

## Recommendations of the ICSI 2006

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### INTRODUCTION

India is proud of its heritage of eminent statisticians who contributed significantly to the welfare of humanity in India and abroad. Due to their untiring efforts, Agricultural Statistics in the country stands on a fairly sound footing. Recognizing the efforts of the statisticians and the importance of Statistics in agricultural research, Indian Society of Agricultural Statistics (ISAS) was formed on 03 January 1947 with the then Agriculture Minister Dr. Rajendra Prasad as its founder President. Dr. Rajendra Prasad continued to preside over the activities of the Society for 16 years even after becoming the President of India. The Society had also the proud privilege of having notable personalities and high dignitaries as its Presidents in the past and Dr. Mangala Rai, Secretary, Department of Agricultural Research and Education and Director General, Indian Council of Agricultural Research as its current President. The Society has been growing in strength to cover new horizons in time under their able leadership and continued guidance. The Society was nurtured by luminaries like Late Dr. PV Sukhatme and Late Dr. VG Panse and received valuable guidance from Dr. GR Seth, Late Dr. Daroga Singh, Dr. Prem Narain, besides others, as Directors of the IASRI. The present status of the Society is primarily because of the untiring efforts made by these celebrities in building the Society. The basic objective of the Society has been to disseminate research conducted in Agricultural Statistics to meet the challenges of agricultural research in the country. The Society publishes "Journal of the Indian Society of Agricultural Statistics", which serves as a vehicle for the statisticians to disseminate their research work in agricultural statistics aimed at the overall development of agriculture in the country. This is a unique journal that encourages applied research in statistics with applications focused at improving the quality of agricultural research.

Over the period of past sixty years, the Society and the Institute have accumulated numerous successes on pioneering research activities that deserve commemoration. To venerate the Diamond Jubilee Celebrations of the foundation of Indian Society of Agricultural Statistics (ISAS), the Indian Agricultural Statistics Research Institute (IASRI), New Delhi organized an International Conference on "**Statistics**

**and Informatics in Agricultural Research"** during 27-30 December 2006 at New Delhi. The conference was held at the National Agricultural Science Centre (NASC), New Delhi.

As a prologue to the Conference, two pre-conference workshops were organized on 26 December 2006. The details of the pre-conference workshops are

### Hotspot Geoinformatics

Resource person: Dr. GP Patil  
Distinguished Professor of Statistics and  
Director,  
Centre for Statistical Ecology and  
Environment Statistics  
Penn State University, USA

### Regression Diagnostics

Resource persons: Dr. T Krishnan  
Dr. Rajeeva Karandikar  
Ex-Professors of Statistics  
Indian Statistical Institute

The inaugural function was held at NASC Symposium hall. The Hon'ble Minister of Statistics and Programme Implementation, Shri GK Vasan inaugurated the conference. The Minister emphasized the need for conducting basic research in Statistics and Informatics in newer emerging areas so as to help to meet the challenges of agricultural research. The Minister highlighted areas of research particularly the forecasting and forewarning, gender dynamics and women empowerment, food chains and marketing channels, etc. He also emphasized the need of intertwining basic research in Statistics with innovative applications and informatics so as to help the rural population in general and farming community in particular. The Minister also echoed the importance of improving the quality of data, keeping in mind the timeliness, precision and uniformity of definitions of parameters of interest so as to get reliable estimates in time for policy planning. Dr. Mangala Rai, Secretary, DARE and DG, ICAR and President, ISAS delivered the Presidential Address. Dr. Rai stressed the need of collaborative research so that the information generated from research output can be converted into knowledge so that the agricultural research in general

and the farming community in particular gets benefited from the research.

### Conference Details

The keynote speaker was Professor CR Rao. Due to bad health, Professor Rao could not attend the conference and so could not deliver the talk. However, the talk was presented by one of his old students, Dr. T Krishnan. The title of the Keynote Address was “**Has Statistics a Future? If So, in what form?**”

During the conference there were three **Plenary Talks**. The details of the talks are:

#### 1. Plenary Talk 1

Speaker : Dr. GP Patil

Topic : Statistical Geo-informatics of Hotspot Detection and Prioritization for Monitoring, Etiology, Early Warning, and Management for Digital Governance in Agriculture, Natural Resources, Environment, Ecology, and EcoHealth

Chairman : Dr. James H Matis

#### 2. Plenary Talk 2

Speaker : Dr. James H Matis

Topic : Fitting Cumulative Size Mechanistic Models to Insect Population Data: A Nonlinear Random Effects Model Analysis

