect of importance of problems, its design and final requirements; to monitor the progress of on-going research projects and to bring out half yearly monitoring progress reports; to prepare Annual Action Plan, Activity Milestone, EFC Memo, to maintain the Research Project Files and also their submission to ARIC (ICAR). The Unit also provides help in Art, Photography & Reprographic Services.

The following activities were undertaken by the Unit during the year under report:

Publications:

- Annual Report of the Institute for the year 1999-2000
  Complied & edited by AK Srivastava, DK Agarwal, PP Singh and J Srinivasan
- IASRI News, Vol. 4, No.4, Jan.–Mar., 2000
  Complied & edited by AK Srivastava, DK Agarwal, PP Singh, J Srinivasan, Som Dutt and OP Singh
- IASRI News, Vol. 5, No. 1, Apr.–Jun., 2000
  Complied & edited by AK Srivastava, DK Agarwal, PP Singh, J Srinivasan, Som Dutt and OP Singh
- IASRI News, Vol. 5, No. 2, Jul.– Sep., 2000
  Complied & edited by AK Srivastava, DK Agarwal, PP Singh, J Srinivasan, Som Dutt and OP Singh
- IASRI News, Vol. 5, No.3, Oct.– Dec., 2000
  Complied & edited by AK Srivastava, DK Agarwal, PP Singh, J Srinivasan, Som Dutt and OP Singh
- Discussion Papers & Proceedings of XII National Conference of Agricultural Research Statisticians held at RCA, Udaipur (Rajasthan) during Aug. 08-10, 1998
  Complied & edited by HVL Bathla, PP Singh and J Srinivasan

Monitoring Progess Report :

Summary of progress of on-going research projects

Operative period ending 31st March, 2000.
Complied & edited by A.K. Srivastava, D.K. Agarwal, Mohan Lal, Anil Garg and Anil Kumar

Operative period ending 30th September, 2000
Complied & edited by A.K. Srivastava, D.K. Agarwal, Mohan Lal, Anil Garg and Anil Kumar

Communication of Research Material to:

i) ICAR

- Material for preparation of DARE-ICAR Annual Report for the year 2000-2001
- Reply of audit para regarding the Quinquennial Review Team (QRT) of the Institute
- Reply of audit memo regarding the research project of the Institute.
- Follow-up action taken report of the proceedings of the Directors' Conference held at NBPGR, New Delhi on October 12-13, 2000.
- Action taken report on the proceedings of the meeting of Directors of ICAR Institutes held on Oct 12-13, 2000.

- Reply to Parliament Question on Agro Information Technology.
- Information about compilation of the list of video films available with ICAR Institutes.
- The salient achievement report of 1999-2000 for onward transmission to CSC Division for preparation of speeches of Hon'ble Minister (Agri.) and DG, ICAR for AGM of the Society of the Council.
- Impact of deputation/collaboration on the quality of research programmes of the Institute.
- Information on deputation to international organisation/institution abroad under MOU.
- Material for Industry Interface on Agricultural Research
- Review of Annual Report 1999-2000 of Research Institute for giving the Trophy to the Best Annual Report.
- List of Panel of referees for the publications both in English and Hindi brought by DIPA.
- Monthly progress report on President's Address to Parliament sent every month to ADG (ESM), ICAR.
- Preparing the Zero Based Budgeting as per the guidelines of the Council.
- Information of the different research projects files (RPFs I, II, III) of various division of the Institute is properly maintained so as to extract the requisite information need to ARIC/ICAR Bhavan and when required.
- Information regarding progress report for Annual work plan was prepared.
- Preparing the mid-term appraisal for IX Plan scheme as per the guidelines of the Council.
- Reply pertaining to various audit para on various research projects in the Institute.
- Preparing the project based budgeting as per the guideline of the Council.
- Preparing the achievement of IX Plan and proposal prepared for X Plan thrust areas as per the guidelines of the Council.

iii) Other Organizations in India

Department of Science & Technology, Ministry of Science and Technology, New Delhi

- Questionnaire on National Survey on resources devoted to scientific and technological (S&T) activities, 1998-99 edition

Ministry of Statistics and Programme Implementation, New Delhi

- Information on constitution of Search Committee for recommending suitable names to advisory Committee for giving National Awards in the field of statistics.
- Information for bringing out a publication 'List of Statistical Publication'.

Central Statistical Organisation, New Delhi

- Information about the publication of Statistical System in India

National Institute of Rural Development, Hyderabad

- Questionnaire on data base on rural development institution in India

National Statistical Commission, New Delhi

- Write-up on role of IASRI in strengthening the Statistical Systems for Agricultural Sub-Group of the National Statistical Committee.

Indian Institute of Statistical Research (IISR), Lucknow

- Action taken report on the recommendations of XV meeting of ICAR Regional Committee No. IV held at IISR, Lucknow during December 1998 and Status Report.

India Meteorological Department, Pune

- Questionnaire on status related to commercialization

iii) Abroad

- Information for directory of agricultural periodicals of SARRC Countries to SAARC Agricultural Information Centre (SAIC), Bangaladesh.

- Information for International Research Centres Directory to the Gale Group Michigan, USA

Meetings organisation

- Unit organises eleven meetings of Head of Divisions and Senior Officers (SOM) of the Institute to discuss various items related to research, training, education, general matters etc. on May 06, May 19, July 13, August 11, October 17, October 20, November 07, December 07, 2000, Jan 16, 2001, February 12 and March 07, 2001.
- Proceedings of all the HDs/Senior Officers' meeting were prepared and distributed to all concerned.

Research Advisory Committee (RAC)

- Agenda items for the fifth RAC meeting were prepared & supplied to all Members of the Committee.
- Fifth Research Advisory Committee (RAC) meeting of the Institute was organised on Aug 22, 2000 under the Chairmanship of Sh VR Rao, Former Director General, CSO, New Delhi
- Proceedings were prepared and its distribution
- Other miscellaneous correspondence related to RAC were undertaken.

Staff Research Council (SRC)

- Two meetings of the Staff Research Council (SRC) were held during August 04-05, 2000 and January 30-31, 2001
- As per the guidelines of SRC the new research project proposals were sent to the outside experts. The documents alongwith the comments of outside experts were prepared for their approval by the Chairman of the Staff Research Council (SRC) meetings.

National Conference of Agricultural Research Statisticians

- Proposal sent to PAU, Ludhiana (Punjab) for hosting the XIII National Conference of Agricultural Research Statisticians during Nov. 6-8, 2001.
- Discussion Papers & Proceedings of the XII NCARS held at RCA, Udaipur (Rajasthan) were sent to various Institutions/Organisations.
- Major recommendations made during the XII NCARS held at RCA, Udaipur (Raj.) were sent to various Institutions/Organisations for taking necessary action.
- First invitation letter for participating in the XIII National Conference of Agricultural Research Statisticians to be held at PAU, Ludhiana (Punjab) during November 6-8, 2001.

Consultancy Processing Cell

- One meeting of Consultancy Processing Cell was organised at the Institute on Sep 06, 2000 and proceedings was prepared and distributed

88th Session of Indian Science Congress – 2001 at IARI

- Various mailing list were prepared and supplied to the In-charge of the office of Indian Science Congress.
- Participate and registering the participants of the Conference at the venue of IARI.

In addition to the above, the following items were also undertaken:

- Supplying the information about training programmes/research activities received from ICAR and various organisations from time to time among the HDs and Principal Scientists of the Institute
- For finalising the IX Plan EFC Memo of the Institute on various stages
- Information on introduction of Zero Base Budgeting in DARE/ICAR w.e.f. 2000-2001
- Revised proposal on one time catch-up grant of the Institute
- Proposals for deputation of scientists of the Institute for various conferences
- Information for preparation of Organisational Chart of the Institute for displaying in the Committee Room and Exhibition room for 88th Session of Indian Science Congress.

Art, Photography and Reprography

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 of important research and extension activities of the Institute and some slides were prepared. 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.

On Gestetner Copy Printer 5327 machine installed at the unit lab about 3.2 lakh copies of 4743 pages for 261 jobs were multicopied and supplied to various users of the Institute.

GENERAL / MISCELLANEOUS

LIST OF PUBLICATIONS

(a) Papers Published

1. BAJPAI, PK and PRABHAKARAN, VT (2000). A new procedure for simultaneous selection for high yielding and stable crop genotypes. *Ind .J.Genet., 60(2),141-152.*
2. BATRA PK,;PARSAD, RAJENDER, GUPTA, VK and KHANDURI, OP (1999). An alternate strategy for design and analysis of experiments involving split application of fertilizer. *Statistics and Applications, 1(2), 175 – 187.*
3. BHATIA, AK and KAUR, RAJINDER (1998). Statistical assessment of rice based Cropping Sequences. *Journal of Farming Systems Research and Development, Vol. 3 & 4, 36-41.*
4. BHATIA, DK; ARYA, SN; GUPTA, HC and MATHUR, DC (2001). Small area estimation of buffaloe milk production. *Haryana Economic Journal, Karnal, Vol XXI (1-2), pp 110-113.*
5. DAS, SONALI and MINI, KG (1999). Artificial neural networks for prediction in agriculture. Proceedings of 5th International Conference on Cognitive systems. "Cognitive Systems Reviews and Previews", *Phoenix Publishing House, New Delhi, 278-285.*
6. DEY, DEBJANI and DAS, SONALI (2000). Management of the National Pusa Insect Collection Information Using RDBMS with Special Emphasis on Order . *Hymenoptera. Shashpa. 8(1), 23 – 28.*
7. GUPTA, AS; SAXENA, BC and SOOD, RM (2000). Impact of command area on productivity. *Agricultural Situation in India, LVI(10):615-617.*
8. GUPTA, HC; SINGH, JAGBIR and KATHURIA, OP (2000). Methodological investigation on Post Harvest Losses. *Journal of the Indian Society of Agricultural Statistics, 53(2): 161-171.*
9. KAUR, RAJINDER and BHATIA, AK (1998). Crop residue management in rice based cropping systems. *Journal of Farming Systems Research and Development, Vol. 3 & 4 (1&2), 32-35*
10. KHATRI, RS and GOYAL, JP (1999). Estimation of wool production- some problems and prospects, *Journal of Indian Small Ruminant, 5(2): 78-81.*
11. KHURANA , GL; KUMAR, RAJENDRA and GARG, RN(*1998*) Analysis of Means method for exploiting interactions of Agronomic Factors at Reduced levels . *New Botanist, Vol XXV :11 – 19.*
12. KHURANA , GL; KUMAR, RAJENDRA and GARG, RN (*(1998*) Interactions of Environment Vs. Package of Agronomic Factors in Jowar – wheat sequence and their testing procedures. *New Botanist Vol XXV) : 21-28.*
13. KUMAR, RAJENDRA; SREENATH PR and JAIN, SP (2001) . Effect of coefficient of varation on the heterogeneity of error variance in Agricultural Field Experiment. *Journal of Annals of Agricultural Research. Vol 22(1) .*
14. KUMAR, RAJENDRA and KAPOOR, JK (2001). Study of response surface for cultural cum manurial agricultural field experiments *Journal of Annals of Agricultural Research, Vol 22 (2)*
15. LAL, KRISHAN; GUPTA, VK and BHAR, LAL MOHAN (2001). Robustness of designs against missing data. *Journal of Applied Statistics, 28(1), 63 – 79.*
16. MEHTA, SC, AGRAWAL, RANJANA and SINGH, VPN (2000). Strategies for composite forecast. *Journal of the Indian Society of Agricultural Statistics , New Delhi, Vol. No. 53, No. 3.*
17. NARAIN, P.; SHARMA, S.D., RAI, S.C. and BHATIA, V.K. (2000). Regional disparities in socio-economic developments in Tamil Nadu. *Journal of the Indian Society of Agricultural Statistics*, 53(1), 35-46.

18. PARSAD, RAJENDER; SREENATH, PR and AGARWAL, NITI (1999). Construction of balanced bipartite block designs with nested rows and columns. *Calcutta Statistical Association Bulletin, 49(195-196), 177 – 185.*
19. PAUL, AMRIT KUMAR and BHATIA, VK (2000). Empirical comparison of different methods of estimation of heritability of stayability in dairy cattle. *Journal of the Indian Society of Agricultural Statistics*, 53(2), 196-206.
20. PAUL, AMRIT KUMAR and BHATIA, VK (2000). Heritability of stayability by path coefficient approach when herdlife is influenced by unrelated auxiliary characters. *Sankhya*, Series B, 62(3), 463-471.
21. PRAJNESHU and DAS, PK (2000). Growth models for describing statewise wheat productivity. *Journal of the Indian Society of Agricultural Statistics*, 34, 179-81.
22. RAI ANIL, MISHRA PRACHI and SINGH RANDHIR (2000) GIS based spatial sampling techniques in agricultural surveys. *Proceeding of an International Conference on Recent Developments in Statistics and Probability and their Applications. Dec;30 2000 to Jan 2, 2001, 381 - 384.*
23. RAI, ANIL, RAI, T, LAL, MOHAN AND GARG, R.N, (1998). An evaluation of the performance of high yielding varieties of rice in Haryana state. *JNKVV Res J:32(1&2) 8-11.*
24. RAI, ANIL, SINGH, M and PATHAK G.M.(2000). A study of Agroforestry in Chhachhroli block of Yamuna nagar district of Haryana *Journal Annals of Agricultural Research 21(1): 17-22.*
25. RAI, ANIL, SRIVASTAVA, AK and GUPTA, HC (2001) Small sample comparison of Modified Chi-square test statistics for survey data. *Biom. J., 43 (2), 47-59.*
26. RAIGER, HL AND PRABHAKARAN, VT (2000). A statistical comparison between non-parametric and parametric stability measures. *Ind.J.Genet*., 60(4), 417-432.
27. RANA, PS and SINGH, I. (2000). Premium rates estimation using nonparametric density approach in crop insurance in India. *Afro-Asian J.Rural Development*., 33(2), 91-102.
28. RAO, AR and PRABHAKARAN, VT (2000). On some useful interrelationships among common stability parameters. *Ind.J.Genet*., 60(1), 25-36.
29. RUSTOGI, RL AND AGARWAL, SC (2000). Cost of rearing and maintenance of goat in rural areas of Mathura district (U.P.), *Jr. of Animal Research, 34(1): 18-23*
30. SAKSENA, ASHA, KAUR, AJIT and SIKARWAR, HS (2001). A study of behaviour of wheat response to long-term fertilizer application" *Annals of Agri. Res. , Vol. 22(1), March 2001.*
31. SAKSENA, ASHA; BHATIA, AJIT KAUR and SIKARWAR HARNAM SINGH (2001). Study of behaviour of wheat response to long term fertilizer application. *Annals of Agricultural Research. MS 2622; Vol. 22(1)*
32. SARADA, C. and PRAJNESHU (2000). Lagrangian-Poisson distribution for describing spatial spread of aphids. *J.Aphidol*., 14, 33-40.
33. SAXENA, BC; TYAGI, KK and BINDAL, VIJAY. (2000). Techniques for determination of intake by bovines through grazing. *Indian Journal of Animal Science, 70(11): 1105-1107.*
34. SHARMA, BS, PRABHAKARAN, VT and PIRCHNER, F. (2000). Gene action and heterosis in lifetime traits. *J.Ani.Breed.Genet*., 117, 319-330.
35. SHARMA,YK.; SINGH, RANDHIR; RAI ANIL and VERMA, SS (2000) Regression estimates from survey data for small sample sizes. *Journal of the Indian Society of Agricultural Statistics.. 53(2),115-124.*
36. SINGH, RANDHIR; RAI, ANIL and CHHIKARA, RS (2000). Use of Remote Sensing satellite data for crop yield estimation. *Proceeding of an International Conference on Recent Developments in Statistics and Probability and their applications, Dec 30, 2000 to Jan 2, 2001, 448 - 451.*
37. SINGH, RANDHIR and SHARMA, YK (2000): Regression estimators from survey data for small sample sizes. *Journal of the Indian Society of Agricultural Statistics, pp 115-124.*

38. SRIVASTAVA, R.; PARSAD, RAJENDER and GUPTA, VK(2000). Structure Resistant Factorial Designs. *Sankhya B, 62 (2),257-265.*
39. SUD, UC and SRIVASTAVA, AK (2000). Estimation of population mean in repeat surveys in the presence of measurement errors. *Journal of the Indian Society of Agricultural Statistics, 53(2).*
40. VARGHESE CINI; VIJAYA B and SHARMA, VK (2000). Crossover designs for comparison of two treatments in presence of residual effects. *Indian J. Anim. Sci.* 70(8), 862-65.
41. VARGHESE, CINI, and SHARMA, VK (2000). On totally balanced change-over designs. *Journal of the Indian Society of Agricultural Statistics, 53(2), 141-150.*
42. VENUGOPALAN, R. and PRAJNESHU (2000). Pella-Tomlinson nonlinear statistical model with autocorrelated errors. *Journal of the Indian Society of Agricultural Statistics*, **53**, 12-19.

