Director, staff and students of Indian Agricultural Statistics Research Institute heartily welcome Dr. S. Ayyappan who took over charge of Secretary, Department of Agricultural Research and Education (DARE) and Director General (DG), Indian Council of Agricultural Research (ICAR). Dr. S. Ayyappan is an eminent scientist and research administrator who has contributed immensely for the growth of ICAR. We are sure that under his dynamic leadership, ICAR will reach new heights, achieve fame and glory.

Prior to the present assignment, Dr. Ayyappan has served as the Deputy Director General (Fisheries) during 2002-09; Director, Central Institute of Fisheries Education, Mumbai (Deemed University) during 2000-02; Director, Central Institute of Freshwater Aquaculture, Bhubaneswar during 1996-2000.
From Director’s Desk . . .

This volume of Newsletter highlights some of the salient research and training achievements made and other significant activities performed during the period under report.

Universally optimal neighbour balanced block designs have been obtained. For obtaining balanced sampling plans and polygonal designs, a linear integer programming approach has been developed.

To deal with the situations, in which the variable under study is negatively correlated with the size measure of the units, inclusion probability inversely proportional to size sampling scheme has been introduced. Small area estimation methodology for zero inflated data has been developed and illustrated through real life examples.

Crop yield forecasting and disease forecasting models have been developed using the technique of artificial neural networks.

As an outreach activity of the Institute organized a travel workshop on Experimental Designs in collaboration with ANGRAU, Hyderabad for 60 participants.

Three customized training programmes for Central Statistical Organization and one 21 days training programme on Recent Advances in Web Technologies for Information Management in Agriculture were organized.

Scientists of the Institute published 8 research papers and one project report during this period.

The Institute participated in number of meetings/conferences/symposia/workshops etc. More than 20 research papers were presented during these conferences. It is hoped that the contents of this document would be informative and useful for scientists in NARS. Any suggestions for improving the contents of the newsletter further, would be highly appreciated.

Web Bhatia
(VK Bhatia)
RESEARCH ACHIEVEMENTS

- **Neighbour Balanced Designs**
  Neighbour balanced designs, wherein the allocation of treatments is such that every treatment occurs equally often with every other treatment as neighbours, are used when the treatment applied to one experimental plot may affect the response on neighbouring plots besides the response to which it is applied. These designs ensure that no treatment is unduly disadvantaged by its neighbours and help in estimating the neighbour effects besides the direct effects of treatments. Combined intra-inter block reduced normal equations for estimating direct and neighbour effects have been derived. Sufficient conditions have been obtained for the block design to be universally optimal for estimating direct and neighbour effects under mixed effects model. Universal optimality of circular neighbour balanced block designs under mixed effects model, assuming block effects to be random has been established. Some universally optimal families of circular neighbour balanced block designs have also been obtained.

- **Polygonal Designs**
  A linear integer programming approach has been developed for obtaining polygonal designs for given number of treatments \(v\), block size \(k\), concurrence of treatments separated by a distance of \(m + 1\) or more as \(\lambda\) and all other concurrences as zero, \(m \leq \lfloor v/2 \rfloor\) here \(\lfloor \cdot \rfloor\) denotes the greatest integer function. The main feature of the proposed approach is that it directly identifies the required incidence vectors for generating a polygonal design. Using the proposed approach, a complete solution is provided for constructing polygonal designs for number of treatments \(v \leq 100\), block size \(k = 3\), \(\lambda = 1, 2\) and \(m = 1, 2, \ldots, \lfloor v/2 \rfloor\). These designs have a one to one correspondence with Balanced Sampling plans excluding adjacent units.

- **Inclusion Probability Inversely Proportional to Size Sampling Scheme**
  Inclusion probability proportional to size sampling schemes (IPPS) are the sampling schemes in which the first order inclusion probabilities are proportional to size measures. IPPS sampling scheme perform better than the available alternative sampling schemes provided that the sizes of the units are positively correlated with the variable under study and there is proportionality relationship between variable under study and size measure of the units. However, situations may arise in which there is negative correlation of sizes of units with the variable under study. To deal with such situations, the concept of inclusion probability inversely proportional to size sampling scheme (IPIPS scheme) is introduced. IPIPS scheme ensures that the first order inclusion probabilities of units are inversely proportional to size measures of the units. The method of IPIPS scheme has been obtained by making use of Sampfords’ Inclusion Probability Proportional to Size sampling scheme (IPPS sampling scheme). As an alternative, Probability Proportional to Aggregate Inverse of Sizes sampling plan (PPAIS sampling plan) is introduced and its properties are studied. A unit by unit sampling is also suggested to achieve the above proposed sampling plan. An analogue form of ratio estimator is also introduced, which is shown to be unbiased under the PPAIS scheme. The expressions for the second order inclusion probabilities of the PPAIS are also obtained. Performance of the proposed estimator under PPAIS plan and IPIPS sampling scheme is compared with alternative plans and their superiority over other unequal probability sampling schemes is established through a simulation study on bivariate normal populations for different correlations between \(Y\) and \(X\).

