वार्षिक रिपोर्ट ANNUAL REPORT 2009-10

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भाकृअनुप
ICAR

भारतीय कृषि सांख्यिकी अनुसंधान संस्थान
(भारतीय कृषि अनुसंधान परिषद्)
लाइब्रेरी एवेन्यू, पूसा, नई दिल्ली-110 012

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Preface

It gives me immense pleasure in bringing out the Annual Report 2009-10 of the Indian Agricultural Statistics Research Institute (IASRI). The present report highlights some of the glimpses of the research achievements made, new methodologies developed, significant advisory and consultancy services provided, dissemination of knowledge acquired and development of human resource. The scientists, technical personnel, administrative, finance and other staff of the Institute have put in their best efforts in fulfilling the mandate of the Institute.

To fulfill objectives and mandate of the Institute, the research was carried out under 50 research projects in the Institute (01 National Professor Scheme, 30 Institute funded, 05 NAIP funded, 01 AP Cess funded, 04 funded by other outside agencies and 09 in collaboration with other Institutions). 12 projects have been completed and 06 new studies/projects have been initiated with one as ad-hoc study. One of the new initiative undertaken this year is initiation of NAIP Consortium Strengthening Statistical Computing for NARS for creation of sound and healthy statistical/computing environment for the benefit of scientists.

It gives me great satisfaction that the Institute has celebrated its Golden Jubilee year, completing 50 years on 02 July 2009. As part of Golden Jubilee Celebrations, five Golden Jubilee Workshops were organised. A publication *"IASRI ... an era of Exellence"* has also been published.

Eleven training programmes (One under Center of Advanced Faculty Training; one Winter School; one for ISS Probationers; four for CSO officials; three International Training programmes one for CAC staff at Tashkent, one at ICARDA, Syria and one sponsored by AARDO; one special training programme on financial matters for officials of ICAR Hqrs.) were organized. In all 182 participants were trained in these training programmes. Ten other Symposium/ Workshops, one Workshop in Hindi and two Brainstorming sessions on Establishment of Centre of Agricultural Bioinformatics were also organised.

An important breakthrough in the capacity building and sensitization of the scientists of NARS was the initiation of a new concept of organizing "*Travel Training Programmes*" at different locations in various areas of statistics and computer applications. Three such travel training programmes on Advances in Design of Experiments were organized for the scientists of ANGRAU, Hyderabad and its centres and 245 researchers were sensitized.

Scientists of the Institute published 61 research papers in National and International refereed Journals along with 24 popular articles, 06 book chapters, 24 projects/ technical reports/reference manuals, 03 pamphlets and 04 workshops proceedings.

I am happy to note that some of our colleagues received academic distinctions during the year.

The scientists of the Institute were deputed for presentation of their papers in various national/ international conferences. This year two scientists were deputed to present their papers to Washington DC and South Africa. Four scientists visited Malaysia, Tunisia, Uzbekistan, Spain, South Africa, USA and Syria on different assignments.

To promote Hindi, a poster presentation of research papers in Hindi was organized.

This report has been compiled through collective efforts rendered by Heads of Divisions, scientists and other staff of the Institute. I wish to express my sincere appreciation to all of them for their devotion, whole-hearted support and cooperation in carrying out various functions and activities of the Institute.

I wish to express my sincere thanks to all my colleagues in Research Coordination and Management Unit for coordinating various activities and Hindi Section for Hindi Translation of the required material.

It is expected that the scientists in NARS will be immensely benefitted from the information contained in this publication. I look forward to any suggestions and comments for its improvements.

VK Bhatia

(VK Bhatia)
Director

Milestones

1930	• Statistical Section created under ICAR
1940	• Activities of the Section increased with appointment of Dr. PV Sukhatme
1945	• Re-organisation of statistical section into statistical branch as a centre for research and training in the field of Agricultural Statistics
1949	• Re-named as Statistical Wing of ICAR
1952	• Activities of Statistical Wing further expanded and diversified with the recommendations of FAO experts, Dr. Frank Yates and Dr. DJ Finney
1955	• Statistical Wing moved to its present campus
1956	• Collaboration with AICRP initiated
1959	• Re-designated as Institute of Agricultural Research Statistics (IARS)
1964	• Installation of IBM 1620 Model-II Electronic Computer
	• Signing of MOU with IARI, New Delhi to start new courses for M.Sc. and Ph.D. degree in Agricultural Statistics
1970	• Status of a full fledged Institute in the ICAR system, headed by Director
1977	• Three storeyed Computer Centre Building inaugurated
	• Installation of third generation computer system, Burroughs B-4700
1978	• Re-named as Indian Agricultural Statistics Research Institute (IASRI)
1983	• Identified as Centre of Advanced Studies in Agricultural Statistics and Computer Applications under the aegis of the United Nations Development Programme (UNDP)
1985–86	• New Course leading to M.Sc. degree in Computer Application in Agriculture, initiated
1989	• Commercialization of SPAR 1
1991	• Burroughs B-4700 system replaced by a Super Mini COSMOS LAN Server
1992	• Administration-cum-Training Block of the Institute was inaugurated
1993–94	• M.Sc. degree in Computer Application in Agriculture changed to M.Sc. in Computer Application
1995	• Center of Advanced Studies in Agricultural Statistics & Computer Application established by Education Division, ICAR
1996	• Establishment of Remote Sensing & GIS lab with latest software facilities
	• Outside funded projects initiated
1997	• Senior Certificate Course in 'Agricultural Statistics and Computing' revived
	• Establishment of modern computer laboratories
	• First software in India for generation of design along with its randomised layout SPBD release 1.0

1998	• Four Divisions of the Institute re-named as Sample Survey, Design of Experiments, Biometrics and Computer Applications
	• Revolving Fund Scheme on Short Term Training Programs in Information Technology initiated
	• Training programmes in statistics for non-statisticians in National Agricultural Research System initiated
1999	• Strengthening of LAN & Intranet with Fibre optics & UTP cabling
	• Substantial growth in outside funded projects and training programmes
2000	• Two Divisions re-named as Division of Forecasting Techniques and Division of Econometrics
2001	• Data Warehousing activities (INARIS project under NATP) initiated
2002	• Establishment of National Information System on Animal Experiments Laboratory
	• Development of PIMSNET(Project Information Management System on Internet) for NATP
2003	• Establishment of National Information System on Long-term Fertilizer Experiments funded by AP Cess Fund
	• Development of PERMISnet (A software for Online Information on Personnel Management in ICAR System)
	• First indigenously developed software on windows platform released Statistical Package for Factorial Experiments (SPFE) 1.0
2004	• National Information System on Agricultural Education (NISAGENET) Project launched
	• Training Programme for private sector initiated and conducted training programme for E.I. DuPont India Private Limited
	• E-Library Services initiated
2005	• Statistical Package for Augmented Designs (SPAD) and Statistical Package for Agricultural Research (SPAR) 2.0 released
	• Design Resources Server with an aim to provide E-advisory in NARS initiated
2006	• Organisation of International Conference on Statistics and Informatics in Agricultural Research
2007	• Establishment of Agricultural Bioinformatics Laboratory(ABL)
2008	• Software for Survey Data Analysis (SSDA) 1.0 released
2009	• Golden Jubilee Celebration Year of the Institute
	• Strengthening Statistical Computing for NARS initiated
	• International Training Hostel inaugurated

Vision

Statistics and ICT for enriching the quality of Agricultural Research

Mission

Undertake research, education and training in Agricultural Statistics and Computer Applications for Agricultural Research

Mandate

- To undertake basic, applied adaptive, strategic and anticipatory research in Agricultural Statistics and related fields and use these researches in meeting challenges and improving quality of agricultural research.
- To conduct post-graduate teaching and in-service, customized and sponsored training courses in Agricultural Statistics and Computer Applications at National and International level so as to be a lead centre of excellence in Human Resource Development.
- To provide methodological support in strengthening National Agricultural Statistics System by establishing linkages with State departments of agriculture and allied fields, other research institutions, industry, etc.
- To lead in development of Agricultural Knowledge Management and Information System for National Agricultural Research System.
- To provide advisory and consultancy services for strengthening the National Agricultural Research System and undertaking sponsored research and consultancy for National and International organizations.

विशिष्ट सारांश

भारतीय कृषि सांख्यिकी अनुसंधान संस्थान (भा.कृ.सां.अ.सं.) की स्थापना सन् 1959 में कृषि सांख्यिकी अनुसंधान संस्थान के रूप में हुई तभी से यह संस्थान कृषि सांख्यिकी में अनुसंधान के साथ-साथ शिक्षण/प्रशिक्षण करने का महत्वपूर्ण दायित्व निभा रहा है । सूचना प्रौद्योगिकी के क्षेत्र में हो रही प्रगति के दृष्टिगत इस संस्थान ने स्वयं को कृषि अनुसंधान की वर्तमान आवश्यकताओं के अनुरूप ढाल लिया है । इस परिवर्तित परिवेश में, संस्थान को सौंपे गये कार्य हैं-सांख्यिकी में मौलिक, अनुप्रयुक्त और अनुकूली शोध करना, कृषि सांख्यिकी एवं संगणक अनुप्रयोग में स्नातकोत्तर एवं सेवाकालीन प्रशिक्षण पाठ्यक्रम चलाना, परामर्श सेवाएँ प्रदान करना, अनुसंधान हेतु कृषि सांख्यिकी में सूचना कोष के रूप में कार्य करना, कृषि सांख्यिकी एवं संगणक अनुप्रयोग में श्रेष्ठ शिक्षा व प्रशिक्षण के एक उच्च अध्ययन केन्द्र के रूप में संस्थान को विकसित करना, भारतीय कृषि अनुसंधान परिषद् के अन्य संस्थानों एवं राज्य कृषि विश्वविद्यालयों (रा.कृ.वि.), राज्य कृषि/पशुपालन विभागों के साथ सम्पर्क बढ़ाना, राष्ट्रीय कृषि सांख्यिकी प्रणाली को विकसित करने एवं सुदृढ़ बनाने में सहायता करना तथा इन विषयों में राष्ट्रीय एवं अन्तरराष्ट्रीय संगठनों के द्वारा प्रायोजित अनुसंधान करना और प्रशिक्षण प्रदान करना।

इस वर्ष संस्थान के विभिन्न प्रभागों - प्रतिदर्श सर्वेक्षण, परीक्षण अभिकल्पना, जैवमिति, पूर्वानुमान तकनीक, अर्थमिति एवं संगणक अनुप्रयोग में अनेक अनुसंधान परियोजनाएँ चलायी गयीं । संस्थान में विभिन्न महत्व वाले क्षेत्रों में कुल 50 अनुसंधान परियोजनाओं के अन्तर्गत अनुसंधान कार्य किया गया जिनमें से 01 परियोजना राष्ट्रीय आचार्य योजना से, 30 सस्थान द्वारा, 05 एन.ए.आई.पी., 01 ए.पी. सेस द्वारा, 04 बाह्य एजेन्सियों द्वारा वित्त पोषित थीं तथा 09 परियोजनाएँ अन्य संस्थानों के सहयोग से चलायी गयीं। इस वर्ष कुल 12 परियोजनाएँ पूर्ण की गयीं, 06 नयी परियोजनाएँ आरम्भ की गयीं तथा 01 परियोजना आरम्भ करने के साथ-साथ पूर्ण की गयी।

कुछ प्रमुख अनुसंधानिक उपलब्धियाँ इस प्रकार हैं :

- ऐसी परीक्षणात्मक परिस्थितियों के लिए, जिनमें परीक्षणात्मक इकाइयों की संख्या आकलित किये जाने वाले प्राचलों की संख्या से कम है, हैडामार्ड मैट्रिक्स एवं समरूपी अभिकल्पना को प्रयुक्त कर दक्ष मिश्रित-स्तर की सुपरसेचुरेटेड अभिकल्पनाएँ (SSDs) प्राप्त की गयीं। अभिकल्पना में अधिक रनों को जोड़कर $E(s^2)$-इष्टतम द्वि-स्तरीय सुपरसेचुरेटेड अभिकल्पनाओं का विस्तार किया गया । प्राप्त किए गये नए लोअर बाउण्ड के अनुसार विस्तृत अभिकल्पना भी $E(s^2)$-इष्टतम है।
- डिज़ाइन रिसोर्सेज सर्वर पर एस.ए.एस. एवं एस.पी.एस.एस. स्टेप्स (i) अरैखिक मॉडलों के संयोजन एवं (ii) गुच्छ विश्लेषण करने के लिए सिंटेक्स जोड़कर सुदृढ़ बनाया गया। शोधकर्ताओं को ई-लर्निंग प्लेटफार्म देने के लिए, विशेष रूप से आनुवंशिकी-विज्ञानी, जीव-विज्ञानी, सांख्यिकीविद् एवं संगणनात्मक जीव विज्ञान विशेषज्ञों के लिए सांख्यिकीय जिनोमिक्स पर लिंक दिया गया। उपादानीय संरचना सहित ब्लॉक अभिकल्पनाओं के लिए भी एक नया लिंक जोड़ा गया। इस वर्ष के दौरान गुगल एनालिटिक्स के द्वारा सर्वर पर 78 देशों के 448 शहरों में 5392 पृष्ठ देखे गये ।
- बहु-अनुक्रिया परीक्षणों में t आउटलॉयर प्रेक्षण सदिश ज्ञात करने के लिए कुक स्टैटिस्टिक्स के सामान्य एक्सप्रेशन प्राप्त किये गये।
- ऑर्थोगोनली ब्लॉक्ड रिस्पॉन्स सर्फेस अभिकल्पनाओं एवं प्रोजेक्शन मैट्रिक्स का प्रयोग करके प्रोसेस चरों सहित मिश्रित परीक्षणों अभिकल्पनाओं के लिए दो विधियाँ विकसित की गयीं । इन विधियों से प्राप्य प्रोसेस चरों सहित मिश्रित परीक्षणों के लिए 2-5 मिश्रण कम्पोनेन्ट्स एवं 2-स्तर सहित एक प्रोसेस चर के लिए रैखिक एवं द्विघाती मॉडलों के लिए अभिकल्पनाओं को सूचीबद्ध किया गया ।
- उपचारों के दो असंयुक्त सेटों की तुलना करने के लिए उपचारों के सीक्वेन्स की अभिकल्पनाओं की एक सीरीज प्राप्त की गयी तथा टेस्ट वर्सेस टेस्ट, टेस्ट वर्सेस कन्ट्रोल एवं कन्ट्रोल वर्सेस कन्ट्रोल उपचारों के प्रत्यक्ष एवं अवशिष्ट प्रभावों से सम्बन्धित व्यतिरेकों के प्रसरण प्राप्त किये गये ।
- ऐसी परीक्षणात्मक परिस्थितियों, जिनमें परीक्षणात्मक दशाओं के स्तरों में परिवर्तन करना कठिन है, तथा क्रमित कार्य श्रृंखला के लिए परीक्षणात्मक इकाइयों का प्रयोग होता है, के लिए एक समान परीक्षणात्मक अवधियों की संख्या एवं इकाइयों सहित ट्रीटमेन्ट्स के सीक्वेन्सेस सहित नीड़ित अभिकल्पनाओं की दो श्रेणियाँ प्राप्त की गयीं ।
- प्रतिवेशी प्रभावों की उपस्थिति में सेकेन्ड आर्डर रोटेटेबल रिस्पॉन्स सर्फेस डिजाइन्स की विधियाँ विकसित की गयीं ।
- ऐसी परीक्षणात्मक परिस्थितियों, जिनमें उपचार दो कारकों के स्तरों के संयोजन हैं तथा केवल एक ही कारक प्रतिवेशी प्रभाव का दर्शाता है, के लिए प्रतिवेशी संतुलित ब्लॉक अभिकल्पनाओं की अवधारणा दी गयी । एक कारक के लिए प्रतिवेशी संतुलित एक प्लॉट में दो कारकों के लिए पूर्ण एन.बी.बी. अभिकल्पनाएँ तैयार करने के लिए कुछ विधियाँ प्राप्त की गयीं ।
- आंशिक रूप से संतुलित अपूर्ण ब्लॉक अभिकल्पनाओं सहित दो त्रि-श्रेणी ऐसोसिएशन योजना अर्थात् टेट्राहैड्रल एसोसिएशन योजना एवं क्यूबिकल एसोसिएशन योजना को परिभाषित किया गया ।

