Executive Summary

Indian Agricultural Statistics Research Institute (IASRI) established in 1959 as an Institute of Agricultural Research Statistics was mainly responsible for 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 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 for research, to develop the Institute as an Advanced Centre of Excellence in education and training in Agricultural Statistics and Computer Applications and to liaise with other ICAR Institutes and SAUs, State Agricultural/ Animal Husbandry Departments, to assist in the development and strengthening of National Agricultural Statistics System and to undertake sponsored research and training of national and international organisations in these disciplines.

A number of research projects were undertaken during the year in different Divisions of the Institute namely Sample Survey, Design of Experiments, Biometrics, Forecasting Techniques, Econometrics and Computer Applications. Research was carried out under 30 research projects in the Institute, of which 17 were Institute funded, 8 AP Cess funded and 5 funded by outside agencies in various thrust areas. Out of these 30 projects, 5 projects (2 Institute funded, 3 AP Cess funded) were completed. This year, 4 new projects (2 Institute funded and 2 CSO funded) were initiated.

Some of the salient research achievements were:

- In a bid to evolve efficient design of experiments for quality agricultural research, a comprehensive catalogue of α - designs was prepared along with lower bounds to A and D efficiencies.

- A new method of construction of nested block designs for making test treatment-control treatment comparisons was developed which yielded minimally connected designs with respect to sub-blocks.

- On the recommendation of the task force on "Balanced Use of Fertilizer" constituted by Ministry of Agriculture, Govt. of India, a comprehensive study on evaluation of fertilizer response ratios for different crops for various nutrients using On-Farm trials was undertaken and response ratios for cereals, pulses, oilseeds at state and country level, were obtained.

- To study the yield trends in relation to different soil characteristics viz. available N, P, K, pH and OC, soil data were transcripted. Statistical analysis of experiments on determining level and frequency of phosphorus application in different cropping systems revealed that for judicious use of phosphorus, its application at the rate of 30 kg P_2O_5 per hectare applied in either season in alternate years might be economical.

- For agroforesty experiment, a series of circular neighbour balanced complete block designs with *v* tree species and (*v*-1) crop species balanced for tree effects were obtained using a complete set of mutually orthogonal latin squares.

- A series of pair-wise uniform designs with even block size balanced for all the error correlation structures was also obtained.

- For examining masking effect in the presence of many outliers, a newly developed statistic was employed in various experimental situations and it was concluded that individually some observations were not influential, but jointly with some other observations, they were found to be influential.

- With a view to collect Agricultural Statistics in Meghalaya, the use of remote sensing based methodology was advocated and suitable estimators for area under paddy crop were developed using the estimate obtained by road survey and classified images obtained through remote sensing. Besides this various methods of estimation like ratio estimators, grid based sampling etc. were used to estimate the paddy area covered by clouds/cloud shadows in the image.

- Based on several indicators and physical verification, the survey capabilities of private sector were assessed through a sponsored study.

- In a study on editing and imputation using Neural Networks, the back propagation algorithm for imputing the missing data was developed in command line interface in Java.

- Under the crop revenue insurance, premium rates were estimated with the help of existing yield approach methodologies for different crops of various districts of Karnataka state.

- From the study on Dietary pattern and nutritional status of rural households, a general trend of reduction was observed in consumption of cereal in favour of non cereal foods. The consumption of other non cereal foods like milk and milk products, egg, meat and fish, fruits and vegetables groups tend to increase in most of the states under study. However, the shift from cereal based to non cereal based diet was not visible in all categories of socio-economic groups uniformly. An effort was also made to study the rural households deficient in different nutrients including important vitamins and minerals. It was observed that the proposition of deficient households in different nutrients varied from state to state and among different categories of land holdings. In most of the states the proportion of deficient rural households was higher in landless, sub-marginal and marginal class and it decreased with the size of holdings. The analysis was suggestive that the landless, sub-marginal and marginal category of households in most of the states should be treated as target groups to raise their income, to maintain their nutritional status.

- The study on Lac marketing in India was undertaken with a view to provide a practical solution of the problem of declining trend in total lac production in the country during past decades. Accordingly an integrated approach was adopted where the three aspects namely lac cultivation, lac marketing and lac processing was examined in the major producing states of Jharkhand, West Bengal, Chhattisgarh, Madhya Pradesh and Maharashtra by primary survey data.

- Information pertaining to agricultural research, education and related aspects available from different sources were compiled together in the form of Agricultural Research Data Book 2005 which was ninth in the series and was an attempt to put together main components/indicators of such information.