- **Small Area Estimation for Zero Inflated Data**
  The thrust of planning process, in recent years, has shifted from macro to micro level. There is demand by the administrators and policy planners for reliable estimates of various parameters at the micro level. In view of the demands of modern time, the thrust of research efforts have shifted to development of precise estimators for small areas. An offshoot of this development is that various Small Area Estimation (SAE) techniques are being proposed by the researchers for implementation. SAE techniques are now increasingly used in many developed countries. In our country large number of surveys/censuses are being carried out. There are, therefore, opportunities for use of SAE techniques so that reliable estimates of various parameters of interest are available to administrators and policy planners. Commonly used methods of SAE based on a linear mixed model, for example, the empirical best linear unbiased predictor, pseudo-empirical best linear unbiased predictor and model-assisted empirical best predictor of Jiang and Lahiri (2006, J. American Statist. Assoc., 101, 301–311) can be inefficient for zero-inflated data situations. Presence of excess zeros in the data is a well-known problem in small area estimation. A variety of approaches have been suggested for dealing with this problem. However, when the focus is on SAE using survey data, much less is known— even though presence of excess zeros within a small area are clearly much more influential than they are in the larger overall sample. Accordingly, in the study “Small Area Estimation for Zero Inflated Data” a method has been developed for SAE using the mixture model that accounts for presence of excess zeros in the data. For this purpose, the mixture model is defined as a combination of linear mixed model and generalized linear mixed model. The proposed approach of SAE works in three steps. First a linear mixed model is fitted for positive values of the variable and then in the second step, a generalized linear mixed model is fitted for probability of positive values. Finally the two models are combined...
Forecasting Crop Yield and Forewarning Diseases using Artificial Neural Networks

Artificial Neural Networks (ANN) have received a great deal of attention, because complicated problems can be treated by this even if the data are imprecise and noisy. Use of this approach has been studied for forecasting crop yield as well as forewarning diseases. Neural network models have been developed using crop yield (detrended) of rice, wheat and sugarcane for Central plain zone (Kanpur, Lucknow, Fatehpur and Hardoi districts), Eastern plain zone (Allahabad, Varanasi, Faizabad and Ballia districts) and Bundelkhand zone (Jhansi, Banda and Jalaun districts) of Uttar Pradesh state in India as response or output variable and weather indices as input variables. For disease forewarning, models have been developed for various aspects viz. maximum pest disease severity, crop age at first appearance of disease, crop age at maximum disease severity for Alternaria blight and Powdery mildew for different locations and for different varieties in mustard crop as response variable and weather indices as predictors. In the study, Multi Layer Perceptron (MLP) and Radian Basis Function (RBF) based neural network with different hidden layers (one and two) and different number of neurons in a hidden layer with hyperbolic function as an activation function have been studied and compared with weather indices based regression model and it has been found that MLP performs better in terms of Mean Absolute Percentage Error (MAPE) in most of the cases which indicates that neural network models possess considerable potential as an alternative to regression models for forecasting agriculture system.

Dr. Himadri Ghosh was awarded Mrs. Bhargavi and CR Rao Award for Best Poster Presentation during the International Conference of frontiers of interface between statistics and sciences held at CR Rao Advanced Institute of Mathematics, Statistics and Computer Science during 30 December 2009 – 02 January 2010.

Dr. AK Gupta received III prize for the research paper entitled Estimation of Area, Production and Productivity of Flowers for oral presentation during the National Symposium on Lifestyle Floriculture: Challenges and Opportunities held at Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan (HP) on 20 March, 2010.

VI SIT A BROAD

Dr. V.K. Bhatia, participated in the Conference on Implementing the Strategy for Improving Agricultural statistics in Africa during 01-05 February 2010 at Tunis, Tunisia.

HUMAN RESOURCE DEVELOPMENT

A training programme on Small Area Estimation for the Indian Statistical Services and other senior officers of States/Union Territories, was organized during 18-22 January 2010. This course was sponsored by Central Statistical Organization, Ministry of Statistics & Programme Implementation, Govt of India. Dr. UC Sud was the Course Director and Dr. Hukum Chandra was the Co-Course Director of the programme.

