

कृषि अनुसंधान सांख्यिकीविदों
का
सोलहवाँ राष्ट्रीय सम्मेलन
**SIXTEENTH NATIONAL CONFERENCE
OF
AGRICULTURAL RESEARCH STATISTICIANS**

(23–24 दिसम्बर 2010)
(23-24 December 2010)

कार्यवृत्त
Proceedings



भारतीय कृषि सांख्यिकी अनुसंधान संस्थान
(भा.कृ.अ.प.)
लाइब्रेरी एवेन्यू, पूसा, नई दिल्ली-110 012
RCMU/PME Cell



**Indian Agricultural Statistics Research Institute
(ICAR)**

Library Avenue, Pusa, New Delhi-110 012

www.iasri.res.in

E-mail: director@iasri.res.in, pme@iasri.res.in

Phone: 011-25841479, Fax: 011-25841564

आमुख

कृषि अनुसंधान सांख्यिकीविदों के सोलहवें राष्ट्रीय सम्मेलन का परिचर्चा-शोधपत्र एवं कार्यवृत्त प्रस्तुत करते हुए मुझे हार्दिक प्रसन्नता का अनुभव हो रहा है । यह सम्मेलन भारतीय कृषि अनुसंधान परिषद् (भा.कृ.अनु.प.) के संस्थानों, परियोजना निदेशालयों, कृषि विश्वविद्यालयों एवं केन्द्र/राज्य कृषि पशुपालन/मत्स्य विभागों के सांख्यिकीविदों के लिए, भारतीय कृषि सांख्यिकी अनुसंधान संस्थान, नई दिल्ली में आयोजित किया गया था । इस सम्मेलन का विषय "कृषि सांख्यिकी एवं सूचना विज्ञान में राष्ट्रीय प्राथमिकताएँ" था । उद्घाटन सत्र एवं समापन समारोह के अतिरिक्त इस सम्मेलन में चार विभिन्न सत्रों में चर्चा आयोजित की गई । सम्मेलन में किये गये विचार-विमर्श से, वैज्ञानिकों को अनुसंधान के लिए प्राथमिक क्षेत्रों की पहचान करके उन पर अनुसंधान करने के लिए प्रोत्साहन मिला । मुझे आशा है कि यह कार्यवृत्त वैज्ञानिकों के लिए अति उपयोगी होगा और भविष्य में कृषि सांख्यिकी एवं संगणक अनुप्रयोग के विभिन्न क्षेत्रों में उपयुक्त अनुसंधान अध्ययन करने में मददगार सिद्ध होगा ।

मैं, भारतीय कृषि अनुसंधान परिषद् के महानिदेशक एवं कृषि अनुसंधान एवं शिक्षा विभाग (डेयर) के सचिव, डॉ. एस. अय्यप्पन, का इस सम्मेलन से सम्बन्धित सभी आवश्यक सुविधाएँ उपलब्ध कराने के लिए, विशेष आभार व्यक्त करता हूँ । मैं, कृषि वैज्ञानिक चयन मंडल के अध्यक्ष, डॉ. सी. डी. मायी का भी बहुत आभारी हूँ जिन्होंने इस सम्मेलन का उद्घाटन करने के लिए अपनी सहमति दी और इसके लिए अपना बहुमूल्य समय निकाला । मैं, भा.कृ.अनु.प. के उप-महानिदेशक (कृषि अभियांत्रिकी) डॉ. मदन मोहन पाण्डेय का भी आभार प्रकट करता हूँ जिन्होंने इस सम्मेलन को आयोजित करने में हमें अपना बहुमूल्य मार्गदर्शन प्रदान किया । मैं, भारत के मुख्य सांख्यिकीविद् प्रोफेसर टी.सी.ए. अनन्त का भी बहुत आभारी हूँ जिन्होंने समापन समारोह में मुख्य अतिथि बनने के हमारे अनुरोध को स्वीकार किया तथा इस सम्मेलन की अनुशंसाओं को अंतिम रूप देने में हमारी मदद की । विभिन्न सत्र अध्यक्षों, संयोजकों, प्रारम्भिक विचार वक्ताओं का भी धन्यवाद करता हूँ जिन्होंने इस सम्मेलन के विभिन्न तकनीकी सत्रों का आयोजन किया और विभिन्न संगठनों द्वारा उनके स्टाफ को इस सम्मेलन में प्रतिनियुक्त करने के लिए धन्यवाद देता हूँ ।

मैं, भा.कृ.अनु.प. के राष्ट्रीय आचार्य, डॉ. वी.के. गुप्ता का बहुत आभारी हूँ जिन्होंने इस सम्मेलन के उद्घाटन सत्र, ओपन हाउस एवं समापन समारोह में प्रतिभागिता करने के लिए अपना बहुमूल्य समय निकाला तथा इस सम्मेलन के कार्यों में अपना पूर्ण सहयोग दिया । मैं, डॉ. राजेन्द्र प्रसाद, प्रभागाध्यक्ष, परीक्षण अभिकल्पना एवं प्रभारी, अनुसंधान समन्वय एवं प्रबन्धन एकक के अथक परिश्रम की सराहना करना चाहूँगा जिन्होंने इस सम्मेलन में आयोजक, सचिव के रूप में अपना पूर्ण सहयोग दिया । अनुसंधान समन्वय एवं प्रबन्धन एकक के अधिकारीगण एवं संस्थान के अन्य अधिकारी भी धन्यवाद के पात्र हैं जिनके श्रमसाध्य प्रयासों से यह सम्मेलन सफलतापूर्वक आयोजित हो सका ।

(विजय कुमार भाटिया)
निदेशक

Preface

It is a matter of great pleasure for me in presenting the Discussion Papers & Proceedings of the XVI National Conference of Agricultural Research Statisticians of the I.C.A.R. Institutes, Project Directorates, Agricultural Universities and Central/State Departments of Agriculture/Animal Husbandry/Fisheries held at Indian Agricultural Statistics Research Institute, New Delhi. The theme of the Conference was 'National Priorities in Agricultural Statistics and Informatics'. Besides Inaugural Session and Plenary Session, the discussion in the Conference was held in four different sessions. The deliberations in the Conference, *inter alia*, have helped in identifying priority areas of research requiring concerted efforts on the part of the Scientists. I hope the proceedings will be well received by the scientific fraternity and help in the formulation of the appropriate research studies in different component areas of Agricultural Statistics and Computer Application in the near future.

I am grateful to Dr. S. Ayyappan, Director General, Indian Council of Agricultural Research (ICAR) and Secretary, Department of Agricultural Research and Education (DARE), Government of India for providing necessary facilities. I am very much grateful to Professor C.D. Mayee, Chairman, Agricultural Scientists' Recruitment Board who had kindly consented and spared his precious time to inaugurate this Conference. I am thankful to Dr. M.M. Pandey, Deputy Director General (Engg.), ICAR for providing encouragement and support for organizing the conference. I am thankful to Professor TCA Anant, Chief Statistician of India for accepting invitation to be the Chief Guest at the plenary session and for his valuable guidance, advice and support in finalising the recommendations of the conference. I am also thankful to the Sessional Chairpersons, Conveners, and the discussant openers who have taken pains to conduct the technical sessions and various organizations, who have deputed their Staff and also to the delegates who have made it convenient to attend the conference and took active participation in deliberations of the conference.

I am also thankful to the Dr. V.K. Gupta, ICAR National Professor who had spared his precious time for participating in Inaugural Session, Open House and Plenary Session and in coordinating the work of the Conference. I would like to express my appreciation of the hard work put in by Dr. Rajender Parsad, Head, Division of Design of Experiments and Incharge, Research Co-ordination and Management Unit/PME Cell, in coordinating the work of the Conference as Organizing Secretary. Thanks are also due to the staff members of the Research Co-ordination and Management Unit/ PME Cell and other officers of the Institute for their painstaking efforts for organizing the Conference.