- सामान्य ब्लॉक अभिकल्पना द्वारा आँकडों के ऑन लाइन विश्लेषण के लिए एक मॉडयूल विकसित किया गया जिसे संस्थान की वेबसाइट के मुख पृष्ठ पर अपलोड किया गया ।
- ट्रीटमेन्ट्स की दी हुई संख्या v, ब्लॉक आकार k के लिए बहुभुजीय अभिकल्पनाएं प्राप्त करने के लिए एक रैखिक पूर्णांक इण्टीजर प्रोग्रामिंग पद्धति विकसित की गयी जिसमें उन ट्रीटमेन्ट्स जो m+1 या उससे अधिक हों, के कांक्रेस λ तथा अन्य ट्रीटमेन्ट युग्मों के कॉन्क्रेन्स शून्य हो । यहाँ $m \leq \left[\frac{v}{2}\right]$ माना गया एवं [·] उच्चतम पूर्णांक फलन को दर्शाता है । ये अभिकल्पनाएँ संतुलित प्रतिचयन योजनाएं प्राप्त करने के लिए उपयोगी हैं ।
- ऑन-फार्म परीक्षणों के आँकड़ों का प्रयोग करते हुए एन.ए.आर.पी. जोन स्तर, राज्य स्तर एवं अखिल भारतीय स्तर पर 14 फ़सलों (05 अनाज, 04 दालें और 05 तिलहन) के उर्वरक पोषक के प्रति किलोग्राम उपयोग द्वारा एक किलोग्राम फ़सल उपज में औसत वृद्धि, उर्वरक अनुक्रिया अनुपात (एफ.एफ.आर) प्राप्त किये गये । अनाज, तिलहन एवं दालों के समूह के लिए नियंत्रण के प्रति N उर्वरक अनुक्रिया अनुपात क्रमशः 9.20, 7.73 एवं 1.5 कि.ग्रा./कि.ग्रा. हैं जबकि नियंत्रण के प्रति NPK के ये मान क्रमशः 10.80, 5.60 एवं 6.70 कि.ग्रा./कि.ग्रा. हैं । राष्ट्रीय स्तर पर समस्त खाद्यान्न फ़सलों का पूल्ड अनुक्रिया अनुपात 8.79 कि.ग्रा./कि.ग्रा. (नियंत्रण के प्रति NP) एवं 10.98 कि.ग्रा./कि.ग्रा. के मध्य में है । सभी खाद्यान्न फ़सलों के लिए नियंत्रण के प्रति NPK का उर्वरक अनुक्रिया अनुपात 9.27 कि.ग्रा./कि.ग्रा. पाया गया जो कि अनुशंसा के अनुसार N, NP, NK के लिए पाये गये अनुक्रिया से अधिक था ।
- मल्टी लेयर परसेप्ट्रोन (एम.एल.पी.) एवं रेडिअल आधारित फलन (आर.बी.एफ.) आधारित एक या दो हिडन लेयरस सहित न्यूरल नेटवर्क्स का प्रयोग करके एवं चावल, गेहूँ व गन्ना उपज को रेसपोन्स चर तथा मौसम चरों को इन्पुट चर लेते हुए उपज पूर्वानुमान मॉडल विकसित किए गए।
- एम.एल.पी. एवं आर.बी.एफ. आधारित नेटवर्क्स का प्रयोग करते हुए तथा इनपुट चरों के रूप में मौसम चरों का प्रयोग करके सरसों की फ़सल में अल्टरनेरिआ ब्लाइट एवं पाउड्री मिल्ड्यू के लिए रोग पूर्व-चेतावनी मॉडल्स विकसित किये गये ।
- वर्ष 1971-2002 की अवधि के दौरान अधिकतम एवं न्यूनतम तापमान तथा प्रातः एवं सांय की सापेक्ष आर्द्रता के मौसम सम्बन्धी आँकड़ों का प्रयोग करते हुए उत्तर प्रदेश में आलू की उपज को पूर्वानुमान के लिए मौसम आधारित मॉडल विकसित किये गये ।
- अप्राचलिक फलन ऑटोरिगेरेसिव मॉडल लगाने के लिए गुणांक फलनों का आकलन किया गया जिसमें भारित न्यूनतम वर्ग विधि द्वारा टेलरस सीरिज एक्सपेंशन का प्रयोग किया गया जबकि करनेल डेंसिटी फलन को भार के रूप में लिया गया। स्व ऐक्साइटिंग थरेशोल्ड ऑटोरिग्रेसिव (एस.ई.टी.ए.आर.) एक से अधिक थरेशोल्ड सहित अरैखिक समय श्रृंखला मॉडल्स की फैमिली की कृषि में प्रयोगात्मकता को दर्शाया गया। ये समय श्रृंखलाएं वृतीय रूप में आँकड़ों का प्रदर्शन करती हैं।
- मल्टीमॉडल वर्षा सम्बन्धी आँकड़ों के लिए सांख्यिकीय लर्निंग थ्योरी के उपयोग द्वारा 'बॉडी' एवं 'टेल' में मिश्रण के वितरण के संयोजन की पद्धति का प्रदर्शन किया गया । वर्षा सम्बन्धी आँकड़ों में सैद्धांतिक 'टेल' वितरण के संयोजन हेतु चरम मान सूचकांक के तीन आकलकों की संगणना की गयी।
- महत्वपूर्ण अनाजों (चावल, गेहूँ, ज्वार, बाजरा, मक्का), तिलहनों (मूँगफली, सरसों), खाद्य-तेलों (नारियल का तेल, मूँगफली का तेल, सरसों का तेल) एवं दलहनों (चना, मूँग, अरहर, उड़द इत्यादि) की थोक कीमत पर काल श्रेणी आँकड़ों का प्रयोग करते हुए काल श्रेणियों की स्थिरता की टेस्टिंग के लिए संवर्धित डिक्की फ्यूलर तकनीक, कोइण्टीग्रेटिंग वेक्टर्स का पता लगाने के लिए जोहन्सन की को-इण्टीग्रेशन विधि तथा संतुलन के प्रति काल श्रेणियों के समायोजन की गति का पता लगाने के लिए सदिश त्रुटि करेक्शन मकैनीजम नामक उन्नत अर्थमितीय साधनों का प्रयोग करते हुए स्पेशियल मार्केट इन्टीग्रेशन अध्ययन किया गया । विश्लेषण से ज्ञात हुआ कि हाल के वर्षों में बाजारों के बीच एककीकरण में सुधार हुआ है । कृषि-वस्तुओं की कीमतों में भारत के कुछ चुने हुए राज्य स्तर के थोक के बाज़ारों के बीच अग्रसरित होने की प्रवृति है ।
- भावी व्यापार के क्षेत्र में महत्वपूर्ण फ़सलों के लिए कीमत वॉल्टिलिटि, कीमत डिसकवरी एवं जोखिम प्रबन्धन का अध्ययन किया गया तथा भारतीय गेहूँ एवं मक्के की फ़सल के कॉन्ट्रेक्ट डिजाइनों की अमेरिका के कॉन्ट्रेक्टों से तुलना की गयी। भावी यूचर मार्किट की वॉल्टिलिटि, स्पॉट मार्किट वॉल्टिलिटि से अधिक बड़ी होती है। भावी कीमतों की तुलना में स्पॉट कीमतों का वितरण अधिक विषम होता है ।
- "पादप आनुवंशिकी एवं प्रजनन" से सम्बन्धित कृषीय उत्पादकता को बढ़ाने में सहायक कारकों की पहचान करने के लिए मल्टीडाइमेंन्शनल स्केलिंग (एम.डी.एस.) विधि का प्रयोग किया जाता है । यह पाया गया कि भारत न केवल एबोयोटिक एवं बायोटिक स्ट्रेसेस की ओर अधिक ध्यान दे रहा है बल्कि ऐसे क्षेत्रों जैसे - बायोइन्फॉरमेटिक्स, मोलीक्यूलर असिस्टिंग सिलेक्शन, ट्रांस्जैनिक्स इत्यादि के विकास की ओर भी ध्यान दे रहा है ।
- द्विचरणीय प्रतिचयन के अन्तर्गत एक मद के लिए डोमेन तथा समष्टि योग, दोनों के आकलक विकसित किये गये जहाँ डोमेन की विशिष्टता अनुभव की गयी, परन्तु चरण 1 की प्रतिदर्श इकाई से आईटम रिस्पाँस आवश्यक रूप से उपलब्ध नहीं था ।

- द्विचरणीय प्रतिचयन के अन्तर्गत अनुपात आकलक के प्रसरण के अनुमानित अनभिनत आकलक विकसित किये गये ।
- "शून्य-स्फीत आँकड़ों के लिए लघु क्षेत्र आकलन" नामक अध्ययन में मिक्चर मॉडल का उपयोग करते हुए एस.ए.ई के लिए एक विधि विकसित की गयी जो आँकड़ों में अतिरिक्त शून्य उपस्थिति की गणना करती है । इस उद्देश्य के लिए मिक्चर मॉडल को लीनियर मिक्चर मॉडल एवं जर्नलाइज्ड लीनियर मिक्स्ड मॉडल के संयोजन के रूप में परिभाषित किया गया है । एस.ए.ई. की प्रस्तावित अप्रोच तीन चरणों में कार्यरत है। प्रथम, चर के धनात्मक मानों के लिए एक लीनियर मिक्स्ड मॉडल संयोजित किया जाता है, दूसरे चरण में, धनात्मक मानों की सम्भाव्यता के लिए जर्नलाइज्ड लीनियर मिक्स्ड मॉडल संयोजित किया जाता है । अन्त में, आकलन के चरण में दोनों मॉडलों को संयोजित किया जाता है ।
- ऐसी परिस्थितियों में जिनमें अध्ययनधीन चर तथा इकाइयों के आकारों का नकारात्मक सह-सम्बन्ध होता है उनमें आकार प्रतिचयन योजना के व्युत्क्रमानुपाती सम्भाव्यता (आई.पी.आई.पी.एस. योजना) को शामिल करने की अवधारणा शामिल की गयी। आई.पी.आई.पी.एस. योजना सुनिश्चित करती है कि इकाइयों की फर्स्ट आर्डर सम्भाव्यता इकाइयों के आकार के मापों के व्युत्क्रमानुपाती हो ।
- चावल जीनोम में न्यूक्लियोटाइड पॉलीमॉरफ़िज्म (SNPs) के संगणनात्मक विश्लेषण के लिए चावल जीनोम के फलन-अवयवों पर एक वेब आधारित सूचना-तंत्र विकसित किया गया । फलन-अवयवों पर सिंगल SNPs पर सूचना प्राप्त करने के लिए ऑन-लाइन सुविधाएँ उपलब्ध करायी गयी । चावल फलन-अवयवों पर वेब आधारित सूचना प्रणाली में प्रयोक्ताओं को प्रमोटर रीजन, अनट्रॉंस्लेटेड रीजन्स, ट्रॉंन्सलेशन स्टार्ट साइट्स, स्प्लाइस साइट्स, एक्सॉंस, इन्ट्रॉंस, ट्रॉंसलेशन स्टॉप साइट्स इत्यादि पर सिक्वेन्स सम्बन्धी सूचना प्राप्त करने की सुविधा उपलब्ध है । स्प्लाइस स्टोर में स्प्लाइस साइट्स, पोजीशन व्हेट, मैट्रिसेस, फाइलोजेनिटिक सम्बन्धी इत्यादि के वर्गीकरण पर भी सूचना उपलब्ध है ।
- गेहूँ फ़सल प्रबन्धन पर विकसित विशेषज्ञ तंत्र का वैरायटी सिलेक्शन मॉड्यूल एवं रोग नैदानिक मॉड्यूल का हिन्दी वर्जन आरम्भ किया गया । विशेषज्ञ तंत्र के हिन्दी मॉड्यूल के लिए डाटाबेस SQL सर्वर की सहायता से तैयार किया गया है जो हिन्दी भाषा के सपोर्ट के लिए UNICODE स्वीकार करता है।
- आनुवंशिकी सह-सम्बन्ध के आकलन के लिए, आउटलायर्स की उपस्थिति में, आनुवंशिकी सह-सम्बन्ध के आकलक बहुत ही अवआकलित हैं जिसके परिणामस्वरूप अभिनति में बहुत वृद्धि होती है। आउटलायर्स की उपस्थिति में मानक त्रुटि में बहुत वृद्धि होती है ।
- पशु प्रजनन हेतु सांख्यिकीय पैकेज (एस.पी.ए.बी. 2.1) का एक β-वर्जन विकसित किया गया । पशुओं के आनुवंशिक प्राचलों के आकलन एवं उनकी प्रजनन स्ट्रैटिजीज एवं सिलेक्शन प्रोसेस तैयार करने के लिए यह पैकेज पशु प्रजनकों के लिए बहुत उपयोगी है ।
- कृषि अनुसंधान में समेकित डाटा मार्ट के लिए नॉलेज डाटा वेयरहाउस में समेकित डाटा मार्ट के लिए मल्टीडाइमेन्शनल मॉडल तैयार किया गया । विभिन्न डाटा मार्ट्स को समय श्रृंखला आँकड़ों पर आधारित करके ऑन-लाइन विश्लेषण एवं प्रागुक्ता/पूर्वानुमान के लिए ये मॉडल विकसित एवं क्रियान्वित किये गये । इस ऑन-लाइन प्रागुक्ता के लिए तीन प्रकार के मॉडल अर्थात् ट्रेण्ड, विकास एवं स्व समाश्रयण शामिल किये गये ।
- भा.कृ.सां.अ.सं. के सर्वर से http://permisnet.iasri.res.in/ यू.आर.एल. पर भा.कृ.अ.प. में मानव शक्ति नियोजन (PERMISnet-II) के लिए डिसिज़न सपोर्ट सिस्टम क्रियान्वित किया गया ।
- पी.जी. स्कूल, भा.कृ.अ.सं., नई दिल्ली के लिए एक ऑन-लाइन प्रबन्धन-तंत्र विकसित किया गया । इसमें पाठ्यक्रमों के प्रबन्धन, छात्रों, संकाय, प्रशासन एवं ई-लर्निंग के लिए पाँच माड्यूल हैं । इस तंत्र में 267 छात्र तथा 412 संकाय सदस्य पंजीकृत हो चुके हैं । इस तंत्र में 23 विषयों में 536 पाठ्यक्रम सूची हैं । सभी छात्रों को प्रथम एवं द्वितीय ट्राइमेस्टर के लिए ऑन-लाइन रजिस्टर किया गया ।
- ई-लर्निंग सोल्यूशन फ़ॉर एग्रिकल्चरल एज्यूकेशन यूजिंग मूडल (मोड्यूलर ऑबजेक्ट ओरिएन्टेड डायनेमिक लर्निंग एनवार्यनमेन्ट) में कृषि सांख्यिकी के अन्तर्गत "एलीमेन्ट्री स्टैटिस्टिकल मेथड्स" तथा संगणक अनुप्रयोग के अन्तर्गत "फण्डामेंटल्स ऑफ़ कम्प्यूटर्स ऐण्ड प्रोग्रामिंग" पाठ्यक्रम तैयार किये गये ।