A six days Training Programme on Research Methodology for Official Statistics sponsored by Central Statistical Organization for ISS officers and statistical personnel was organized during 01-06 February 2010. Dr UC Sud was the Course Director and Dr. T. Ahmad was the Co-Course Director of the programme.

A twenty one days training programme on Recent Advances in Web Technologies for Information Management in Agriculture under Centre of Advanced Faculty Training organized during 16 February - 08 March 2010. Ms. Anu Sharma was the Course Director and Sh. SB Lal was Co-Course Director of the training programme.

A Refresher Training Programme on Agricultural Statistical System in India for 14 participants (non-ISS Officers of State Depts of DES) sponsored by Central Statistical Organisation, Ministry of Statistics & Programme Implementation (MOSPI), Government of India (GOI) was organised during 15-19 March, 2010. Dr KK Tyagi was the Course Director and Dr AK Gupta was the Co-Course Director of the programme. The training programme was inaugurated by Sh SK Das, Director General, CSO. Valedictory address was delivered by Dr BBPS Goel, Ex-Director, IASRI and Dr. VK Gupta, National Professor, ICAR presided over the valedictory function.

Two days computer training was conducted by Institute during 16-17 February 2010 on the topics MS Word, MS Excel and Role of IT in the functioning of Finance Division under special training programme on financial matters’ for the officials of ICAR Hqrs.

Conferences/Symposia/Workshop organized

Conducted a Travel Workshop on Experimental Designs jointly with ANGRAU, Hyderabad for the scientists and teachers of...
ANGRAU, Hyderabad at RARS, Anakapalle on 06 January 2010. Dr. Rajender Parsad from IASRI Co-ordinated this workshop. Faculty members for this workshop were Dr VK Gupta, Dr Rajender Parsad and Dr Hukum Chandra. 60 participants from North Coastal Zone, West Godavari Zone and High Altitude Zone attended this workshop.

- During International Conference on Statistics, Probability, Operations Research, Computer Science and Allied Areas held at Andhra University, Visakhapatnam from 04-08 January 2010, following sessions of Special Invited Talks were organized.
  - Design of Experiments (Conveners: Dr. Rajender Parsad and Dr. Sudhir Gupta).
  - Small Area Estimation (Conveners: Dr. Hukum Chandra and Co-Convenor: Dr. U.C. Sud)
  - Recent Advances in Sample Surveys (Convener: Dr. U.C. Sud and Co-Convenor: Dr. Hukum Chandra)
  - Statistical Modelling (Convener: Dr. Prajneshu and Co-Convenor: Dr. Himadri Ghosh)
  - Recent Advances in Statistical Genetics (Convener: Dr. V.K. Bhatia and Co-Convenor: Dr. A.K. Paul).

- Organized a Symposium on Statistics for Studying the Impact of Climate Change during XII Annual Conference of Society for Statistics, Computer and Applications at Department of Statistics, Siksha Bhavana, Viveva Bharati during 24-26 February 2010 (Conveners: Dr Rajinder Parsad and Dr K. Chatterjee).

- Workshop cum brainstorming session on Future Technology Needs for Rainfed Agriculture in India in collaboration with CRIDA, Hyderabad on 19 March, 2010.

COMPUTING FACILITIES

Wide Area Network

Internet services have been provided to the users and the website of IASRI is being updated regularly. This site has been visited 443807 times since 01 April 2008 and 809052 times since 05 September 2003.

SEMINARS DELIVERED

Seminars in different areas of Agricultural Statistics and Computer Application were delivered. These seminars include presentation of salient findings of the completed research projects by the scientists, thesis/ORW/course seminars of students of M.Sc. and Ph.D. (Agricultural Statistics) and M.Sc. (Computer Application) and Guest Seminars.

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<td>Guest</td>
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Guest seminars were delivered by Dr. Ramanna V. Davuluri, Director, Comutational Biology, The Vista Cancer Centre,The Vista Institute, (USA), Dr. Sat Gupta, Professor of Statistics, North Carolina,(USA) and Dr. Bikas Sinha, Former Member, National Statistical Commission.