V.K. BHATIA
DIRECTOR

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**XVI NATIONAL CONFERENCE OF
AGRICULTURAL RESEARCH STATISTICIANS
(December 23-24, 2010)**

Venue: Auditorium, Computer Centre Building, IASRI, New Delhi

December 23, 2010 (Thursday)		
0930 - 1000	Registration	
Inauguration		
1000 - 1015	Welcome Address	Dr. VK Bhatia, Director, IASRI
1015 - 1020	Lighting of Lamp	Dignitaries
1020 - 1050	Keynote Address: Some Random Thoughts on Agricultural Research Statisticians	Dr. VK Gupta, ICAR National Professor
1050 - 1120	Inaugural Address	Dr. CD Mayee, Chairman, ASRB
1120 - 1125	Vote of Thanks	Dr. Rajender Parsad, Organizing Secretary
1125 - 1200	Tea Break	
1200 - 1330	Technical Session I: Action taken on the Recommendations Made during the XV National Conference Chairman: Dr. VK Bhatia; Convener: Dr. Rajender Parsad	
1330 - 1415	Lunch Break	
1415 - 1630	Technical Session II: Priorities for Research in Agricultural Statistics: Current Status and Future Challenges Chairman: Dr. Alope Dey; Conveners: Dr. UC Sud and Dr. A Dhandapani Speakers: <ol style="list-style-type: none"> 1. Dr. Prajneshu, IASRI, New Delhi 2. Dr. Pranesh Kumar, University of Northern Columbia, Canada 3. Sh. AK Srivastava, FOD, Faridabad 4. Dr. TR Sharma, NRC PB, New Delhi 5. Dr. Tauqueer Ahmad, IASRI, New Delhi 6. Dr. J Jayasankar, CMFRI, Cochin 7. Dr. K Muralidharan, CPCRI, Kasargod Discussant: <ol style="list-style-type: none"> 1. Dr. KP Suresh, NIANP, Bangalore 	
1630 - 1645	Tea Break	
1645 - 1715	Presentation on Strengthening Statistical Computing for NARS Chairman: Dr. VK Bhatia; Speaker: Dr. Rajender Parsad Dr. A Dhandapani	

December 24, 2010 (Friday)		
0930 - 1115	Technical Session III: Priorities for ICT in Agriculture Chairman: Dr. SK Raheja; Conveners: Dr. RC Goyal and Dr. RC Agrawal Speakers: <ol style="list-style-type: none"> 1. Dr. Rajni Jain, NCAP, New Delhi 2. Sh. Himanshu, KAB-II, ICAR, New Delhi 3. Dr TS Anurag, Media Lab Asia, New Delhi 4. Dr. Avnish K. Bhatia, NBAGR, Karnal Discussants: <ol style="list-style-type: none"> 1. Dr. Sudeep, IASRI, New Delhi 2. Dr. PS Pandey, IARI, New Delhi 3. Dr. Anil Rai, IASRI, New Delhi 	
1115 - 1130	Tea Break	
1130 - 1315	Technical Session IV: Priorities for Human Resource Development in Agricultural Statistics and Computer Applications Chairman: Dr. Bal BPS Goel; Conveners: Dr. Krishan Lal and Dr. B Singh Speakers: <ol style="list-style-type: none"> 1. Dr. Vijayaraghava Kumar, KAU, Thiruvananthapuram 2. Dr. Seema Jaggi, IASRI, New Delhi 3. Dr. Alka Arora, IASRI, New Delhi Discussants: <ol style="list-style-type: none"> 1. Dr. Med Ram Verma, IVRI, Izatnagar 2. Dr. Showkat Maqbool, SKUA&T, Srinagar 3. Dr. Shashi Dahiya, IASRI, New Delhi 	
1315 - 1415	Lunch Break	
1415 - 1515	Open House Discussion on How to Attract students in Post Graduate Programme in Agricultural Statistics/ Biostatistics/ Computer Applications? Chairman: Dr. VK Gupta; Convener: Dr. Rajender Parsad	
Plenary Session		
1515-1520	Welcome	Dr. VK Bhatia, Director, IASRI
1520-1545	Presentation of reports by Conveners and summary of recommendations	Conveners of Respective Sessions
1545-1550	Remarks	Dr. VK Gupta, ICAR National Professor
1550-1605	Valedictory Address	Prof. TCA Anant, Chief Statistician, Government of India
1605-1610	Vote of Thanks	Dr. Rajender Parsad, Organizing Secretary
1610-1630	Tea Break	

INAUGURAL SESSION

December 23, 2010 (Thursday)

(10.00 A.M. to 11.30 A.M.)

Welcome Address	:	Dr. VK Bhatia, Director IASRI, New Delhi
Lighting of Lamp	:	Dignitaries
Keynote Address	:	Dr. VK Gupta, ICAR National Professor New Delhi
Inaugural Address	:	Dr. CD Mayee, Chairman ASRB, New Delhi
Vote of Thanks	:	Dr. Rajender Parsad, HD (DE) and Organizing Secretary IASRI, New Delhi

TECHNICAL SESSION - I

Action taken on the Recommendations Made during the XV National Conference

December 23, 2010 (Thursday)
(12.00 Noon to 01.30 P.M.)

Chairman	:	Dr. NP Sirohi ADG (Engineering), ICAR, KAB-II, New Delhi
Convener	:	Dr. Rajender Prasad, HD (DE) and Organizing Secretary, IASRI, New Delhi
Discussions	:	All Participants

Action Taken Report on the Recommendations made during the XV National Conference of Agricultural Research Statisticians held at Birsa Agricultural University (BAU), Ranchi, Jharkhand during December 03-04, 2007

The recommendations finalized in the conference were sent to all the Agricultural Universities, ICAR Institutes, Bureaus, National Research Centres and the Project Directorates. A total of 10 recommendations were made during the last conference. The recommendations were made in the context of small area estimation, development of indigenous web enabled software packages, initiation of research programmes in bioinformatics, uniformity in admission criteria, strengthening of human resource development, creating a network of statisticians, etc. The proposed action on the various recommendations was to be taken by IASRI, ICAR Institutes, State Agricultural Universities, All India Co-ordinated Research Projects and Deemed Universities. The action taken report has been received from various NARS organizations. It is encouraging to know that on all the recommendations, timely action has been taken by various NARS organizations.

A detailed statement showing the action taken report on the recommendations by various Institutes/Universities is given in the sequel:

1. Action Suggested

A network of agricultural scientists and agricultural statisticians in NARS and statisticians in other research organizations/universities may be created for providing e-advisory, e-consultancy and e-training to improve the quality of agricultural research. An online virtual library may be created in various areas of research in statistics.

(Action: IASRI/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	<ul style="list-style-type: none"> • For e-advisory, e-consultancy, e-training, e-learning and teaching to improve the quality of research in Statistics - Strengthened Design Resources Server (www.iasri.res.in/design) with an objective to disseminate research in Design of Experiments among peers over the globe. The server is of great help for the experimenters in agricultural sciences, biological sciences, social sciences and industry in planning and designing their experiments. One important feature of the server is the Discussion Forum that aims at providing online advisory and consultancy to the experimenters and creating a network of agricultural scientists and statisticians. The ultimate objective of this server is to provide e-advisory services. Presently, this is being achieved through the link "Ask a Question". - Efforts have been made in developing e-learning contents (text material, tables and graphics,

		<p>questions, exercises, self-test objective type questions, assignments, power point presentations and audio scripts) on Agricultural Statistics under a project “An e-Learning solution for Agricultural Education”.</p> <ul style="list-style-type: none"> - E-books on Design and Analysis of Agricultural Experiments, Advances in Data Analytical Techniques and Statistical Methods for Agricultural Research have been developed and uploaded at IASRI website for the benefit of all agricultural research workers. - The write ups of the seminars delivered by the students during the different academic sessions as part of their course curriculum on different aspects of Statistics have been compiled, edited and brought in the web as e-learning material for easy accessibility of the readers (www.iasri.res.in/seminar/AS299/new1.html). • Online virtual libraries <ul style="list-style-type: none"> - IASRI has developed an excellent e-library resource base in the field of Agricultural Statistics, Computer Applications and allied fields to support teaching, research and consultancy in the relevant areas. - Catalogue of its resources have been Bar-Coded & Computerized. Library is also providing Computerized Circulation with Bar-Coded Electronic Membership Cards. It has developed its OPAC (On-line Public Access Catalogue) for use in the IASRI premises to search for bibliographical details of documents and its availability as well as on-line reservation of document(s).
2.	Punjab Agricultural University, Ludhiana	<p>The information from large number of agricultural produce markets relating to the major crops through the Marketing Intelligence Centre set up has been collected in 2009. The forecasting of prices of various agricultural commodities is also done by the centre. This is helpful for the farmers as well as the policy makers at the state and national level. The work on the research project entitled, “Cost of cultivation of principal crops in Punjab” which provides data for fixing of the MSP of different crops in the country is in progress.</p>

A network of agricultural scientists and agricultural statisticians in NARS and statisticians in other research organizations/universities is being created through Discussion Forum on Design Resources Server (www.iasri.res.in/design). E-advisory and E-consultancy services are being provided through “Ask a Question” facility at Design Resources Server. For e-learning three e-books on Design and Analysis of Agricultural Experiments, Advances in Data Analytical Techniques, Statistical Methods for Agricultural Research are made available at IASRI Web page and Design Resources Server. Efforts have been made in developing the forum of development online courses through e-Learning solution for Agricultural Education (elearnagri.iasri.res.in/home/). Further efforts on creating online

virtual library resource in several other areas of Statistics such as Sample Size Determination, etc. are being created.