Research papers accepted for publication

1. GUPTA, AS; and SAXENA, BC. Vital demographic parameters in sheep and goats. *Indian Veterinery Journal.*
2. GUPTA, VK ; RAMMANA, DVV and PARSAD, RAJENDER. Weighted A-optimal block designs for comparing test treatments with controls with unequal precision. *Journal of Statistical Planning and Inference* . (Special issue in the memory of Professor YAMAMOTO)
3. KAUR, RAJINDER and BHATIA, AK. Performance of oilseed crops in comparison to other crops in different crop sequences. *Brassica News.*
4. KHURANA, GL ; KUMAR, RAJENDRA and GARG, RN. Identification of agronomic factors for higher grain productivity . *New Botanist, Vol. XXVI.*
5. KHURANA, GL; KUMAR, RAJENDRA and GARG, RN. Testing of Adaptability of complex designs in C.S.R. experiments. *New Botanist Vol. XXVI.*
6. KUMAR, MUKESH ; SINGH, P.V. and KUMAR, ANIL Flowering and bulb production of Tuberose (Polianthes Tuberosa) . *Jounral of Farming systems Research and Development*
7. KUMAR, MUKESH ; SINGH, P.V. and KUMAR, ANIL. Effect of spacing, levels of nitrogen and GA III on growth and yield of Tubedrose (Polianthes Tuberosa) . *Journal of Farming Systems Research and Development . 6(1 & 2)*
8. PARSAD, RAJENDER and GUPTA, VK. Balanced Bipartite Row – column Designs Ass. combinatorial .
9. PRAJNESHU AND RAVICHANDRAN, S. (2001)- Use of expected-value parameters for estimating length-weight relationship in fishes. *To appear in Ind.J.Fish.*, 48.
10. RAO, AR and PRABHAKARAN, VT (2001). A bootstrap method of estimating heritability from varietal trial data. *To appear in Ind. J. Genet.*, 61(2).
11. RAVICHANDRAN, S. and PRAJNESHU (2001). Dynamical time-series modelling for describing fish production. *To appear in Ind.J.Ani.Sci.*, 71
12. RAVICHANDRAN, S. and PRAJNESHU (2001) - State space modelling versus ARIMA time-series modelling. To appear in *Journal of the Indian Society of Agricultural Statistics .*
13. SARKER, S. and RANA, P.S. (2001). On mathematical formulation of lactation curves. *To appear in Ind.J. Ani.Sci.*
14. SINGH, JAGBIR and BATHLA, HVL. Estimation of food grain losses and seasonal fluctuation. *Agricultural Situation in India.*
15. SINGH, R, SEMWAL, DP, RAI, A. and CHHIKARA, RS (2000) Small area estimation of crop yield using remote sensing satellite data, *Int. J. Remote Sensing. (Accepted).*
16. SINGH, RANDHIR. Small area estimation of crop yield using remote

sensing satellite data. *International Journal of Remote Sensing.*

17. SRIVASTAVA, AK and JHA, GK. Some Methodological Issues in Agricultural Surveys. *Jr. of Income & Wealth.*
18. SUD, UC; SRIVASTAVA AK and SHARMA, DP. On a biased estimation in repeat surveys. *Journal of the Indian Society of Agricultural Statistics*
19. VARGHESE, CINI and GEORGE, KC. A composite sow index and its effects due to rice, parity and season. *Indian Journal Animal Science.*
20. VATS, MR ; SEHGAL, DK and MEHTA, DK. Extraneous factors affecting cumulative yields in long-term ferilizer experiments. *Indian Journal of Agricultural Research.*

Research Project Reports

Published

1. A methodological investigation in estimating seasonal fluctuations in post-harvest food grains losses (wheat) by *Jagbir Singh, HC Gupta and OP Kathuria*
2. A pilot study of Agroforestry in Chhachhauli block of Yamunanagar district (Haryana) (2000) by VPN Singh, Anil Rai and VK Jain
3. A Study of variance estimation in complex surveys (2000) by *Anil Rai, AK Srivastava and Man Singh*
4. Agricusltural Research Data Book 2001 by *HVL Bathla, KK Tyagi, RS Khatri, Jagbir singh, RM Sood, JP Goyal, SC Agarwal, MS Verma and BN Chakraborty*
5. CD-ROM /Electronic Book on design and Analysis of Agricultural Experiments (2000) by *Rajender Parsad,, R Srivastava and VK Gupta*
6. Estimation of Demand for Credit and its impact on employment and income by *UN Dixit, Ashok Kumar and Ant Ram, .*
7. Estimation of regression coefficients from sample survey data (2000) by *UC Sud, Anila Rai, IC Sethi and VPN Singh*
8. Evaluation of Fatigue Score card for Animal, Annual Report of AICRP on Increased utilization of Animal Energy with Enhanced System Efficient in Collaboration with KVK, Reweri by *M. Din, Jyotsna, P.K. Srivastava and Rajender Parsad*
9. Monograph on design of experiments (1990-2000) by *VK Gupta, Rajender Parsad and Seema Jaggi*
10. Planning designing and analysis of experiments planned on stations under the Project Directorate for Cropping Systems Research Status Report (1999-2000). by *Rajinder Kaur, Ajit Kaur*
11. Statistical modelling for projection of bovine populations and prediction of milk availability by *SN Arya and SC Aggarwal*
12. Studies on optimality of block design for making test treatments – comparisons (2000) by *Rajender Parssad R. Srivastava V.K. Gupta*
13. Study for estimation of area and production of important vegetable crops on the basis of partial harvest by *AK Srivastava, DL Ahuja, DC Mathur and K Chugh*
14. To study the effect of various input components on the yield of important vegetable crops by *AK Gupta*
15. Use of discriminant function of weather parameters for developing forecast model on rice crop(2000) by *T. Rai and Chandrahas.*
16. Use of remote sensing satellite data in crop surveys by *Randhir Singh and RC Goyal*

Finalised

1. Development of early warning and yield assessment models for rainfed crops based on agrometeorological indices *by Asha Saksena, R.C. Jain (Retired on 30.11.99), R.L. Yadav*
2. Pilot study for developing Bayesian probability forecast model based on farmers' appraisal data on wheat crop by *Chandrahas and T. Rai*

DISSERTATIONS APPROVED

Ph.D. (Agricultural Statistics)

1. DILEEP KUMAR PANDA - On Robustness of Diallel and Triallel

Crossing Plans Against Exchange or Interchange of Crosses

In plant and animal improvement experimentations, various forms of mating design like diallel, triallel and double cross play a vital role in evaluating the action or interaction of genetic materials. All these mating designs are to be embedded in an experimental design called environmental design to obtain observations for further analysis using appropriate statistical procedures for drawing valid conclusions. Sometimes, a scientifically planned experiment turns out to be useless when some disturbances occur and violate the assumptions required by the statistical procedures. Thus, it is of interest to investigate the designs that are insensitive to such aberrations. An attempt has been made in this thesis to study the robustness of block designs for diallel and triallel crossing plans against exchange or interchange of crosses using connectedness and efficiency criteria. It has been shown that all binary balanced block (BBB) designs for complete diallel crosses are robust against exchange of a cross in one of the blocks except a BBB design with p (number of lines) = 4, b (number of blocks) = 3 and k (block size) = 2. The balanced block designs for diallel crosses in which each of the line appears same number of times in each of the blocks have also shown to be robust. The above class of designs are also robust against interchange of a pair of crosses.

Robustness of optimal triallel crossing plans against exchange or interchange of crosses has been studied. It has been observed that all designs for $p \geq 10$ are robust according to connectedness as well as efficiency criteria.

(Guide:Dr.V.K.Sharma)

2. HANUMAN LAL RAIGER - On Stability Concepts, Stability Assessments and Improved Procedures for Varietal Selection.

One of the important steps in any crop improvement programme is to assess the performance of improved varieties in multi-environment trial for identifying superior varieties for large scale propogation. In actual practice varieties perform differently in different environments, leading to alteration of their ranking in the environments. The non-parametric techniques of ranking has been used to study the genotypic- environment interaction by a galaxy of workers. However, there has been hardly any attempt to tackle the difficulties that arise when non-linear interactions are present. A procedure for dealing such situation is developed under the present study. Further, different computations on Type – I error and power of the test are made for evaluating the merits of various stability measures. Performance of non-parametric measures vis-à-vis parametric measures has been assessed based on the above criteria. Application of stability measure(s) to real data on pearl millet was also made in regard to their suitability for stability assessment.

(Guide: Dr.V.T.Prabhakaran)

3. SARADA CHUNDURI - Statistical Study of Spatial and Temporal Aspects of Pests Populations and Pesticide Consumption

During the last three decades or so, major advances have been made in increasing crop productivity as a result of large scale adoption of modern high yielding varieties and improved technologies. This all-round intensification has resulted in increased pesticide application in agriculture, which in turn, accentuated the pest problem. It was estimated that over one lakh species of pests annually destroy food sufficient to feed 135 million people all over the world. In India, pests destroy crop worth several thousands of every year. Thus, to tackle this problem, proper plant protection measures are of great relevance. Unfortunately, large scale and unscrupulous application of pesticides in intensive agriculture has resulted in large number of adverse effects such as human and animal health hazards, degradatinatural resource,environmental pollution and total imbalance of agro - ecology. However, a total ban on pesticides without availability

of economically viable alternatives would result in significant reduction in current production and would also raise food prices several times.Therefore, proper management of pest population and sustainable pesticide use is necessary for preventing yield losses to ensure food supply to teeming millions and preventing adverse effects of use of pesticides. To this end a study of spatial and temporal aspects of pest population growth as well as statistical modelling of pesticide consumption has been carried out. Four important Generalized (stopped - sum) distributions, viz. Neyman Type - A, Thomas, Polya - Aeppli and Lagrangian - Poisson distributions are studied to understand spatial spread of pest populations. Two methods of parameter estimation, viz. 'Method of moments' and 'Method of maximum likelihood' are discussed. Unfortunately most of the standard statistical software packages, like statistical package for social sciences (SPSS) and Statistical Analysis System (SAS) do not contain computer programs for fitting these distributions/. Therefore, these are developed for fitting the above mentioned contagious distributions. As an illustration, these distributions are fitted to the data sets collected from entomological literature. The two nonlinear curvature measures, viz. Intrinsic nonlinearity and parameter effects nonlinearity are described in detail along with their computations. As these measures are expressible as ratio of two matrices, containing first and second partial derivatives, their evaluation involve huge computations. The procedure for achieving the task is thoroughly discussed. As an illustration, curvature measures are computed for a nonlinear dynamical model for aphid population growth applied to some data on potato aphid. Marginal curvatures and profile - t plots for individual parameters are studied. This type of investigation helps in knowing to which parameter is showing highly nonlinear behaviour and hence, needs a reparameteruzation. Further, a procedure for choice of suitablereparameterization is described. The technique of 'Expected value parameters' as well as 'Simulation studies' are used to identify suitable reparameterization and illustrated with an example. The sensitivity analysis is carried out by first varying single parameter and thereafter by simultaneous variation of two parameters. The corresponding two and three - dimensional graphs are presented . Further, the choice of design points for a nonlinear model for better estimation with the help of sensitivity functions is also discussed.

'Statistical Modelling' of pesticide consumption data of the country during the period 1966-67 to 1997-98 was carried out Polynomial functions approach and time - series modelling are considered for modelling purposes. In the former, a second degree polynomial function with AR(1) error structure is found to be appropriate for the data under consideration. In the latter approach, two procedures viz ARIMA models and piece-wise threshold time - series models are employed for describing the pesticide consumption data. Among several models considered, ARIMA (1,2,1) is found to be appropriate model based on autocorrelations and partial autocorrelation functions. A noteworthy, feature is that pesticide consumption increased upto year 1990 and is exhibiting a downward trend thereafter. To capture this, a piece-wise threshold time - series model is considered by taking 1990 as the threshold year. Two ARIMA submodels, one for the period up to 1990 and the other for the period beyond 1990 are fitted. The performance of this model is found to be the best. However, there is no guarantee that this good performance of the selected models continue to hold in future also. The moment pesticide consumption starts showing an increasing trend, which is most likely to occur sooner than later, the models need to be fitted again to the updated data to arrive at the most appropriate model.

(Guide: Dr.Prajneshu)

4. S. RAVICHANDRAN - A Study of Dynamical Modelling in Agriculture

In the field of agriculture, data are usually collected over time. So, dynamical techniques are of great relevance for modelling and forecasting of such data sets. Introduction deals with various categories

of mathematical models are discussed. Some important nonlinear growth models and surplus production models are also described along with estimation procedures for fitting such nonlinear models. A brief review of ARIMA time series modelling approach is also provided. Use of "expected-value parameters" for fitting nonlinear statistical models is also discussed. This type of reparameterization results in a model having close-to-linear behaviour and low correlations among parameter estimates. The well-known nonlinear allometric model and Fox surplus production model are considered. The explicit expressions in terms of expected-value parameters are derived and the methodology is demonstrated by applying it to real-life fisheries data. Time-varying state space regression modelling approach using Kalman filtering technique is also discussed. As an illustration, the methodology is applied to all - India data on marine fisheries. Studies on another promising approach, viz. State space modelling approach using Kalman filtering technique is discussed. The advantage of this technique is that it can take into account the time dependency of the underlying parameters. As an illustration, modelling and forecasting of all-India marine products export data is carried out. "Structural time series modelling (STM)" approach when there is presence of prominent trend is discussed. Specifically, three types of STM models, viz. Local level model (LLM), Local linear trend model (LLTM), and Local linear trend model with intervention (LLTMI) are discussed along with their estimation procedures and then applied these to data sets from agriculture. Structural time series modelling for describing all-India milk production based on logistic growth curve is also discussed. All - India shrimp export data is also modelled via STM when the series under consideration follows an autoregressive process. It is found that STM performs much better than ARIMA approach, as judged by various goodness of fit criteria. Finally, identified model is used to forecast shrimp export for the next five years. Various types of structural time series models, which are capable of explaining "cyclical fluctuations" is discussed. As an illustration, all-India lac production data, which has prominent five years' cycles along with a declining trend is modelled. Results are compared with corresponding analogue from ARIMA family. Finally, forecasting of all-India lac production data is carried out. For modelling seasonal fluctuations in fish populations, appropriate models from the family of STM are identified. A heaspect of this approach is that the peculiar features, like trend, and seasonal fluctuations, exhibited by the data dictate the particular model from the family of STM to be employed. Two types of forms, viz. dummy seasonality, and trigonometric seasonality are considered for describing seasonal fluctuations. As illustrations, these models are fitted to quarterly landings of silverbellies and croakers in Tamil Nadu, India during the period 1975-96. Comparisons with ARIMA models reveal that the former approach is much superior to the latter. Finally, the identified models are used for forecasting purpose. Two new promising approaches, viz. "Bayesian analysis of time series (BATS) " and "Structural time series modelling (STM)" are discussed and applied to model India's foodgrain production data for the period 1966-1999 is discussed. Forecasts for the year 2020, on the basis of these two models, are made. Bayesian nonlinear, nonnormal state space (BNS) formulation for this model is also discussed in this chapter. Posterior density function is obtained by using Gibbs sampling procedure. The relevant computer program for fitting of BNS model is also appended. As an illustration, the methodology is applied to some fisheries data employing "Bayesian inference using Gibbs sampling (BUGS)" software package.