संस्थान के वैज्ञानिकों द्वारा राष्ट्रीय एवं अन्तरराष्ट्रीय स्तर के जर्नलों में कुल 61 शोध पत्र, 04 लोकप्रिय लेख, 06 पुस्तक अध्याय, 24 परियोजना/तकनीकी रिपोर्टें/संदर्भ मैनुअल्स, 03 पैम्फ़लेट और 04 कार्यशालाओं के कार्यवृत्त प्रकाशित किये गये। कृषि अनुसंधान डाटा पुस्तिका 2009 प्रकाशित की गयी जो श्रृंखला की 13वीं कड़ी है ।

डॉ. हुकुम चन्द्र को इन्टरनेशनल ऐसोसिएशन ऑफ़ सर्वे स्टेटिशियन्स द्वारा कोकरान हनसेन पुरस्कार 2009 प्रदान किया गया ।

डॉ. ए.के. वशिष्ठ को 11-12 सितम्बर 2009 के दौरान पाण्डिचेरी, विश्वविद्यालय, पुडुचेरी में आयोजित राष्ट्रीय स्तरीय कार्यशाला एवं सेमिनार के दौरान श्रेष्ठ शोध पत्र पुरस्कार प्रदान किया गया ।

डॉ. हिमाद्री घोष को 30 दिसम्बर 2009 से 02 जनवरी 2010 के दौरान हैदराबाद विश्वविद्यालय, हैदराबाद में आयोजित फरन्टियर ऑफ इन्टरफेस बिटवीन स्टेट्टिस्कस ऐण्ड साइन्सिज अन्तरराष्ट्रीय सम्मेलन में श्रेष्ठ पोस्टर प्रस्तुति के लिए श्रीमती भार्गवी एवं प्रो. सी.आर. राव पुरस्कार प्रदान किया गया।

डॉ. ए.के. गुप्ता को 20 मार्च 2010 को डॉ. वाई.एस. परमार बागवानी एवं कृषि वानिकी विश्वविद्यालय, नौनी, सोलन (हि.प्र) में आयोजित नेशनल सिम्पोजियम ऑन लाइफस्टाइल फ्लोरीकल्चर- चैलेंजेस ऐण्ड अपोरच्युनिटीज में मौखिक प्रस्तुति के लिए तृतीय पुरस्कार प्रदान किया गया ।

गेहूँ फसल प्रबन्धन विशेषज्ञ तंत्र को श्रेष्ठ ई-कॉन्टेन्ट एवं श्रेष्ठ ई-लर्निंग सोल्यूशन के लिए मेन्थन पुरस्कार दक्षिण एशिया - 2009 प्रदान किया गया ।

संस्थान के वैज्ञानिकों को अनेक राष्ट्रीय/अन्तरराष्ट्रीय सम्मेलनों में शोध-पत्र प्रस्तुत करने के लिए प्रतिनियुक्त किया गया ।

इस वर्ष निम्नलिखित 11 प्रशिक्षण कार्यक्रम आयोजित किये गये जिसमें 182 प्रतिभागियों को प्रशिक्षण दिया गया ।

- उच्च संकाय प्रशिक्षण केन्द्र के अन्तर्गत कृषि में सूचना प्रबन्धन हेतु वेब प्रौद्योगिकियों में नवीनतम उन्नति पर एक 21 द्विवसीय प्रशिक्षण कार्यक्रम ।
- जैवसूचना एवं सांख्यिकीय जीनोमिक्स पर एक शीतकालीन स्कूल ।
- तीन अन्तरराष्ट्रीय प्रशिक्षण कार्यक्रम-(i) ताशकंद में सी.ए.सी. कर्मचारियों के लिए परीक्षणात्मक अभिकल्पनाएँ एवं आँकड़ों का विश्लेषण (ii) आई.सी.ए.आर.डी.ए., एलिप्पो, सिरिया में अभिकल्पना परीक्षणों के विश्लेषण के विकास एवं (iii) एफ्रो एशियन रूरल डिवेल्पमेन्ट ऑर्गनाइज़ेशन द्वारा प्रायोजित - कृषि-सर्वेक्षणों में सुदूर संवेदन एवं जी.आई.एस. का अनुप्रयोग।
- भारतीय सांख्यिकी सेवा (आई.एस.एस.) के XXIX बैच के परिवीक्षाधीन अधिकारियों के लिए केन्द्रीय सांख्यिकीय संगठन द्वारा प्रायोजित 'डाटा एनालिसिस विद स्टैटिस्टिकल टूल्स' विषय पर एक 26 दिवसीय प्रशिक्षण कार्यक्रम।
- चार पुनश्चर्या पाठ्यक्रम (i) सेवाकालीन भारतीय सांख्यिकीय सेवा अधिकारियों एवं राज्य सरकार/केन्द्र शासित प्रदेशों के वरिष्ठ अधिकारियों/सी.एस.ओ. के लिए सांख्यिकीय संगणना एवं आँकड़ों के प्रसार की तकनीकों में सूचना प्रौद्योगिकी का अनुप्रयोग (ii) भारतीय सांख्यिकी सेवाओं एवं राज्य के अन्य वरिष्ठ अधि कारियों के लिए लघु क्षेत्र आकलन तकनीकें (iii) भारतीय सांख्यिकी सेवा के 12 अधिकारियों एवं सांख्यिकीय कर्मिकों के लिए केन्द्रीय सांख्यिकीय संगठन, सांख्यिकीय एवं कार्यक्रम कार्यान्वयन मंत्रालय, भारत सरकार द्वारा प्रायोजित आधिकारिक आँकड़ों के लिए अनुसंधान तथा (iv) राज्यों/केन्द्र शासित प्रदेशों/सांख्यिकी एवं कार्यक्रम कार्यान्वयन मंत्रालय, भारत सरकार के पी.एस.यू. के सांख्यिकीय कार्मिकों के लिए भारत में कृषि सांख्यिकी प्रणाली ।

भा.कृ.अ.प. मुख्यालय के अधिकारियों के लिए वित्त सम्बन्धी मामलों पर एक विशेष प्रशिक्षण कार्यक्रम ।

आचार्य एन जी. रंगा कृषि विश्वविद्यालय, राजेन्द्र नगर, हैदराबाद तथा उसके केन्द्रों पर परीक्षण अभिकल्पनाओं में एडवांसिज पर तीन यात्रा प्रशिक्षण कार्यक्रम आयोजित किए गए जिनमें 245 शोधकत्ताओं ने प्रतिभागिता की।

संस्थान के स्वर्ण जयन्ती समारोह के आयोजन के दौरान 05 प्रसार कार्यशालाएँ आयोजित की गयीं:

- परीक्षण अभिकल्पना
- लघु क्षेत्र आकलन तकनीकों का प्रयोग
- कृषि में विशेषज्ञ तंत्र
- कृषि में डिसीजन सपोर्ट के लिए सुदूर संवेदन एवं भौगोलिक सूचना पद्धति
- जीनोमिक्स में सांख्यिकीय एवं संगणनात्मक मुद्दे

दस अन्य संगोष्ठियाँ, कार्यशालाएँ/व्याख्यान सत्र, अन्तरर्राष्ट्रीय सम्मेलनों के दौरान विशेष आमंत्रित वार्ताएँ आयोजित की गयीं।

कृषीय जैव-सूचना केन्द्र की स्थापना पर दो ब्रेनस्टार्मिंग सत्र आयोजित किए गए।

संस्थान की शिक्षण एवं प्रशिक्षण सम्बन्धी गतिविधियाँ, जिनमें समस्त स्नातकोत्तर अध्यापन कार्यक्रमों का नियोजन, आयोजन एवं समन्वयन शामिल है, भारतीय कृषि अनुसंधान संस्थान के स्नातकोत्तर स्कूल के सहयोग से चलायी गयीं । इस वर्ष कुल 16 छात्रों 03 पीएच.डी. (कृषि सांख्यिकी), 05 एम.एससी. (कृषि सांख्यिकी) एवं 08 एम.एससी. (संगणक अनुप्रयोग) ने अपना डिग्री पाठ्यक्रम पूरा किया । 23 नये छात्रों 07 पीएच.डी. (कृषि सांख्यिकी), 08 एम.एससी. (कृषि सांख्यिकी) एवं 08 एम.एससी. (संगणक अनुप्रयोग) को प्रवेश दिया गया ।

भारत एवं दक्षेस देशों सहित अन्य विदेशों के अनुसंधान संस्थानों/विश्वविद्यालयों में सांख्यिकीय आँकड़ों के संकलन, विश्लेषण एवं विवेचन के कार्यों में लगे शोधकर्ताओं के लाभार्थ "कृषि सांख्यिकी एवं संगणक" में एक उच्च प्रमाण-पत्र पाठ्यक्रम आयोजित किया गया । इस प्रमाण-पत्र पाठ्यक्रम में सात अधिकारियों ने सहभागिता की ।

हिन्दी को प्रोत्साहन देने के लिए संस्थान में एक शोध-पत्र-पोस्टर-प्रदर्शन प्रतियोगिता आयोजित की गयी जिसमें हिन्दी पोस्टर तैयार करने में उल्लेखनीय योगदान देने वाले कर्मियों को पुरस्कृत किया गया ।

संस्थान का पुस्तकालय राष्ट्रीय कृषि अनुसंधान प्रणाली (NARS) के अन्तर्गत देश का एक क्षेत्रीय पुस्तकालय है जो संस्थान के प्रयोक्ताओं के साथ-साथ अन्य अनुसंधान संगठनों के प्रयोक्ताओं की सूचना सम्बन्धी आवश्यकताओं को पूरा करने में महत्वपूर्ण भूमिका निभा रहा है ।

1

Executive Summary

Indian Agricultural Statistics Research Institute (IASRI) established in 1959 as an Institute of Agricultural Research Statistics is mainly responsible for conducting research and education/training in Agricultural Statistics. With the advances in information technology, the Institute has adapted itself to the current needs of agricultural research. In the changed scenario, the mandate of the Institute is to undertake basic, applied and adaptive research in Agricultural Statistics, to conduct post graduate and in-service training courses in Agricultural Statistics and Computer Applications, to provide consultancy services, to act as a repository of information on Agricultural Statistics for research, to develop the Institute as an Advanced Centre of Excellence in education and training in Agricultural Statistics and Computer Applications and to liaise with other ICAR Institutes and SAUs, State Agricultural/Animal Husbandry Departments, to assist in the development and strengthening of National Agricultural Statistics System and to undertake sponsored research and training of national and international organisations in these disciplines.

A number of research projects were undertaken during the year in different Divisions of the Institute namely Sample Survey, Design of Experiments, Biometrics, Forecasting Techniques, Econometrics and Computer Applications. Research was carried out under 50 research projects in the Institute, of which 01 National Professor Scheme, 30 Institute funded, 05 NAIP funded, 01 AP Cess funded, 04 funded by other outside agencies and 09 in collaboration with other Institutes in various thrust areas. This year 12 projects were completed, 06 new projects were initiated and one project of ad-hoc nature was initiated and completed as well.

Some of the salient research achievements are:

- For the experimental situations in which the number of experimental units is less than the number of parameters to be estimated, efficient mixed-level

supersaturated designs (SSDs) have been generated by juxtaposing a uniform design with a Hadamard matrix. $E(s^2)$-optimal two-level SSDs have been extended by adding more runs to the design. The extended design is also $E(s^2)$-optimal according to the new lower bound obtained.

- The Design Resources Server has been strengthened by adding SAS and SPSS steps and syntax for (i) fitting of non-linear models and (ii) performing cluster analysis. A link on Statistical Genomics, essentially as an e-learning platform for the researchers particularly the geneticists, the biologists, the statisticians and the computational biology experts has been created. Another link for block designs with factorial structure has also been added. During the year, google analytics gave 5392 page views and usage of the server through 448 cities across 78 countries.
- For detecting t outlier observation vectors in multi-response experiments, general expression of Cook statistic has been obtained.
- Two methods of construction of designs for mixture experiments with process variables have been developed using orthogonally blocked response surface designs and projection matrices. The designs for mixture experiments with process variables obtainable from these methods of construction have been catalogued for both Linear and Quadratic models for 2-5 mixture components and one process variable with 2-levels.
- A series of designs involving sequences of treatments for comparing two disjoint sets of treatments has been obtained and variance of contrasts pertaining to direct as well as residual effects of test versus test, test versus control and control versus control treatments has also been obtained.
- For the experimental situations wherein experimental units are used for a series of tasks one after another in the experimental conditions whose levels are difficult to change, two classes of nested designs involving sequences of treatments with same number of experimental periods and units have been obtained.
- A method of construction of second order rotatable response surface designs in the presence of neighbour effects has been developed.
- The concept of Neighbour Balanced Block (NBB) designs has been defined for the experimental situation where the treatments are the combinations of levels of two factors and only one of the factor exhibits neighbour effect. Some methods of constructing complete NBB designs for two factors in a plot strongly neighbour balanced for one factor has been obtained.
- Two three-class association schemes called tetrahedral association scheme and cubical association scheme have been defined along with methods of constructing partially balanced incomplete block designs.
- A module for online analysis of data generated through a general block design has been developed and uploaded on the home page of the Institute.
- 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 λ and all other concurrences as zero, $m \leq \left[\frac{v}{2}\right]$, here [.] denotes the greatest integer function. These designs are useful for obtaining balanced sampling plans.
- Fertilizer Response Ratio (FRR), average increase of grain yield in kilogram of a crop due to per kilogram use of fertilizer nutrient of 14 crops (5 cereals, 4 pulses, 5 oilseeds) at NARP zone level, state level and all India level have been obtained using the data from On-farm trials. The fertilizer response ratios of N over control are 9.20, 7.73 and 8.51 kg/kg for cereals, oilseeds and pulse group whereas these value of NPK over control are 10.80, 5.60 and 6.70 kg/kg respectively. The fertilizer response ratio for all foodgrain crops for NPK over control is observed as 9.27 kg/kg which is more than response observed for N, NP, NK over control.
- Crop yield forecast models have been developed using rice, wheat and sugarcane yields as response variable and weather variables as input variables using multi-layer perceptron (MLP) and radial basis function (RBF) based neural networks with one or two hidden layers.
- Disease forewarning models using MLP and RBF based neural networks are developed for *Alternaria Blight* and *Powdery Mildew* in mustard crop using weather variables as input variables.
- Weather based models for forecasting potato yield in Uttar Pradesh have been developed by using

weather data on maximum and minimum temperature and morning and evening relative humidity during the period 1971-2002.