- Under Statistical investigation on the performance of non-parametric stability measures when the genotype x environment data is non-normal, the merits of different non-parametric stability measures were examined.
- Some investigations on stable and robust clustering procedures were undertaken with the aim to study exhaustively and critically the important clustering methods used in most emerging fields in agriculture and allied sciences.
- The identification of different methods for studying precise estimation of genetic variance components was taken up and the bias of the estimates of heritability were examined under different situations.
- Under the project Statistical Package for Animal Breeding 2 (SPAB 2), different models were developed.
- For the project Development of expert system on wheat crop management, multimedia effects were added to the system for felicitating the user with its voice for identification for disease, insects and weeds.
- For the NISAGENET project, sensitization, feasibility and requirement analysis were carried out by conducting different workshops at various State Agricultural Universities and Research Institutions.
- Under the project development of Software for the analysis of survey data, the object oriented programming concepts on the language C^{++} with added advantages of the latest .NET technology was used.
- A new project Development of PERMISnet-II was initiated with a view to maintain and strengthen the existing PERMISnet and to add new models as per the requirement of manpower planning using .NET technology.
- New web-enable software for Agricultural Field Experiments Information System (AFEIS) was developed and is now available at IASRI website.
- National information system on long term fertilizer experiments was developed to store and maintain the data generated under long term fertilizer experiments in progress/concluded at various organizations under the Horticulture, Crop Sciences and NRM Divisions of ICAR.
- Two statistical packages Statistical Package for Agricultural Research (SPAR 2.0) and Statistical Package for Augmented Designs (SPAD) were released on the Annual Day Function of the Institute.

Scientists of the Institute published 57 research papers in National and International refereed journals along with 8 book chapters, and 12 project/technical reports.

Some scientists of the Institute received academic distinctions during the year. Dr. VK Gupta received ICAR National Professor Award for his contributions in the field of Agricultural Statistics to work in the project entitled 'Designs for single factor and multi-factor experiments and their applications in agricultural systems research'. Dr. VK Gupta was also awarded Prof. PV Sukhatme Gold Medal Award for outstanding contribution in Agricultural Statistics for the biennium 2004-05 from Indian Society of Agricultural Statistics. Dr. Rajender Parsad, National Fellow was awarded Dr. DN Lal Memorial Lecture Award from Indian Society of Agricultural Statistics, New Delhi for the biennium 2004-05.

Scientists of the Institute were deputed for presentation of their papers in several National/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.

In a separate meeting, the presentation of Final Report of Farm Mechanization project was made before the Secretary, Ministry of Agriculture, Senior Officials of DOAC, ICAR, and Experts at Krishi Bhavan, New Delhi

In the 59th Annual Conference of Indian Society of Agricultural Statistics held at Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu, the technical address entitled 'ICT as tool for Information, Knowledge Management and Intelligence' was delivered by Prof. SD Sharma, Sessional President of

the Conference. During this conference two symposia 'Statistical and Computational Issues in Rainfed Agriculture' and 'Energy Issues in Agriculture' were also convened.

A lead paper entitled 'Fertiliser Response Ratios' analysing the crop-fertiliser ratios for various crops in different regions of the country, was presented during Brainstorming Session on Declining Crop Responses to Fertilisers.

A two-days National Workshop on Long Term Mechanization Strategies for different Agro Climatic Zones/ States was organized for discussing the long term mechanization strategies for different agro climatic zones/States with officials of State Govt.(s)/DOAC, Ministry of Agriculture/ICAR, DES, CIAE, experts involved with the preparation of the strategy papers, associate scientists, award winning farmers and officials from different institutions and other private organizations.

In order to disseminate the findings of the project Modeling for forecasting of crop yield using weather parameters and agricultural inputs financed by AP Cess Fund of ICAR, a dissemination workshop was organized.

Two one-day workshops were also organized on 'Training and Implementation of Personnel Management Information System in ICAR (PERMISnet)'. Eighty-four Nodal Officers attended these workshops.

A workshop on Sensitization-cum-Requirement Analysis for NISAGENET project was organized at IASRI, New Delhi during 7-8 June 2005. The workshop was attended by Nodal Officers of the project of North zone and by Nodal Officers who did not attend the earlier three workshops held in their respective zones.

Four training programmes under the aegis of Centre of Advanced Studies in Agricultural Statistics and Computer Application were organized for the research personnel of NARS.

The activities relating to education and training which include planning, organization and coordination of the entire Post-graduate teaching programmes of the Institute were undertaken in collaboration with PG School, IARI. During this year, a total of 10 students {3 Ph.D.(Agricultural Statistics), 4 M.Sc. (Agricultural Statistics) and 3 M.Sc. (Computer Application)} completed their degrees. 15 new students {4 Ph.D. (Agricultural Statistics), 5 M.Sc. (Agricultural Statistics) and 6 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. Six officials participated in this Certificate Course.

The Library of the Institute with a status of Regional Library under NARS, played a vital role in meeting the information needs of the in-house users as well as users from other research organisations. The library services have been totally transformed into digital 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.