(Guide : Dr. Prajneshu)

M.Sc. (AGRICULTURAL STATISTICS)

1. AMITAVA DEY - Robust Block Designs for Diallel Crosses Against A Missing Observation

Diallel crossing is a useful method for conducting plant-breeding experiments. The diallel cross is a type of mating design

used to study the genetic properties of a set of inbred lines.

Non-availability of data in a planned experiment may sometimes lead to such a poor residual design that it may not even be possible to estimate all the elementary treatment contrasts through the residual design, or it may happen that the residual design is treatment connected but the efficiency of the residual design may fall considerably as compared to the original design. Thus it is necessary to study the robustness of block designs for diallel crosses against missing observations.Robustness of block designs for diallel cross experiments have been investigated for the situation when the interest of the experimenter is in estimating the general combining ability effects assuming that the specific combining ability affects are excluded from the model. The block designs for diallel cross experiments that are robusthave been identified against a missing observation, using connected and efficiency criterion. Catalogues have been prepared of robust matting designs as per efficiency criterion of robustness. Robustness of binary balanced block designs for diallel cross experiments generated from NBIB designs against one complete block missing have also been studied.

(Guide:Dr.R.Srivastava)

2. JUGNU ANSARI - An Investigation on the Effect of Mating Designs on the Variance of Heritability Estimates

For planning the breeding programmes for animal and plant improvement the method of selection is an important aspect. The reliability of this method is based on the magnitude of genetic differences among the individual of base population to which this method is applied. A quantitative measure of genetic variability associated with this description is provided by the coefficient of heritability. The value of heritability coefficient should lie between zero and one. But, while dealing with animal breeding data, frequently the sample estimates of heritability coefficient turn out to be either negative or a value greater than unity. In the present dissertation a critical and comprehensive review of past work done on the occurrence of inadmissible estimates, their causes, optimum designs for experimentation and procedures for improved estimation of heritability has been done. The estimation of heritability and its variances by bootstrap technique was also studied to gain insight into the existing gaps. A detailed description of simulation and bootstrap techniques has been used in the present work. For this study , generation of random numbers, normal variates with certain parametric values and simulating master samples from half –sib and full-sib models, that are used for bootstrapping in order to get variance estimates of heritability . It also gives the optimum sample sizes, structure and number of bootstrap replications for obtaining meaningful estimates of heritability. We compared variance of bootstrap estimates of heritability obtained from half-sib method with those determined from sire component of full sib analysis. A second comparison was carried out between sire and sire+dam components of full-sib analysis. Here also these comparisons are based on the bootstrap estimate of variances.

(Guide:Dr.V.T.Prabhakaran)

3. NAVEEN CHONA - Estimation of Fish Catch from Inland Resources at Small Area Level

The growing demand for reliable estimates at smaller areas makes small area estimation in survey sampling an important subject. The sample surveys lanned for estimation for larger reas, if used for small areas then sample sizes are inadequate. Incase of inland fisheries in India, the position of statistics of catch from different inland resources is not satisfactory. The concept of small area has not so far been explored in this area and it was considered necessary to investigate some small area estimation techniques in case of inland fisheries. For estimating the fish catch of different species (Small Areas) at district level, three estimators namely direct, raking ratio and composite estimators have been developed. Total numbers of water

units in selected districts have been considered as the auxiliary variable in developing these estimators. It has been observed that for estimate of fish catch of different species in these districts, the composite estimator has proved to be the best with minimum percent standard errors as compared to other estimators i.e. direct and raking ratio.

(Guide:Dr.H.V.L Bathla)

4. N.OKENDRO SINGH - Study on the Effect of Sample Size and Structure on the Bootstrap Estimates of Variance of Heritability

The present investigation was conducted to study the effect of sample size and structure for estimating the precision under different mating designs of heritability and to decide the optimum number of bootstrap replications required for precision of heritability. This was achieved empirically by using the simulated data for different values of population parameters. The bootstrap technique which is an analytical and highly computer oriented method was used to obtain the estimate of heritability, bias and standard error. The heritability estimates were obtained by two different procedures namely regression of offspring on parent and half-sib analysis. In the first case, the results were obtained from the data simulated by parent-offspring model by selecting different master samples of 200, 500, 1000 and 1500 pairs of observations from the populations with different heritability levels for different bootstrap replication numbers. The optimum number of bootstrap replications required to obtain stable estimate of standard error of heritability for all the three cases considered was about 100 that required 100 above for small sample. The optimum sample size required to get precise estimate of standard error for both low and moderate heritability values was about 1000 but the sample size of 500 was sufficient for high heritability value. The bootstrap estimates of heritability using half-sib analysis was obtained by drawing samples of 200, 500 and 800 for different family structures of each sample size. As in other method the stable estimate of bootstrap standard error required was about 200 bootstrap replications in all the levels of heritability values taken. It was found that the optimum family size and structure was 10 sires and 50 progenies per sire for low heritability. Similarly, the optimum sample size and structure for getting the precise estimate of standard error of heritability were 40 sires and 10 progenies per sire and 20 sires and 10 progenies per sire of moderate and high heritability values respectively.

(Guide: Sh.S.D.Wahi)

5. RAMESH KOLLURU - On Some Aspects of Growth Patterns of Crossbred Cattle

The research on cattle growth is one of the important studies in the animal sciences. Although methods are available in literature for the analysis of growth data, no universal method is recommended. In the present study data on body weight was taken from birth to an age upto 27 months on 25 crossbred cattle. As the scatterplots revealed a sigmoid shape and also that the growth of animals, in general follow a non-linear distribution, five non-linear models were used to model weight age data for the animals. Also that these sigmoid models are empirical in the sense that the parameters have some biological interpretability. Comparisons were made among these models for goodness of fit. The three sigmoid models viz., Brody, Von-Bertalanffy and Gompertz over estimated the weights. Richards and Logistic models suited the data pattern. Logistic model in comparison with Richard's model, is computationally easier to fit. In the above said models parameters were estimated using ordinary least squares technique. But the assumptions for applications of this technique are rarely met in practical situations. So we estimated the parameters under hetroscedastic variance structure. The estimates obtained so revealed to be better. Since the data is taken on repeated measurements the errors may be of two types, systematic and random. The parameters were estimated through Hierarchical non-linear modeling. Using the hierarchical non-linear models,

the data patterns are better described compared with the earlier techniques.

(Guide: Dr.P.S.Rana)

6. SUMANTA KUMAR DAS - Optimization Techniques under Multiple Frame Sampling for Multivariate Stratification

The approach of multiple frames includes independent selection of samples from different frames and to obtain combined estimate on the basis of both the samples and optimization of the sample sizes and the weights attached to the sample portion coming from the common frames.

Optimization in sampling is normally viewed in terms of variance and cost function. Here we choose a function of several variables, which is maximized or minimized subject to one or more constraints. The constraints are generally equalities or inequalities, which must be satisfied by the variables of the objective function. Optimization is an important aspect in the study of sampling from multiple frame situations. A sampling design is considered for multipurpose surveys in which several stratifying variables are available and the objective is to estimate the totals or means of several variables each highly correlated with one of the stratifying variable.The design involves selecting separate subsamples independently by stratifyin gvariable in turn. Estimation then involves pooling data from separate subsamples using multiple frame sampling. The strategy is compared with standard approaches such aratio regression in simulation study and relative efficiency will be determined.

(Guide:Dr.B.C.Saxena)

M.Sc.(COMPUTER APPLICATION)

1. BASANT KUMAR - Pest Management Information System on Sugarcane

Inspite of India ranking first in area and production among the sugarcane growing countries of the world, yield per hectare is still much lower than most of the countries. Among the various reasons of low productivity, attack inspect/pests, diseases, weeds, motes etc plays an important role. It is estimated that about 10% of the total sugarcane crop in the country is destroyed every year as a result of the attack of several pests, disease and infestation by the weeds. Solution are available in the form of control measures and IPM (a sustainable approach to manage the insect/pests problems by combining biological cultural, physical and chemical tools in a way that minimizes economic, health and environmental resks). But the information, which is available in the form of books, journals, magazines etc. are beyond the reach of common person, also they are not in updated form. So a need was felt to put the information in electronic format through the Internet. Pest Management Information System in Sugarcane (PMISS) can be implemented as a network-based system with a server. It maintains information regarding Sugarcane and its IPM primarily with emphasis on insects, diseases, weeds and mites infesting it. There is also provision to insert, update and delete the information. It has three – layered architecture. It has been developed in HTML, JavaScript, Microsoft Access and Java Servlets & JDBC. PMISS runs at any node of Internet through a browser.

(Guide: Dr.P.K.Malhotra)

2. MD. ZUBIR AHMAD - Information System for Apple Crop

Apple fruit is one of the important fruit of India. Apple industry is the backbone of Indian fruit industry and APEDA has identified apple as one of the eight fruits for accelerating export potential. Though apple is grown in different states but major share is contributed by only 3 states. Information on Apple crop is available in the form of books, journals and popular magazines etc. and are beyond the reach of needy across the world. Extension agency also requires updated information to advise the farmers on apple cultivation. The present investigation was carried out with the idea of developing an Information System for Apple Crop (ISAC) that will provide

information on all aspects of apple cultivation, processing and marketing. The system has been developed using Visual Basic at the front end and MS-Access at the backend. ISAC runs at any windows based computer system. This software also has help and index to facilitate smooth operation. A person with little computer knowledge can operate and get desired information.

(Guide: Sh.Mahesh Kumar)

3. PRAKHAR PRASHANT - Integrated Pest Management Information System on Tomato

India has a major share in the agriculture production in the world and the second largest producer of fruits and vegetables. With the advent of new upcoming technologies and research work undertaken in the field of agriculture, it has become possible to minimize the losses in crop production due to infestation by the insects/pests, diseases, weeds and mites. India has taken strong initiative in the fruits and vegetables research to increase production and productivity in a sustainable manner. Information on tomato crop is available in the form of books, journals, magazines etc. are beyond the reach of common person across the world. So there is a need to put the information in electronic format through the Internet. The present investigation was carried out with the idea of developing Integrated Pest Management Information System on Tomato (IPMIST) software that incorporates basic information on Tomato, its IPM and infestation by various insects, diseases, weed and mites and can be accessed through Internet. It has a three-layered architecture. It has been developed in HTML, JavaScript, Microsoft Access and Java Servlets & JDBC (the latest technology of Sun Microsystems). IPMIST can be implemented as a network-based system with a server. There is provision to insert, update and delete the information.

(Guide: Dr.P.K.Malhotra)

4. RACHANA CHADHA - Digital Image Processing of Indian Remote Sensing Satellite Data

Remote Sensing is a multidisciplinary activity which deals with the Inventory,monitoring and assessment of natural resources through the analysis of data obtained by observations from a remote platform. The digital images obtained need to be manipulated and interpreted with the aid of computer. Therefore, software is required to process the digital image. Hence, software entitled "Interactive Digital Image Processing System "(IDIPS) has been developed as user-friendly software for image restoration, enhancement and classification of Indian Remote Sensing Satellite digital data. The software IDIPS has been developed for Window platform. Microsoft Foundation Classes (MFC) in Visual C++ development environment is used to develop IDIPS. MFC is a library of C++ classes used to build Win32 applications. IDIPS make use of the various classes from MFC. One of the most important classes is CRSPrjDoc that contains the data of the application. Further the class CRSPrjView class displays the images formed by using the data stored in CRSPrjDoc class. IDIPS allows user to restore an image and view various band images and false color composites. It also provides facility to perform linear and non-linear enhancement, edge detection, calculates vegetation indices. Distribution of data can be analyzed by viewing histograms. In classification, IDIPS provides the facility of supervised classification and hence allows user to select training areas of each land cover class. For each training site, the statistical parameters are generated. The classifiers used are minimum distance to means classifier, parallel piped classifier and maximum likelihood classifier.

(Guide: Dr.S.D.Sharma)

5. RITU MALIK - Development of Web Based Current Awareness Service for Library

Library serves as a Centre for arousing and stimulating intellectual curiosity and the desire to learn by offering materials and programs to satisfy the desire for knowledge. Current Awareness Service (CAS) of Library endeavors to keep the user informed promptly of all nascent

thoughts created in their fields of work and related fields. One such service is "CURRENT CONTENT ON AGRICULTURE (CCA)" is brought out by IARI (Indian Agricultural Research Institute) library, in which Xerox copy of the content/index page of issue are bounded as a booklet and send to all the divisions of the IARI library. Keeping speed timeliness of CAS in mind, Webo Current Awareness Service (WCAS) is developed as the Intranet solution to bring the CCA on the web and overcome its limitations, that is, time required reaching it to ultimate user. WCAS Software provides CAS for Journals, Books and Thesis. WCAS's, one of the silent features is to provide the list of Journal's Issue, which are procured by the Library between the two specified dates. WCAS allows its users to see the content/Index page of the recently procured issue. WCAS is developed using Java Servlets (server side programming) and JDBC (Java Database Connectivity), which makes it platform independent. WCAS is based on Windows DNA (Distributed InterNet Application) Architecture, divided into two parts namely, EndUser and Administrator (for library staff to update the information in the database). Through EndUser portion, WCAS provides three types of search facilities namely, Phrase/Keyword Search, Boolean Search and Combined Search.

(Guide: Sh.Mahesh Kumar)

6. SOUBHRATRA DAS - Web Based Information System on Integrated Pest Management of Cucurbits

Over the last few decades, the country has made impressive progress in the field of agriculture. Agriculture still remains the most vital sector in the economy of our country. It has become possible to minimize the losses in crop production due to infestation by the insects/pests, diseases, weeds and mites by using new technologies and research. The initiatives taken in the fruits and vegetables research to increase production and productivity in a sustainable manner can yield better results if information is readily available to the concerned. The information, which is available in the form of books, journals, magazines etc. can reach the common person if it is available in electronic format through the Internet. The present investigation was carried out with the idea of developing Integrated Pest Management Information System (CIPMIS) software that incorporates basic information on Major Cucurbits, its IPM and infestation by various insects, diseases, weed and mites. It has a three-layered architecture. It has been developed in HTML, JavaScript, Microsoft Access and Java Servlets & JDBC (the latest technology of Sun Microsystems). CIPMIS can be implemented as a network-based system with a server. There is provision to insert, update and delete the information.

(Guide: Dr.P.K.Malhotra)

7. V.V.SUMANT KUMAR - Development Of Web Based E-Choupal

Development of Electronic Chaupal is an attempt to increase the scope of the Chaupal, which means a forum where a group of persons (generally farmers) meet together and discuss issues of their interest. The main goal of this project is to give working solutions to farmers regarding various problems of crops. E-Chaupal is a combination of Non Virtual Reality Modeling Language (VRML) Chat Software, VRML Chat Software & Discussion Forums. The efforts are focused on the graphical user interface, which shall not be restricted to two-dimensional graphics, rather the farmer can experience a three-dimensional shared environment, in which he or she can navigate in a natural way. Its abilities are demonstrated on the concrete application of Electronic Chaupal. The E-Chaupal has been designed using object-oriented methodology and implemented using Java & VRML.