- For fitting of non-parametric functional autoregressive models, the coefficient functions have been estimated using Taylor's series expansion in which unknown coefficients are estimated by the method of weighted least squares, weights being the kernel density function. The applicability of self-exciting threshold autoregressive (SETAR) family of non-linear time series models with more than one threshold is demonstrated in the field of agriculture, having time series data that depicts cyclical patterns.
- For multimodal rainfall data, methodology of fitting mixture of distributions to 'body' and 'tail' using statistical learning theory is demonstrated. Three estimators of extreme value index are computed to fit the theoretical tail distribution to the rainfall data.
- Spatial market integration has been studied using advanced econometric tools namely Augumented Dickey Fuller technique for testing stationarity of time series, Johansen's Co-integration method for finding the co-integrating vectors and Vector Error Correction mechanism for finding out the speed of adjustment of price series to equilibrium for whole sale market of important cereals (rice, wheat, jowar, bajra, maize), oilseeds (ground nut, mustard), edible oils (coconut oil, ground nut oil, mustard oil) and pulses (gram, moong, arhar, urd, etc.) using time series data on wholesale prices. The analysis revealed that the integration among the markets has improved over the recent years. The prices of agricultural commodities tend to converge among a few selected state-level wholesale markets in India.
- In the area of futures trading, price volatility, price discovery and risk management are studied for important crops, and the contract designs of Indian wheat and maize crops are compared with US contracts. The volatility of futures market is greater than the spot market volatility.
- Multidimensional scaling (MDS) approach is used for identifying the factors contributing towards enhancing agricultural productivity pertaining to the subdomain "Plant Genetics and Breeding". It is found that India is focusing not only on abiotic and biotic stresses but also on evolving areas such as bioinformatics, molecular assisted selection, transgenics, etc.
- Estimators of both domain and population totals for an item of interest are developed under two-phase sampling where the domain identity is realized, but the item response is not necessarily available from a phase I sampled unit.
- An approximately unbiased estimator of the variance of ratio estimator under the two-phase sampling has been developed.
- 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). This 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.
- For situations in which the variable of interest is negatively correlated with sizes of units, the concept of inclusion probability inversely proportional to size sampling (IPIPS) scheme is introduced. IPIPS scheme ensures that the first order inclusion probabilities of units are inversely proportional to size measures of the units.
- For computational analysis of SNPs in rice genome, a web based information system on functional elements of rice genome has been developed. Online facilities have been created to access the information on Single Nucleotide Polymorphisms (SNPs) at functional elements. Web information system on rice functional elements help facilitate users to extract sequence information on promoter regions, untranslated regions, translation start sites, splice sites, exons, introns, translation stop sites, etc. Information on classification of splice sites, position weight matrices, phylogenetic relationships etc. is also provided in the Splice Store.
- The variety selection and disease diagnostic modules of the expert system on wheat crop management have been developed in Hindi using SQL server that accepts UNICODE for the support of Hindi language.
- In presence of outliers, it is seen that the estimates of genetic correlation are highly under estimated with the result that the bias increases considerably. The standard error in the presence of outliers also increases considerably.

- A β–version of Statistical Package for Animal Breeding (SPAB 2.1) has been developed. The package is quite useful for animal breeders for estimation of genetic parameters and for formulating sound breeding strategies and selection processes.
- In knowledge data warehouse for agricultural research, multidimensional model for the Integrated Data Mart has been designed. Models have been developed and implemented for on-line analysis and prediction/forecasting based on time series data to different data marts. Three types of models i.e. trend, growth, and auto regression are incorporated for this on-line prediction.
- Decision support system for manpower planning (PERMIS*net-II)* has been implemented in ICAR from IASRI server at the URL http://permisnet.iasri.res.in.
- Developed an online management system for PG School, IARI, New Delhi. It has five modules for management of courses, students, faculty, administration and e-learning. At present the system has 267 registered students and 412 faculty members. The system has 536 courses listed in 23 disciplines. All the students have been registered online for I, II trimesters of academic year 2009-10.
- In the e-Learning solution for agricultural education using *MOODLE (Modular Object Oriented Dynamic Learning Environment)*, the courses "Elementary Statistical Methods" under the discipline of Agricultural Statistics and "Fundamentals of Computers and Programming" under the discipline of Computer Applications have been prepared.

Scientists of the Institute published 61 research papers in National and International refereed Journals along with 24 popular articles, 06 book chapters, 24 projects/ technical reports/reference manuals, 03 pamphlets and 04 workshops proceedings. The Agricultural Research Data Book 2009 which is thirteenth in the series has been published.

Dr. Hukum Chandra received Cochran-Hansen Prize 2009 from International Association of Survey Statisticians.

Dr. AK Vasisht received the Best Research Paper Award during national level Workshop-cum-Seminar held at Pondicherry University, Puducherry during 11-12 September 2009.

Dr. Himadri Ghosh received Mrs. Bhargavi and Professor CR Rao Award for Best Poster Presentation during International Conference on Frontiers of Interface between Statistics and Sciences held at University of Hyderabad, Hyderabad during 30 December 2009 to 02 January 2010.

Dr. AK Gupta received III prize for oral presentation during the National Symposium on Lifestyle Floriculture: Challenges and Opportunities held at Dr.YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP) on 20 March 2010.

Expert System on Wheat Crop Mangement received Manthan Award South Asia 2009 for best e-content and best e-learning solution.

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

This year following eleven training programmes were organized in which 182 participants were imparted training

- A twenty one days training programme under Centre of Advanced Faculty Training on Recent Advances in Web Technologies for Information Management in Agriculture.
- Winter School on Bioinformatics and Statistical Genomics.
- Three International training programme on (i) Experimental Designs and Data Analysis for the CAC Staff at Tashkent, (ii) Advances in Design and Analysis of Experiments at ICARDA Aleppo, Syria and (iii) Applications of Remote Sensing and GIS in Agricultural Surveys sponsored by Afro Asian Rural Development Organization at the Institute.
- CSO Sponsored 26 days training programme on Data Analysis with Statistical Tools for Indian Statistical Service (ISS) Probationers of XXIX batch.
- Four refresher training programmes on (i) Applications of Information Technology in Statistical Computing and Data Dissemination Techniques for in-service ISS officers and senior officers of State Governments/UT (ii) Small Area Estimation for the Indian Statistical Services and other senior officers of States/Union Territories

(iii) Research Methodology for Official Statistics for twelve ISS officers and statistical personnel and (iv) Agricultural Statistical System in India for statistical personnel of States/UTs/PSUs of CSO.

  - One special training programme on financial matters for the officials of ICAR Hqrs.

- Three Travel Training programmes on Advances in Design of Experiments were organized for the scientists of Acharya NG Ranga Agricultural University, Rajendra Nagar, Hyderabad and its centres and 245 researchers were sensitized.
- 05 Dissemination workshops as part of Golden Jubilee celebrations of the Institute were organized
  - Design of Experiments
  - Applications of Small Area Estimation Techniques
  - Expert Systems in Agriculture
  - Remote Sensing and GIS for Decision Support in Agriculture
  - Statistical and Computational Issues in Genomics
- Ten other Symposium/Workshop/lecture sessions/ special invited talks during International Conference were organised.
- Two Brainstorming Sessions on Establishment of Centre of Agricultutal Bioinformatics were organised.

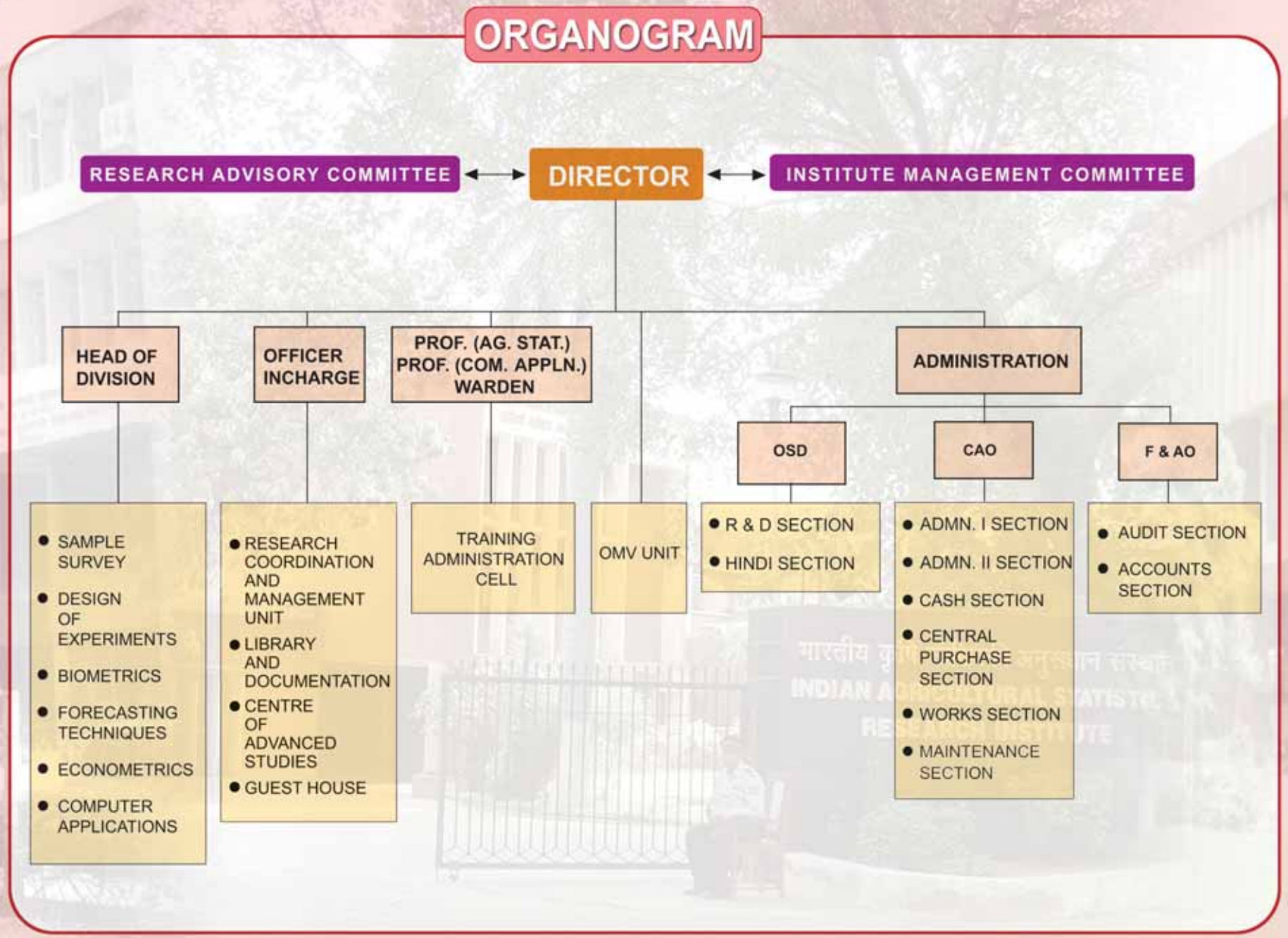
The activities relating to education and training which include planning, organization and coordination of the entire Post-graduate teaching programmes of the Institute were undertaken in collaboration with PG School, IARI. During the year, a total of 16 students, 03 Ph.D. (Agricultural Statistics), 05 M.Sc. (Agricultural Statistics) and 08 M.Sc. (Computer Application) completed their degrees. 23 new students 07 Ph.D. (Agricultural Statistics), 08 M.Sc. (Agricultural Statistics) and 08 M.Sc. (Computer Application) were admitted.

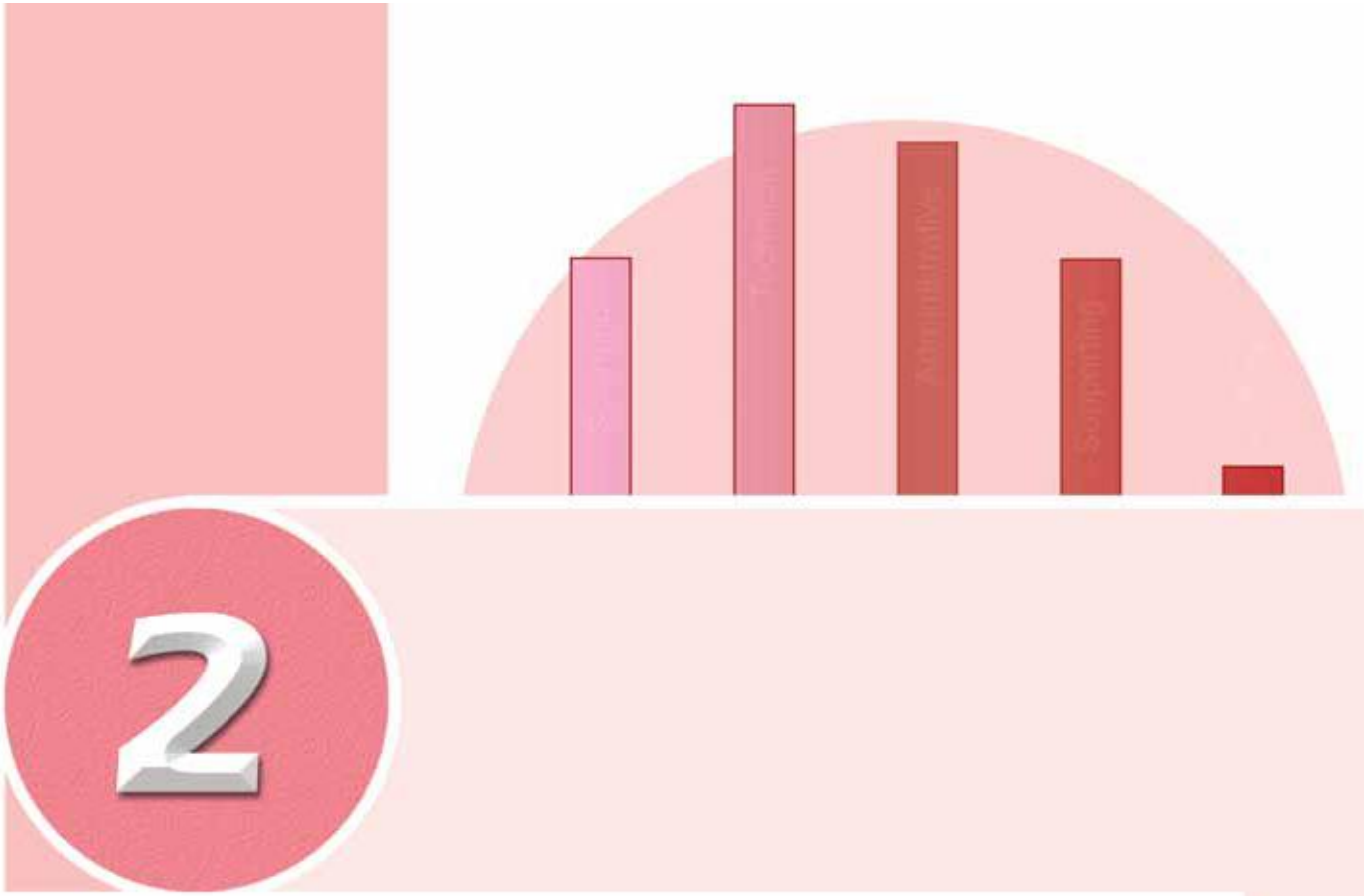
A Senior Certificate Course in Agricultural Statistics and Computing was organised. Seven officials participated in this Certificate Course.