Chairman : Sat N Gupta

#### 3. Plenary Talk 3

Speaker : Dr. Padam Singh

Topic : Micronutrients Deficiency in India

Chairman : Dr. Nawab Ali

Besides, there were two **Memorial Lectures**, the details of which are given below:

#### 1. Dr. Rajendra Prasad Memorial Lecture

Speaker : Dr. GS Bhalla

Topic : Globalization and Current Crisis in Indian Agriculture

Chairman : Dr. GP Patil

#### 2. Dr. VG Panse Memorial Lecture

Speaker : Dr. AK Nigam

Topic : Understanding and Combating Undernutrition

Chairman : Dr. Padam Singh

## MAJOR THEMES AND SUB-THEMES FOR INVITED TALKS

There were **54 Invited Talks** presented under the following thematic areas of the conference:

### Theme 1: Statistical Applications in Agricultural Research

(Convenors: Murari Singh & HVL Bathla)

1. Sustainable Agriculture
2. Livestock/Poultry and Fisheries
3. Horticulture
4. Bio-diversity
5. Natural Resource Accounting

### Theme 2: Emerging Issues in Areas of Basic Statistical Research

(Convenors : Sudhir Gupta & Rajender Parsad)

1. Design of Experiments
2. Sampling Methods and Applications
3. Statistical Genetics
4. Spatio-Temporal Modeling
5. Statistical Inference

### Theme 3: Agricultural Informatics

(Convenors : Ajay Gupta & PK Malhotra)

1. Knowledge Management
2. Geo-informatics
3. Public-Private Sector Interface
4. Information Communication Technology (ICT) for Reaching the Stakeholders
5. Software

### Theme 4: Statistical and Computational Biology in Agriculture

(Convenors: Jose Crossa & VK Bhatia)

1. Statistical Genomics
2. Statistical Proteomics
3. Bio-informatics
4. Micro-array Technology

### Theme 5: Statistical and Economic Issues for Prosperity of Rural Community

(Convenors: RPS Malik & Ranjana Agrawal)

1. Food, Nutrition and Livelihood Security
2. Post-Harvest Management
3. Measurement of Hunger and Poverty Indicators for Socio-economic Development
4. Gender Dynamics and Woman Empowerment

### Theme 6: Human Resource Development for Agricultural Statistics and Informatics

(Convenors: CK Midha & VK Sharma)

1. Teaching and Training in Agricultural Statistics
2. Teaching and Training in Computer Application

## POSTER PRESENTATION

There were 155 poster presentations. The posters were highly appreciated by the sessional panels appointed for reviewing the posters presented and to give some suggestions for improvement.

## RECOMMENDATIONS

The following recommendations have emerged from the conference:

### General Recommendations

1. In view of the applicational nature of the discipline of Statistics to other sciences, it is important to convert the information generated through research in this discipline into knowledge by associating with the subject matter specialists.
2. Statistics and Informatics must be judiciously mixed so as to serve the humanity in a better and effective way.
3. Basic research in Statistics and Informatics should be conducted in newer emerging areas of micro array experiments, computational biology, genomics of plant, livestock, fishery, flora and fauna, biodiversity, evaluation and valuation, statistical modeling, precision agriculture.
4. The dissemination process should be further strengthened so that the newer methodologies developed are applied to different areas of agriculture, animal science and fisheries research.
5. Efforts should be made to improve the quality of data and while providing the estimates timeliness and accuracy of estimates of parameters of interest should be maintained for proper and effective policy planning. Further, the definitions of various parameters used by different agencies should be uniform. For micro-level policy planning research in small area techniques should be continued more rigorously.
6. Food fortification (food fortified with micronutrients such as iron and vitamin A) is the best strategy for controlling micronutrient based under nutrition in the community.
7. Management of severely undernourished children is urgently needed. For this their proper identification is necessary which is feasible only by using growth charts based upon standard deviation classification. Further, as the nutrition peaks at 11-12 months of age, the right age for intervention is targeting children less than one year of age.