(Guide:Dr.S.D.Sharma)

LIST OF APPROVED ON-GOING PROJECTS

S.No.	Project title	Project leader and associates
	Inland fish catch estimation	
1.	Sample survey to evolve methodology for estimation of fish catch from rivers or streams specially of the hilly areas	HVL Bathla KK Kher AK Gupta
	Assessment and evaluation studies	
2.	Estimation of flow and changes in dynamic population	Jagbir Singh
3.	Sampling procedure for selection of representative sample of fertilizer from ship (Funded through A.P. Cess Fund)	UC Sud HVL Bathla Anil Rai
4.	Study relating to formulating long term mechanisation strategy for each agro-climatic zone/state (Funded by Department of Agriculture and Cooperation, Ministry of Agriculture)	KK Tyagi HVL Bathla DL Ahuja MS Narang Satya Pal RM Soon Bhagwan Dass SC Agarwal AK Gupta KK Kher Man Singh
	Poultry meat production	
5.	Pilot sample survey to develop a sampling methodology for estimation of poultry meat production.	Mahender Singh
	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.	Pilot sample survey for estimating the area and yield rates of ginger and potato in hilly areas.	SS Gupta MS Narang RC Gola
	Cost of Prodcution Studies	
8.	Pilot study on cost of production of coconut in Kerals (Funded from Coconut Development Board, Kochi, Kerala)	UC Sud HVL Bathla Jagbir Singh DC Mathur KK Kher
	Remote sensing and Geographic Information System	
9.	Study of Land Use Statistics through integrated modelling using Geographic Information System (Funded by AP Cess fund)	Anil Rai AK Srivastava Randhir Singh HC Gupta VK Jain
10.	Development of GIS based techniques for identification of potential agro-forestry area	Tauqueer Ahmad Randhir Singh Anil Rai
	Cropping Systems Research	
11.	Planning, designing and analysis of experiments planned on stations under the Project Directorate for Cropping Systems Research	Rajinder Kaur Ajit Kaur Bhatia
12.	Planning, Designing and Analysis of 'On Farm Research Experiments' planned under Project Directorate of Cropping System Research	PK Batra NK Sharma Mahesh Kumar

S.No.	Project title	Project leader and associates
13.	Planning, designing and analysis of data relating to experiments conducted under AICRP on long-Term Fertilizer Experiments	MR Vats DK Sehgal DK Mehta
	Information system for Agricultural and Animal Experiments	
14.	Designs for fitting response survaces in agricultural experiments (Ap-Cess Fund ICAR)	Rajender Parsad R Srivastava PK Batra
	Experimental Designs for Agricultural, Animal, Agro-forestry and Fisheries Research	
15.	A statistical investigation on the long term effect of fertilizers on productivity of cereal crop sequences	VK Sharma Rajinder Kaur
16.	A diagnostic survey of design and analysis of field experiments	Rajender Parsad VK Gupta PK Batra R Srivastava Rajinder Kaur Ajit Kaur Bhatia Praween Arya
17.	Fertilizer response ratios for different crops in India	SD Sharma VK Sharma PK Batra NK Sharma
18.	Statistical Investigation of the fertilizer use efficiency in relation to cultural practices	Rajendra Kumar JK Kapoor
	Statistical investigations in Genetics and Bio-technology	
19.	Three associate class partially balanced incomplete block designs and their application in partial diallel cross	Cini Vearghese VK Sharma Seema Jaggi
20.	Agricultural Field Experiments Information System	PK Batra OP Khanduri DC Pant
21.	Planning, designing and analysis of experiments relating to AICrP on STCR	Aloke Lahiri VK Sharma A Subbarao MR Vats DK Mehta Rajender Parasad
22.	Design and analysis of agroforestry experiments	DP Handa Seema Jaggi VK Sharma AS Gill
	Computer simulation studies and applications of re-sampling techniques like bootstraps, Jackknife, balanced repeated replications in Agricultural Statistics	
23.	Development of statistical procedures for selecting genotypes simultaneously for yield and stability.	AR Rao VT Prabhakaran AK Singh
24.	Studies on data processing techniques for statistical analysis of large field variability in hilly and salt affected soil regions	VK Bhatia Rajender Parsad
	Studies on gene action, estimation of genetic parameters and genetic merit, genetic progress and other related statistical methods	
25.	On some robust estimation of heritability.	VK Bhatia AK Paul
26.	Empirical investigations on the influence of fixed effects on the estimates of heritability.	SD Wahi AR Rao Lal Chand

S.No.	Project title	Project leader and associates
27.	Studies on growth pattern and heritability of fitness traits in Indian breeds of goats.	Lal Chand VK Bhatia SD Wahi
	Non-linear statistical modelling of biological, ecological and economic phenomena	
28.	Study of non-linear time series modelling in agriculture	Himadri Ghosh Prajneshu AK Paul
29.	Pilot study for developing Bayesian probability forecast model based on farmers' appraisal data on wh eat crop.	Chandrahas T Rai
30.	Development of forewarning system for aphids, myzus persicae (sulzer) on potato.	TP Trivedi (NCIPM,) SM Paul Khurana (ACPIP, Shimla) RC Jain (Retired on 30.11.99) SC Mehta LM Bhar G Singh (GBPUAT, Pantnagar)
31.	Development of early warning and yield assessment models for rainfed crops based on agro-meteorological indices.	Asha Saksena RC Jain (Retired on 30.11.99) RL Yadav Director, Modipuram Meerut.
32.	Forecasting the loss in yield due to weeds.	Madan Mohan TK Das (IARI), T Rai Ranjana Agrawal
33.	Forecasting of fish production from ponds	LM Bhar SS Walia AK Roy, (CIFA) Radhey Shyam (CIFA).
34.	Pilot study on forecasting of brood-lac yield from Butea monosperma (Palas)	AK Jaiswal, (ILRI) KK Sharma (ILRI) Chandrahas
35.	Studies on bioecology and population dynamics of major pests of mango (hoppers, fruitfly, leaf webber and inflorescene midge) and guava (fruit borer).	RPShukla, (CISH) SC Mehta Shashi Sharma (CISH).
36.	Development of model of forewarning about infestation of the insects of paddy crop.	MK Sharma, (NDUAT) V.Pandey, (NDUAT) RS Singh (NDUAT) Ramasubramanian V. SS Walia
37.	Epidemiology and forecasting of powdery mildew and Anthracnose.	AK Misra (CISH), Om Prakash (CISH) Ramasubramanian V.
38.	Forecasting sugarcane yields using Multiple Markov Chains.	Ramasubramanian V. Ranjana Agrawal LM Bhar
	Study of Technological change, risk and uncertainty in Agriculture	
39.	An econometric stydy of technological dualism in Egg. Production	
	Modelling for Agricultural Planning	
40.	Study of demand for agricultural products and its implication for food security in India	RK Pandey
41.	Jai Vigyan National science and technology mission on household food and nutritional security for Tribal, Backward and Hilly areas	RK Pandey Sushila Kaul Dharam Raj Singh

CONSULTANCY, PATENTS, COMMERCIALISATION OF TECHNOLOGY

- Technical guidance were provided to the Scientists from Sher-e-Kashmir University of Agricultural Sciences and Technology regarding the problems pertaining to the estimation of crop production.

- Regarding finalisation of methodology for estimation of fruits and vegetables in Rajasthan, consultancy was provided to the Joint Director (Stat), Board of Revenue, Ajmer.

- Regarding analysis of data of the post-harvest losses project at Indian Grain Research Institute, Hapur advise provided to the Deputy Director of the Institute.

- Sri Parasher, Marketing Officer from Deptt. of Marketing and Inspection, Nagpur visited the Institute regarding advice pertaining to the methodology for analysis of data of the project entitled "Assessment of post harvest losses and marketable food grains".

RAC, MANAGEMENT COMMITTEE, SRC ETC. MEETINGS WITH SIGNIFICANT DECISION

Research Advisory Committee

Research Advisory Committee of the Institute as approved by the Council is as follows:-

1.	Sh VR Rao	Chairman
2.	Dr SD Sharma	Member
3.	Dr MN Das	Member
4.	Prof Prem Narain,	Member
5.	Dr MM Pant	Member
6.	Dr S Mohanty	Member
7.	Dr VJ Shrikhande	Member
8.	Sh Syed Md. Altaf Bukhari	Member
9.	Sh HT Mohan Kumar	Member
10.	Dr JP Mishra	Member
11.	Dr HVL Bathla	Member-Secretary

The fIfth meeting of the Research Advisory Committee of the Institute was held on August 22, 2000. In the meeting the action taken on the recommendations made in the last meeting, all research programmes completed, ongoing, initiated, proposed, submitted for external funding, revolving fund scheme, NATP Project and also the training and teaching programmes organised and proposed were discussed. After detailed discussion, the following recommendations were made:-

1. SRC proceedings should be sent to all the members of RAC, in future.

2. Utilisation of resources in terms of manpower, i.e. scientists involved in programs alongwith percentage of time devoted by them should also be placed before the RAC.

3. A copy of each project report whenever completed should be sent to the RAC members.

4. The Institute should ensure wider publicity of the results achieved, and techniques developed in different projects documented in concise but simple language. These should be sent to the user organisations and other beneficiaries.

5. A detailed note on the forecasting methodologies developed at the Institute should be prepared and sent to the RAC members.

6. The Institute should examine once again the forecasting techniques it has developed in terms of feasibility and affordability. A clear recommendation should come out regarding implementation strategy including identification of agencies which may be involved in collection of information on various parameters of the model and at what level are the forecasts feasible (national, state, district).The Institute should consider undertaking a multi-disciplinary project on forecasting for this with inputs from experts in areas such as meteorology, biometrics and remote sensing.

7. A note containing the objectives, cost effectiveness and final conclusions of the AP Cess funded project entitled "Use of remote sensing data in crop surveys" should be prepared and sent to RAC members.

8. A technical paper on the methodology of the project entitled "Statistical investigations on the long term effects of fertilisers on productivity of cereal crops" should be prepared and sent to RAC members when the project is complete.

9. The experts from outside should be invited to spend time in the Institute and work alongwith the scientists on selected projects in order to provide guidance and larger exposure to the research staff in newer and specialised areas.

10. The areas like remote sensing, forecasting and small area estimation should be given the priority.

11. (i) The Institute involvement in the project entitled "Pilot study on forecasting of brood-lac yield from butea, Monosperma (Palas)" should be much closer. The Institute should also be involved in the data collection process.

12. The project entitled "Forecasting fish production from ponds" should be reviewed and examined whether the project should continue till 31st July, 2002 or need to be terminated earlier.

13. In case conclusions drawn from the project entitled "Pilot study for developing Bayesian probability forecast model based on farmer's appraisal data on wheat crop" are encouraging then it should be tried on a much larger scale through AP Cess funding as this can be an alternative for crop yield estimation purpose. A detailed note on the conclusions of the project should be prepared and sent to the RAC members.

14. The use of the study entitled "Study of demand for agricultural products and its implementation for food security" should be highlighted in the project report and the findings should be compared with the findings of other similar studies undertaken by the NSSO etc. The actual number of hunger and malnutrition should also be given state-wise.

Management Committee

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

The Management Committee has been reconstituted for a period of three years with effect from December 24, 2000 vide Council's Office Order No. 5(1)/97-IA.II (AE) dated January 12, 2001. The present Management Committee of the Institute consists as follows:

1.	Prof. SD Sharma, Director, IASRI	Chairman
2.	Director of Agriculture, Delhi Administration. Old Secretariat, NCT, Delhi	Member
3.	Director of Agriculture, Govt. of Uttar Pradesh, Lucknow	Member
4.	Director, Indian Agricultural Research Institute, Pusa, New Delhi-110012	Member
5.	Dr AK Srivastava, Joint Director, IASRI (ICAR), New Delhi-110012	Member
6.	Dr VK Gupta, Principal Scientist & Head (DE), IASRI (ICAR), New Delhi-110012	Member
7.	Sh RS Khatri, Senior Scientist, IASRI (ICAR), New Delhi-110012	Member
8.	Sh Mahesh Kumar, Senior Scientist, IASRI (ICAR), New Delhi-110012	Member
9.	Asstt. Director General (ES&M), ICAR, Krtishi Bhavan, New Delhi-110001	Member
10.	Sh Naveen Jain, Finance & Accounts Officer, ICAR Headquarters, Krishi Bhavan, New Delhi-110001	Member
11.	Dr Ratan Mandal, Lecturer, Department of English, TNB College, Bhagalpur (Bihar)	Non-official Member
12.	Chief Administrative Officer, IASRI, New Delhi-110012	Member-Secretary

The 42nd meeting of the Management Committee was held on July 7, 2000 under the Chairmanship of Dr. SD Sharma, Director.

The following agenda items were discussed:

i) Presentation of the Divisional activities by the Head, Division of Computer Applications and Head, Division of Econometrics

ii) Confirmation of the proceedings of the 41st meeting of Management Committee held on Sept 1, 1999

iii) Review of action taken on the recommendation of the 41st meeting of the Management Committee

iv) Consideration of proceedings of the Staff Research Council Meeting held on Feb 18-19, 2000

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. Dr. SD Sharma, Director is the Chairman and Dr. D.K. Agarwal Sr.Scientist &Scientist In-Charge (RCMU) is Member-Secretary of SRC.

Two meetings of the staff Research Council (SRC) were held during August 04-05, 2000 and January 30-31, 2001. In the first meeting three new research projects were approved and review of progress of 34 on-going research projects were discussed. In second meeting two new research project proposals approved and review of progress of 34 on-going research projects were discussed.

PARTICIPATION OF SCIENTISTS IN CONFERENCES, MEETINGS, WORKSHOPS, SYMPOSIA, ETC. IN INDIA AND ABROAD

(A) Participation of Scientists in Conference/Workshop/Symposia, etc.