To promote Hindi, a poster presentation was organized at the Institute and awards were distributed for the outstanding performances.

The Library of the Institute with a status of Regional Library under NARS, played a vital role in meeting the information needs of the in-house users as well as users from other research organisations.

ORGANOGRAM


RESEARCH ADVISORY COMMITTEE
DIRECTOR
INSTITUTE MANAGEMENT COMMITTEE
HEAD OF DIVISION
OFFICER INCHARGE
PROF. (AG. STAT.)
PROF. (COM. APPLN.)
WARDEN
ADMINISTRATION
OSD
CAO
F & AO
SAMPLE SURVEY
DESIGN OF EXPERIMENTS
BIOMETRICS
FORECASTING TECHNIQUES
ECONOMETRICS
COMPUTER APPLICATIONS
RESEARCH COORDINATION AND MANAGEMENT UNIT
LIBRARY AND DOCUMENTATION
CENTRE OF ADVANCED STUDIES
GUEST HOUSE
TRAINING ADMINISTRATION CELL
OMV UNIT
R & D SECTION
HINDI SECTION
ADMN. I SECTION
ADMN. II SECTION
CASH SECTION
CENTRAL PURCHASE SECTION
WORKS SECTION
MAINTENANCE SECTION
AUDIT SECTION
ACCOUNTS SECTION



2

Introduction

Indian Agricultural Statistics Research Institute (IASRI) has been and continues to be a premier Institute of the Indian Council of Agricultural Research (ICAR) with glorious tradition of carrying out research, teaching and training in the areas of *Agricultural Statistics* and *Computer Application*. Recognizing the importance of research and education in Agricultural Statistics way back in 1930, the then Imperial Council of Agricultural Research established a small *Statistical Section* to assist the State Departments of Agriculture and Animal Husbandry in planning and designing their experiments, analysis of experimental data, interpretation of results, and also rendering advice on the formulation of the technical programmes and examining the progress reports of the schemes funded by the Council. The activities of the Section increased rapidly with the appointment of Dr. PV Sukhatme as Statistician to the Council in 1940 and studies were initiated for developing objective and reliable methods for collecting yield statistics of principal food crops. The efficiency and practicability of these methods was demonstrated in different States for estimating crop yield. As a result, in the course of a few years, the method was extended practically to the entire country to cover all principal food and non-food crops. Research in sampling theory and training of field staff and statistical staff were the activities initiated in this period resulting in the re-organization of the Statistical Section into a Statistical Branch in 1945 with appropriate expansion in its strength. The designation of Statistician was changed to Statistical Advisor. The Statistical Branch was renamed as Statistical Wing in 1949. The Statistical Wing soon acquired International recognition as a centre for research and training in the field of Agricultural Statistics. During 1952 on the recommendations of two FAO experts, Dr. Frank Yates and Dr. DJ Finney, who visited the Council on the invitation of the Government of India, activities of the Statistical Wing were further expanded and diversified. Subsequently, in recognition of its important role as a training and research institution, the Statistical Wing was re-designated as the Institute of Agricultural

Research Statistics (IARS) on 02 July 1959. In April 1970, the Institute was declared as a full-fledged Institute in the ICAR system and is since then headed by a Director. On 01 January 1978 the name of the Institute was changed to Indian Agricultural Statistics Research Institute (IASRI) emphasizing the role of 'Agricultural Statistics' as a full-fledged discipline by itself.

The Goal of the Institute is to conduct research, education and training in Agricultural Statistics and Computer Applications in Agriculture. The vision of the institute is to use the power of Statistics as a science blended judiciously with information communication technology to enhance the quality of agricultural research. To convert this vision into a reality, the Institute has set for itself a mission to undertake research, teaching and training in Agricultural Statistics and Computer Applications so that these efforts culminate into improved quality of agricultural research and also meet the challenges of agricultural research in newer emerging areas. The functions and activities of the Institute have been re-defined from time to time in the past. The present main thrust of the Institute is to conduct basic, applied, adaptive, strategic and anticipatory research in Agricultural Statistics, to develop trained manpower and to disseminate knowledge and information produced so as to meet the methodological challenges of agricultural research in the country.

The Institute has made its presence felt in the National Agricultural Research System (NARS). The Institute is also becoming progressively a repository of information on agricultural research data and has taken a lead in the country in developing a data warehouse on agricultural research data. The Institute also occupies a place of pride in the National Agricultural Statistics System (NASS) and has made several important contributions in the strengthening NASS, which has a direct impact on the national policies. Some of the research activities and their impact are given in the sequel:

Research Achievements and Impact

The Institute has made some outstanding and useful contributions to the research in Agricultural Statistics in the fields like Design of Experiments, Statistical Genetics, Forecasting Techniques, Statistical Modelling, Sample Surveys, Econometrics, Computer Applications in Agriculture, Software Development, etc. IASRI has conducted basic and original research on many topics of interest and has published number of papers in national and international journals of repute. IASRI has been providing and continues to provide support to the NARS by way of analyzing voluminous data using advanced and appropriate analytical techniques. IASRI has also been very actively pursuing advisory services that has enabled the Institute to enrich the quality of agricultural research in the NARS. Through its advisory, IASRI has made its presence visibly felt in NARS and now experimenters look to IASRI for designing experiments and analysis of experimental data.

The efficient designs like balanced incomplete block designs, group divisible and extended group divisible designs, reinforced extended group divisible designs, square and rectangular lattice designs, α-designs, reinforced α-designs, augmented designs, designs for fitting response surfaces, etc. and advanced analytical techniques including contrast analysis, linear models with nested structures, experiments with mixtures methodology, mixed effects models, biplot, etc. have been adopted by the experimenters in NARS. The application of α-designs and resolvable block designs has improved the precision of treatment comparison in Crop Improvement programmes of Rapeseed and Mustard, Sorghum, etc. The analytical techniques for estimating/projecting the Energy Requirement in the Agricultural Sector has been exploited for the analysis of countrywide data. The analytical techniques for the analysis of data from the experiments conducted to study the post harvest storage behaviour of the perishable commodities like fruits and vegetables are being widely used in NARS. The Institute works in close collaboration with NARS organizations and many projects are being run at the Institute in collaboration with All India Co-ordinated Research Projects and ICAR Institutes. Institute has developed linkages with the CGIAR organizations such as CIMMYT, IRRI and ICARDA. The status of experimentation is now changing and with the support provided in terms of suggesting efficient designs and analyzing the data using modern complicated statistical tools, the research publications of the agricultural scientists are finding a place in high impact factor international journals.

The methodology for General Crop Estimation Surveys (GCES), cost of cultivation studies, Integrated Sample

Surveys (ISS) for livestock product estimation, fruits and vegetable survey, which are being adopted throughout the country are research efforts of IASRI. Methodology based on small area estimation technique for National Agricultural Insurance Scheme suggested by IASRI has been pilot tested in the country. A status paper on chronological development and present status of information support system for management of agriculture was prepared as a part of State of Indian Farmer: A Millennium Study of Ministry of Agriculture. The sample survey methodology for imported fertilizer quality assessment, fish resources estimation, flower production estimation, area and production of horticultural crops estimation, etc. have been developed and passed on to the user agencies. Integrated methodology for estimation of multiple crop area of different crops in North Eastern Hilly Regions using Remote Sensing data has been developed. Sampling methodology for estimation of post harvest losses has been successfully adopted in AICRP on Post Harvest Technology for assessment of post harvest losses of crops/commodities

The Institute has also made very significant contributions in developing the analytical techniques for the estimation of genetic parameters, models for pre-harvest forecasting of crop yields, models for forewarning of incidence of pests and diseases and econometrics and statistical modeling of biological phenomena using non-linear models, non-parametric regression, structural time series, neural network and machine learning approaches. The techniques developed have potential applications in long term projections of food grain production, aphid population, marine fish production, etc. The methodology developed for forecasting based on weather variables and agricultural inputs was used by Space Application Centre, Ahmedabad, to obtain forecast of wheat yield at national level. Models developed for forewarning of aphids in mustard crop were used by National Research Centre for Rapeseed and Mustard to provide forewarning to farmers which enabled them to optimize plant protection measures and save resources on unnecessary sprays consecutively for three years. The modification in the procedure of estimation of genetic parameters has been suggested for incorporating the effect of unbalancedness, presence of outliers, aberrant observations and non-normality of data sets. Procedures for studying genotype × environment interactions have been developed and used for the analysis of data generated from crop improvement programmes. The research work on construction of selection indices and progeny testing and sire evaluation have been used for animal improvement programmes. The Institute has now initiated research in the newer emerging area of statistical genomics.

Achievements in Information Communication Technology

The Institute has the capability of development of Information Systems, Decision Support Systems and Expert Systems. Realizing the need of integration of databases to prepare a comprehensive knowledge warehouse that can provide desired information in time to the planners, decision-makers and developmental agencies, Integrated National Agricultural Resources Information System (INARIS) with the active support of 13 sister institutes as partners has been developed. The data warehouse comprises of 59 databases on agricultural technologies of different sectors of agriculture and related agricultural statistics at districts/state/national levels, population census including village level population data as well as tehsil level household assets and livestock census. Subject-wise data marts have been designed, multi-dimensional data cubes developed and published in the form of on-line decision support system. The Institute has also developed information systems for agricultural field experiments, animal experiments and long term fertilizer experiments conducted in NARS. Besides, a comprehensive Personnel Management Information System Network (PERMISnet) has been implemented for the ICAR for manpower planning, administrative decision making, and monitoring. For National Agricultural Technology Project, a Project Information and Management System Network (PIMSnet) was developed and implemented for concurrent monitoring and evaluation of 845 projects. A National Information System on Agricultural Education Network in India (NISAGENET) has been designed, developed and implemented so as to maintain and update the data regularly on parameters related to agricultural education in India. Online Management System for PG School, IARI has been developed. An Expert System on Wheat Crop Management has also been developed and implemented.

A milestone in the research programmes of the Institute was created when it started developing indigenous

statistical software packages mainly for analysis of agricultural research and animal breeding data. Statistical packages for generation of experimental designs for various experimental situations, both unstructured and factorial structure of treatments, catalogues of designs, randomized layout of design and analysis of data were also developed. Statistical packages developed and widely being used in NARS are:

- Statistical Package for Agricultural Research (SPAR) 2.0
- Statistical Package for Block Designs (SPBD) 1.0
- Statistical Package for Factorial Experiments (SPFE) 1.0
- Statistical Package for Augmented Designs (SPAD) 1.0
- Software for Survey Data Analysis (SSDA) 1.0
- Statistical Package for Animal Breeding (SPAB) 2.1

The creation of Design Resources Server, an e-learning and e-advisory resource for the experimenters, has been another revolution in the growth of the Institute. The server provides a platform to popularize and disseminate research and also to further strengthen research in newer emerging areas in design of experiments among peers over the globe in general and among the agricultural scientists in particular so as to meet the emerging challenges of agricultural research. This server is hosted at www.iasri.res.in/design.

Achievements in Human Resource Development

The one of the thrust areas of the Institute is to develop trained manpower in the country in the disciplines of Agricultural Statistics and Computer Applications for meeting the challenges of Agricultural Research in the newer emerging areas. A humble beginning in the area of development of trained manpower was made in 1945 with the initiation of two regular certificate courses, one course of six months duration, called Junior Certificate Course (JCC) and the other course of one year duration called Senior Certificate Course (SCC). Besides, there was another course of one year duration known as Professional Statisticians' Certificate Course (PSCC) that was introduced to train professional statisticians. Subsequently, a Diploma course involving a research project of one year duration, in addition to PSCC consisting of one year course work in advanced statistics, was also introduced. This necessitated the augmentation of the staff and accordingly, the strength of the branch was increased to two Professors of Statistics and other staff. These certificate courses helped in strengthening the linkages of the Institute with the State Departments of Agriculture and Animal Husbandry. The certificate courses started in 1945 were discontinued by the Indian Council of Agricultural Research (ICAR) in 1985-86. However, during 1997, the Senior Certificate Course in Agricultural Statistics and Computing was revived. This course is now of six months duration and lays more emphasis on statistical computing using statistical softwares. The course is divided into two modules viz. (i) Statistical Methods and Official Agricultural Statistics, and (ii) Use of Computers in Agricultural Research, of three months duration each, 77 participants have completed both modules, 21 have completed module-I and 12 have completed module-II since 1997.

The year 1964 witnessed tremendous changes in the activities of the Institute when an memorandum of understanding was signed with Indian Agricultural Research Institute (IARI), New Delhi to start new degree courses leading to M.Sc. and Ph.D. in Agricultural Statistics. In 1981, a two years Diploma Course in Advanced Computer Programming was introduced. On the recommendations of UNDP, this course was soon discontinued and in 1985 another new course leading to an M.Sc. degree in Computer Applications in Agriculture was initiated in collaboration with IARI, New Delhi. This course was re-designated as M.Sc. degree in Computer Application during 1993-94. The Institute has so far produced 176 Ph.D. and 292 M.Sc. students in Agricultural Statistics and 89 M.Sc. students in Computer Application. The alumni of the Institute are at present occupying high positions in Universities and other academic research institutions of USA, Canada and other countries.