2. Action Suggested

Application of small area estimation methods needs to be explored in the areas of crop, fishery and livestock improvement programmes.

(Action: ICAR Institutes/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	<p>Research efforts in small area estimation are:</p> <ul style="list-style-type: none"> - A project on Small area estimation for zero inflated data has been completed at IASRI. In this project Small Area Estimation (SAE) that accounts for presence of excess zeros in the data has been developed using the mixture model (a combination of linear mixed model and generalized linear mixed model). The proposed approach works in three steps. Firstly, a linear mixed model is fitted for positive values of the variable and then at the second step, a generalized linear mixed model is fitted for probability of positive values. Finally, the two models are combined at estimation stage. The performance of the proposed method is illustrated through the survey data of 59th round of the National Sample Survey Office (NSSO) on Debt-investment Survey 2002-03 for rural areas of Uttar Pradesh. The variable of interest is amount of loan outstanding per household with an aim to predict the district level average value of amount of loan outstanding per household. - A project entitled District level poverty incidence estimation from NSSO data using small area estimation technique has been undertaken which is sponsored by CSO, Ministry of Statistics and Programme Implementation, Government of India. - Research papers entitled Disaggregate-level estimates of indebtedness in the state of Uttar Pradesh in India-an application of small area estimation technique and Small area estimation with binary variables have been accepted for publication in the Journal of Applied Statistics and Journal of Indian Society of Agricultural Statistics respectively. - Several training programmes have been conducted on Small Area Estimation.
2.	Indian Institute of Horticultural Research, Bangalore	Application of small area estimation methods is being explored in the ongoing research projects.

3.	Central Institute of Temperate Horticulture, Srinagar	Exploration of small area estimation methods is being taken care of.
4.	University of Agricultural Sciences, Dharwad	Problems on this topic are allotted to Masters degree students.
5.	Indian Agricultural Research Institute, New Delhi	The recommendation has been noted for exploring small area estimation in case of crops.
6.	College of Basic Sciences & Humanities, PAU, Ludhiana	One research project entitled, "Estimation of multi-characteristics in agricultural and social sciences" funded by the University Grants Commission is taken up by the scientists.
7.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	Noted for further programme.
8.	Indian Institute of Vegetable Research, Varanasi	As no scientist in the discipline of Agricultural Statistics is posted in the Institute, hence, we are not able to initiate action.
9.	Sher-e-Kashmir University of Agricultural Sciences & Technology-Jammu, Jammu	Statisticians of the Division of Agricultural Economics & Statistics are planning to submit research proposal on this aspect in near future.
10.	Sher-e-Kashmir University of Agricultural Science & Technology of Kashmir, Srinagar	The Division of Agricultural Statistics is exploring the possibility of using small area estimation methodology in two research studies in respect of crop production estimates and a livestock survey this year.
11.	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan	IASRI, New Delhi is already involved in theoretical work on topic (Small area estimation methods) and its applied aspects. It would be appropriate if the statistics faculty in the Department of Basic Sciences of this University is trained at IASRI for the purpose so that methods be explored for its application in horticulture and forestry crops.
12.	Rajasthan College of Agriculture, Udaipur	Efforts are being made to explore the application of small area estimation methods in the areas of crop, fishery and livestock improvement programmes.
13.	Navsari Agricultural University, Navsari (Gujarat)	Due to lack of qualified faculties particularly in this branch of statistics, it is difficult to implement this recommendation at present.

The research studies on application of small area estimation methods have been undertaken. Application of small area estimation techniques in the areas of crop, fishery and livestock improvement programmes need further exploration.

3. Action Suggested

Development of indigenous web enabled statistical packages (software) should be taken up for the improvement of agricultural research output as well as for the teaching programmes.

(Action: ICAR Institutes/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	<ul style="list-style-type: none"> • Development of following web enabled modules/ packages is being taken up: - Online generation of randomized layout of Basic Designs such as completely randomized design and randomized complete block design both for single factor and multifactor experiments and Latin square designs for single factor experiments. The field book can be created as a .csv file or a text file. This is available at www.iasri.res.in/design/Basic Designs/generate designs.htm. - Online generation of randomized layout of an augmented randomized complete block design for given number of test treatments, control treatments and number of blocks with given block sizes, not necessarily equal, is developed and is available at www.iasri.res.in/design/Augmented Designs/home.htm. - Online generation of simplex centroid designs is available at http://www.iasri.res.in/mixture/mixtures.aspx. - Online generation of complete set of mutually orthogonal Latin squares of order s, s being a prime or prime power less than 1000. One can also generate an orthogonal array with parameters $(s^{s+1}, s^2, s, 2)$ by choosing the output option as orthogonal arrays. The URL of this link is www.iasri.res.in/WebHadamard/mols.htm. - Online layout of block designs with factorial treatment structure and supersaturated designs available at www.iasri.res.in/design/factorial/factorial.htm and www.iasri.res.in/design/Supersaturated Design/Supersaturated.html respectively. - Online analysis of data generated from augmented randomized block designs. This is available at www.iasri.res.in/spadweb/index.htm. - Online analysis of data generated from complete/ incomplete block designs having equal/unequal replications as well as block sizes have been developed and is available at www.iasri.res.in/WebAnalysis/index.aspx. - Statistical Package for Agricultural Research SPAR 3.0 - Software for Survey Data Analysis (SSDA 2.0) - Web Solutions for Partially Balanced Incomplete Block Designs • Besides the development of indigenous web enabled

		<p>statistical packages/ modules discussed above, a general purpose high end statistical package SAS/JMP/JMP Genomics has been procured with 151 licenses for perpetual use with three years updates and upgrades to provide enabling statistical computing facilities to the researchers of NARS under the NAIP Consortium on Strengthening Statistical Computing for NARS.</p> <p>- The package can be installed on multiple official machines both in stand-alone as well as intranet mode. The availability of SAS/JMP/JMP Genomics has enabled the researchers to undertake probing, in-depth, appropriate, intractable analysis of data generated from agricultural research including those in advanced research areas like biotechnology, genomics, microarrays, forecasting, agricultural field experiments, surveys, microarrays, massive data sets such as climate change, biodiversity, market intelligence, etc.</p>
2.	Indian Institute of Horticultural Research, Bangalore	Web based SAS software provided under NAIP is used in the ongoing research projects for data analysis.
3.	Central Institute of Temperate Horticulture, Srinagar	Web enabled software and latest software like SAS have already been installed for the improvement of agricultural research output.
4.	University of Agricultural Sciences, Dharwad	Statistical packages have been developed by the Department of Agricultural Statistics for improvement of agricultural research output as well as for the teaching programme.
5.	Indian Agricultural Research Institute, New Delhi	Statistical data analyses software supplied by IASRI under NAIP sub-project such as SAS is being used for teaching and research purpose.
6.	Punjab Agricultural University, Ludhiana	The statistical packages like CPCS and GSTAT which cover basic, applied and various designs of experiments have been developed and are installed in the computer laboratory of the Department of Mathematics, Statistics & Physics for the use of PG students for their research purposes.
7.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	SAS software is being used for statistical analysis of research data generated at this university
8.	Indian Institute of Vegetable Research, Varanasi	As no scientist in the discipline of Agricultural Statistics/Computer Application is posted in the Institute hence we are not able to initiate action.
9.	Sher-e-Kashmir University of	One of the statisticians from the Division of Agricultural Economics & Statistics is working as Nodal Officer in NAIP-I

	Agricultural Sciences & Technology- Jammu, Jammu	project entitled Strengthening Statistical Computing for NARS through which improvement of agricultural research output as well as its use in teaching programme, by using SAS software, will positively be made in near future.
10.	Sher-e-Kashmir University of Agricultural Science & Technology of Kashmir, Srinagar	University Research Council in its 45 th meeting this year approved a study of developing Computer Programmes for Commonly used designs of field experiments based on web based R-Software.
11.	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan	SAS software provided by ICAR for statistical analysis under research project on Strengthening Statistical Computing for NARS under the National Agricultural Innovation Project is being used for research. Training programme for the scientists of this University will be conducted by NDRI, Karnal.
12.	Navsari Agricultural University, Navsari (Gujarat)	Presently the software packages developed by IASRI are being used specifically for breeding experimentation data analysis. An indigenous package for analyzing and predicting the future prices of few crops for south Gujarat region is developed and used for analysis of data. The development of indigenous web enabled data analysis packages will be taken up in future.

