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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 50 research projects in the Institute, of which 40 were Institute funded, 01 AP Cess funded, 06 funded by outside agencies and 03 in collaboration with other institutes in various thrust areas. This year 08 projects were completed and 11 new projects were initiated.

Some of the salient research achievements were:

- Developed a column wise co-ordinate exchange and replacement algorithm for generation of two-level balanced supersaturated designs (SSDs) for even number of runs and nearly balanced SSDs for odd number of runs with desired efficiency. The concept of repeated webs has been introduced in the coordinate exchange algorithm to generate multi-level SSDs with desired efficiency.

- Developed a general purpose algorithm to obtain balanced and unbalanced mixed-level SSDs through

intensive computer aided search. The algorithm relies heavily on exchange and interchange of column coordinates, but because of asymmetry, the exchange and replacement have been so modified that the levels appear unequal number of times but in a given order so that the pair wise occurence of levels of any two factors is proportional to the frequency of occurence of respective levels in the design. A catalogue of SSDs has been prepared.

- A method of construction of block designs having orthogonal factorial structure (OFS) with balance has been obtained in which all main effects are balanced in the sense that these are estimated with full efficiency. Prepared a catalogue of designs for three-factor factorial experiments having OFS and balance.

- A procedure of simultaneous optimization of several ingredients for complete/incomplete multi-response experiments useful in food processing experiments has been developed.

- Balanced incomplete block designs that are globally resistant of degree one and/or of degree k(block size) have been identified and catalogued.

- Neighbour balanced block designs for making test treatments-control treatment(s) comparisons have been obtained. Robust neighbour balanced block designs against missing observations have been identified and catalogued.

- Design Resources Server has been strengthened by adding links on experiments with mixtures, online generation of mutually orthogonal latin squares and orthogonal arrays, online generation of randomized layout of factorial completely randomized designs, factorial randomized complete block designs.

- For the experimental situations in which it is required to measure the effect of response from two or more factors such as types of fertilizers, fertilizer and pesticide spray, fertilizer and irrigation, feed and medicine, two or more types of feeds, etc. over varying periods of time, a class of designs involving sequences of treatments with two or more interacting factors balanced for first order residual effects of the treatment combinations has been constructed and a list of parameters of these designs along with the variance of contrasts of treatments has been prepared.

- A class of nested designs involving sequences of treatments for the experimental situations, in which the experimental units are subjected to sequences of treatments in different periods over different

sessions such that conditions are altered from one session to other, is obtained.

- The methodology of projection has been used for construction of the mixture designs with process variables.

- In a pilot study to develop methodology for estimation of production of Mushroom, the productivity of mushroom as estimated from data obtained through stratified two-stage random sampling was found to be 4.46 kg/tray with 1.2% standard error. The producitivity based on complete enumeration was observed as 4.94 kg/tray. The magnitudes of standard errors as well as the closeness of the two figures pointed towards the fact that the random sample survey based approach appears to be suitable for estimating the production of mushroom.

- Minimum Variance Linear Unbiased Estimators (MVLUEs) for estimating different parameters such as extent of farming practices, resources and activities with energy use at district/state level have been finalized. MVLUEs for estimating seasonal variation and average of farming practices and resources over Kharif and Rabi seasons have also been developed. MVLUEs of the parameters for the characteristics, viz. land used under dairy, land under cultivation and allied agriculture, total land possessed by the households and land area under irrigation have been obtained.

- In a study on status and projection estimates of agricultural implements and machinery, the district-wise mechanization indicators, such as ratio of mechanical power to the total power (comprising of power from animate and inanimate sources) have been worked out. Group-wise correlations between mechanization indicators and average food grain productivity have been obtained. Projection estimates of agricultural machinery making use of different models have also being worked out.