The functioning of the Institute as a Centre of Advanced Studies in Agricultural Statistics and Computer Application during October 1983 to March 1992 under the aegis of United Nations Development Programme was another landmark in the history of the Institute. The purpose of this programme was to develop the Institute as a centre of excellence with adequate infrastructure and facilities to undertake advanced training programmes and to carry out research in various emerging areas of Agricultural Statistics and

Computer Application. Under this programme, a number of illustrious statisticians and computer scientists from abroad visited the Institute with a view to interacting with the scientists, giving seminars/ lectures and suggesting gaps in the research programmes of the Institute. Under the programme some scientists of the Institute received training for capacity building from abroad. Another singular development in the growth of the Institute was the Centre of Advanced Studies programme in Agricultural Statistics and Computer Application established during the VIII Five Year Plan in 1995. Under this program the institute organizes training programmes on various topics of current interest for the benefit of scientists of NARS. These training programmes cover specialized topics of current interest in statistics and agricultural sciences. During the period under report the Centre of Advanced Studies (CAS) is renamed as Centre of Advanced Faculty Training (CAFT). So far 44 training programmes have been organised under the aegis of Centre of Advanced Faculty Training. In all a total of 781 participants have been benefited.

There is yet another form of training courses, which are tailor made courses and are demand driven. The coverage in these courses is need based and the courses are organized for specific organizations from where the demand is received. The Institute has conducted such programmes for Indian Council of Forestry Research, Indian Statistical Services probationers and Senior officers of Central Statistical Organization and many other organizations. The Institute has also conducted several international training programmes on request from FAO, particularly for African, Asian and Latin American countries. The Institute has broadened the horizon of capacity building by opening its doors to the agro-based private sector. One such training programme was organized for research personnel of E.I. DuPont Pvt. Ltd. The Institute has also conducted training programmes for the scientists/research personnel of CGIAR organizations such as ICARDA and Rice-Wheat Consortium for Indo-Gangetic plains. A number of research workers from the Institute have served as consultants and advisors in Asian, African and Latin American countries. Also, a number of statisticians and students of the Institute are at present occupying high positions in universities and other academic and research institutions of USA, Canada and other countries.

Infrastructural Developments

As the activities of the Institute started expanding in all directions, the infrastructure facilities also started expanding. Two more buildings 'Computer Centre' and 'Training-cum-Administrative Block' were constructed in the campus of the Institute in the years 1976 and 1991, respectively. An important landmark in the development of the Institute was the installation of an IBM 1620 Model-II Electronic Computer in 1964. A third generation computer Burroughs B 4700 system was installed in March 1977. The Burroughs B–4700 system was replaced in 1991 by a Super Mini COSMOS-486 LAN Server with more than hundred nodes consisting of PC/AT's, PC/XT's and dumb terminals all in a LAN environment. Later, COSMOS-486 LAN Server was replaced by a PENTIUM-90 LAN Server having state-of-art technology with UNIX operating system. Computer laboratories equipped with PCs, terminals and printers, etc. had been set up in each of the six Scientific Divisions as well as in the Administrative Wings of the Institute.

For undertaking research in the newer emerging areas, a laboratory on Remote Sensing (RS) and Geographic Information System (GIS) was created in the Institute. The laboratory was equipped with latest state-of-art technologies like computer hardware and peripherals, Global Positioning System (GPS), softwares like ERMapper, PCARC/INFO, Microstation 95, Geomedia Professional, ARC/INFO Workstation and ERDAS Imagine with the funds received through two AP Cess Fund projects. This computing facility has further been strengthened with the procurement of ARC-GIS software under NATP programme.

An Agricultural Bioinformatics Lab (ABL) fully equipped with software and hardware has been created to study crop and animal biology with the latest statistical and computation tools.

The LAN at IASRI has steadily been strengthened and the Computer Centre, Sample Survey Block, Training and Administration Block and Panse Guest House have been connected using fiber optical cable as backbone and connectivity has been established for 462 nodes. The LAN is being managed using manageable switches. Currently the internet services are being provided through Firewall and secure servers with multiple CPU capabilities on a 8 Mbps bandwidth.

Primary and Secondary DNS, Domain: iasri.res.in, Website (http://www.iasri.res.in) and E-mail services are being maintained in house. Live E-mail and Internet facilities are being provided to the scientists/technical/ administrative staff. Newly built, International Training Hostel was Inaugurated by Hon'ble Dr. Mangala Rai Secretary, DARE & Director General, ICAR on, 09 July 2009. Internet facilities at International Training Hostel is being provided on a 512 Kbps download speed using MTNL Broadband WiFi Modem.

There are various labs at the Institute for dedicated services like ARIS lab for Training, Stat lab for Statistical analysis and Centre for Advance Study lab.

Keeping pace with the emerging technologies in the area of Information Technology (IT), from the year 1998 onwards the computer hardware and software have been constantly upgraded/replaced with newer platforms and versions. The computing environment in the Institute has latest rack mount servers, PCs, notebook computers, laser mono & colour printers, inkjet printers, scanners, DVD duplicator, visualiser and video projectors. All the divisions, administrative and accounts sections of the Institute have been provided with PCs, printers and peripherals. Software packages that are needed for application development, statistical data analysis, network securities and office automation are being made available to the scientists and staff of the Institute. Some of the important softwares that are available are SAS, SPSS, SYSTAT, GENSTAT, Data warehouse software – Cognos, SPSS clementine, MS Office 2007, MS Visual Studio Dot net, Macro-Media, MS Project, E-views, Trend Micro Antivirus, NEURAL NETWORKS (STATISTICA), Gauss Software, Minitab 14, Maple 9.5, Matlab, Sigma Plot Web Statistica and Lingo Super.

The Institute continued to provide selective information documentation services to scientists in the ICAR Institutes and Agricultural Universities on references to documents relating to areas of their specific interest. The bibliographic databases in Biotechnology and Animal Science Research are being maintained in the Bio-Informatics Laboratory providing Selective Dissemination of Information (SDI) services on VETCD, BEASTCD and AGRICOLA databases of the Food and Agriculture Organisation under United Nations.

Organisational Set-up

The Institute has following six Divisions, two Units and three Cells to undertake research, training, consultancy, documentation and dissemination of scientific output.

Divisions

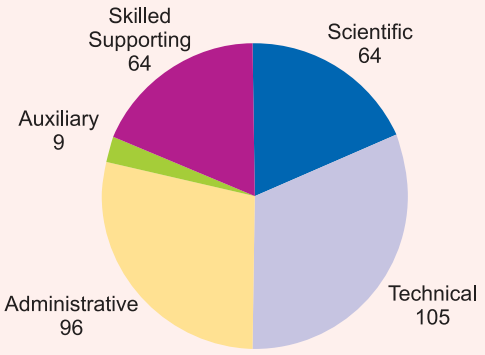
- Sample Survey
- Design of Experiments
- Biometrics
- Forecasting Techniques
- Econometrics
- Computer Applications

Units

- Research Co-ordination and Management Unit (RCMU)
- Institute Technology Management Unit (ITMU)

Staff Position (as on 31 March 2010)

Manpower	No. of posts sanctioned	No. of posts filled
Director	1	1
Scientific	130	63
Technical	221	105
Administrative	109	96
Auxiliary	14	9
Skilled Supporting	80	64
Total	**555**	**338**



Staff Strength in Position as on 31 March 2010

Cells

- Training Administration Cell (TAC)
- Consultancy Processing Cell (CPC)
- Planning, Monitoring and Evaluation (PME) Cell

Financial Statement

The Standing Finance Committee had approved the XI Plan Budget of the Institute. The total outlay of Rs. 1200 lakhs was sanctioned under the XI Plan budget of the Institute.

Through regular monitoring, the Institute was able to ensure optimal utilization of funds available in the budget. The actual utilization of the budget both under plan and non-plan is furnished in the sequel.

Budget Allocation vis-à-vis Utilization (2009–10)

(Rupees in Lakhs)

Head of Account	Allocation		Expenditure	
	Plan	Non-Plan	Plan	Non-Plan
Pay & Allowances	0.00	2224.98	0.00	2224.64
TA	5.33	4.63	5.32	4.63
OTA	0.00	0.31	0.00	0.30
HRD/Fellowship	1.66	27.25	1.65	26.06
Contingencies	75.58	157.21	75.57	157.13
Equipments	18.32	6.37	18.32	6.45
Furniture	1.49	0.00	1.49	0.00
Works	21.00	29.00	21.00	29.00
Library	26.62	0.00	26.62	0.00
Total	**150.00**	**2449.75**	**149.97**	**2448.21**


STATISTICAL PACKAGE FOR AGRICULTURAL RESEARCH
SPAR 2.0
SPAR 2.0
Sangeeta Ahuja
P.K.Malhotra
V.K.Bhatia
Rajender Parsad
V.H.Gupta
Indian Agricultural Statistics Research Institute
Statistical Package for Factorial Experiments
SPFE
SPFE 1.0
Sangeeta Ahuja
Rajender Parsad
V.K.Gupta
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
LIBRARY AVENUE, PUSA, NEW DELHI- 110 012
SOFTWARE FOR SURVEY DATA ANALYSIS
SSDA
SSDA Version 1.0
DIVISION OF COMPUTER APPLICATION
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
LIBRARY AVENUE, PUSA, NEW DELHI- 110 012
Statistical Package for
Augmented Designs
ICAR
STATISTICAL PACKAGE FOR ANIMAL BREEDING
(SPAB Ver 2.0)
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
(ICAR)
LIBRARY AVENUE, PUSA, NEW DELHI-110012

3

Research Achievements

The research targets set by the Institute were implemented by six Divisions of the Institute, viz. Sample Survey, Design of Experiments, Biometrics, Forecasting Techniques, Econometrics and Computer Applications. The basic, applied, adaptive and strategic research in Agricultural Statistics and Computer Application is carried out under six broad programmes that cut across the boundaries of the Divisions and encourage interdisciplinary research. The six programmes are as under:

1. Development and analysis of experimental designs for agricultural system research
2. Forecasting and remote sensing techniques and statistical applications of GIS in agricultural systems
3. Development of techniques for planning and execution of surveys and analysis of data including economic problems of current interest
4. Modeling and simulation techniques in biological systems
5. Development of informatics in agricultural research
6. Teaching and training in Agricultural Statistics and Computer Application

Programme 1: DEVELOPMENT AND ANALYSIS OF EXPERIMENTAL DESIGNS FOR AGRICULTURAL SYSTEM RESEARCH

Supersaturated Designs for Scarce Experimental Resources

Supersaturated Designs (SSDs) are essentially fractional factorial plans employed generally in screening experiments in which usually a large number of factors are investigated, but only a few of them are active having significant influence on the response. This feature of SSDs is termed as effect sparsity. Identification of these few active factors correctly and economically is the main purpose of such experiments. The focus on the class of SSDs is for its run-size economy and mathematical novelty. The run size is not enough to estimate the main effects of all the factors in the experiment.

Two-level SSDs have been studied extensively because of their application and ease of generation. But multi-level SSDs are often required in agricultural, industrial and scientific experimentation for exploring nonlinear effects of the factors. Mixed-level SSDs are also requested frequently in experimentation. In an experimental situation where in several factors have same number of levels and one or two factors have different number of levels than the rest of the factors, mixed level SSDs become useful. The few factors with different levels may be called as factors of asymmetry and are important factors. Some recent references on mixed level SSDs are Fang *et al.* (2003; *Metrika* **58**), *Li et al.* (2004; *Statist. Prob. Letters* **69**), Koukouvinos and Mantas (2005; *Statist. Prob. Letters* **74**), Ai *et al.* (2007; *J. Statist. Plann. Inf.* **137**), Tang *et al.* (2007; *J. Statist. Plan. Inf.* **137**) and Gupta *et al.* (2008; *J. Statist. Theo. Pract.* **2;** 2009; *Statist. Prob. Letters* **79**).

Some methods of constructing $E(f_{NOD})$-efficient and $E(\chi^2)$-efficient, balanced, mixed level SSDs, derived essentially from the juxtaposition of uniform designs (centered L_2-discrepancy) and Hadamard matrices have been given and criteria have been used to investigate the efficiency of the designs constructed. One method of construction generates SSDs of the type $n^s \times 2^{n-1}//n$. Mathematical expressions of $E(f_{NOD})$ and $E(\chi^2)$ have been obtained for this series of SSDs and it has been shown algebraically that all the designs are always $E(f_{NOD})$ and $E(\chi^2)$ optimal. Here $n \equiv 0 \{mod\ (4)\}$ and s ($<n$) is a positive integer. The case $s = 1$ is very interesting as for this case for every design $E(f_{NOD}) = 1$ and $E(\chi^2) = 2$ and all the designs are optimal according to these two criteria. Another series of SSDs obtained are of the type $(n/2) \times 2^{n-1}//n$. For this series of SSDs it is not possible to obtain neat expressions for $E(f_{NOD})$ and $E(\chi^2)$. However, for $n \leq 60$, all the designs obtained are f_{NOD} -optimal and their $E(\chi^2)$-efficiency is also very high.

For the construction of SSDs, uniform designs and Hadamard matrices have been taken respectively from http://www.math.hkbu.edu.hk/UniformDesign/, maintained by Chang-Xing Ma, and from http://www.iasri.res.in/WebHadamard/WebHadamard.htm, (maintained at Design Resources Server, IASRI).

SSDs are useful for the experimental situations where the number of experimental units is less than the number of parameters to be estimated. In such experimental situations, it is quite common that an experimenter begins the experimentation using an efficient design with the resources available at that time in the form of number of affordable runs, say n. The experimenter uses a two-level $E(s^2)$-optimal SSD(n, m) = d. After the initiation of the experiment or after the experiment is over, additional resources become available that permit the experimenter to include r, $1 \leq r < m-n$ more runs to the design d. How does the experimenter pick the additional runs and augment the original design d so as to get an extended SSD ($n+r$, m) = $d^{\$}$, which is also $E(s^2)$-optimal in the extended class. In other words, the problem is to obtain an extended $E(s^2)$-optimal SSD($n+r$, m) = $d^{\$}$ given that the original SSD(n, m) = d is $E(s^2)$-optimal.

This situation has been handled by adding r runs to the already used $E(s^2)$-optimal SSD (n, m) and using the existing bounds given by Das *et al.* (2008; *J. Statist. Plann. Inf.* **138**) and Suen and Das (2009; *J. Statist. Plann. Inf.* **140**) depending upon ($n+r$) is even or odd for evaluating the efficiency of the extended design. But this bound may be difficult to attain because the sub-design with n runs is already $E(s^2)$-optimal. Therefore, a new lower bound to $E(s^2)$ of the extended design $d^{\$}$, obtained by adding r new runs to d, given that d is $E(s^2)$–optimal, has been obtained.

A new class of extended $E(s^2)$-optimal two-level SSDs has been obtained by adding runs to an existing $E(s^2)$-optimal two-level SSDs. The extended design is a union of two optimal SSDs belonging to different classes. New lower bound to $E(s^2)$ has been obtained for the extended SSDs. For some optimal designs generated, the value of $E(s^2)$ smaller than the lower bound given by Das *et al.* (2008, *J. Statist. Plann. Inf.* **138**). This class of unbalanced SSDs needs to be studied further in detail.