Indigenous web enabled statistical packages/ modules have been developed for generation of randomized layout of designs and analysis of experimental data. Further efforts are being made to develop indigenous web enabled software for plant breeding data and survey data.

General purpose high end statistical packages SAS/JMP/JMP Genomics have been procured with 151 licenses for perpetual use with three years updates and upgrades to provide enabling statistical computing facilities to the researchers of NARS under the NAIP Consortium on Strengthening Statistical Computing for NARS.

4. Action Suggested

Information management leading to the development of knowledge based systems should be taken up in a network mode. This would require strengthening in terms of human resources and infrastructure facilities.

(Action: ICAR/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	Following Expert Systems/ Information Systems/ Knowledge Management Systems have been developed/initiated - Expert System for Maize Crop initiated with DMR, Delhi - Expert System for Seed Spices initiated in collaboration with NRCSS, Ajmer - Expert System on Wheat Crop Management has been Strengthened, Refined and Implemented

		<ul style="list-style-type: none"> - Project Information and Management System of ICAR (PIMS-ICAR) for providing information on research projects, duplication of research and monitoring of research projects - Decision Support System for Manpower Planning: PERMISnet II - Intranet Solutions for PG School, IARI - Agricultural Field Experiments Information System made online <p>Besides the above for development of knowledge based systems through network mode, following initiatives have been taken up at ICAR level</p> <ul style="list-style-type: none"> - SAS BI Server procured under Strengthening Statistical Computing for NARS - Establishment of National Bioinformatics Grid
2.	Indian Institute of Horticultural Research, Bangalore	A research project on Developing decision support system for increasing production in fruit crops is in progress.
3.	University of Agricultural Sciences, Dharwad	A very good infrastructure development has been made in this University for the Department of Agricultural Statistics. Two class rooms equipped with all audiovisual aids have been provided. Separate computer laboratory having 40 computers have also been developed for the Department.
4.	Punjab Agricultural University, Ludhiana	<p>The School of Information Technology has already started development of infrastructure facilities like:</p> <p>(i) Establishment of campus wide networking (ii) One GBPS bandwidth connectivity (iii) Implementation of e-governance at the University.</p> <p>New courses like MCA, PGDCA have been started for the development of human resources in IT sector.</p>
5.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	At present there is only one computer scientist who is involved in maintaining, teaching UG and PG classes. The recommendation will be taken on priority basis, as and when the posts will be filled.
6.	Sher-e-Kashmir University Agricultural, Science & Technology-Jammu, Jammu	In this regard IASRI, being apex body, is requested to take initiatives for creation of one post of Programmer or IT personnel in the Department of Statistics at each SAU in order to strengthen the system.
7.	Sher-e-Kashmir University of Agricultural Science & Technology of Kashmir, Srinagar	A web based University approved project on information management system of horticultural crops (Apple and Pear) of Kashmir Valley has been taken up with existing infrastructure from Autumn 2009.
8.	Navsari Agricultural University, Navsari (Gujarat)	Work on information management system is initiated in limited extent and it can be further extended when sufficient infrastructure is available.

More than 63 information systems, 21 decision support systems, 22 e-advisory /e-learning resources are available in the NARS. Efforts have also been made to develop Expert Systems for various food and horticultural crops. Besides these steps in terms of procurement of SAS BI server for analysis in server-client architect mode and establishment of National Bioinformatics Grid for creation of databases and analysis in network mode have been undertaken. All these steps are towards infrastructure creation. Strengthening in terms of human resources needs to be taken up at priority.

5. Action Suggested

Development, strengthening and maintenance of data warehouse in agricultural research should be continued and data mining may also be taken up.

(Action: ICAR/ICAR Institutes/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	Following efforts have been made in this direction: <ul style="list-style-type: none"> - Developed Knowledge Data Warehouse for Agricultural Research. - Applied Machine Learning Approach for Data Mining from Agricultural Datasets. - Central Data Warehouse has been strengthened in its on-line analytical capabilities and large datasets has been populated from different sectors through dimensional modelling including data from, population census, livestock census etc. - SAS E-miner has been procured along with SAS BI Server under the NAIP Consortium of Strengthening Statistical Computing for NARS for taking up data mining activities.
2.	Indian Institute of Horticultural Research, Bangalore	Data collected through primary sample surveys on different aspects of perennial crops are documented as a database.
3.	Central Institute of Temperate Horticulture, Srinagar	Data warehouse is being developed and updated regularly.
4.	University of Agricultural Sciences, Dharwad	The database of important agricultural crops in Karnataka state has been developed. Some more work in this regard has been planned for future.
5.	Indian Agricultural Research Institute, New Delhi	Database development and its maintenance is a part of our in-house project (2009-14). Accordingly, the final report along with data will be placed on website for data mining.
6.	Punjab Agricultural University, Ludhiana	A data bank containing data of various parameters related to agriculture, animal husbandry, poultry, etc. need to be established for further general use of the scientists.
7.	Dr. Balasaheb Sawant Konkan Krishi	SAS has been received by this university which will be used for statistical analysis of research data generated at

	Vidyapeeth, Dapoli	this University.
8.	Indian Institute of Vegetable Research, Varanasi	As no scientist in the discipline of Agricultural Statistics/Computer Application is posted in the Institute hence we are not able to initiate action.
9.	Sher-e-Kashmir University of Agricultural Science & Technology of Kashmir, Srinagar	Metrological data, rice/wheat/apple production and livestock data for last 10 years in the Kashmir Valley is being developed and maintained in a Research Council approved project from this year in collaboration with Divisions of Pomology, Agronomy and Division of Plant Breeding & Genetics.
10.	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan	Presently, no work on development, strengthening and maintenance of data warehouse in horticultural and forestry research and data mining is being done by this University and the same cannot be taken up for requiring of high configuration server machines.
11.	Navsari Agricultural University, Navsari (Gujarat)	Point noted and being done and data are maintained.

Several databases pertaining to important agricultural crops, various parameters related to agriculture, animal husbandry, poultry, development of Knowledge Data Warehouse for Agricultural Research, metrological data etc. are being developed/ strengthened. Data mining work has been undertaken through development of Knowledge Data Warehouse for Agricultural Research and Machine Learning Approach for Data Mining from Agricultural Datasets. Potential of SAS E-miner would be exploited for future data mining activities.

6. Action Suggested

Joint collaboration of agricultural statisticians, computer scientists, biotechnologists and molecular biologists is needed to initiate research programmes in the area of bio-informatics and genomics useful for Indian agriculture.