- Socio-economic analysis of 120 selected fish farmers of Punjab state revealed that the net benefit-cost ratio of aquaculture was 0.62 on large farms indicating that the return per rupee of investment was impressive on large farms whereas it was 0.31 for small category of farms. It was also observed that about 96 percent of the difference between the observed and the frontier output was mainly due to the inefficient use of resources which are under the control of fish farmers.

- The weather parameter based models for forecasting potato yield in Uttar Pradesh, were developed at district as well as at zone levels by pooling the data of various districts within the respective zones. The performance of the models was judged on the basis of co-efficient of determination and predicted residual sum of squares (PRESS). In most of the cases, the coefficient of determination of models were highly significant with reasonably low value of PRESS indicating very good fitting of the models. The forecast from weather indices based regression models were found to be better than those based on complex polynomials.

- Models for forecasting rice and sugarcane yield were developed at district level using discriminant function technique, principal component analysis and weather indices based approaches. Forecast models developed through discriminant function technique performed better than the models based on principal component analysis and weather indices.

- For stochastic process modeling and forecasting through discrete nonlinear time series approach, three operators, selection, crossover and mutation have been used.

- In a study of rainfall distribution and rainfall based crop insurance, method of moments, and method of maximum likelihood were used for estimation of parameters of Generalized Lambda Distributions (GLD).

- For computational analysis of SNPs at functional elements of rice genome, the genomic coordinates of functional elements have been obtained and stored in database. A web page has been developed for Agricultural Bioinformatics Lab (ABL) wherein links are provided to bioinformatic tools, local BLAST, *etc. BioPerl* and *.cgi* scripts are written for sequence alignment and filtering of BLAST report. SNPs along with their flanking sequences are collected and processed in a format suitable for populating database. Online local BLAST has been developed to locate and quantify blocks of similarity between query sequence and database sequences.

- Under the study on empirical investigations on estimation of genetic correlation, it has been observed that the estimates of genetic correlations are biased in general and the bias decreased considerably with increase in sample size, whereas it increases considerably with increase in heritabilities of the two correlated traits. The estimates of genetic correlation are highly overestimated from samples drawn from populations with negative genetic correlation and their bias is quite high as compared to positive genetic correlation. The bootstrap estimates of standard error of genetic correlation are in general lower than the estimated standard error and the difference reduces to zero with increase in sample size in most of the cases.

- In a study small area estimation for zero inflated data, it has been observed that the results obtained through mixture model perform good in terms of relative biases and relative root mean squared errors when data contains a large proportion of zero values.

- Statistical Package for Animal Breeding 2.1 (SPAB 2.1) was strengthened by additing modules for calculation of repeatability, simulation and bootstrap techniques of data analysis for different genetic relationships.

- Expert system on wheat crop management was strengthened by the addition of one sub module for nematode identification. The database for the hindi module of expert system has been designed using SQL server that accepts UNICODE for the support of hindi language. A part of the variety selection module is complete. The system displays varieties through state and zone map with the hindi interface.

- In the web solutions for Partially Balanced Incomplete Block (PBIB) designs, methods of construction of a series of cubic PBIB (3) designs were compiled and computer modules were developed for online generation, randomization and analysis for these designs.

- Knowledge data warehouse for agricultural research was strengthened by redesigning the data mart related to crops and three techniques of future projections were incorporated in on-line Decision Support System (DSS). Multidimensional model of the census data related to household amenities was designed and data of some states have been published. On-line Analytical Processing (OLAP) cubes for the Census data (2001) were published. Thematic maps of productivity of various crops were digitized based on historical data using GIS software.

- Beta testing of decision support system for manpower planning (PERMIS*net)* was completed. Data from online PERMIS*net* database has been merged with database structure of PERMIS*net*-II.

User manual has been printed and linked with the system. New reports on manpower planning were also developed.

- For the intranet solutions for PG School, IARI, the Green Book of PG School, IARI, New Delhi has been made online from where various chapters and syllabi of various disciplines can be downloaded in PDF and Doc format. Designing of database schema for other intranet solutions viz., Student Management, Faculty Management and PG School Administration Management has been completed.