A catalogue of 67 $E(f_{NOD})$-optimal mixed-level SSDs generated from uniform design and Hadamard matrix has been prepared. The $E(\chi^2)$-efficiency of the designs is also given. Similarly a small catalogue of extended two-level $E(s^2)$-optimal SSDs has been prepared. The extended designs are $E(s^2)$-optimal before and after adding r runs to SSD(n, m).

Further, the layout of the designs given in the catalogue can also be obtained. The bibliography on SSDs has also been expanded by adding the latest references on SSDs.

Designs for Crop Sequence Experiments

A factorial experiment run in a block design (block designs with factorial structure) is said to have the *Orthogonal Factorial Structure* (OFS) if the adjusted treatment sum of squares can be split up orthogonally into components due to different factorial effects like main effects and interactions. In such a design *inter-effect orthogonality* holds if the best linear unbiased estimates of the estimable treatment contrasts belonging to different factorial effects are orthogonal or uncorrelated. Any factorial effect is said to be *balanced* if all the normalized contrasts belonging to that effect are estimated with the same variance. These designs have very interesting applications in crop sequence experiments where two crops are grown in two cropping seasons, Kharif and Rabi. One set of treatments is given in the Kharif crop and another distinct set of treatments is given in the Rabi crop. The observations are recorded in both the seasons. The interest of the experimenter is in the direct effects of Kharif and Rabi treatments, the residual effect of the Kharif treatments and the interaction of the residual effect of Kharif treatments and direct effect of Rabi treatments. There may be more than two crops sequence. Similarly, the treatments in the individual cropping season could have a factorial structure. These extensions are pretty simple and straight forward. From experimenter's point of view, it is desirable that the main effects efficiencies are very high and the interaction efficiencies are also reasonably high.

For two factor factorial experiments with $v = s_1 \times s_2$, where s_1 and s_2 are the number of levels of the two factors, respectively and v is the total number of treatment (combinations), some methods of construction of factorial designs with all main effects balanced are available in the literature when (i) s_1 is an integral multiple of s_2; block size is a multiple of both s_1 and s_2 and (ii) s_1 and s_2 have a common factor, like $s_1 = f_1 f$ and $s_2 = f_2 f$; block size is a multiple of both s_1 and s_2. It is indeed possible that $s_1 = f_1 \times f_2 \times \ldots \times f_p$ and $s_2 = h_1 \times h_2 \times \ldots \times h_q$. Then it is indeed possible to obtain a design for $v = f_1 \times f_2 \times \ldots \times f_p \times h_1 \times h_2 \times \ldots \times h_p$ factorial experiment having all the properties of the original design.

A unified method of construction of factorial designs for $v = s_1 \times s_2$ has been given. The designs generated are (i) with single replication of treatment combinations and (ii) with replication two or more of the treatment combinations. The designs are balanced in the sense that main effects can be estimated with full efficiency. Some of the interaction effects also have full efficiency. The efficiency of the other interactions is high. Using replacement and collapsing of levels, one can generate designs for $v = f_1 \times f_2 \times \ldots \times f_p \times h_1 \times h_2 \times \ldots \times h_p$ factorial experiment. Most of the methods available fall as a particular case of this unified approach.

This unified approach, however, does not allow the construction of designs when s_1 and s_2 are co-prime and block size is a multiple of both s_1 and s_2. This needs to be investigated further.

Structure Resistant Designs

Extended group divisible designs are useful for crop sequence experiments. In these experiments, sometimes either the level of a factor may be lethal or material pertaining to that level may become unavailable at the time of laying out the experiment. Therefore, it is desired to obtain extended group divisible designs that retain the property of orthogonal factorial structure with balance when the observations pertaining to treatment combinations of a particular level of a factor are missing. For such situations, structure resistant extended group divisible designs with unequal block sizes have been obtained.

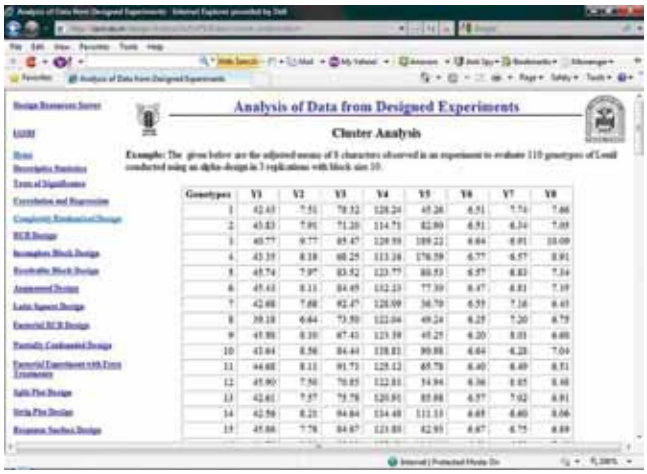
Design Resources Server

- Design Resources Server (www.iasri.res.in/design) developed to popularize and disseminate research in design of experiments among experimenters and research statisticians has been strengthened. The home page of the server is

The following new additions have been made on Design Resources Server

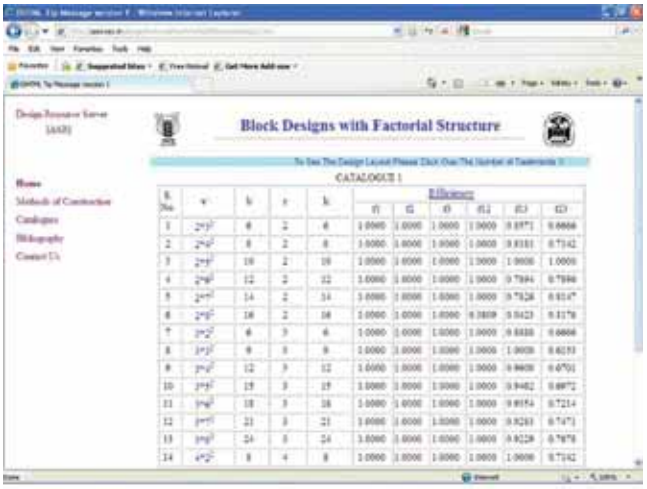
- **Analysis of data**

  The page "Analysis of Data" has been strengthened by adding the steps and syntax for (i) fitting non-linear models using SAS and SPSS on the sub-link Non-Linear Models, and (ii) performing cluster analysis of data using SAS and SPSS on the sub-link Cluster Analysis. Some screens shots for analysis of data appear like



- **Block designs with factorial treatment structure**

  On the link Designs for Factorial Experiments, a sub-link has been added on Block Designs with Factorial Treatment Structure giving a bibliography with 232 references on the subject. Catalogues of designs having orthogonal factorial structure permitting estimation of main effects with full efficiency and controlling efficiency for interaction effects are also given at this link. URL for this link is www.iasri.res.in/design/factorial/factorial.htm. Some screen shots for block designs with factorial treatment structure are as given below:



- **Statistical genomics**

  A new link on Statistical Genomics has been initiated essentially as an e-learning platform which can be useful to the researchers particularly the geneticists, the biologists, the statisticians and the computational biology experts. It contains the information on some public domain softwares that can be downloaded free of cost. A bibliography on design and analysis of microarray experiments is also given. These are hosted at http://iasri.res.in/design/Statistical_Genomics/default.htm. A screen shot of this link is

- **Dissemination of the Server**

  To popularize the server among agricultural scientists, a Bulletin on the Design Resources Server was published which was released by Dr. MM Pandey, DDG (Engg), ICAR on 29 April 2009. The presentations on the Server were made at (i) Central Asia office of ICARDA at Tashkent during 01-05 June 2009; (ii) ANGRAU, Hyderabad during 16-17 June 2009; (iii) RARS, Tirupati on 05 October 2009; (iv) ICARDA, Aleppo, Syria during 08-19 November 2009; (v) BCKV, Kalyani on 22 December 2009; (vi) RARS, Ankapalle on 06 January 2010 and (vii) National Research Centre for Agroforestry, Jhansi on 12 February 2010.

- **Usage of the Server**

  - Warren F. Kuhfeld. Orthogonal Arrays. Analytics Division SAS, Document No. 273 (http://support.sas.com/techsup/technote/ts723.html).
  - Electronic text material in "New and Restructured Post-Graduate Curricula & Syllabi on Statistical Sciences (Statistics/Agricultural Statistics; Bio-Statistics, Computer Application) of Education Division, Indian Council of Agricultural Research, New Delhi, 2008.
  - Jingbo Gao, Xu Zhu, Nandi, A.K. (2009). Non-redundant precoding and PARR reduction in MIMO OFDM systems with ICA based blind equalization. *IEEE transactions on Wireless Communications*, **8(6),** 3038-3049.
  - Design Resources Server is a copyright of IASRI (ICAR). The server has been registered under Google analytics on 26 May 2008. During 26 May 2008 - 31 March 2010, Google Analytics gave 10402 page views, 8444 unique page views and usage through 782 cities across 92 countries in 6 continents. During 01 April 2009 to 31 March 2010, the Server gave 5392 page views and usage through 448 cities across 78 countries in 6 continents.

Outliers in Multi-response Experiments

Experiments in which data on several responses are measured from an experimental unit corresponding to the application of a treatment, are known as multi-response experiments. Multi-response experiments are very common in agricultural experiments. Complete multi-response experiments are those experiments in which all the response variables are recorded from each experimental unit. Outlier(s) in multi-response experiments is/are likely to appear. If an experimental plot is heavily infested with pests, disease and/or weeds then all the responses observed from that plot may be outlier(s). Outlier(s) may also occur because of heavy irrigation on some experimental plot(s) by mistake. Outlier(s) could very well be due to transcription errors. The data from such experiments is generally analyzed without giving any importance to these outlying observations. When outliers are present in the data, the whole setup of the experiment is disturbed which may result in erroneous conclusions. Therefore, it becomes pertinent to detect outlier(s) before analyzing the data from these experiments.

A test statistic has been developed earlier for detection of a single outlier observation vector in multi-response experiments conducted in block designs. It may happen that all the components of the observation vector obtained from an experimental unit may not be outlier. To deal with the situations where observations from all the responses may not be outliers, general expression of Cook-statistic has been obtained for detecting any t observations from each of any k responses as outliers. Then appropriate expressions for some particular cases are also obtained.

Further, outlier(s) may exist in more than one observation vectors. Therefore, a general expression of Cook-statistic under mean shift model for detecting any t outlier observation vectors has been obtained. Two upper bounds of Cook-statistic have also been obtained. These upper bounds help to reduce the computation of all possible sets of t outlier observation

vectors. If these upper bounds are not statistically significant, then there is no need to compute all possible set of vectors. Developed statistics are applied to real experimental data.

Designs for Mixture Experiments in Agriculture

Mixture experiments with process variables have commonly been used in agricultural experiments. For example, consider an experiment that has been conducted with the application of 120 kg Nitrogen (N) applied in splits at different crop growth stages. Since the fixed quantity of nitrogen has been applied at different crop growth stages, therefore, the response depends upon the proportion of nitrogen applied at different crop growth stages. This experiment has been conducted with two varieties of paddy viz. Saket-4 (early) and Rasi (medium). The split doses of nitrogen applied in splits constitute the experiments with mixtures. The varieties are not the part of mixture proportions but they affect the response variable. So the variety is the process variable and the whole experiment becomes mixture experiment with process variable. These experiments in NARS are generally conducted and analyzed using a randomized complete block design. This provides the inference on the best treatment tried during the experiment and does not provide any information on the relationship of the proportions with the response variable. Further, the experimenter may be interested in obtaining optimum split which may be other than those tried in the experiment.These questions can be answered by drawing an analogy of these experiments with experiments with mixtures. The basic problem in analyzing the data from these experiments as per experiments with mixtures methodology is that the number of points are chosen arbitrarily and may not allow fitting of canonical polynomials.

To deal with such situations, two methods of construction of designs for mixture experiments with process variables have been developed. In Method I, the use of orthogonally blocked response surface designs and projection matrices is suggested. In Method II, blocking criteria of response surface designs suggested by Wu and Ding (1998; *J. Statist. Plann. Inf.,* **71**, 331-348) is employed. The designs for mixture experiments with process variables obtainable from these methods of construction have been catalogued for both Linear and Quadratic models for 2-5 mixture components and one process variable with 2-levels.

Experimental Designs for Agricultural Research Involving Sequences of Treatments

In many agricultural experiments and veterinary trials, it is often required to measure the effect of response from two or more factors. In some of such trials, one of the factors does not exhibit residual effects, while the others do. For this situation, a class of factorial designs involving sequences of treatment combinations arising from two factors that are balanced for residual effects of one factor has been obtained. These designs can be obtained for all levels of first factor (≥ 3) with a restriction of number of levels of second factor as 2. These designs are found to be partially variance balanced with treatment combinations following a varying circular association scheme. Efficiency of these designs has been studied in comparison to a single factor design.

The most distinguishing feature of designs involving sequences of treatments is the presence of residual or carry over effects of treatments as observations are taken repeatedly from same experimental units from period to period. These carry over effects may be of different magnitudes and types. But mostly the carry over effect is in some way or other proportional to the direct effect of treatments. Designs involving sequences of treatments with an additive carry over model with carry over effects proportional to the direct effects are suitable for such situations. Proportionality parameter is unknown and prior information on the proportionality parameter would be helpful. Particular interest centers on the sign of the proportion, that is, whether carry over takes the form of assimilation or a contrast between successive treatments. But this entirely depends on the nature of the experiment. Model and experimental set up for evaluation of designs involving sequences of treatments with residual effects proportional to direct effects has been defined. Information for the estimation of contrasts pertaining to direct effects of treatments in six classes of designs involving sequences of treatments [Williams (1949, *Australian J. Sci. Res.*, **A2**); Balaam (1968, *Biometrics,* **24**); Sharma 1981, *Australian J. Statist.*, **23(3)**)] for proportionality parameter taking values from -1 to +1, is worked out empirically using SAS codes developed, as compared to an orthogonal design with the same number of replications. The value of the proportionality parameter is estimated based on the maximum information obtained for different number of treatments. This will

help the experimenter in selecting an appropriate design for a given situation.

In some experimental situations involving sequences of treatments, the experimenters are interested in the comparison of several new (test) treatments to another set of established (standard or control) treatments rather than in all possible pair-wise comparisons. Here, the interest is in drawing inference on a subset of comparisons among treatments and so designs need to be developed to meet these requirements. A series of designs involving sequences of treatments for comparing two disjoint sets of treatments has been obtained and variance of contrasts pertaining to direct as well as residual effects of test versus test, test versus control and control versus control treatments have been worked out. A list of parameters of these designs has been prepared for number of test treatments < 15 along with the variances.