PUBLICATIONS

Research Papers Published


Project Reports:


PAPERS PRESENTED IN CONFERENCES

- 97th session of Indian Science Congress held at Trivandrum, Kerala during 03-07 January 2010.
  - Agrawal, Ranjana, Chandrahas and Kaustav, Aditya. Use of discriminant function analysis for forecasting wheat yield.
  - Varghese, Eidho, Jaggi, Seema and Varghese, Cini. Row-column designs balanced for nearest neighbours.
• Meher, Prabina Kumar, Rao, AR, Wahi, SD and Jaggi, Namita. An empirical investigation on detection of multivariate outliers in breeding data.

Invited talks
• Bhatia, VK and Paul, AK. Genetics of Stayability of Dairy Cattle. Session on Recent Advances in Statistical Genetics.
• Gupta, VK, Kole, Basudev Parsad, Rajender and Bhar, LM. Mixed Level Supersaturated Designs. Session on Design of Experiments.

• Abeynayake, NR and Jaggi, Seema. A review of block designs with neighbour effects.

National Meet of Tractor and Agricultural Machinery Manufacturers (TAMM) at PAU Ludhiana during 16-17 January 2010.
• Tyagi, KK, Singh, Jagbir, Kher, KK, Jain, VK and Singh, Surendra. Status and projection estimates of agricultural implements and machinery.

International Statistical Association Joint Statistical Meeting held at Andhra University, Visakhapatnam during 04-08 January 2010.

Invited talks
• Gupta, VK, Kole, Basudev Parsad, Rajender and Bhar, LM. Efficient unbalanced mixed-level supersaturated designs.
• Gupta, VK, Kole, Basudev and Parsad, Rajender. Mixed level supersaturated designs.
• Parsad, Rajender, Gupta, VK and Malhotra, Raj S. Experimental designs for mitigation and adaptation strategies of climate change. Symposium on statistics for studying the impact of climate change.

Contributed Papers
• Bhowmik, Arpan, V, Ramasubramanian, Chandrasas and Kumar, Adarsh. Logistic regression for classification in agricultural ergonomics.
• Gupta, VK, Singh, Poonam, Kole, Basudev and Parsad, Rajender. Addition of runs to a supersaturated design.
- V, Ramasubramanian, Bhatia, VK, Garg, KG, Kumar, Suresh, Kumar, Amrender and Kumari, Jyoti. Technological scenario in plant genetic and breeding using scientometrics.
- International conference on optimization and its application held at Banaras Hindu University, Varanasi on 17 February 2010.
  - Dr. Prajnesu. Fuzzy Regression models (Invited Talk).
- 11th International conference of the International Academy of Physical Sciences held at University of Allahabad on 20 February 2010:
  - Dr. Prajnesu. Nonlinear time-series models.
- National Symposium on Lifestyle Floriculture: Challenges and Opportunities held at Dr. Y S Parmar University of Horticulture and Forestry, Nauni, Solan (HP) on 20 March 2010.
  - AK Gupta. Estimation of area, production and productivity of flowers.

**Invited Talks**
- Dr. VK Bhatia, Application of Statistics for Growth of Quantitative Genetics and Estimation of Genetic Parameters.
- Dr. Prajnesu, Nonlinear statistical models and their applications.
- Rajender Parsad, Applications of Experiments with Mixtures.

**ADVISORY SERVICES**
**Consultancy project:**
Prioritization of Rainfed Area in the Country in collaboration of CRIDA Hyderabad was approved by National Rainfed Authority, Ministry of Agriculture, New Delhi. This consultancy is for development of Socio-economic indicators which are to be integrated with Bio-physical indicator to be developed by CRIDA, Hyderabad at district level for prioritization of district for development.

**PERSONNEL**
**Congratulations on your Promotion**

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<tr>
<th>Name</th>
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<tr>
<td>Dr. UC Sud</td>
<td>Head, Division of Sample Survey</td>
<td>09.02.2010</td>
</tr>
<tr>
<td>Dr. AK Vasisht</td>
<td>ADG(PIM)</td>
<td>02.03.2010</td>
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**Appointments**

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<td>Smt. Udita Shyokand, Scientist</td>
<td>15.03.2010</td>
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**Transfer to Institute**

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<td>Sh SK Sharma, Asstt. F&amp;AO</td>
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**Transfer from Institute**

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<tr>
<td>Sh Vishal Acharaya, Asstt. F&amp;AO</td>
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**Wish you Happy Retired Life**

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<td>Sh. SS Walia, Scientist(SG)</td>
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<td>Dr. Jagbir Singh, P. Scientist</td>
<td>31.01.2010</td>
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<td>Smt. Kiran Rani oberoi, AAO</td>
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<td>Sh. KK Kher, Scientist(SG)</td>
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<td>Capt. Mehar singh, CAO</td>
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