(Action: ICAR Institutes/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	<ul style="list-style-type: none"> A Sub-program under NAIP Component-I Establishment of National Agricultural Bioinformatics Grids in ICAR has been taken up in collaboration of five domain institutions i.e NBPGR New Delhi, NBAGR Karnal, NBFGR Lucknow, NBAIM, Mau and NBAIL Bangalore. This is a joint collaboration of agricultural statisticians, computer scientists, biotechnologists and molecular biologists. In this programme, infrastructure related to high end supercomputing facility and advance training in taking up research in agricultural bioinformatics will be taken up for NARS. Other projects that have been undertaken in the area of Statistical Genomics/ Bioinformatics in

		<p>collaboration with other institutions are</p> <ul style="list-style-type: none"> - Computational analysis of SNPs at functional elements of rice areas - Genomics and molecular markers in crop plants (in collaboration with NRCPB, New Delhi) - Bio-prospecting of genes and allele mining for abiotic stress tolerance (NAIP Component IV: Consortium Partner) <ul style="list-style-type: none"> • Agricultural Bioinformatics lab has been established.
2.	Indian Institute of Horticultural Research, Bangalore	Agricultural statisticians, computer scientists, biotechnologists are jointly involved from IIHR, in a recently initiated IASRI network project on National Agricultural Bioinformatics Grid.
3.	Central Institute of Temperate Horticulture, Srinagar	Multidisciplinary work has been initiated in bioinformatics particularly in the area of disease diagnostics in temperate fruit crops.
4.	University of Agricultural Sciences, Dharwad	Efforts are being made to initiate the interdisciplinary activities.
5.	Indian Agricultural Research Institute, New Delhi	USI is already working in a joint collaboration mode of statisticians, computer scientists and biotechnologists in our Bio-informatics project sponsored by the Department of Biotechnology, Government of India.
6.	Punjab Agricultural University, Ludhiana	<ul style="list-style-type: none"> • The proposals namely Making bio-diesel from Algae and Bio-fortification in pulses are made in collaboration with the Department of Microbiology and School of Agricultural Biotechnology. The work has already been initiated on gene expression in wheat and maize. Some projects have been submitted to DBT and DST. Efforts are also in progress to initiate the research projects in the areas of bio-informatics and genomics by involving the statistics faculty. • Joint collaborative research programme with the Departments of Biotechnology, Plant Pathology and Agrometeorology has been initiated.
7.	Indian Institute of Vegetable Research, Varanasi	Establishment of ICAR funded National Agricultural Bio-informatics Grid is in progress in collaboration with IASRI, NBPGR and IIHR, where IIVR is one of the nodal centre.
8.	Sher-e-Kashmir University of Sciences & Technology-Jammu, Jammu	At present our university has started degree programme in Biotechnology at UG level only. So there is scope to start collaborative research work in future.
9.	Sher-e-Kashmir University of Agricultural	Though no formal collaboration exists with molecular biologists, however statistical and software

	Science & Technology of Kashmir, Srinagar	collaboration has taken place with Divisions of Animal Breeding & Genetics and assistance is provided to Bioinformatics Wing in Faculty of Veterinary Sciences.
10.	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan	The Statistics Faculty as well as Department of Biotechnology are already involved in various PG research and other research projects pertaining to areas under consideration.
11.	Rajasthan College of Agriculture, Udaipur	This issue has been taken up in the Research Review Committee meeting held on 17 th June, 2010 under the Chairmanship of Honorable Vice Chancellor, MPUAT, Udaipur.
12.	Navsari Agricultural University, Navsari (Gujarat)	Point noted and necessary program will be initiated in this area in near future.

An initiative of Establishing a National Bioinformatics Grid has been undertaken under NAIP Component-I in which agricultural statisticians, computer scientists, biotechnologists and molecular biologists are collaborating. Several other projects have also been undertaken in which agricultural statisticians, computer scientists, biotechnologists and molecular biologists are partners.

7. Action Suggested

Academic opportunities should be increased for the discipline of computer application by bringing out special issue of the Journal of Indian Society of Agricultural Statistics or a new journal, organizing exclusive conferences and advanced trainings in computer application.

(Action: IASRI/ISAS)

A special issue of Journal of the Indian Society of Agricultural Statistics (JISAS) has been proposed on Applications of Artificial Intelligence in Agriculture. A section on Computer Applications for publishing the research papers on informatics has also been created in JISAS.

8. Action Suggested

There is an acute shortage of trained human resources for the development, deployment and maintenance activities relating to Information Technology. Strengthening of human resource must be done on priority basis in discipline of Agricultural Statistics and Computer Application through fresh recruitment.

(Action: ICAR/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	The Council has been requested filling up the vacant scientific positions at IASRI.
2.	Indian Institute of Horticultural Research, Bangalore	As there is only one statistician working at IIHR, Bangalore it is requested to post at least two more statisticians through ARS.

3.	Punjab Agricultural University, Ludhiana	In order to address the shortage of trained human resources in IT sector, new teaching programmes, i.e. MCA and PGDCA have been initiated from the academic session, 2009-10. Also M.Sc. Biotechnology, M.Sc. 5-year Integrated Programme and new streams in B.Sc. Hons (Agri.) and B.Sc. Hons (Home Science) have been introduced. Some of the Statistics courses are mandatory for these degrees. So more faculty in Statistics is required and accordingly fresh recruitments need to be made.
4.	CCS Haryana Agricultural University, Hisar	Faculty trainings are being conducted by the Director of Research in collaboration with the AAREM, CCS HAU, Hisar.
5.	Sher-e-Kashmir University of Science & Technology-Jammu, Jammu	There is need of creation of more posts in the discipline of Agricultural Statistics in our university as well as at present man power in the discipline of statistics is insufficient.
6.	Sher-e-Kashmir University of Agricultural Science & Technology of Kashmir, Srinagar	In view of its tremendous importance in agricultural research, strengthening of human resource in the disciplines of Agricultural Statistics and Computer Applications in SAU's is possible only if a directive in this regard is issued by ICAR to Vice Chancellors of SAU's.
7.	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan	The issue needs to be taken up on priority at university level for fresh recruitments in the discipline of agricultural statistics with specialization in information technology/computing mathematics.
8.	Rajasthan College of Agriculture, Udaipur	Recommendation has been made to fill up the vacant posts in the Department.
9.	Navsari Agricultural University, Navsari (Gujarat)	Point noted and scientists are deputed for short/medium term training program for capacity building in respective areas; but there is acute shortage of qualified and trained person/ scientist. This demands creation of new positions.

Several positions of Agricultural Statisticians and Computer Application scientists are vacant. The Council/ SAUs have been requested to fill up these positions on priority basis.

9. Action Suggested

The M.Sc. and Ph.D. course curricula should be dynamic and must be revised from time to time to include latest developments. If required, new courses may be added.

(Action: IASRI/IVRI/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	<ul style="list-style-type: none"> The course curricula has been revised for the M.Sc. and Ph.D. Programmes in Agricultural Statistics and M.Sc. programme in Computer Application of

		<p>PG School, IARI, New Delhi from the Academic Year 2010-11. The revision included introduction of new courses, refinement and addition of new topics in each course. Courses on Bioinformatics were also introduced for M.Sc. Programme in Agricultural Statistics.</p> <ul style="list-style-type: none"> • Course curriculum of M.Sc. in Bioinformatics has been prepared.
2.	University of Agricultural Sciences, Dharwad	Curricula and Syllabi have been revised from the Academic year 2009-10 as per the recommendations of Broad Subject Matter Area Committee of ICAR.
3.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	New syllabus developed by the IV Dean's Committee appointed by the ICAR is being implemented to M.Sc. and Ph.D. classes from academic year 2009-10.
4.	CCS Haryana Agricultural University, Hisar	The new course curricular proposed by ICAR (for PG classes) is in the process of implementation from the incoming session 2010-11 after minor modification.
5.	Sher-e-Kashmir University of Agricultural Science & Technology-Jammu, Jammu	Our university has already adopted the course curricula at UG as well as at PG levels strictly in accordance with the Fourth Dean's Committee recommendations.
6.	Sher-e-Kashmir University of Agricultural Science & Technology of Kashmir, Srinagar	New and the restructured Syllabus for M.Sc./ Ph.D. programmes as proposed by ICAR, Education Division in April, 2009 may be implemented by all SAU's to include the recent developments in the discipline and to ensure uniformity in resident instruction programmes in NARS.
7.	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan	The university has already adopted the newly suggested course curriculum of the ICAR.
8.	Rajasthan College of Agriculture, Udaipur	No action can be taken as M.Sc. (Agricultural Statistics) and Ph.D. (Agricultural Statistics) are not running in this Department.
9.	Navsari Agricultural University, Navsari (Gujarat)	Noted and being done. New PG program recommended by ICAR is being implemented. Also necessary changes are made as and when required in curricula.

The M.Sc. and Ph.D. course curricula have been revised as per recommendations of IV Dean's Committee appointed by the ICAR. Course curriculum for initiating a new course on M.Sc. in Bioinformatics has been prepared.

10. Action Suggested

There should be uniformity in admission criteria, evaluation system. Some of the topics such as soil science, agronomy, genetics etc. must be taken as remedial courses. Adequate mathematical background must be made compulsory for admission to M.Sc. (Agricultural Statistics).