Sr. No.	Name of the Scientist	Programme	Venue	Period
1.	Dr SD Sharma	Second National Workshop on Environment Statistics	Ministry of Statistics and Programme Implementation, Govt. of India, New Delhi	Apr 06-07, 2000
2.	Dr Randhir Singh	Map-India- 2000 – 3rd International Conference on GIS, GPS and Remote Sensing	New Delhi	Apr 10-12, 2000
3.	Dr.R.K.Pandey	Panel Discussion on Bio-Technology, Social Science and food Security	NCAP, New Delhi	May 02, 2000
4.	Dr SD Sharma	Interaction Workshop with World Bank Mid-Term Review Mission under NATP	I.A.R.I., New Delhi	May 10, 2000
5.	Dr AK Srivastava	Workshop on Study to Review of State Policies on incentive schemes in primary schools and estimate their contributions to girl participants in education	NCERT, New Delhi	May 23, 2000
6.	Dr. P. S. Rana	The XV Annual Conference of Ramanujan Mathematical Society	Ramanujan Institute for Advanced study in Maths, University of Madras, Chennai	Jun 05-07, 2000
7.	Dr HVL Bathla Dr Randhir Singh	National workshop on Improvements of Agricultural Statistics-2000' organised by DES, Ministry of Agriculture	New Delhi	Jun 28-29, 2000
8.	Sh NK Sharma		NAARM, Hyderabad	Jul 03, 2000
9.	Dr HVL Bathla Dr KK Tyagi Dr DL Ahuja Dr M.S. Narang Sh Satya Pal Sh RM Sood Sh S.C. Agarwal Sh Bhagwan Das Sh A.K. Gupta Dr Man Singh*	Seminar - cum - Group discussion related to the project "Study relating to formulating long term mechanization strategy for each agro climatic zone/state.	I.A.S.R.I., New Delhi-12	Jul 24 - 25, 2000
10.	Dr Randhir Singh	Seminar organised by CDAC and PCI "Open House- Geometrica".	New Delhi	Jul 28, 2000
11.	Dr HVL Bathla Dr UC Sud Dr Jagbir Singh Sh DC Mathur	Group discussion regarding methodological aspects in the project entitled "A pilot study on cost of production of coco-nut in Kerela"	I.A.S.R.I., New Delhi-12	Aug 09, 2000

Sr. No.	Name of the Scientist	Programme	Venue	Period
12.	Dr. SD Sharma	Workshop on Project Monitoring & Evaluation under NATP	NCAP, New Delhi	Aug 17, 2000
13.	Dr Sushila Kaul	Networking of Social Scientists	NCAP, New Delhi	Aug 17-18, 2000
14.	Dr. (Mrs.) Ranjana Agrawal Sh. S.C. Mehta Dr. LM Bhar	"Monitoring, forecasting and geographical distribution maps of pests of major crops	NCIPM, New Delhi	Sep 07, 2000
15.	Dr.R.K.Pandey Dr.S.Kaul, Dr.D.R.Singh	Review Workshop on Jai-Vigyan National Science and Technology Mission Project on Household food Security	NCAP, New Delhi.	Sep 16, 2000
16.	Dr PK Malhotra	Workshop on `Prioritization in Agricultural Research'	Suraj Kund, Haryana	Sep 29-30, 2000
17.	Dr. P. S. Rana	National Symposium on Stochastic Modelling and Operations Management	Kurukshetra University, Kurukshetra	Oct 19-21, 2000
18.	Dr SD Sharma	Conference of Center and States in the field of Official Statistics	Vigyan Bhavan, New Delhi	Oct 23-24, 2000
19.	Dr VK Gupta Dr PK Batra Mrs Rajinder Kaur Dr Rajender Parsad	RAC meeting of Project Directorate for Cropping Systems Research	PDCSR, Modipuram, Meerut	Oct 23-24, 2000
20.	Mrs Rajinder Kaur Mrs Ajit Kaur Sh NK Sharma	24th workshop of AICRP on Cropping Systems Research	MPKV, Rahuri	Nov 02-04, 2000
21.	Dr.S.Kaul	Workshop on Women in Agriculture	Organised by Indian society of Agricultural Economics and Delhi School of Economics and NCAP at NCAP, New Delhi	Nov 09-10, 2000
22.	Dr DP Handa Sh Rajendra Kumar	International conference on land resources management	Vigyan Bhavan, New Delhi	Nov 09-13, 2000
23.	Sh Sanjeev Panwar Sh Prawin Arya	Workshop on Total Factor Procuctivity:Concepts and Methods	NCAP, New Delhi	Nov 11, 2000
24.	Ms.K.G. Mini Dr VK Gupta Dr Aloke Lahiri	3rd Annual conference of the Society of Statistics, Computer and Application	Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu)	Nov 20-23, 2000.
25.	Dr PK Malhotra	One day workshop on `Accreditation for Quality Assurance' organised by Education Division of lCAR	IARI, New Delhi	Nov 21, 2000
26.	Dr SD Sharma	National Symposium on Accreditation for Quality Assurance in Agricultural Education	Education Division, ICAR, New Delhi	Nov 23-24, 2000
27.	Dr. SD Sharma Dr AK Srivastava Dr. Prajneshu Dr. V K Bhatia	54th Annual Conference of ISAS	N. D. University of Agricultural and	Nov 28-30, 2000

Sr. No.	Name of the Scientist	Programme	Venue	Period
	Sh. SD Wahi Dr VK Gupta Dr PK Batra Mrs Rajinder Kaur Mrs Ajit Kaur Dr Rajender Parsad Dr Anil Rai Dr HVL Bathla Dr KK Tyagi Dr DL Ahuja Sh RS Khatri Dr Jagbir Singh Sh AK Gupta Dr GK Jha		Technology, Faizabad (U.P.)	
28.	Dr Cini Varghese	9th International Workshop on Matrices and Statistics	ISI, Hyderabad	Dec 09-13, 2000
29.	Dr Tauqueer Ahmad	7th International Conference on 'Statistics, Combinatorics and Related Areas'	IIT, Bombay	Dec. 19-21,2000
30.	Dr RK Pandey Dr S Kaul	Networking for Social Scientist	Tamil Nadu, Veterinary and Animal Science University, Chennai	Dec 27, 2000
31.	Dr RK Pandey Dr S Kaul	Annual Conference of Agricultural Economics Research Association (India)	Tamil Nadu, Veterinary and animal Science University, Chennai	Dec 28-29, 2000
32.	Dr VK Bhatia Dr R Srivastava Dr Rajender Parsad	Internation World Mathematics year 2000 workshop on Statistical Modelling Computations Graphical Methods and Data Analysis	University of Delhi, Delhi	Dec 29, 2000
33.	Dr SD Sharma Dr HVL Bathla Dr VK Gupta Dr VK Sharma Dr Randhir Singh Dr VK Bhatia Dr DK Agarwal Dr DP Handa Dr R Srivastava Dr Chandrahas Sh T Rai Dr PK Batra Dr Aloke Lahiri Dr KK Tyagi Dr BC Saxena Dr DL Ahuja Dr Jagbir Singh Dr. SS Kutaula Sh SD Wahi Dr Anil Rai Dr Seema Jaggi Dr Rajender Parsad Dr GK Jha	First Joint Statistical meeting of the International Indian Statistical Association and Indian Statistical Organisations and an Internation Conference on Recent developments in Statistics and probability and their appliciations	India International Center, New Delhi	Dec 30, 2000 - Jan 03, 2001
34.	Dr SD Sharma Dr AK Srivastava and about 100 Scientists & Technical staff	88th Session of Indian Science Congress	IARI, New Delhi	Jan 03-07, 2001

Sr. No.	Name of the Scientist	Programme	Venue	Period
35.	Dr.R.K.Pandey Dr.Sushila Kaul	60th Annual Conference of Indian Society of Agricultural Economics	Kalyani University, Kalyani	Jan 22-24, 2001
36.	Dr SD Sharma	Exhibition-cum-seminar `ELITEX `2001-Electronics & IT Exposition'	IHC, New Delhi	Feb 04-05, 2001
37.	Dr PK Malhotra Dr RC Goyal	Exhibition-cum-seminar `ELITEX `2001-Electronics & IT Exposition'	IHC, New Delhi	Feb 05-06, 2001
38.	Dr Randhir Singh	Map India 2001 – 4th Annual International Conference and Exhibition on GIS, GPS and Remote Sensing	New Delhi	Feb 07-09, 2001
39.	Dr AK Srivastava	Third National Workshop on Environmental Statistics	Thiruvananth-apuram, Kerala	Feb 08-09, 2001
40.	Dr SD Sharma Dr AK Srivastava	Seminar on Understanding Agricultural Development through National Surveys organized as a part of NSS Golden Jubilee Celebrations	National Sample Survey Organization, Bangalore	Mar 02-03, 2001
41.	Dr SD Sharma	Seminar on "e-Security" organized by the Delhi Chapter of the Computer Society of India	Constitution Club, New Delhi	Mar 31, 2001

*Technical Personnel

(B) Participation of Scientists in Training Programmes

Sr. No.	Name of the Scientist	Programme	Venue	Period
1.	Dr PK Malhotra	3rd Management Development Programme in Agricultural Research	NAARM, Hyderabad	Apr 24-29, 2000
2.	Sh VK Jain Sh GM Pathak	Training Programme on ARC/ INFO under A.P. Cess fund project entitled "Study of land use statistics through integrated modell-ing	Environmental Science Research Institute, New Delhi	May 22 – Jun 02, 2000
3.	Dr AK Srivastava	South zone trainers' training programme for computeri-zation of integrated sample survey for live stock products organised by AH & D Deptt. of Min. of Agril., New Delhi and AH Deptt., Karnataka Govt.,	Bangalore	Jun 26-27, 2000
4.	Dr. P.K. Malhotra Dr. R C Goyal Sh. V.H.Gupta Ms. Alka Arora Sh. K.K Chaturvedi Sh. Saurabh Prakash Sh. Sudeep Sh. Vipin Dubey Sh PL Gupta* Sh Pratap Singh* Ms Hemlata Swami*	Training programme on 'SQL Server 7.0'	STG, New Delhi	Jul 20-28, 2000
5.	Dr. Rajender Parsad	A training programme on "Analytical Tools and Techniques for Assessing	Nation Academy of Agricultural	Aug 01 - 10, 2000

Sr. No.	Name of the Scientist	Programme	Venue	Period
		Agricultural Sustainability"	Research Management, Hyderabad	
6.	Dr. R C Goyal V.H.Gupta Ms. Alka Arora Sh. K.K Chaturvedi Sh. Saurabh Prakash Sh. Sudeep Sh. Vipin Dubey Sh PL Gupta* Sh RK Saini* Sh Pratap Singh* Ms Hemlata Swami*	Training programme on 'Active Server Pages'	STG, New Delhi	Aug 05-20, 2000
7.	Sh Subhash Chand* Sh Jai Bhagwan*	Development of Internet and Intranets using LINUX Operating System	CIRG, Mathura	Aug 21-26, 2000
8.	Sh Pal Singh Ms Anshu Dixit Ms Sangeeta Ahuja	71 FOCARS	NAARM, Hyderabad	Aug 25 - Dec 22, 2000
9.	Dr. VK Bhatia	A training programme on 'New Features of Version 8 of SAS'	SAS Institute India, Mumbai	Aug 30-31, 2000
10.	Dr UC Sud	A training programme on 'Remote sensing and GIS applications in Agriculture'	AIT, Bangkok	Sep 05 - Dec 04, 2000
11.	Ms Prachi Misra	Training Programme on "IRDAS IMAGINE"	Kalkaji, New Delhi	Sep 11-15, 2000
12.	Dr. AR Rao Ms Ajit Kaur Bhatia Sh Md Samir Farooqui	Training Programme on 'Design and Analysis of Agricultural Experiments'	IASRI, New Delhi	Sep 15 - Oct 05, 2000
13.	Dr Tauqueer Ahmed	Training Programme on "ARC View GIS" organised by ESRI India.	Kalkaji, New Delhi	Sep 18-19, 2000
14.	Dr GK Jha	X Winter school on 'Remote sensing in Agriculture with special emphasis on crop weather relations' sponsored by DOS, Govt. Of India	Div. of Agril. Physis, IARI, New Delhi	Nov 13 - Dec 08, 2000
15.	Dr Seema Jaggi	Training Course on "Visual and Graphic Communication" under the aegies of CAS	Division of Agricultural Extension, IARI, New Delhi	Nov 14 - Dec 04, 2000
16.	Ms Prachi Misra	FOCARS Training	NAARM, Hyderabad	Dec 01, 2000-Mar 30, 2001
17.	Dr. A. K. Paul Dr. Ramasubramanian V.	Hindi Pragya Training	Shashtri Bhawan, New Delhi	Jan 1, 2001 to date.
18.	Dr. Rajender Parsad	Training programme on "Development of Databases and Information System"	IASRI, New Delhi	Jan 10-30, 2001
19.	Dr VK Mahajan	Multi Media in Teaching	Madras Vet. College, Chennai	Feb 01-21, 2001
20.	Dr Ramasubramanian V. Ms Sonali Das	2nd Winter School on Statistical Exploration of patterns of spatial and other types of large data	ISI, Kolkata	Feb 06-23, 2001
21.	Sh JP Goyal	CAS Training Programme	IASRI, New	Feb 06-26, 2001

Sr. No.	Name of the Scientist	Programme	Venue	Period
	Dr AR Rao	on "Recent Advances in the Analysis of Survey Data"	Delhi	
22.	Sh LM Bhar	UGC Refresher Course on Statistics	ISI, Kolkata	Feb 27 - Mar 22, 2001

*Technical Personnel

(C)

(D) Participation of the Institute in various meetings/ discussions/ functions, etc.

1. Meetings of the Board of Studies in the discipline of Computer Application May 1, Sept 22 and Oct 4, 2000.

2. Students debate to mark the National Technology day Celebration at the Institute on May 11, 2000. The Chief guest was Dr A Alam, Dy Director General (Engg.), ICAR.

3. Meeting on competititve Agricultural Technology Funds in India held at NCAP, New Delhi on May 02, 2000.

4. Meeting of the Committee to finalize the details of course contents of Software Engineering Training Programme for the XXIII batch of ISS probationers of the Ministry of Statistics and Programme Implementation on July 4, 2000. Dr SD Sharma, Director of the Institute chaired the meeting.

5. Meetings of the Board of Studies in the discipline of Agricultural Statistics on Sept 22 and Oct 4, 2000

6. The 350th meeting of the Academic Council of Post graduate School, IARI, New Delhi on Mar 14, 2001

7. The Full Dress Rehearsal on March 29, 2000 and the main XXXIX Convocation of the Post Graduate School, IAREI, New Delhi on March 30, 2001 respectively.

8. Discussions along with Joint Director and Heads of Division with Mr. David Hearle, Director, IMA, UK who visited the Institute on April 11, 2000. Mr. Hearle also delivered a seminar talk at the Institute on Quality Management in Training Programs.

9. Meeting regarding issues relating to crop cutting experiments under National Agricultural Insurance Scheme (NAIS) under the chairmanship of Shri Bhagat Singh, Additional Secretary, Department of Agriculture & Cooperation, Ministry of Agriculture, New Delhi on April 19, 2000.

10. Discussions about the various activities of the Institute with Dr Abuzar Asra, Asian Development Bank, Manila, The Philippines, who visited the Institute on April 24, 2000

11. The second meeting of the sub-group on Agricultural Statistics of the National Statistical Commission on April 25, 2000 at CSO Sardar Patel Bhavan.

12. Panel discussion at National Centre for Agricultural Economics and Policy Research on May 2, 2000

13. Meeting with mid-term Review Mission under NATP in connection with O&M Reforms, Personnel Policies Review, Financial Management, Institutional Review, Public Private Sector Interface, Strengthening ICAR Training Etc. on May 9, 2000 at IARI, New Delhi

14. A demonstration on Project Information Management System (PIMS) at IASRI before the World Bank Mid Term Review Mission on May 11, 2000

15. Discussions with Ms Jetty Bruggeman, IAC, Wageningen, Netherlands to review PME activities at IASRI under NATP on May 12, 2000

16. The Golden Jubilee Function of the National Sample Survey Organisation at Vigyan Bhavan, New Delhi on May 15, 2000/. Dr C Rangarajan, Hon. Governor of Andhra Pradesh was the Chief Guest. He delivered the keynote address on the occasion. Dr Arun Shourie, Minister of State for Statistics & Programme Implementation, Government of India presided

17. Presentation on computer technologies to improve accessing of information related to agricultural research and development through Internet by Mr. Perez Trejo from FAO Hqrs. , Rome on May 17, 2000. Dr RS Paroda, Secretary, DARE & Director General, ICAR chaired.

18. Meeting with World Bank Supervision Mission under NATP for revising the cost of the project. The meeting was held on May 19, 2000 at IARI, New Delhi

19. Meeting on competitive Agricultural Technology Funds in India organised by NCAP, New Delhi on May 20, 2000.

20. Meeting of the O&M Task Force under NATP on June 12, 2000 held at NCAP, New Delhi.

21. Meeting under the chairmanship of Secretary, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India to discuss method of fertilizer demand assessment of soil testing and bio-fertilizers in Krishi Bhavan, New Delhi on June 13, 2000

22. Meeting of the Executive Council of the Indian Society of Agricultural Statistics held under the chairmanship of Dr RS Paroda, Secretary, DARE & Director General, ICAR and President of the Society on July 4, 2000.

