



Some of the salient research achievements are:

- Biological assays (bioassays) are a set of techniques relevant to the comparisons between the strengths of alternative but similar biological stimuli (a pesticide, fungicide, a drug, plant extract, chemical formulations, etc.) based on the response produced by them on the subjects (an animal tissue, a plant, a bacterial culture, insects, plants or isolated organisms, etc.). For such experiments, efficient block designs for parallel line assays (including multiple parallel line assays) and slope ratio assays have been obtained and catalogued. These designs have useful applications in microbial experiments, residual toxicity of the soil applied herbicides, etc. The experimental findings corroborated by sound statistical principles of design and analysis of bioassays particularly in drug/vaccine formulation have better chances of getting patents.
- Trend free binary balanced block designs, trend free nested balanced incomplete block designs and trend free block designs for diallel crosses have been obtained and catalogued. These designs will be quite useful for experiments conducted in hilly areas, poultry experiments and green house experiments.
- Computer programs have been developed for the generation of various types of change over designs which included William Square designs, two treatment change over designs, totally balanced change over designs and minimal balanced change over designs. These designs are quite useful for animal nutrition experiments.
- Computer algorithms for generation of efficient designs based on exchange and interchange procedures have been developed. The procedure of computing lower bounds to A- and D-efficiencies has been incorporated in the algorithm. Several new efficient designs for making all possible pairwise treatment comparisons have been obtained. The efficient designs for the parametric combinations for which Balanced incomplete block designs are non-existent or solutions are unknown have also been obtained. The efficient designs for making test treatments-control treatment(s) comparisons with differential precision have been obtained through the computer aided search.
- The data received from AICRP on Long Term Fertilizer Experiments, AICRP on Cropping Systems (On Stations and on On-Farm Research) were analyzed using appropriate statistical techniques.
- Models based on weather indices were developed and validated for forewarning system for important insects, pests and diseases for rice, sugarcane, pigeon pea, cotton, mustard and groundnut in collaboration with Central Research Institute for Dryland Agriculture, Hyderabad.
- The performance of mixture time-series models viz. Gaussian Mixture Transition Distribution models and Mixture Autoregressive models have been studied and illustrated through real data sets on weekly onion price data of Nasik variety.
- Forecast models based on weather parameters and agricultural inputs have been developed for forecasting the rice, wheat and sugarcane yields in UP state by extending the existing district level models and refining the existing methodology.
- A sampling methodology based on Remote Sensing, Geographical Information System and survey data for the estimation of area under paddy crop and paddy yield in Meghalaya has been developed in a pilot study taken up in Rhi-boi district of the State. The methodology is being tested in this and one more district of the state for estimating the crop acreage and yield for the entire state.
- Farm Mechanization Strategy papers for different Agro-climatic zones/States have been prepared on the basis of the results of the survey data from 120 selected districts of the country and the experience of farm mechanization experts.
- Methodology for estimation of wool production has been developed through a pilot study that was taken up in two districts Bikaner of Rajasthan and Kolar of Karnataka.
- Sampling methodology for the estimation of loose flowers on the basis of market arrivals has also been developed.
- The study on estimation of cost of production on coconut in Kerala revealed that basin opening and application of organic manures are the most commonly adopted practices among the farmers and the technologies pertaining to plant protection measures, spacing for optimum plant density and cultivation of hybrids/high yielding varieties were at the low level of adoption.

- An econometric study of technological dualism in egg production based on primary survey data of selected poultry farms in Mansa and Ludhiana districts of Punjab revealed that the net returns from Cage System farms were more than the Deep Litter System farms. The inputs (feed, labour, medicines and electricity) use efficiency is low in Deep Litter farms as compared to the Cage System farms.
  - A technical efficiency analysis of rice-wheat system in Punjab revealed that the majority of farmers in Punjab did not appear very far from frontier technology but there existed possibilities of increasing rice and wheat output with better use of technical skills at least in deployment of factors of production.
  - From analysis of the primary data collected for the base year 2001 and the year 2004 on household food and nutritional security for tribal, backward and hilly areas under “Jai-Vigyan National Science and Technology Mission Project”, it was found that the cost of rearing sheep decreased, average yield of wool per animal increased and the rate of mortality and morbidity of sheep decreased for the participating farmers as a result of technological intervention.
  - The bias in the estimates of heritability reduced when the data was adjusted for all the fixed effects present in the data under half-sib model.
  - A Central Data Warehouse (CDW) of the Agricultural Resources of the Country has been developed under the NATP Mission Mode project “Integrated National Agricultural Resources Information System”. In all 59 databases on agricultural technologies generated by the council, research projects in operation and related agricultural statistics from published official sources at least from the year 1990 onwards at the district level were integrated for the development of the data warehouse. The data warehouse has been created with the collaboration from 13 other ICAR Institutes. Subject-wise data marts were created and multi-dimensional cubes have been developed and published on Internet. This data warehouse provides systematic and periodic information to scientists, planners, decision makers and developmental agencies in the form of On-Line Analytical Processing decision support system.
  - An ‘Expert System on Extension’ has been developed to help the farmers to take appropriate decisions and disseminate need based research findings to the millions of the farmers at a time, which is neither possible nor practicable by the conventional system of extension. The expert system developed is generic in nature and allows the entry of any crop and for any region of the country. Due to limited resources and time, only information on seven selected crops has been considered.
  - The development of Statistical Package for Agricultural Research (SPAR 2.0) has been completed and is being finalized for release.
  - PIMSNET has been developed for Online Monitoring and Concurrent Evaluation of Projects being undertaken at ICAR Institutions. Reports required by Project Implementation Unit, NATP were generated through PIMSNET. Six Sensitization and training workshops for PIMSNET Implementation were organised.
- Scientists of the Institute published 43 research papers in National and International refereed journals, 7 book chapters, 13 project/technical reports. Institute also published Agricultural Research Data Book 2004 which is eighth in the series. One book on ‘Information Support for the State of Indian Farmer – A Millennium Study’ was published in association with Department of Agriculture and Cooperation, Ministry of Agriculture, Government of India. One electronic book on Design and Analysis of Agricultural Experiments has also been designed and developed with a link on the Institute Website. This electronic book has been referred by several research personnel of NARS. 79 research papers were presented during several International and National Conferences by the scientists of the Institute.
- Institute received second prize under the aegis of ‘Rajrishee Tondon Rajbhasha Puraskar Yojna’ of Indian Council of Agricultural Research.
- Some scientists of the Institute received academic distinctions during the year. Dr. Rajender Parsad received ICAR National Fellow Award for his contributions in the field of Agricultural Statistics to work in the project entitled ‘Efficient Design of Experiments for Quality Agricultural Research’. Four scientists received ‘Best Paper Awards’ for their published papers in Journal of the Indian Society of Agricultural Statistics in the fields of Design of Experiments, Statistical Genetics, Statistical Methods and Applied Statistics.