(Action: ICAR Deemed Universities/SAUs)

ACTION TAKEN

S.No.	Name of the Institute/ University	Action taken
1.	Indian Agricultural Statistics Research Institute, New Delhi	The request that the students with B.Sc. in Statistics/ Mathematics/ Computer Applications should be able to complete their M.Sc. degree in two years and the remedial courses in agriculture may be offered in early or late hours has been sent to IARI for consideration.
2.	University of Agricultural Sciences, Dharwad	Considered as and when necessary
3.	Indian Agricultural Research Institute, New Delhi	<ul style="list-style-type: none">• At IARI, there is uniformity in admission criteria and evaluation system.• The candidates, who have not been exposed to agricultural science discipline in their Bachelor Degree programme and are admitted at IARI, New Delhi, will have to take remedial courses of 37 credits during the first three trimesters. These courses shall be over and above the prescribed credit load for the M.Sc. / Ph.D. degree and will be graded and counted for calculating OGPA like regular courses.• Candidates with B.Sc. in mathematical stream are also eligible for admission to M.Sc. in Agricultural Statistics and Computer Application
4.	Punjab Agricultural University, Ludhiana	The issue is already being dealt with at the University level. Graduation with Mathematics is an essential condition for admission to M.Sc. (Statistics) at Punjab Agricultural University. During M.Sc. (Statistics), courses in Mathematics constitute as “Supporting Courses” and Genetics, Plant Breeding and other Agricultural Sciences as “Minor Subject(s)”.
5.	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli	Not applicable as there is no M.Sc. and Ph.D. programme in Agricultural Statistics.
6.	CCS Haryana Agricultural University, Hisar	Genetics, Computer Science and Agricultural Economics are being taken as minor subjects. By and large, students with adequate mathematical background are admitted in M.Sc. Further, mathematics is also taken as a supporting subject in M.Sc. and Ph.D. irrespective of their background at UG level.
7.	Sher-e-Kashmir University of Science &	Our university has already been considering the criteria regarding uniformity in admission as well as evaluation

	Technology-Jammu, Jammu	criteria as per ICAR. So far as mathematical background at PG level is concerned, there is urgent need to include at least one remedial course, especially for those students who are coming without mathematics background at 10+2 level, in mathematics entitled “Elementary Algebra and Calculus” or “Elementary Mathematics” of 3(3+0) credit hours at B.Sc. (Ag.) level at all SAUs uniformly, as at present only two courses entitled “Statistics” of 2(1+1) credits and “Introduction to Computer and Applications” of 2(1+1) credit have been recommended by Fourth Dean’s Committee
8.	Sher-e-Kashmir University of Agricultural Science & Technology of Kashmir, Srinagar	The new restructured ICAR proposed syllabus if implemented simultaneously in all SAU’s shall take care of the recommendation.
9.	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni, Solan	This point has already been considered in new course curricula suggested by the ICAR.
10.	Rajasthan College of Agriculture, Udaipur	No action can be taken as M.Sc. (Agricultural Statistics) and Ph.D. (Agricultural Statistics) are not running in this Department.
11.	Navsari Agricultural University, Navsari (Gujarat)	With implementation of new PG program of ICAR, such norms are common throughout country. These remedial courses like soil science, agronomy, genetics etc are really useful and these courses are included as courses of PG degree program of Agricultural Statistics.

Uniformity in admission criteria and evaluation system are being followed. Students are encouraged to take soil science, agronomy, genetics, etc. as minors. The request that the students with B.Sc. in Statistics/ Mathematics/ Computer Applications should be able to complete their M.Sc. degree in two years and the remedial courses in agriculture may be offered in early or late hours has been sent to IARI for consideration.

TECHNICAL SESSION - II

Priorities for Research in Agricultural Statistics: Current Status and Future Challenges

December 23, 2010 (Thursday)
(14.15 P.M. to 16.30 P.M.)

Chairman	:	Dr. Alope Dey Senior Scientist, INSA, ISI Delhi Centre, New Delhi
Convener	:	1. Dr. UC Sud, HD (SS), IASRI, New Delhi 2. Dr. A Dhandapani, Principal Scientist, NAARM, Hyderabad
Speakers		1. Dr. Prajneshu, IASRI, New Delhi 2. Dr. Pranesh Kumar, University of Northern Columbia, Canada 3. Sh. AK Srivastava, FOD, Faridabad 4. Dr. TR Sharma, NRC PB, New Delhi 5. Dr. Tauqueer Ahmad, IASRI, New Delhi 6. Dr. J Jayasankar, CMFRI, Cochin 7. Dr. K Muralidharan, CPCRI, Kasargod
Discussant		1. Dr. KP Suresh, NIANP, Bangalore 2. Dr. Rajender Prasad, IASRI, New Delhi
Discussions	:	All Participants

The following papers were presented during the session:

1. Priorities of Research in Statistical Modelling: Current Status and Future Challenges
- *Prajneshu and Himadri Ghosh, IASRI, New Delhi*
2. Copula Based Information Measures to Characterize Uncertainty: Applications of the Marshall-Olkin Copulas
- *Pranesh Kumar, Department of Mathematics and Statistics, University of Northern British Columbia, Prince George, BC V2N 4Z9, Canada*
3. Crop Yield Estimation Under Changing Cropping System – Need for Methodological Improvement
- *AK Srivastava, NSSO (FOD), Faridabad*
4. Agricultural Bioinformatics: Current Status & Future Needs
- *TR Sharma, National Research Centre on Plant Biotechnology, IARI, New Delhi*
5. Agricultural Statistics Research with special emphasis on Sample Survey: Status and Challenges
- *Tauqueer Ahmad, IASRI, New Delhi*
6. Challenges and Opportunities in Fisheries Information Analysis- A Agri-statistician's perspective
- *J Jayasankar, CMFRI, Kochi*

7. Plantation Crops' Research Statistics: An Action Plan for the Next Decade
- *K Muralidharan, CPCRI, Kasaragod*

Discussants:

1. Meta-Analysis in Animal Nutrition and Physiology: Synthesizing Research Results (New Application of Statistical Tools in Animal sciences)
- *KP Suresh, Ragavendra Bhatta, S Mondal, S Nandi and KT Sampath, National Institute of Animal Nutrition and Physiology, Bangalore*

The discussion was followed up by a presentation on Strengthening Statistical Computing for NARS by Rajender Parsad, IASRI, New Delhi and A Dhandapani, NAARM, Hyderabad.

The recommendations made during the session were given in the Plenary Session.

TECHNICAL SESSION - III

Priorities for ICT in Agriculture

December 24, 2010 (Friday)
(09.30 A.M. to 11.15 A.M.)

Chairman	:	Dr. SK Raheja Former Director, IASRI, New Delhi
Conveners	:	1. Dr. RC Goyal, Principal Scientist, IASRI, New Delhi 2. Dr. RC Agrawal Principal Scientist, NBPGR, New Delhi
Speakers		1. Dr. Rajni Jain, NCAP, New Delhi 2. Sh. Himanshu, KAB-II, ICAR, New Delhi 3. Dr TS Anurag, Media Lab Asia, New Delhi 4. Dr. Avnish K Bhatia, NBAGR, Karnal
Discussant		1. Dr. Sudeep, IASRI, New Delhi 2. Dr. PS Pandey, IARI, New Delhi 3. Dr. Anil Rai, IASRI, New Delhi
Discussions	:	All Participants

The following papers were presented during the session:

1. ICT and Research Priorities in NARS
- *Rajni Jain, NCAP, New Delhi*
2. E-Publishing and Knowledge Systems in Agricultural Research
- *Himanshu, KAB-II, ICAR, New Delhi*
3. Media Lab Asia's Experience in the Area of ICT in Agriculture
- *TS Anurag, Media Lab Asia, New Delhi*
4. Learning Algorithms for Agricultural Computing
- *Avnish K Bhatia, NBAGR, Karnal*

Discussants:

1. Knowledge Systems in Agricultural Research & Extension - Opportunities & Challenges
- *Sudeep, IASRI, New Delhi*
2. Priorities of the Development of Infrastructure for Agricultural Bio-informatics
- *Anil Rai, IASRI, New Delhi*
3. ICT in Agriculture
- *A. Dandhapani, NAARM, Hyderabad*

The recommendations made during the session were given in the Plenary Session.

TECHNICAL SESSION - IV

Priorities for Human Resource Development in Agricultural Statistics and Computer Applications

December 24, 2010 (Friday)

(11.30 A.M. to 13.15 P.M.)