23. Meeting of the Advisory Committee of the 88th Session of Indian Science Congress 2001 under the chairmanship of Dr MS Swaminathan held at India Habitat Centre, New Delhi on July 7, 2000

24. Third Executive Development Programme in Agricultural Research Management held during July 15-18, 2000 at NAARM, Hyderabad.

25. Group seminar held at IASRI on `Study relating to formulating long term mechanization strategy for each agro climatic zone/state on July 24-25, 2000

26. Meetings of the ICAR Scientific Panel on Agricultural Engineering on July 27-28, 2000

27. Meetings of the Staff Research Council of the Institute on August 4-5, 2000 to discuss the research agenda of Institute, monitor the project progress and approve new research projects of the IASRI scientists. Director of the Institute Chaired the meetings.

28. Meeting of the Directors of Centre of Advanced Studies at Krishi Anusandhan Bhavan, New Delhi on August 8, 2000 to discuss the progress of the project.

29. Meeting of the Research Advisory Committee of the Institute on August 22, 2000 to discuss the research priorities in Agricultural Statistics & Computer Applications.

30. Meeting of sub group on agricultural statistics of the National Statistical Commission at Sardar Patel Bhavan, New Delhi on august 24-25, and Sept 27, 2000

31. Meeting of the Project Management Committee (PMC) of NATP on Sept 4, 2000 at Krishi Bhavan, New Delhi. Mrs. Sathi Nair, Additional Secretary, Department of Agriculture & co-operation, Ministry of Agriculture chaired the meeting.

32. Meeting in connection with National Agricultural Insurance Scheme under the chairmanship of Shri Nitish Kumar, Hon'ble Minister of Agriculture, Government of India at Krishi Bhavan, New Delhi on September 11, 2000 to present the Small Area Crop Estimation approach.

33. Presented the Small Area Crop Estimation approach for the National Agricultural Insurance Scheme under the chairmanship of Secretary, Department of Agriculture & Co-operation, government of India at Krishi Bhavan, New Delhi on September 12, 2000

34. Meeting of the Project Screening Committee of Animal Science Panel of ICAR under the chairmanship of DDG (Animal Science) on September 25-26, 2000

35. Regional Technical Coordination Committee Meeting of CIMMYT from Sept 30 to Oct 2, 2000 at Kathmandu, Nepal and made a presentation of PIMS

36. Discussions on PIMS with Ms Jetty Bruggeman, IAC, Wageningen, the Netherlands and other scientists of the Institute on Oct 3-4, 2000

37. Meeting in connection with the EFC of the project `Crop Estimation Survey' in the Directo4rate of Economic & Statistics, Ministry of Agriculture, New Delhi on Oct 3, 2000

38. Meeting with the World Bank Review Team to discuss various issues concerning the Rainfed Agro-Eco System under NATP held at NCIPM, New Delhi on Oct 9, 2000

39. First meeting of the ITKIC (Indigenous Technical Knowledge Information Committee) for the mission mode project under NATP entitled "Collection, Documentation and Validation of Indigenous Technical Knowledge" on Oct 10 2000.

40. Meeting of the Editorial Committee of the Indian Journal of Agriculture Science (ICAR) at Krishi Anusandhan Bhavan, New Delhi on Oct 11, 2000

41. ICAR Directors Meet on Oct 12-14, 2000 at NBPGR, New Delhi and made a presentation on data warehouse for NARS

42. Meeting under the chairmanship of Director General, ICAR in connection with the organisation of 88th Indian Science Congress, 200 on Oct 16 and Nov 1, 2000

43. Executive Council of Indian Society of Agricultural Statistics, held at IASRI, New Delhi on Oct 18, 2000

44. Meeting in connection with the National Agricultural Insurance Scheme under the chairmanship of Shri Bhagat Singh, Additional Secretary, Department of Agriculture &* Cooperation, Ministry of Agriculture at Krishi Bhavan, New Delhi on Nov 9, 2000 to discuss the modalities for implementing small areas crop estimation approach.

45. Meeting of the Advisory Committee of the 88th Session of the Indian Science Congress, 2001 under the chairmanship of Dr MS Swaminathan on Nov 20, 2000.

46. Meetings of the Sub-group on Agricultural Statistics of the National Statistical Commission, Government of India at Sardar Patel Bhavan, New Delhi on Nov 13 and Dec 2, 2000

47. Meeting of all the CCPIs of NATP project entitled 'Pilot study on assessment of harvest and post harvest losses', on Dec 04-05, 2000 at IASRI, New Delhi for finalising the project propsal in the light of RPC recommendations. Dr HVL Bathla, HD(SS) is PI of the project.

48. Meetings of Project Management Committee (PMC) pertaining to the project entitled 'Study relating to formulating long term mechnaisation strategy for each agroclimatic zone/state' held on Dec 08, 2000, Jan 10, 2001.

49. Meeting under the chairmanship of Director General, ICAR in connection with the 88th Session of the Indian Science Congress, 2001 held at NASC Complex on Dec 12, 2000

50. Meeting of the Coordination Committee pertaining to the training course on 'Recent Advances in the Analysis of Survey Data' sponsored by CAS was arranged for finalising the topics of lecturers to be allotted to the faculty members on Dec 13, 2000.

51. Meeting with Dr. Prem Vashist, Director, Agro Economic Research Centre, Delhi University regarding NATP project entitled, 'Pilot study on assessment of harvest and post harvest losses' as per recommendations made by RPC of NATP on Dec 15, 2000.

52. Meetings regarding formulation of a project proposal on 'The State of the Indian Farmer': A Millenium Study' at Ahmedabad on Dec 19, 2000.

53. Meeting of the NATP Mission Mode Project ` Digitization of Databases of National Agricultural Resources' at IASRI on Dec 19-20, 2000

54. Discussion on topics of mutual interest with Professor James H Matis, Department of Statistics, Texas, A&M University, College station, Texas, USA who visited the Institute on Dec 29, 2000

55. Series of meetings on Crop Yield Estimation at Gram Panchayat Level for National Agricultural Insurance Scheme (NAIS) on Jan 2, 2001 at Kanishka Hotel, New Delhi.,

56. II Meeting of ITK Information Committee on Collection, Documentation and Validation of Indigenous Technical Knowledge under the Chairmanship of Dr. Alam, DDG (Engg.) at Krishi Bhavan, New Delhi on Jan 04, 2001.

57. Meeting of collaborators of NATP Sub-project on Institutionalization of PME & Networking of Social Scientists at NCAP, New Delhi on Jan 15, 2001

58. Annual Dialogue on `Information and Communication Technology for Poverty Eradication' at MS Swaminathan Research Foundation, Chennai during Jan 18-20, 2001

59. Discussions regarding WAICENT with Dr Anton Mangstl, director, Library & documentation Systems, FAO who visited the Institute on Jan 23, 2001. Dr Anwar Alam, DDG (Engg.), ICAR and concerned scientists from the Institute also took part in the discussion.

60. Meetings of the Staff Research Council of the Institute to discuss the research agenda of Institute, monitor the project progress and approve new research projects of the IASRI scientists on Jan 30-31, 2001. The Director of the Institute chaired meetings.

61. Meeting to discuss timely submission of area information under Timely Reporting Scheme/EARS under the chairmanship of Economic & statistical Adviser at the Directorate of Economics & Statistics, held at Krishi Bhavan, New Delhi on Jan 31, 2001

62. Meeting of the Sectional Committee MSD: 3 of the Bureau of Indian Standards, New Delhi on Feb 1, 2001

63. Meeting of Editorial Board of Statistics & Computer Applications at Indian Statistical Institute, New Delhi in the office chamber of Unit Head Dr Aloke Dey.

64. The lecture on `Demographic Studies Today' which was delivered by Sh SK Sinha, Deputy Registrar General, Office of Registrar General of India, New Delhi held at IASRI on Feb 14, 2001

65. Twenty-ninth meeting of the 'Sub-committee for ISO/TC 69 Work" (MSC 3.3) on February 19, 2001 at Bureau of Indian Standards, New Delhi.

66. Expert Consultation Group Meeting on Global Forest Survey organised by Forest Survey of India at FAO Office, New Delhi on Feb 27-28, 2001.

67. Meeting at DES regarding a study proposed to be undertaken entitled, "Cost of cultivation/production for opium on March 05, 2001.

68. Meeting under the chairmanship of Additional Secretary, Department of Agriculture & Cooperation, Ministry of Agriculture, Government of India in connection with the implementation of National Agriculture Insurance Scheme at Gram Panchayat level by adopting alternative methodology. Small Area Crop Estimation Approach, held at Krishi Bhavan, New Delhi on March 9, 2001

69. Meeting of the Sub-group of the X Five Year Plan on Animal Husbandry Statistics held at the `Department of Animal Husbandry & Dairying, Government of India at Krishi Bhavan, New Delhi on March 12, 2001

70. Address delivered by Noble Laureate Prof Norman E. Borlaug to Delhi based Scientists at IARI Auditorium on March 13, 2001

71. Inaugural Function of Krishi Vigyan Mela of IARI, New Delhi on March 15, 2001

72. Fourth meeting of Food Analysis and Nutrition Sectional Committee, FAD 58 on March 15, 2001 at Bureau of Indian Standards, New Delhi.

73. Meeting of Agricultural Census held at IASRI, New Delhi on March 17, 2001.

74. Meeting with Sh Paul Joseph, Jt. Secretary, Sh RS Dohare, Addl. Commissioner (My.) and Sh R. Tewari, Dy. Commissioner (My.), DOAC concerning reviewing the progress of the Farm Mechanisation project alongwith utilisation of funds on March 22, 2001..

75. Felicitation Function of Prof CR Rao on March 23, 2001 at Hotel Samrat, New Delhi on his receiving the Padma Vibhushan

Award. The function was organised by the Ministry of Statistics & Programme Implementation, Government of India.

76. The seminar delivered by Prof Sat N Gupta, Department of Mathematics and Statistics, University of Southern Maine, Portland, USA held at IASRI on March 24, 2001. The topic of the seminar was `Role of Consulting in Research and Teaching of Statistics'

77. Preliminary meeting with Dr Padam Singh, Chairman, Quinquennial Review Team of the Institute on March 27, 2001 held in the chamber of the DDG (Engg.), ICAR.

Lectures Delivered by the Scientist at other organisations

Prof. SD Sharma

- Delivered a lecture on "Data Processing and Computational Techniques in Agricultural Systems" in the Symposium on Information Systems for Indigenous Development and Agro based Industries, jointly organized by the Section of Computing Science and Forum on Communication and Information Science on Jan 06, 2001 during the 88th Session of the Indian Science Congress held at IARI, New Delhi.

Dr. AK Srivastava

- Delivered a lecture on "Role of Sample surveys in Policy formulation" in the CAS training programme in Agricultural Economics Division, IARI on Aug 31, 2000.

- Delivered a lecture on "Research activities of the Institute" in ISEC course for ISI Calcutta at IASRI on Sep 18, 2000.

Dr. HVL Bathla

- Delivered two lecturers to the participants of the training programme "Designing and analysis of field experiments" at CCS, HAU, Hissar.

- Delivered a lecturer on "Sample Suyrveys" to the ISS probationers on Dec 08, 2000.

Dr. Ranjana Agrawal

- Delivered two lecturers on "Crop forecasting methods" in course entitled "Designing and analysis of field experiments" at CCSHAU, Hisar

Dr. LM Bhar

- Delivered a lecturer on "Forecasting techniques with respect to plant disease control" in a short course on Application of epidemiological principles in plant disease control" at Deptt. of Plant Pathology, CCS Haryana Agril. University, Hisar during Dec. 11-20, 2000.

Dr. Rajender Parsad

- Delivered five Lectures on " 1. Resolvable Block Designs (2 lectures) 2. Variance Balanced Block Designs (3 lectures)" to the participants of the Advanced Lecture Circuit in Design of Experiments at Department of Statistics, University of Delhi, Delhi, during Sep 09-10, Nov 11 and Nov 18, 2000

- Delivered two lectures on "1. Covariance Analysis 2. Response Surface Designs" to the participants of the training programme on " Designing and Analysis of Field Experiments" held at Academy of Agricultural Research Education and Management, CCS HAU, Hissar during Oct 17, 2000 to Nov 13, 2000.

- Delivered a lecture on "Statistical Methods and Computer Applications in Pesticide Science" to the participants of the training programme on "Recent Developments in Agrochemical Research to Meet the Challenges of the 21st Century, Division of Agricultural

Chemicals, Indian Agricultural Research Institute, New Delhi during Nov 06-15, 2000

- Delivered a lecture on Design of Experiments: "Activities and Functions" to the Indian Statistical Services Personnel of the 24th Batch on Dec 08, 2000.

Dr. Seema Jaggi

- Delivered a series of lectures on Partially Balanced Incomplete Bolck (PBIB) designs, Refresher Course, University of Delhi, Delhi in the month of Nov, 2000.

Dr. VK Sharma

- Delivered two lectures on use of non-linear models for studying technological Change in Indian Agriculture Training programme on 'Quantitative techniques for policy analysis in Agricultural Economics, Division of Agricultural Economics, New Delhi from Sep, 07 - Oct 09, 2000.

Visit Abroad

- Dr AK Srivastava, Joint Director attended an Internation Workshop as a resource person on Agricultural Surveys based on Multiple Frame Sampling Methods organised by FAO/SIAP at Bangkok, Thailand from November 19-29, 2000. This was a consultancy assignment from Food and Agriculture Organisation, Rome.

- Dr. UC Sud, Senior Scientist visited AIR, Bangkok to attend a three months training programme on "Use of GIS in improvement of crop statistics" under the AHRD project from Sep 05-Dec 04, 2000.

Radio Talk/TV Interview/Press Conference

- Attended the Curtain Raiser Press Conference of the 88th Session of the Indian Science Congress, 2001 at New Delhi on Dec 27, 2000

PAPERS PRESENTED BY THE SCIENTISTS OF THE INSTITUTE AT THE CONFERENCES/ WORKSHOPS/SEMINARS, ETC.