### Theme 1: Statistical Applications in Agricultural Research

1. Statistical issues related to proper infrastructure for post harvest management of highly perishable commodities of animal, bird and fish origin and efficient utilization of by-products of these commodities need to be addressed.
2. Data bases need to be created for studying the food chains from production till consumption as processed foods. Value addition to these data bases in the form of marketing channels, nutritive value, energy and environmental safety and quality of the finished product also need to be made.
3. Agricultural reforms need to be accelerated by improving public investment on agriculture, especially in irrigation, institutional credit, etc. along with the revitalization of agencies like extension, agricultural administration, cooperatives, for rejuvenating agricultural research as also to benefit the farming community.
4. Methodologies for forecasting the livestock and agricultural production, by using various latest techniques of spatial sampling, remote sensing and fuzzy regression etc. need to be developed.
5. Remote sensing techniques should be used for developing methodologies for crop area estimation in fragmented agricultural area and detection of change.
6. Uniform scientific methodologies should be adopted by all the states to strengthen fisheries and horticultural database.
7. Quantities of natural resources like forestry, land, water and mineral resources used in the production process need to be quantified for the purpose of Natural Resource Accounting.
8. The existing administrative set up responsible for Livestock Statistics at the Center and State level is inadequate to meet the present requirements. Accordingly, there is a need to upgrade the present Livestock Statistics Division to a full fledged Directorate – Directorate of Livestock Economics and Statistics. Besides, having adequate Divisions at the national level, it will also have its officers at the State and District Headquarters.

### Theme 2: Emerging Issues in Areas of Basic Statistical Research

1. The estimation procedures for censored skewed populations need to be modified. Basic research may be pursued in the areas of current interest like

- randomized response models, rank set sampling, dependence measures etc.
2. Application and refinement of wavelet theory may further be explored in multivariate linear calibration studies.
  3. Efforts should be made for modeling ecological, biological and economic phenomena and then validating them at state and national level.
  4. Fractional factorial designs and supersaturated designs have important applications in many areas of agricultural research. Efficient designs should be generated and software package should be developed for generation of these designs.

### **Theme 3: Agricultural Informatics**

1. For the benefit of experimenters and practicing statisticians efforts in computer aided generation of situation specific and efficient designs, both in terms of precision and resources, should be strengthened.
2. For improving the quality of experimentation web resources on design and analysis of experiments should be activated globally and should also encompass in its gamete e-advisory, e-learning and discussion forum.
3. In order to utilize new digital opportunities that are in place for reaching the farmers, it is imperative that efforts be made by all the stake holders in NARS for content creation on technologies and need based information and knowledge that needs to be disseminated to the farmers.
4. The use of Hotspot Geo-informatics and digital governance should be explored in agriculture, natural resource accounting, environment, ecology and watersheds, etc.
5. There is urgent need to strengthen the existing databases and data warehouse in agricultural research and development and undertake data mining on them so as to discover knowledge required for market intelligence so as to make agriculture competitive and enumerative to the farmers.
6. Datamining methods applied on large datasets using machine learning methods and techniques like pattern recognition, decision trees and error validation should form an area of research.

### **Theme 4: Statistical and Computational Biology in Agriculture**

1. In gene mapping of QTL, sound statistical methodologies need to be developed for the situations of multiple traits. Procedures also require

to be modified accordingly by considering information on both continuous and discrete traits in a single mapping experiment.

2. Statistical analysis for understanding  $G \times E$  interactions, applications of mixed linear experiments, designing and analysis of micro array experimental data need to be strengthened on a continual basis to account for the rapid growth of functional genomics.
3. Research efforts should be made for development of statistical theory incorporating the problems associated with germ plasm collection from multi site population having varying distribution of genetic variation and breeding behaviour of the species at the individual sites.

### **Theme 5: Statistical and Economic Issues for Prosperity of Rural Community**

1. Statistical and economic studies should be conducted for food, nutritional and livelihood security for underprivileged people and a multi-pronged strategy should be suggested.
2. There is decline in quality of employment for rural women. Focus is required on quality employment opportunities for women.
3. Women centric rural enterprises should be promoted through understanding their requirements for credit, control over resources, skill development and support system, market information and links, handling legal and regulatory matters, social safety-nets, etc.
4. Statistical and economical issues for advocating necessary policy changes related to efficient water management need to be addressed by taking into account the prevailing bias against investment in large dams in India.
5. Statistical procedures for constructing socio-economic development index need to be further strengthened specially at micro-level.

### **Theme 6: Human Resource Development for Agricultural Statistics and Informatics**

1. To create a trained manpower in the newer emerging areas so as to meet the challenges of agricultural research, M.Sc. programmes in Geoinformatics and Bioinformatics should be started by IASRI and other State Agricultural Universities.
2. The course curriculum for Masters degree programme in Statistics should be so oriented that it includes topics like official statistics, statistical quality data, general insurance, agricultural insurance, projection of demands for commodities, data warehousing and data mining, etc.