Chairman	:	Dr. Bal BPS Goel Former Director, IASRI, New Delhi
Convener	:	1. Dr. Krishan Lal Principal Scientist, IASRI, New Delhi 2. Dr. B. Singh Principal Scientist, IVRI, Izatnagar
Speakers	:	1. Dr. Vijayaraghava Kumar, KAU, Thiruvananthapuram 2. Dr. Seema Jaggi, IASRI, New Delhi 3. Dr. Alka Arora, IASRI, New Delhi
Discussant	:	1. Dr. Med Ram Verma, IVRI, Izatnagar 2. Dr. Showkat Maqbool, SKUA&T, Srinagar 3. Dr. Shashi Dahiya, IASRI, New Delhi
Discussions	:	All Participants

The following papers were presented during the session:

1. Post Graduate Courses in Agricultural Statistics- Some Management Issues
- *Vijayaraghava Kumar, KAU, College of Agriculture, Vellayani, Thiruvananthapuram*
2. Priorities for Human Resource Development in Agricultural Statistics
- *Seema Jaggi and VK Bhatia, IASRI, New Delhi*
3. Priorities for Human Resource Development in Computer Applications
- *Alka Arora, IASRI, New Delhi*

Discussants:

1. Priorities for Human Resource Development in Biostatistics and Computer Applications at IVRI
- *Med Ram Verma and B. Singh, Division of Livestock Economics, Statistics and Information Technology, IVRI, Izatnagar*
2. Priorities and Impact of Technology in Changing the Teaching and Learning Agricultural Statistics in SAU's
- *S. Maqbool, A.H.Mir and Nageena Nazir, Division of Agricultural Statistics, SKUAS and T, Shalimar, Srinagar*
3. An Elearning System for Agricultural Education
- *Shashi Dahiya, IASRI, New Delhi*

The recommendations made during the session were given in the Plenary Session.

Open House Discussion

December 24, 2010 (Friday)

(02.15 P.M. to 03.15 P.M.)

Chairman	:	Dr VK Gupta National Professor, ICAR, New Delhi
Convener	:	Dr Rajender Parsad Head, Design of Experiments IASRI, New Delhi
Discussion		All the Participants

Issues Raised

- Attract students in Post Graduate Programme in Agricultural Statistics/ Biostatistics/ Computer Applications
- Filling up of vacant positions upto sanctioned strength / increasing number of vacancies?
 - Direct recruitment at entry level
 - For Lateral entry recruitment, ASRB may be requested to modify the guidelines to attract candidates from outside the system.
- Mitigation of dwindling manpower?
 - Synergy and strong interactions among the statisticians/ Computer application in NARS
 - Creating provision of visiting faculty, consultants, with proper remuneration and local hospitality
 - Creating provision of PDF

PLENARY SESSION

December 24, 2010 (Friday)
(03.30 P.M. to 04.30 P.M.)

Welcome	:	Dr. VK Bhatia Director IASRI, New Delhi
Presentation of reports by Conveners and summary of recommendations	:	Conveners of Respective Sessions
Remarks	:	Dr. VK Gupta ICAR National Professor New Delhi
Valedictory Address	:	Prof. TCA Anant Chief Statistician of India New Delhi
Vote of Thanks	:	Dr. Rajender Parsad, Organizing Secretary IASRI, New Delhi

The Dr. VK Bhatia, Director of the Institute welcomed Chief Guest, Prof. TCA Anant, Chief Statistician of India, New Delhi and all the delegates present at the concluding session. At the outset, Chairman complemented the discussions openers for initiating discussions on the research activities in different fields of Agricultural Statistics and Computer Application in the deliberations during two days of the Conference. Thereafter, the Chairman highlighted some of the areas identified by various discussion openers meriting attention of the Scientists in the next years. He requested the Conveners of various Sessions to present their reports which *inter-alia* included recommendations emerging from the respective sessions.

RECOMMENDATIONS

The recommendations based on the deliberations of different Technical Sessions were presented by their respective conveners. After prolonged deliberations the recommendations finally emerged are as follows:

1. With the advent of informatics, the shape of research has changed. The basic research efforts and innovative applications need to be focused on (i) Analysis of massive data sets; (ii) Designs for scarce experimental resources and applications of supersaturated designs in massive data sets; (iii) Stochastic differential methodology and its applications in growth models; non-linear univariate and multivariate time series models, etc.
(Action: ICAR Institutes/SAUs)
2. Methodological studies need to be undertaken for reappraisal and refinement of existing methodologies and development of new methodologies for agricultural systems. Small area estimation techniques need to be applied rigorously for estimation of important agricultural parameters of interest at smaller area level and application of remote sensing and Geographical Information System needs to be explored further in different areas of sample surveys.
(Action: ICAR Institutes/SAUs)
3. The sampling methodologies and estimation procedures in the Fisheries domain need to be strengthened with the objectives of increasing the precision and timely dissemination of estimates for which collaborative efforts with SMD Institutes concerned may be initiated by IASRI.
(Action: ICAR Institutes/SAUs)
4. Appropriate methods for robust estimation of central values, spatial analysis, efficient designs and analytical techniques of data for the experimental situations where the experimental units are long lived may be developed.
(Action: ICAR Institutes/SAUs)
5. The Design Resources Server is helpful for the agricultural researchers and statisticians across NARS for e-learning and e-advisory. Web resources on design of experiments should be further strengthened. For dissemination of statistical techniques and identification of statistical researchable issues efforts, like Design Resources Server may be replicated in areas of Sample Surveys, Statistical Modelling, Statistical Genetics, etc.
(Action: IASRI)
6. A high end statistical computing environment has been created in NARS. Efforts may be made to develop a system so as to provide some analysis modules at BI server in such a way researchers across NARS users may not have any statistical computational difficulty at their end.
(Action: IASRI)
7. Development of Infrastructure for Agricultural Bio-informatics must be taken up by related institutions on priority. Research in bioinformatics, genomics, computational biology in network mode would need attention. It has to be a multi-disciplinary approach

and biologists, statisticians, computer scientists, mathematicians, etc. need to work together as a team.

(Action: ICAR Institutes/SAUs)

8. Knowledge based systems must be developed to improve the performance of farmers and farming technologies. The development of GIS/RS based systems for strengthening the Decision Support Systems may also be taken up.

(Action: ICAR Institutes/SAUs)

9. The basic qualification prescribed for M.Sc./ M.V.Sc. courses in Statistical Sciences must be uniform at all Deemed universities and at SAUs. The students getting admission in PG Programme must have sound background of Mathematics/ Statistics. It was recommended that the students having B.Sc. with Statistics/ Mathematics as one of the subjects should also be eligible for M.Sc. in Statistical Sciences. Further, the degree name should be M.Sc. (Statistics) / M.Sc. (Computer Applications) to help the students to compete with the M.Sc. students of the traditional universities in the job market.

(Action: Education Division ICAR/ Deemed Universities/SAUs)

10. The students of Masters' degree programme in Statistical Sciences possessing B.Sc. in Statistics/ Mathematics (from Non-agricultural stream) may be given the option to offer remedial courses as extra credit hours in each trimester so that they can complete their degree requirements without spending one extra year.

(Action: Education Division ICAR/ Deemed Universities/SAUs)

11. A separate course in M.Sc. (Bio-informatics) must be started at IASRI, New Delhi.

(Action: ICAR Institutes)

12. There is an acute shortage of trained faculty of Statistics/ Computer Applications at Deemed University/ SAUs. To strengthen the human resource deployment, more recruitment of Scientists/ Assistant Professors should be done. The recruitment of Scientist (CA) at entry level must be revived in ARS.