Sr No	Author(s)	Title of the paper	Programme	Venue	Period
1.	Singh, Randhir	Use of GIS for sampling design for Agricultural Surveys	Map-india-2000 – 3rd International Conference on GIS, GPS and Remote Sensing	New Delhi	Apr 10-11, 2000
2.	Rana, PS	Prediction in lactation curves	XV Annual Conference of Ramanujan Mathematical Society	Ramanujan Institute for Advanced study in Maths, University of Madras, Chennai	Jun 05--07 2000
3.	Pandey, RK Kaul, Sushila	Analytical Procedure and report Format for Socio-Economic Survey for Existing Food Security Status	Review wrkshop on Jai-Vigyan National Science and Technology Mission Project on household food secruity	NCAP, New Delhi.	Sep 16, 2000
4.	Malhotra, PK Rai, Anil	Concept paper on Dataware housing	Workshop on "Prioritization in Agricultural Research"	Suraj Kund, Haryana	Sep 29-30 2000
5.	Rana, PS	On modelling for growth pattern in crossbred cattle	National Symposium on Stochastic Modelling and Operations Management	Kurukshetra University, Kurukshetra	Oct 19-21, 2000
6.	Lahiri, Aloke	Studies on determining economic fertilizer doses working data on soil test values of the nutrients.	3rd Annual Conference of the society of statistics, computer and application	Tamil Nadu Agricultural University, Coimbatiore (T.N.)	Nov 20-23, 2000
7.	Ghosh, Himadri	Optimal designs for variance components estimation in diallel cross experiments	-do-	-do-	-do-
8.	Ahuja, DL Tyagi, KK	Estimation of feed, seed and wastage Ratios for food grains	54th Annual Conference of ISAS	NDUAT, Kumarganj, Faizabad	Nov 28-30, 2000
9.	Bhardwaj, SP Pandey, RK Mahajan, VK	Statistical Analysis of Production and Resource Use in Broiler Production	-do-	-do-	-do-
10.	Bhatia, Ajit Kaur	Yield maximization of a system of cropping by	-do-	-do-	-do-

Sr No	Author(s)	Title of the paper	Programme	Venue	Period
		optimal combination of input use.			
11.	Chand, Lal Wahi, SD Bhatia, VK	Genetic parameters of fitness characters in Jamana Pari and Black Bengal goats	-do-	-do-	-do-
12.	Gupta, AK Mogha, AK Satya Pal	Effect of fertilizer and insecticides & pesticides on the yield of vegetables	- do -	- do -	- do -
13.	Kaur, Rajinder	Evaluation of relationship between two rice varieties	-do-	-do-	-do-
14.	Raut, KC Khatri, RS	Some aspects of livestock development in india- A critical appraisal	- do -	- do -	- do -
15.	Pal, Satya Rai, T Sood, RM Gupta, AK	Yield Gap Analysis using path coefficient technique	- do -	- do -	- do -
16.	Sharma, VK Kaur, Rajinder	A statistical investigation on the long-term effect of fertilizer on productivity of cereal crop sequences	- do -	- do -	- do -
17.	Singh, Jagbir Bathla, HVL	Assessment of performance of Design strategy	- do -	- do -	- do -
18.	Singh, VPN Rai, Anil Jain, VK	Re-sampling procedures in survey sampling- A emperical study	- do -	- do -	- do -
19.	Tyagi, KK Sharma, SD Srivastava, AK Bathla, HVL	On study relating to formulating long term Farm Mechanization strategy for each Agro-climatic zone/state	-do-	-do-	-do-
20.	Wahi, SD Singh, Okendro N.	Effect of sample size & structure on the bootstrap estimate of variance of heritability	-do-	-do-	-do-
21.	Jha, GK Bathla, HVL	Methodological aspects of Horticulture Crops - Problems and Issues	Symposium on "Statistics of Horticulture Crops- Problems and Issues" organised during the 54th Annual Conference of ISAS	NDUAT, Kumarganj, Faizabad	Nov 28-30, 2000
22.	Varghese, C Rao, AR Sharma, VK	Robustness of change-over designs	Ninth International workshop on matrices and	ISI, Hyderabad	Dec 09-13, 2000

Sr No	Author(s)	Title of the paper	Programme	Venue	Period
			Statistics		
23.	Srivastava, AK	Information Support for Management of Agriculture	Workshop on The State of the Indian Farmer': A Millenium Study	Indian Institute of Manage-ment, Ahmedabad	Dec 19, 2000
24.	Ahmad, T	GIS based spatial sampling procedures for environmental studies in agriculture	`Environmental Statistics Symposium of 7th International Conference on Statistics, Combinatorics and Related Areas	IIT, Bombay	Dec 19-21, 2000
25.	Pandey, RK Pandey, RK Kaul, Sushila	Agricultural Economics Research and Education Which Way to Go In The First Decade Of the Millenium	Annual conference of Agriculture Economics Research Association	Tamil Nadu Veterinary and Animal Science University, Chennai	Dec 28-29, 2000
26.	Ghosh, Himadri	Optimal diallel cross design for estimation of heritability	First Joint Statistical meeting of the International Indian Statistical Association and Indian Statistical Organisations	India International Centre, New Delhi	Dec 30, 2000 – Jan 03, 2001
27.	Jha, GK Srivastava, AK Rai, Anil	Conditionally unbiased ratio-type estimators	-do-	-do-	-do-
28.	Parsad, Rajender	Optimal Designs for multi-allel cross experiments	-do-	-do-	-do-
29.	Ramasubramanian V. , Singh, Randhir Rai, Anil	Conditional inference for variance estimation under two-phase sampling	-do-	-do-	-do-
30.	Singh, Randhir	Use of remote sensing satellite data for crop yield estimation	-do-	-cdo-	-do-
31.	Srivastava, AK	Crop Yield Estimation at Gram Panchayat Level for National Agricultural Insurance Scheme (NAIS)_	Small Areas Crop Estimation Survey	Ministry of Agriculture, Kanishka Hotel, New Delhi	Jan 2, 2001
32.	Gupta, VK	Weighted A-optimal block designs for comparing test treatments with controls with unequal precision	88th Session of Indian Science Congress	IARI, New Delhi	Jan 03-07, 2001
33.	Handa, DP Sreenath, PR Rajpali, SK	Efficiency of Latin Square experimentation with oats	-do-	-do-	-do-
34.	Kaul, Sushila	Study of Food Availability	-do-	-do-	-do-

Sr No	Author(s)	Title of the paper	Programme	Venue	Period
	Pandey, RK	and Status of Food Security in India			
35.	Kumar, Ashok Handa, DP Rajpali, SK Saxena, AK	Frequency distribution of plot yield in Lucerne (Medicagop Sativa) as live stock feed	-do-	-do-	-do-
36.	Singh, Randhir	Land use/land cover statistics and extent of floods during 97-98 for district Rohtak, Haryana using remote sensing satellite data	-do-	-do-	-do-
37.	Kaul, Sushila Pandey, RK	Economic Study of Tenancy Structure in India	60th Annual Conference of Indian society of Agricultural Economics	University of Kalyani, Kalyani	Jan 22-24 2001
38.	Singh, Randhir	Use of satellite data and farmers eye estimate of yield for crop yield forecasting	Map India 2001 – 4th Annual International Conference and Exhibition on GIS, GPS and Remote Sensing	New Delhi	Feb 07-09, 2001

WORKSHOPS, SEMINARS, SUMMER INSTITUTES, FARMERS' DAY ETC. ORGANISED AT THE INSTITUTE

Recent Advances in the Analysis of Survey Data under National Agricultural Research System (NARS)

The Institute organised a Centre of Advanced Studies (CAS) sponsored Training Programme on **"Recent Advances in the Analysis of Survey Data"** for the **Scientists / Asstt. / Asso. Prof. of various SAUs under National Agricultural Research System (NARS)** during **Feb 06–26, 2001**. Seventeen participants participated in the training programme. On Feb. 06, 2001, the Course Introductory session was organised while on Feb. 26, 2001, the Valedictory Function of the Training Programme was organised. Prof. A. Alam, Dy. Director General (Engg.) was the Chief Guest. The Chief Guest distributed the Certificates to the participants. Dr. S.D. Sharma, Director welcomed the Chief Guest. Dr H.V.L. Bathla presented the Course Director's report relating to the training programme and Dr K.K. Tyagi, Associate Course Director proposed Vote of Thanks. The core faculty for this was drawan from the Division of sample survey. Scientists from the other Divisions of the Institute also delivered few lectures. Apart from this, faculty were also invited from National Sample Survey Organization, Directorate of Economics & Statistics, Office of Registrar General of India, Indian Council of Medical Research and University of Delhi etc. to deliver lectures on some specific topic. During the training, the participants were exposed to recent advances in the field of Sample Surveys like Historical Perspective of Sample Surveys, Simulation Techniques, Small Area Estimation, Model Based Approach in Survey Sampling, Regression analysis, Categorical data analysis, Variance Estimation, Remote Sensing, Current Status of Crop Surveys, Qualitative Aspect in Agricultural Survey, Multiple and Imperfect Frames in Sample Surveys, Inferential Aspects in Survey Sampling, Imputation Techniques, GIS, Current Status of Livestock Surveys etc. The participants were also given exposure to working on computers and use of different statistical packages related to sample surveys like, MS Excel, PC CARP, SAS, MS Access, SPSS, ARC/INFO etc. The main thrust of the progaramme was on application of these emerging areas in collection and analysis of survey data.

Design and Analysis of Agricultural Experiments under the aegis of Centre of Advanced Studies (CAS)

A training programme on "Design and Analysis of Agricultural Experiments" was organised under the aegis of Centre of Advanced Studies for Agricultural Statistics and Computer Application from September 15, 2000 to October 05, 2000. The objective of the training programme was to expose the Scientists working in different areas of agriculture, animal sciences and fisheries to latest designs, analysis of experimental data and use of latest software packages like SAS and SPSS etc. The training was planned in such a way that it was a blend of theory and application. The participants were engaged in analysing the data using software packages like SAS etc. The participants were provided notes of lectures in the form of manual in the beginning of the training programme. The participants were drawn from various State Agricultural Universities and ICAR institutes. In all seventeen participants participated in the programme. The faculty was drawn both from the institute and outside.

Development of Databases and Information System

A training proglramme on `Development of Databases and Information System was organised in the Institute from Jan 10-30, 2001. The course was meant klnfor scientists and faculty members of ICAR Institutes and State Agricultural Universities. The participants

were exposed to the advancement taking place in the field of Information Technology.

Forecasting Techniques

A two-day training programme on forecasting techniques for trainees of Senior Certificate Course during Dec. 26-27, 2000.

Economic Evaluation of Productivity Improvements and Technical Change in Agriculture Sector

A short course entitled "Economic Evaluation of Productivity Improvements and Technical Change in Agriculture Sector" was organised during August 24 to September 02, 2000. Twenty five teachers and scientists working in various ICAR, Institutes and State Agricultural Universities participated in the course. The faculty for the course was drawn from IASRI, IARI, NCAP, ICAR Head Quarters, National Council of Applied Economics Research, New Delhi and Delhi University, Delhi. The course was inaugurated by Prof. S.D.Sharma, Director, IASRI. Dr. R.K.Pandey was the Course Director and Dr.(Ms.) Sushila Kaul was the Co-director.

The Annual Day

The Annual Day of the Institute was celebrated on July 01, 2000. As a part of the celebration a debate contest for Technical and Administrative staff was organised on June 30, 2000 in the afternoon session . The topic of the contest was ' Whether Contractual Services can lead to improve work culture'. Shri D.C.Pant, Technical Officer convened this contest. Another Declamation Contest for students and scientists was held on July 1, 2000. The topic of the contest was ' Role of Information Technology in Growth of Statistics' Dr.D.K.Agarwal, Sr. Scientist and Scientist Incharge (TAC) was the convenor.

In the afternoon session, the main Annual Day function was celebrated. Dr. Anwar Alam, D.D.G. (Engg.) , ICAR was the Chief Guest. Dr.V.L.Chopra, former DG, ICAR delivered the Tenth Nehru Memorial Lecture entitled 'Conventional Breeding and Genetic Engineering'. The late Shri M.K.Bose Memorial Prize was awarded to Shri Pramod Kumar, Departmental candidate securing highest marks in the Senior Certificate Course in Agricultural Statistics & Computing examination of the Institute during the year 1999-2000. The prizes were also distributed to the winners and runners for the Debate and the Declamation Contest.

Seminars

The result of 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 in all eight-six Seminars were organised, out of which sixty-seven seminars were delivered by the students of PG School, IARI, eleven by the Scientists of the Institute and eight were delivered by eminent guest speakers. Name(s) and topics of the research seminars delivered by eminent scientists are as follows:

Seminars by Guest Speakers

S.No.	Speaker	Topics	Date
1.	Mr David Hearle, Director, IMA, UK	Quality management of training programme	11-04.2000
2.	Dr BD Tikkiwal, Retired Professor, Institute of Development Research & Statistics, Jodhpur	On filling of data gaps for efficient planning of agricultural education	24-06-2000

S.No.	Speaker	Topics	Date
3.	Dr AK Sinha	Rank Set Sampling (Application in Agril)	15-05-2000
4.	Dr Murari Singh, ICARDA, ALLEPO, Syria	Selection of Covariance Structur5e for Plot Errors from A Three Course Wheat Rotational Trial	19-06-2000
5.	Dr JN Srivastava, Professor, Department of Maths & Stat., Colorado State University, Fort Collins, Colorado-905219. USA	Multistage search procedures for identifying two factor interactions when higher one are negligible	19-01-2001
6.	Prof James H. Matis, Department of Statistics, Texas, A&M University College Station, Texas, USA	Modelling & Forecasting of Biological population	27-01-2001
7.	Sh SK Sinha, Deputy Registrar General, Office of the Registrar General of India, RK Puram, New Delhi	Demographic Studies	14-02-2001
8.	Prof Sat N. Gupta, Department of Mathematics & Statistics , University of Southern Maine, Portland, USA	Role of consulting in research and teaching of statistics	24-03-2001
Seminars by Institute Scientists			
9.	Sh SC Mehta, Scientist (Sr Scale) Division of Forecasting Techniques, IASRI, New Delhi-110012	Study on bio-ecology and population dynamics of major pests of mango and guava	28-07-2000
10.	Dr Randhir Singh Principal Scientist Division of Sample Survey IASRI, New Delhi-110012	Use of Satellite Data Along with Soil Parameters for Crop yield Estimation and Modelling	29-07-2000
11.	Sh Balbir Singh Scientist (Sr Scale) Division of Computing Science IASRI, New Delhi-110012	Development of software for on-line information system for personal manpower planning for ICAR	31-07-2000
12.	Sh Himadri Ghosh Scientist Division of Biometrics IASRI, New Delhi-110012	Study of non-linear time series modelling in Agriculture	31-07-2000
13.	Dr Chandrahas Sr Scientist Division of Forecasting Techniques, IASRI, New Delhi-110012	Pilot study for developing Bayesian porbability forecast model based on farmer's appraisal data on wheat crop (completed project)	26-08-2000
14.	Dr T Rai Scientist (Sr Scale) Division of Forecasting Techniques, IASRI, New Delhi-110012	Project completion	08-09-2000
15.	Dr UC Sud	GIS and Remote Sensing	21-12-2000

S.No.	Speaker	Topics	Date
	Sr Scientist Division of Sample Survey IASRI, New Delhi-110012		
16.	Dr VK Sharma Principal Scientist Division of Design of Experiments IASRI, New Delhi-110012	A statistical investigation on the long-term effect of fertilizers on productivity of serial crops sequences (completed project)	20-01-2001
17.	Sh AK Gupta Scientist Division of Sample Survey IASRI, New Delhi-110012	Sample survey to evolve methodology of fish catch from rivers and streams of hilly areas	02-02-2001
18.	Dr KK Tyagi Sr Scientist Division of Sample Survey IASRI, New Delhi-110012	Study relating to formulating long term mechanisation strategy for each agro-climatic zone	02-02-2001
19.	Dr UC Sud Sr Scientist Division of Sample Survey IASRI, New Delhi-110012	A pilot study on cost of production of coconut in Kerala	03-02-2001

88th Session of Indian Science Congress

88th Indian Science Congress on Food, Nutrition & Environmental Security was jointly organised by Indian Science Congress Association (ISCA), Indian Council of Agricultural Research (ICAR), Indian Agricultural Research Institute (IARI) and National Academy of Agricultural Sciences (NAAS) at Indian Agricultural Research Institute during January 03-07, 2001, IASRI was given the responsibility of organising two sessions on Mathematics & Statistics. In addition to above, Institute was also given the responsibility of preparation of Web-site, registration and distribution of material to the participants.