- Under the machine learning approach for data mining, exploratory data analysis of two datasets has been performed. Support Vector Machines (SVM) gave better accuracy of classification in comparison to ANN both with or without discretization of data. Comparing the classification accuracies for discretization based SVM with simple SVM, it has been shown that discretization based SVM performs better than simple SVM.

- In the e-Learning solution for agricultural education using *MOODLE (Modular Object Oriented Dynamic Learning Environment)*, Plug-in for Equation Editor was installed and integrated with MOODLE for working with equations. A workshop entitled "Sensitization Workshop on content management for e-Learning systems using MOODLE" was also organized. A site containing lesson on "Descriptive Statistics" were prepared and deployed.

- Developed e-Learning resources on Basic concepts of Statistics and Design of Experiments through CG online learning resources (http://learning.cgiar.org) in collaboration with ICARDA, Syria.

- Detailed statistical analysis for rice on modeling aspects pertaining to classification of districts based on productivity under the NAIP funded project Visioning, Policy Analysis and Gender (V-PAGe) Sub-programme II: Technology Forecasting, revealed that if technological needs for districts which fall under low productivity group are fulfilled then an increase of 7% in rice production can be achieved. Implications of Information and Communication Technology (ICT) in the future growth of Indian agriculture was examined with respect to various dimensions of related research and developments specifically in Asian region. Patent analysis revealed that, there is tremendous growth in number of patents in ICT after 1990. Bibliometric analysis of research publication indicated that there is shift in research priority from basic to applied research in the field of ICT. A workshop on "Forecasting Future Technological Needs for Rice in India" at Central Rice Research Institute, Cuttack, Orissa, was also organised.

- A package 'PAYBITAX' was developed and released for preparing pay bills, pay slips, maintaining GPF accounts, generating different reports, income tax statements and Form-16, and generating arrear bills etc. After the implementation of the 6th Pay Commission, a modified version of the package 'PAYBITAX' was developed which has some additional facilities.

- For the Project Information & Management System of ICAR (PIMS-ICAR), requirement analysis and designing of the database were completed.

- Manual on "Fishery Statistics" in collaboration with CMFRI, Cochin & CIFRI, Barrackpore, funded by CSO, MOS & PI, New Delhi has been prepared.

- The Agricultural Research Data Book (ARDB) 2008 which is twelfth in the series has been published.

Scientists of the Institute published 57 research papers in National and International refereed Journals along with 11 popular articles, 7 book chapters, 21 projects/ technical reports/e-manuals, 2 pamphlets, and 6 research papers in conferences/workshops proceedings.

The QRT report for the period 2001-05 has been approved by the Council.

The second meeting of Common Research Advisory Committee (RAC) of the Indian Agricultural Statistics Research Institute (IASRI) and National Centre for Agricultural Economics and Policy Research (NCAP) was held on 04 December 2008.

Dr. VK Bhatia, Director, IASRI was elected as President/ Chairman of International Indian Statistical Association-India Joint Statistical Meeting (IISA-INDIA JSM) 2000 Trust.

Dr. VK Gupta, National Professor was elected as NAAS Fellow.

Dr. Rajender Parsad, National Fellow was elected as Member of the International Statistical Institute, Netherlands.

Dr. Rajender Parsad was also invited as Consultant Biometrician at International Center for Agricultural Research in Dry Areas, Aleppo, Syria for 3 months. He

was also deputed to participate in Final Review Meeting of the ADB Project on Enhancing Farmers Income and Livelihoods through Integrated Crop and Resource Management in the Rice-Wheat System in South Asia held at Kathmandu, Nepal.