(Action: ICAR/ ICAR Institutes/SAUs)

**List of Participants of XVI National Conference of Agricultural Research Statisticians
at IASRI, New Delhi during 23-24 December 2010**

Sr. No.	Participants Name and Address
Foreign	
1.	Dr. Pranesh Kumar Professor Department of Mathematics and Statistics University of Northern British Columbia Prince George, BC V2N 4Z9, Canada
India	
ANDHRA PRADESH	
2.	Dr. S. Ravichandran, Senior Scientist, Directorate of Rice Research (DRR, ICAR), Rajendranagar, Hyderabad -500020 (AP)
3.	Dr. A. Dhandapani, Principal Scientist, NAARM, Hyderabad
JHARKHAND	
4.	Suresh Rai, Scientist 'C' (Stat.) Department of Computer and Statistics, Central Tasar Research and Training Institute, Govt. of India, Nagri, Ranchi 835303
GUJARAT	
5.	Dr. A.P. Mishra Directorate of Groundnut Research Ivnagar Road, Junagadh-362001 Gujarat
HARYANA	
6.	Dr. Avnish K. Bhatia, National Bureau of Animal Genetics Research, Karnal
7.	Dr. SB Agrawal, Emeritus Scientist, NDRI, Karnal
8.	Dr. A.K. Srivastava, Deputy Director General, FOD, Faridabad
JAMMU & KASHMIR	
9.	Dr. Showkat Maqbool, Assistant Professor (Statistics), Division of Agricultural Statistics, SKUAST – Kashmir, Shalimar, Kashmir – J&K
10.	Dr. S.E.H. Rizvi, Professor & Head, Division of Agril. Economics & Statistics, Faculty of Agriculture, SKUAST-J, Main Campus, Chatha-180009, Jammu (J&K)

KARNATAKA	
11.	Dr. K.P. Suresh, Ph.D (Biostatistics) Scientist (SS), National Institute of Animal Nutrition & Physiology (NIANP), Adugodi, Bangalore
KERALA	
12.	Shri Manoj Kumar, Scientist, Extension, Information and Statistics Division, CIFT, Matsyapuri P.O., Cochin - 682 029
13.	Dr. Vijayaraghava Kumar, Professor & Head, Deptt. of Agricultural Statistics, College of Agriculture, Velloyani P.O. Trivandrum-695522
14.	Dr. J. Jayasankar, Sr. Scientist, CMFRI, Cochin
15.	Dr. K. Muralidharan, Head, Social Sciences, CPCRI, Kasaragod
NEW DELHI	
16.	Prof. TCA Anant Chief Statistician of India and Secretary Ministry of Programme Implementation, Sardar Patel Bhawan, New Delhi- 110001
17.	Dr. VK Bhatia Director IASRI, New Delhi
18.	Dr. SK Raheja Former Director IASRI, B-21, Naraina Vihar, IASRI, New Delhi- 110028
19.	Dr. Bal BPS Goel Former Director IASRI, B-77, Naraina Vihar, New Delhi - 110028
20.	Dr. Alope Dey Senior Scientist, INSA, ISI Delhi Centre, 7 SJS Sansanwal Marg, New Delhi -110016
21.	Dr VK Gupta National Professor ICAR, IASRI, New Delhi
22.	Dr. P. K. Malhotra HD (CA), IASRI, New Delhi

23.	Dr. Rajender Parsad HD (DE) and Organizing Secretary IASRI, New Delhi
24.	Dr. Prajneshu HD (Biometrics), IASRI, New Delhi
25.	Dr. (Smt.) Ranjana Agarwal HD (FT), IASRI, New Delhi
26.	Dr. U. C. Sud HD (SSM) IASRI, New Delhi
27.	Dr. S. P. Bhardwaj Acting HD (Econometrics) IASRI, New Delhi
28.	Dr. Chandrahas Principal Scientist, IASRI, New Delhi
29.	Dr. V. K. Mahajan Principal Scientist, IASRI, New Delhi
30.	Dr, RC Goyal Principal Scientist, IASRI, New Delhi
31.	Dr. K. K. Tyagi Principal Scientist, IASRI, New Delhi
32.	Dr. Anil Rai Principal Scientist, IASRI, New Delhi
33.	Dr. P. K. Batra Principal Scientist, IASRI, New Delhi
34.	Dr. Krishan Lal Principal Scientist, IASRI, New Delhi
35.	Sh. SD Wahi Principal Scientist, IASRI, New Delhi
36.	Dr. Prawin Arya Senior Scientist, IASRI, New Delhi
37.	Dr. Ramasubramanian V. Senior Scientist, IASRI, New Delhi
38.	Dr. Sudeep Senior Scientist, IASRI, New Delhi

39.	Dr. Himadri Ghosh Senior Scientist, IASRI, New Delhi
40.	Dr. Amrit Kumar Paul Senior Scientist, IASRI, New Delhi
41.	Dr. A. Ramakrishna Rao Senior Scientist, IASRI, New Delhi
42.	Dr. (Smt.) Seema Jaggi Senior Scientist, IASRI, New Delhi
43.	Dr. (Smt.) Cini Varghese Senior Scientist, IASRI, New Delhi
44.	Dr. Anil Kumar Senior Scientist, IASRI, New Delhi
45.	Dr. Ashok Kumar Gupta Senior Scientist, IASRI, New Delhi
46.	Dr. Tauqueer Ahmad Senior Scientist, IASRI, New Delhi
47.	Dr. Lal Mohan Bhar (Ag. Stat.) Senior Scientist, IASRI, New Delhi
48.	Dr. (Smt.) Sushila Kaul (Econ.) Senior Scientist, NASM, IASRI, New Delhi
49.	Dr. (Smt.) Alka Arora Scientist (Selection Grade), IASRI, New Delhi
50.	Sh. HS Sikarwar Scientist (Selection Grade), IASRI, New Delhi
51.	Sh. Satya Pal Scientist (Selection Grade), IASRI, New Delhi
52.	Sh. SC Mehta Scientist (Selection Grade), IASRI, New Delhi
53.	Sh. N. K. Sharma Scientist (Selection Grade), IASRI, New Delhi
54.	Sh. D. K. Sehgal Scientist (Selection Grade), IASRI, New Delhi

55.	Sh. O. P. Khandoori Scientist (Selection Grade), IASRI, New Delhi
56.	Sh. V. K. Jain Scientist (Selection Grade), IASRI, New Delhi
57.	Dr. Dharam Raj Singh Scientist Senior Scale, IASRI, New Delhi
58.	Sh. S. B. Lal Scientist Senior Scale, IASRI, New Delhi
59.	Smt. Anshu Dixit Bhardwarj Scientist Senior Scale, IASRI, New Delhi
60.	Smt. Sangeeta Ahuja Scientist Senior Scale, IASRI, New Delhi
61.	Smt. Shashi Dahiya Scientist Senior Scale, IASRI, New Delhi
62.	Smt. Anu Sharma Scientist Senior Scale, IASRI, New Delhi
63.	Md. S. N. Islam Scientist Senior Scale, IASRI, New Delhi
64.	Sh. Pal Singh Scientist Senior Scale, IASRI, New Delhi
65.	Sh. Amrender Kumar Scientist Senior Scale, IASRI, New Delhi
66.	Md. Wasi Alam Scientist Senior Scale, IASRI, New Delhi
67.	Md. Samir Farooqui Scientist Senior Scale, IASRI, New Delhi
68.	Dr. Sinaramane N Scientist Senior Scale, IASRI, New Delhi
69.	Dr. Sanjeev Panwar, Scientist (Selection Scale) IASRI, New Delhi
70.	Sh. Soumen Paul Scientist, IASRI, New Delhi
71.	Sh. Eldho Varghese Scientist, IASRI, New Delhi

72.	Dr. RC Agrawal Principal Scientist NBPGR, New Delhi
73.	Prasanjit Paul NCIPM, New Delhi
74.	Sh. Rakesh Kumar Meshram, SRF, NCIPM, New Delhi
75.	Ms. Sarita Patle, USI, IARI, New Delhi
76.	Dr. T.R. Sharma, NRCPB, New Delhi
77.	Dr. Rajni Jain, NCAP, New Delhi
78.	Dr. Himanshu, ICAR, New Delhi
79.	Dr. T.S. Anurag, Research Scientist, Media Lab Asia, 6-Nehru Place, New Delhi
80.	Dr. PS Pandey, IARI, New Delhi
81.	Dr. Ajaya Kumar Sahu, MRPC, 307, Jyotishikhar Building, District Center, Janakpuri, New Delhi – 110058
UTTAR PRADESH	
82.	Sh. VK Singh, Director, Agricultural Statistics and Crop Insurance, Department of Agriculture, Govt. of UP, Krishi Bhawan, Madan Mohan Malviya Marg, Lucknow - 226 001 (UP)
83.	Dr. Med Ram Verma, Division of Livestock Economics, Statistics and Information Technology, I.V.R.I., Izatnagar (UP) – 243122
ORISSA	
84.	Nitiprasad N. Jambhulkar, Scientist, Division of Social Sciences, Central Rice Research Institute, Cuttack - 753006
WEST BENGAL	
85.	Dr. Anurup Majumder, Prof. and Head, Bidhan Chandra Krishi Viswavidyalaya, Mohanpur – 741252, District - Nadia