DISTINGUISHED VISITORS

INDIAN

Dr RS Paroda,
Director General, ICAR & Secretary, DARE,
Government of India,
Krishi Bhavan,
New Delhi-110001

Mr DK Trehan,
Economics and Statistical Advisor,
Directorate of Economics and Statistics,
Krishi Bhavan, New Delhi

Prof A Alam,
Deputy Director General (Engg.),
ICAR, Krishi Bhavan,
New Delhi-110001

Dr M Neelkantan,
Deputy Director General (FOD),
National Sample Survey Organisation,
Faridabad

Dr MN Das,
Former Director, IASRI,
New Delhi-110012

Prof S Mohanty,
VIM-242, Saila Shree Vihar,
Bhubaneswar - 751 021 (Orissa)

Dr Padam Singh,
Additional Director General,
Indian Council of Medical Research,
New Delhi

Dr. VJ Shrikhande,
Former Prof. and Head,
Department of Statistics,
2-GH-8, 156, Machhla Magra, Sector - 11,
Udaipur - 313 001 (Rajasthan)

Sh VR Rao,
Ex-Director General,
Central Statistical Organisation,
New Delhi

Dr. S Ilyas,
Assistant Director General (ESM),
I.C.A.R., Krishi Bhavan,
New Delhi - 110 001

Dr BD Tikkiwal,
Retired Professor,
Institute of Development Research & Statistics,
Jodhpur

Sh. HT Mohan Kumar,
Dimbada Estate,
Hurudi Post - 577 119,
Sakaleshpur Taluk,
Hasan Distt. (Karnataka).

Sh SK Sinha,
Deputy Registrar General,
Office of the Registrar General of India,
RK Puram, New Delhi

Dr MC Agarwal,
Professor (Statistics),
Delhi University,
Delhi

FOREIGN

Mr David Hearle,
Director, IMA,
UK

Dr Adel El-Beltagy,
Director General,
ICARDA, ALLEPO, Syria

Ms Jetty Bruggeman,
Management Information System,
IAC,
Wageningen,
Netherlands

Dr Murari Singh,
ICARDA,
ALLEPO,
Syria

Mr Joost, Frans Newman
IAC, Wageningen,
Netherlands

Mr L. Harrington
IAC, Wageningen,
Netherlands

Prof James H. Matis,
Department of Statistics,
Texas, A&M University
College Station,
Texas, USA

Dr Anton Mangstl,
Director,
Library and Documentation Systems,
FAO

Prof Sat N. Gupta,
Department of Mathematics & Statistics ,
University of Southern Maine,
Portland, USA

Dr Jim Ryan,
World Bank

Dr Ashok Seth,
World Bank

Dr RK Gupta,
CIMMYT-RWC
Maxico

Mr Peter Hobbs
CIMMYT-RWC,
Maxico

Dr J N Srivastava,
Professor,
Department of Maths & Stat.,
Colorado State University,
Fort Collins,
Colorado-905219. USA

IASRI PERSONNEL

(As on 31.03.2001)

Prof. SD Sharma, **Director**
Dr AK Srivastava, **Joint Director**

Division of Sample Survey

Dr HVL Bathla, ***Principal Scientist and Head***

Principal Scientist

Dr Randhir Singh

Sr. Scientists

Dr KK Tyagi
Dr DL Ahuja
Dr BC Saxena
Dr UC Sud
Shri RS Khatri
Shri AS Gupta
Shri SRS Arya
Dr MS Narang
Dr Jagbir Singh
Shri DC Mathur
Shri JP Goyal

Scientists (Sr. Scale)

Shri SC Agarwal
Shri Satya Pal
Shri SC Sethi
Shri Bhagwan Dass
Shri RC Gola
Shri VK Jain
Shri RM Sood
Shri KK Kher

Scientists

Dr. Tauqueer Ahmad
Dr. GK Jha
Shri AK Gupta
Shri RM Bhasin
Ms Prachi Bhasin

Division of Design of Experiments

Dr VK Gupta, ***Principal Scientist & Head***

Principal Scientist

Dr VK Sharma

Sr. Scientists

Smt. Rajinder Kaur
Dr Ravindra Srivastava
Dr DP Handa
Dr PK Batra
Shri JK Kapoor
Dr Aloke Lahiri

Scientists (Sr. Scale)

Shri DK Mehta
Shri DK Sehgal
Shri MR Vats
Shri NK Sharma
Shri GL Khurana
Smt Ajit Kaur Bhatia
Dr Rajender Parsad
Dr (Mrs) Seema Jaggi

Scientists

Dr. Cini Varghese
Shri Rajendra Kumar Singh
Shri Anil Kumar

Division of Biometrics

Dr Prajneshu, ***Principal Scientist and Head***

Principal Scientist

Dr VT Prabhakaran
Dr VK Bhatia

Sr. Scientists

Dr PS Rana
Shri Lal Chand
Shri SD Wahi

Scientist (Sr. Scale)

Shri Indra Singh

Scientists

Dr. Amrit Kumar Paul
Shri Himadri Ghosh
Dr. A Rama Krishan Rao
Ms Mini KG

Division of Forecasting Techniques

Dr. (Smt.)Ranjana Agarwal, ***Principal Scientist & Head***

Sr. Scientists

Dr Chandrahas
Smt Asha Saksena

Scientists (Sr. Scale)

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

Scientists

Dr Lal Mohan Bhar
Dr Ramasubramanian V
Shri Amrender Kumar

Division of Econometrics

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

Sr. Scientists

Dr SP Bhardwaj
Dr SS Kutaula
Dr. Ashok Kumar

Scientists (Sr. Scale)

Shri Ant Ram
Smt Sushila Kaul
Shri Mahinder Singh

Scientists

Shri Prawin Arya
Shri Sanjeev Panwar
Md. Wasi Alam
Dr. Dharam Raj Singh

Division of Computing Science

Dr PK Malhotra, ***Principal Scientist and Head***

Principal Scientist

Dr RC Goyal

Sr. Scientists

Dr IC Sethi
Dr VK Mahajan
Dr RK Jain
Shri Mahesh Kumar
Shri KC Gupta
Dr Anil Rai

Scientist (SG)

Shri OP Khanduri

Scientists (Sr. Scale)

Shri HO Aggarwal
Shri Balbir Singh
Shri HS Sikarwar

Scientists

Shri VH Gupta
Ms Alka Arora
Shri Ravi Kumar Badge
Ms Sonali Das
Ms Shashi Dahiya
Shri Sanjeev Kumar
Shri Mohmmad Samir Faroqqui
Ms Sangeeta Ahuja
Shri Sudeep Kumar
Shri Sauravh Parkash
Shri Pal Singh
Shri Krishan Kumar Chaturvedi
Shri Vipin Kumar Dubey
Ms Anshu Dixit
Shri Shahnawazul Islam

Training Administration Cell

Dr. AK Srivastava, ***Joint Director***
Dr VK Sharma, ***Professor (Ag. Stat.)***
Dr. PK Malhotra, ***Professor (CA)***
Sh RS Khatri, ***Warden***
Dr. DK Agarwal, ***Scientist-in-charge***

Research Coordination and Management Unit

Dr. AK Srivastava, ***Joint Director***
Dr. DK Agarwal, ***Scientist-in-Charge***

Library

Dr. SS Srivastava, ***Head***

Administration

Shri Chironji Lal, ***Chief Administrative Officer***
Shri HK Samadar, ***Finance & Accounts Officer***

ANY OTHER RELEVANT INFORMATION SUCH AS SPECIAL INFRASTRUCTURAL/ DEVELOPMENT

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 Joint Staff Council of the Institute was reconstituted for the period of three years w.e.f. March 27, 2001 as under:

Prof. SD Sharma		Director	Chairman
Official-side Representatives			
1.	Dr. AK Srivastava	Joint Director	Member
2.	Dr. VK Gupta	Principle Scientist	Member
3.	Sh. RS Khatri	Sr. Scientist	Member
4.	Dr. L.M. Bhar	Scientist	Member & Secretary (Official side)
5.	Sh. Chironji Lal	C.A.O.	Member
6.	Sh. HK Samadar	F&AO (Ex-Officio)	Member
Staff-side Representatives			
7.	Sh DPS Mann	Assistant	Secretary
8.	Sh. KB Sharma	UDC	Member
9.	Sh Ghasi Ram	Technical Officer (T-5)	Member
10.	Sh Jarnail Singh	Field Investigator	Member
11.	Sh. RK Saini	Technical Officer (T-5)	Member
12.	Sh Raj Pal Singh	S.S. Gr.II	Member
13.	Sh Ram Paras	S.S. Gr.III	Member

One meeting of Institute Joint Staff Council were held on June 05, 2000 under the Chairmanship of Prof. SD Sharma, Director of the Institute to resolve various matters for the benefit of IASRI staff.

IASRI Employees Co-operative Thrift and Credit Society

The society which is registered with the Registrar Co-operative Societies, Delhi Administration, Delhi continued its activities in the similar manner as during the past years by advancing loans to its members and looking after their welfare. The source of funds of the society are share money, compulsory deposits and fixed deposits from the members of the society. At present the number of members on the roll of the society is 471.

The election of the new management committee was held on May 27, 2000 and office bearers are as follows:

1. Sh. VK Mishra	President
	Vice President
	Secretary
	Treasurer
	Internal Auditor
	Member
	Member
	Member
	Member
	Member
	Member
	Member
	Member
	Member

Main achievements of the Society

1. The society advanced Rs.45,00,000/- to the members as loan
2. An amount of Rs.501/- was given as gift to the each seven members and Rs. 751/- to eleven members on their retirement from the Institute

3. The financial help was extended from the member welfare fund to the tune of Rs. 4,000/- and Rs. 5,000/- to the bereaved family of two members and also Rs. 1000/- to Shri Bhoop Singh and Rs. 2,000/- each to Shri Bhagwat Rai and Sh. Rattan Singh for their treatment who were suffering from incurable diseases and required expensive medication.

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. The Grievance Committee of the Institute was reconstituted with the approval of the Management Committee of the Institute for a period of two years w.e.f. July 28, 1999 as follows:

Official-side Representative		
1.	Prof. SD Sharma	Chairman
2.	Dr. AK Srivastava	Member
3.	Sh. Chironji Lal	Member
4.	Sh. HK Samadar	Member
5.	Sh. DN Bhatia	Member-Secretary
Staff-side Representative		
6.	Sh. Mahendar Singh	Member
7.	Sh. RK Singh	Member
8.	Sh. Sudershan Sharma	Member
9.	Sh. Purshotam Sharma	Member

Five meetings of the Grievance Committee of the Institute were held on Apr 28, Jul 31, Oct 30, 2000, Feb 13 and Mar 24, 2001 under the chairmanship of the Director.

Women Cell

A Women Cell has been set up at the Institute on Jan 27, 2000. The Cell functions for the Wlefare of Woem in General. It caters to the issues grievances pertaining to the women employees. Woemn Cell consists as given below:-

1.	Chief Administrative Officer	Chairman
2.	Smt Cini Vergheese, Scientist	Member
3.	Smt Meena Nanda, Technical Officer	Member
4.	Smt Pushpa Bareja, Assistant	Member
5.	Smt Usha Sood, SS Grade-I	Member
6.	Smt Seeta Malhotra, Asstt. Admn. Officer	Convenor

A meeting of the Cell was held on March 16, 2001.

Hostel Activities

There are two well furnished hostels viz. Panse Hostel and Sukhatme Hostel to cater the residential requirements of the trainees and students of M.Sc., Ph.D. courses and Senior Certificate Courses (SCC) at the Institute within its premises. Officers and other trainees to the various other refresher, short-term and ad-hoc courses organised at the Institute are also provided residential accommodation at the Panse Hostel. Ample facilities exist for the cultural activities and sports for the hostel inmates. Hostel mess is run by the students on co-operative basis. The general management of the hostels is vested with the Warden, who is assisted by the Prefect and the other students. The main activities included are as follows:

A General Body meeting of IASRI hostel inmates was held under the Chairmanship of Shri RS Khatri, Warden. For smooth functioning of the hostel activities, the following executive committee members were elected for the session 2000-2001.

1	Prefect	Mr Amitava Day
2	Assistant Prefect/ Mess Secretary	Ratan Jyoti
3	Sports Secretary	Harish Kumar Subratra Kumar Satpati
4	Computer Secretary	V Bhushan Babu Vikas Kumar
5	Chief Auditor	Md. Jawaid Ashraf
6	Maintenance Secretary	Abhishek Rathor Parveen Krishna
7	Health & Sanitation Secretary	Hemant Kumar

On the eve of annual day on July 2, 2000, a sports week was organised by IASRI in Sukhatme Hostel where students at IASRI including girls participated in various sports like table tennis, badminton etc. Several other sport events like table tennis and Tug-of-war were also organised between faculty members and students. A cricket match was also organised between faculty members and students including SCC students on March 6, 2001.

Boarding and lodging arrangements were made in Panse Hostel (Guest House) for the participants of various training programmes organised at the Institute. Similar arrangements were made for the guests who stayed in guest house from different departments/ organisations.

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 and a gift of Rs.500/- is being given to the retiring exployees of the Institute. A meeting of the Benevolent funds was held on Jan 20, 2001.

Co-operative 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. Cold drinks, coffee, snacks provisions and general merchandise etc. were made available at reasonable rates to the staff members of the Institute.

Member's Children Education Welfare Scheme was introduced by the Managing Committee during the year 1997-98 for the promotion of educational improvement for the children of the members of the cooperative store. Under the scheme 33 children of the members of the cooperative store were benefited so far.

The General Body meeting of the Cooperative Store was held on March 07, 2001 and dpresided by Dr. SD Sharma, Director, IASRI, New Delhi. The following office bearers were elected unanimously in the General Body Meeting held on March 07, 2001:

1	Shri SK Mahajan	President
2	Dr. SS Srivastava	Vice-President
3	Shri SC Agarwal	Secretary
4	Shri NK Sharma	Treasurer
5	Shri Asha Ram Sharma	Member
6	Shri DN Bhatia	Member
7	Shri KB Sharma	Member
8	Shri Mohan Lal	Member
9	Shri Vinod Kumar Mishra	Member
10	Ms Vijay Bindal	Member
11	Mrs Harsh Kapoor	Member

The total membership of the cooperative store as on 31st March, 2001 was 436.

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 general recreation and welfare of its members. The club organises sport tournaments annually at Institute level for different games/events e.g. Table Tennis, Carrom, Volleyball, Card games etc. The sport tournaments for the year 2000 were organised during 2000-2001.

The prize distribution function of the Recreation and Wlefare Club was held on July 2, 2000, on the Annual Day function of the Institute. Sh GM Pathak, Technical Officer (T-6) was adjudged the Best Sportsman of the Year 1999-2000

Following is the Executive Committee of R&W Club:

1. Prof. SD Sharma	President
2. Dr. KK Tyagi	Vice-President
3. Sh. Santosh Kumar	Secretary
4. Sh. Ram Bhool	Sports Secretary
5. Sh. KK Hans	Treasurer
6. Sh. Mohan Lal	Member
7. Sh. Naresh Kumar	Member
8. Sh. Pradeep Kumar	Member
9. Sh. Diwan Singh	Member

Sports Activities

A contingent comprising of about 45 (officers and staff) participated in the ICAR Zone IV Inter Institutional Tournaments at Indian Grass and Fodder Research Institute (IGFRI) from Nov 14-18, 2000

The Institute team participated in various games and brought laurels to the Institute by way of achieving the prestigious positions as:

Champion Trophy in Table Tennis (Men) by out closing teams from 21 Institutes and even the finals were won by a comfortable margin of 3-0 against NBPGR, New Delhi. under the captaincy of Sh OP Khanduri.

The Institute also took part and won in the following events:

1. Smt Vijay Laxmi Murthy won the winner up in Table Tennis (Women)
2. Smt Ranjana Agarwal won the runner up in Chess (Women)
3. Sh PR Paaite won 200 meter and 100 meter running race and was adjudged the fastest man.

The Institute particiapted Inter Zonal Sports Meet held at CIFE, Mumbai during Feb 21-23, 2001. It won winner up in Table Tennis Men.

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