डॉ. रंजना अग्रवाल को उनके लेख 'कम्प्यूटर की कहानी उसी की जुबानी' पर केन्द्रीय सचिवालय हिन्दी परिषद् द्वारा आयोजित 26वीं अखिल भारतीय वैज्ञानिक तथा तकनीकी विषयों पर हिन्दी लेख प्रतियोगिता के अंतर्गत अखिल भारतीय महिला विशेष पुरस्कार मिला।

Sh. KK Chaturvedi, Scientist received the Scientist of the Year Award from the Society for Recent Development in Agriculture.

Dr. Hukum Chandra, Scientist has been chosen for the award the Cochran-Hansen Prize 2009 by the International Association of Survey Statisticians

Dr.(Mrs.) Sushila Kaul, Senior Scientist was awarded Best Education Performance Award-2007 by the Economic and Human Resource Development Association. She was also deputed to participate in 5th Asia-Pacific Co-operative Research Conference organized by International Cooperatives Alliance at Hanoi, Vietnam.

Dr. Himadri Ghosh, Senior Scientist received Best Poster Presentation Award in Mathematical Sciences section of 96th Indian Science Congress.

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 awards were distributed for the outstanding performances.

A workshop of Broad Subject Matter Areas (BSMA) Committee on Statistical Science to discuss curricula and syllabi for Statistical Sciences was organised .

An Interactive Workshop on Consortium for e-resources in Agriculture (CeRA) to bring awareness in facilities, features and potential of Portal was organized.

This year following ten training programme were organized:

– Four 21 days duration training programmes under Centre of Advanced Studies on (i) Development of Contents for Online e-Learning Systems; (ii) Data Mining in Agriculture; (iii) Advanced Quantitative Techniques in Agricultural Research and (iv) Recent Advances in Sample Survey and Analysis of Sample Survey Data

– Winter School on Advances in Design and Analysis of Agricultural Experiments.

– 10 days training programme on Price Trends and Market Integration under the NAIP project Visioning, Policy Analysis and Gender (V-PAGE).

– CSO Sponsored 26 days training programme on Data Analysis with Statistical Tools for Indian Statistical Services Probationers of XXVII batch.

– Two weeks training programme on Research Methodology was organized for the scientists of Indian Council of Forestry Research and Education.

– International Training Programme on Agricultural Information Management, Experimental Design and Data Analysis at ICARDA, Aleppo, Syria as part of consultancy.

– FAO sponsored Study Visit on Indian Agricultural Statistics System for Afghanistan nationals.

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 the year, a total of 09 students 03 Ph.D. (Agricultural Statistics), 05 M.Sc. (Agricultural Statistics) and 01 M.Sc. (Computer Application) completed their degrees. 19 new students 05 Ph.D. (Agricultural Statistics), 06 M.Sc. (Agricultural Statistics) and 08 M.Sc. (Computer Application) were admitted.

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.

ORGANOGRAM

RESEARCH ADVISORY COMMITTEE ↔ **DIRECTOR** ↔ **INSTITUTE MANAGEMENT COMMITTEE**

HEAD OF DIVISION

- SAMPLE SURVEY
- DESIGN OF EXPERIMENTS
- BIOMETRICS
- FORECASTING TECHNIQUES
- ECONOMETRICS
- COMPUTER APPLICATIONS

OFFICER INCHARGE

- RESEARCH COORDINATION AND MANAGEMENT UNIT
- INSTITUTE TECHNOLOGY MANAGEMENT UNIT
- LIBRARY AND DOCUMENTATION
- CENTRE OF ADVANCED STUDIES
- GUEST HOUSE

PROF. (AG. STAT.) PROF. (COM. APPLN.) WARDEN

- TRAINING ADMINISTRATION CELL

OMV UNIT

ADMINISTRATION

OSD & HEAD OF OFFICE

- ADMN. I SECTION
- ADMN. II SECTION

CAO

- CASH SECTION
- CENTRAL PURCHASE SECTION
- WORKS SECTION
- R & D SECTION
- HINDI SECTION
- MAINTENANCE SECTION

F & AO

- AUDIT SECTION
- ACCOUNTS SECTION