Two scientists of the Institute were deputed for presentation of their papers in the international conferences. To promote Hindi, a poster presentation was organized at the Institute and scientists were also awarded for their outstanding contributions in preparation of Hindi posters.

The methodology for crop yield estimation at smaller area level using farmers' estimates and an experimental design for AICRP on STCR were developed and transferred to the stake holders. The scientists of the Institute also rigorously pursued the Advisory Services for the NARS. The research personnel from Indian Agricultural Research Institute, Central Potato Research Institute, National Research Centre for Groundnut, National Research Centre on Rapeseed and Mustard, CCS Haryana Agricultural University and National Bureau of Plant Genetic Resources, New Delhi were advised on various aspects of designing of experiments and analysis of experimental data.

A meeting of Centrally Sponsored Scheme on 'Strengthening of Database and Information Networking for Fisheries Sector' was organised. A meeting of Technical Committee for Directions for 'Improvement of Animal Husbandry and Dairying Statistics' sponsored by Ministry of Agriculture, Government of India was also organised at the Institute.

The XIV National Conference of Agricultural Research Statisticians of the ICAR Institutes, Project Directorates, State Agricultural Universities and State Departments of Agriculture, Animal Husbandry, Forestry and Fisheries was organised by the Institute at Jawahar Lal Nehru Krishi Vishwa Vidyalaya, Jabalpur. The theme of the Conference was 'National Priorities in Agricultural Statistics and Computer Applications'. In order to disseminate the findings of the research project 'Studies on Block Designs for Biological Assays' a dissemination workshop was organised. The participants of the workshop included many eminent research workers actually engaged in using bio-assays in their research endeavours and the statisticians from various reputed institutions. Major recommendation of the workshop was that software should be prepared for obtaining designs for bioassays and analysis of data. It was also recommended that a course on bioassays be prepared for students of PG School IARI to be taught jointly by statisticians and experimenters. Besides these, two one

day workshops on Training and Implementation of PERMISNET (Personnel Management Information System Network) in ICAR were also organised.

Two training programmes under the aegis of 'Centre of Advanced Studies in Agricultural Statistics and Computer Application', one Winter School on 'Sampling Survey Technique in Agricultural Research' were organised for the research personnel of NARS. One training programme was organised on 'Sample Surveys and Methodological Aspects relating to Cost of Cultivation Studies' for senior officers of Tariff Commission, Government of India. One training programme on 'Experimental Statistics' was organised for the personnel of E.I.DuPont India Private Limited. This training programme was attended by twelve participants. This was the first interface of the Institute with the private sector.

The activities relating to education and training which include planning, organization and coordination of the entire Post-graduate teaching programmes of the Institute are undertaken in collaboration with PG School, IARI. During this year, a total of 12 students {4 Ph.D.(Agricultural Statistics), 5 M.Sc. (Agricultural Statistics) and 3 M.Sc. (Computer Application) } completed their degrees. 16 new students {5 Ph.D.(Agricultural Statistics), 6 M.Sc. (Agricultural Statistics) and 5 M.Sc. (Computer Application)} were admitted. An intensive exercise was undertaken to revise the course curriculum of M.Sc. and Ph.D. courses.

A '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 Institutions/Universities of India and Foreign including SAARC countries. Eight officials including two international participants from Gambia participated in this Certificate Course.

The Library of the Institute is a Regional Library under NARS of the country. It plays a vital role in meeting the information needs of the In-house users as well as users from the NARS. The library services are totally transformed into digitalized form with the launch of elaborated and well featured website of Library (<http://lib.iasri.res.in>) with link to all resources and services available in Library.