Nested Designs involving Sequences of Treatments

In the experimental situations, wherein experimental units are required to perform a series of tasks one after another under various experimental conditions such as different types of lighting or temperature or equipments, it is difficult to change the experimental conditions. Each subject is required to perform all the assigned tasks under one set of conditions during one session. The conditions are altered from one session to another. This has a resemblance with nested structure with experimental conditions treated as levels of first factor (bigger set) and different tasks treated as levels of nested factor (smaller set). For such experimental situations, two classes of nested designs involving sequences of treatments with same number of experimental periods and units have been obtained. The precision of estimation of direct and residual effects is more with the design having more number of levels of the nested factor.

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. Universal optimality of circular neighbour balanced block designs under mixed effects model, assuming block effects to be random, has been established. Combined intra-inter block reduced normal equations for estimating direct and neighbour effects have been derived. Some universally optimal families of circular neighbour balanced block designs have also been obtained.

The concept of Neighbour Balanced Block (NBB) designs has been defined for the experimental situation where the treatments are the combinations of levels of two factors and only one of the factor exhibits neighbour effect. Some methods of constructing complete NBB designs for two factors in a plot strongly neighbour balanced for one factor has been obtained. These designs are variance balanced for estimating the direct effects of contrasts pertaining to combinations of levels of both the factors. An incomplete NBB design for two factors has also been obtained which is found to be partially variance balanced with three associate classes.

Conditions have been derived for the estimation of coefficients of second-order response surface model for the experimental situation in which the experimental units, i.e., plots experience the neighbor effects from immediate left and right neighboring plots assuming the plots to be placed adjacent linearly with no gaps. A method of constructing rotatable designs for fitting second-order response surface in the presence of neighbor effects has been developed.

Partially Balanced Incomplete Block Designs

Two three-class association schemes called tetrahedral association scheme and cubical association scheme have been defined along with methods of constructing partially balanced incomplete block designs based on these schemes. Designs based on cubical association scheme are found to be resolvable. These designs are more efficient than the circular lattice [PBIB(3) designs] with the same number of experimental units for the estimation of elementary treatment contrasts.

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 λ and all other concurrences as zero, $m \leq \left[\frac{v}{2}\right]$, here [.] 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 $m = 1,2,..., \left[\frac{v}{2}\right]$. These designs have one to one correspondence with balanced sampling plans excluding adjacent units.

Generalized Row-column Designs for Agricultural Experiments

Row-column designs are widely used in agricultural and horticultural research for the control of non-treatment variability in experiments conducted both in field as well as glasshouse arising due to two sources of variability in the experimental material. However, for many agricultural experiments, the number of treatments may be substantially larger than the number of replicates and standard row-column designs may not be useful. Semi-Latin Squares which are generalized $n \times n$ Latin squares for nk treatments, where k is an integer greater than one, have been developed in literature for such situations. Intersection of each row and column contains a cell of k units. Each row and each column contains a set of nk units such that every treatment occurs once in every row and every column.

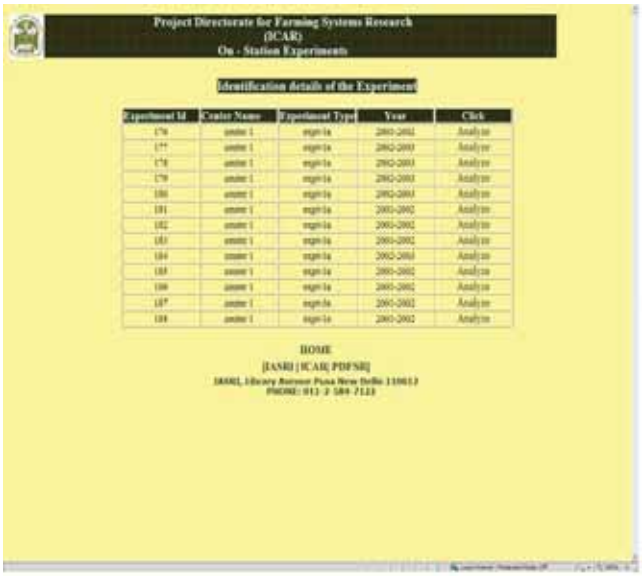
Most of the work on semi-Latin Squares has resulted in designs with complete rows and columns and restricted to cell size two. The experimental situations may require designs with incomplete rows. For such situations, a method of constructing generalized incomplete Trojan-type design for $v = sm$ ($s \geq 2$) treatments in m rows, n columns with cells containing k (= $s\alpha$) sub-units has been developed. Each treatment is replicated p (= αn; α, $n \geq 2$ and $4 \leq p \leq m - 2$) times in the design. The columns of the generalized incomplete Trojan-type design so obtained are complete with each treatment occurring α times and the rows are incomplete.

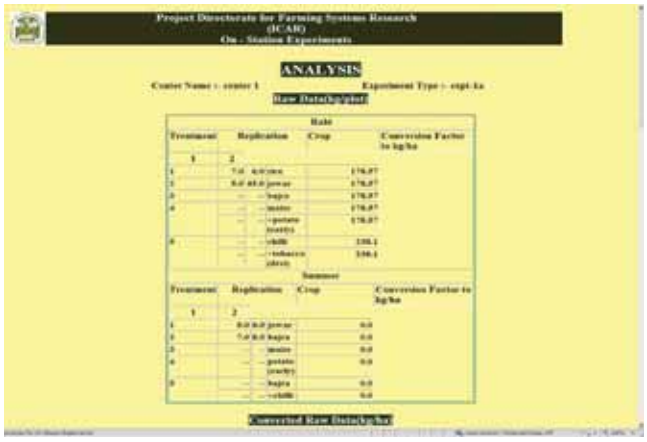
Experiments Planned on Stations under the Project Directorate for Farming Systems Research

The experiments under the Project Directorate for Farming Systems Research are planned and conducted under four types of research programmes viz. (i) development of new cropping systems; (ii) nutrient management in cropping systems; (iii) development of system based management practices and (iv) maximum yield research. These experiments are conducted using Randomized complete block (RCB) design, Factorial RCB design, $3^2 \times 2$ balanced confounded factorial experiments.

Data of 75 experiments conducted during the year 2007-08 have been received and analysis has been completed. Out of 75 experiments, in 26 experiments percent coefficient of variation was found to be more than 10% and in 21 experiments CV was less than 5%. Treatment effects were found to be significant in 57 experiments. Results have been tabulated in the form of summary tables and have been sent to the respective scientist- in-charge of the cooperating centres. The final tables of the results of the experiments conducted during 2007-08 at OSR centres have been prepared and sent to PDFSR, Modipuram for inclusion in the project report of AICRP on IFS. Data of 120 experiments conducted during the year 2008-09 have been received and analysis work is in progress.

Developed the software module for online data entry of Experiment 1a (Intensification /Diversification of cropping sequence based on high value crops). The module for analysis of data pertaining to this experiment has also been developed. Both the modules are in testing stage. Some screen shots are





On Farm Research Experiments

Three types of experiments viz. Response of nutrients; Diversification/Intensification of cropping system and sustainable production system are planned and conducted at 32 On-Farm centres in farmers' fields under the Project directorate of Farming Systems Research, Modipuram during 2008-09. The data of 82 experiments conducted at 1732 farmers' fields at 23 On-Farm centres are processed for statistical analysis. Distribution of percent coefficient of variation (CV) of experiments is obtained and it is observed that majority of experiments (61%) have CV less than 5% and 31% of experiments have CV in the range of 5% to 10%. In 72% of experiment-III (Sustainable production system) the CV is found to be less than 5% whereas it is in 56% of the experiment-I (Response of nutrients).

Software module has been developed for on-line data entry and statistical analysis of experiment-I (Response of nutrients) from the respective centres is under testing stage. Some screen shots that give index for users to view introduction of the experiment, login to view several features including data entry, analysis and reports are:

As per the authentication level of the user, the user can browse the information. A user given the level of Super Adminstrator to enter data in respect of experiments can view the analysis, year-wise report as well as use help module to enter data. A screen shot is as:

On selecting Analysis, one gets the following form for which analysis could be viewed:

The results are displayed as follows:

Analysis of Variance (ANOVA)
for Farming Situation

Sources of Variation	Degree of Freedom	Sum of Square	Mean Sum of Square	F Value	Significance
Blocks(BLK)	1	332.46	332.46	65.57	**
Villages	4	143.98	35.99	7.1	**
Treatment(TRT)	4	3164.41	791.1	156.04	**
BLK * TRT	4	0.33	0.08	0.02	Not Significant
Error	16	81.09	5.07	1.0	
Total	29	3722.27	128.35		

Note:- * Significant(at 5%) ** Highly Significant(at 1%)

Treatment:	T_1	T_2	T_3	T_4	T_5
Mean (q/ha):	36.79	43.94	51.27	59.93	64.92
Response Over Control	--	7.15	14.48	23.14	28.13

Standard Error = 0.95
Critical Difference = 2.01

Analysis of Variance for District/NARP zone

Sources of Variation	Degree of Freedom	Sum of Square	Mean Sum of Square	F Value	Significance
Farming Situation (FS)	0	0.0	0.0	0.0	Not Significant
Treatment(TRT)	4	3164.41	791.1	156.04	**
FS * TRT	0	0.0	0.0	0.0	Not Significant
Error	16	81.09	5.07	1.0	
Total	29	3722.27	128.35		

Treatment	T_1	T_2	T_3	T_4	T_5
Narp Zone Mean(q/ha):	36.79	43.94	51.27	59.93	64.92

Standard Error = 0.95
Critical Difference = 2.01
Coefficient of Variance = 3.14

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Fertilizer Response Ratio

Fertilizer Response Ratio (FRR), average increase of grain yield in kg of a crop due to per kg use of fertilizer nutrient of 14 crops (5 cereals, 4 pulses, 5 oilseed) at NARP zone level, state level and all India level has been obtained from the data of experiments "Response of Nutrients" for the period 1999-2000 to 2006-07. Eight fertilizer response ratios for different fertilizer combinations such as N, NP, NK, NPK over control, P over N and NK, K over N and NP have been worked out for different crops when the recommended doses of these fertilizers are applied.

It is observed that the fertilizer response ratios vary widely from region to region and crop to crop. Fertilizer response ratios for kharif rice of N over control vary from 1.97 kg/kg (North Telengana) to 25.57 kg/kg (Eastern Dry Zone of Karnataka) at NARP zone level and that of NPK over control vary from 4.34 kg/kg (North Telengana) to 26.35 kg/kg (Upper Brahmputra Valley of Assam). At national level the fertilizer response ratio of all nutrient combinations are high and vary from 11.96 kg/kg of N over control to 17.73 kg/kg of P over NK for rice crop whereas these values are low ranged 2.93kg/kg to 7.07 kg/kg for Jowar crop. The response ratios of various nutrients for Maize and Wheat crop are observed to be of moderate and high order at national level. Among the pulse crops, Redgram shows lower response ratios of 2.51 kg/kg to 4.16 kg/kg for various nutrient combinations. The response ratios of cotton are found to be 4.16 kg/kg of N over control and 9.49 kg/kg of K over NP.

From the study, it is seen that for the cereal group of crops the respective response ratios at all India level for all nutrient combinations are higher than those of oilseed and pulse group. The fertilizer response ratios of N over control are 9.20, 7.73 and 8.51 kg/kg for cereals, oilseeds and pulse group whereas these value of NPK over control are 10.80, 5.60 and 6.70 kg/kg respectively. The pooled response ratio for all foodgrain crops put together at national level lies between 8.79 kg/kg (NP over control) and 10.98 kg/kg (K over NP). The fertilizer response ratio for all foodgrain crops for NPK over control is observed as 9.27 kg/kg which is more than response observed for N, NP, NK over control. This indicates that use of recommended dose of NPK enhances productivity.

Experiments Relating to AICRP on STCR

Experiments with new treatment structure involving organic manures and major nutrients N, P and K in a 3^3 factorial setup in 24 design points are conducted at 15 centres of AICRP on STCR project using the design suggested by the Institute. No data is reported from Coimbatore centre. To examine whether the fertility gradient has been created, analysis of variance is carried out using the soil nutrients SN, SP and SK separately as dependent variables. It is observed that out of 13 centres (Bangalore, Bikaner, Barrackpore, Hisar, Jabalpur, Kalyani, Vellanikkera, Ludhiana, New Delhi, Pantnagar, Pusa (Bihar), Rahuri and Raipur) the

fertility gradient is created in respect of SN, SP and SK over all the fields of experimentation in 9 centres (except in Barrackpore, Kalyani, New Delhi and Kerala). In the remaining centres, it is not created for either in respect of SN or SP or SK. While checking the creation of fertility gradient (Organic manure level wise) it is observed that in 7 centres (Bangalore, Bikaner, Hisar, Jabalpur, Pantnagar, Pusa (Bihar) and Rahuri) the fertility gradient is created for SN, SP and SK. In the remaining centres, it is not created for either in respect of SN or SP or SK.

The following analyses are also performed: (1) Evaluation of responses to middle (optimum) doses of N, P and K, (2) Analysis of variance with and without covariates SN , SP and SK, (3) Fitting of response surfaces at various levels of organic manure and also combined over all levels, (4) Testing of homogeneity of the regression equations, (5) Exploration of response surface in the vicinity of the stationary point, (6) Estimating the optimal values of N, P and K to be applied and (7) Estimation of optimal values of N, P and K with the help of targeted yield equations.

When analysis of variance is carried out for Treatment, FYM and their interaction, it is observed that in 6 centres all the effects are significant. In the remaining centres, it is observed that in most of the cases, the interaction effect is not significant. When analysis of covariance is carried out taking the soil available nutrients SN, SP and SK it is observed that in most of the cases, the interaction effect is also significant along with considerable reduction in coefficient of variation. Analysis of covariance helped in identification of the best level of the organic manure. At Pantnagar it is observed that for all the 5 crops (Garlic, Mustard, Onion, Potato and Wheat), the treatment, FYM and their interaction effects are non-significant for both analysis of variance as well as analysis of covariance.

When analysis of variance is carried out for treatment, farmyard manure (FYM) and strips (within FYM levels), it is observed that at almost all the centres, all the effects are significant. In some cases, it is observed that the effect of the strips (within FYM levels) are not significant.

Fitting of response surfaces at various levels of organic manure and also combined over all levels are performed and then the homogeneity of the regression equations are tested. It is observed that at all the centres, the three regression equations are found to be homogeneous. Therefore, combined regression over all the levels of the organic manure is obtained to arrive at appropriate response function.

Substituting the site specific soil test values of SN, SP and SK; the combined regression equation reduces to complete second order Response Surface in terms of added fertilizers N, P and K respectively. Canonical analysis of Response Surface gives the nature of the stationary point as maxima, minima or as saddle point (neither maxima nor minima) with optimum doses of Fertilizer Nitrogen, Fertilizer Phosphorus and Fertilizer Potassium along with predicted yield at stationary point. The exploration of response surface in the vicinity of stationary point is performed when the stationary point is a saddle point**.** This is done with the help of a SAS code developed under this project. In this approach, given the site specific soil test values of the soil available nutrients, it is possible to generate various combinations of optimum values of the nutrients, N, P and K for a given targeted yield. The optimum values of nutrients to be applied obtained through above investigation can be used in demonstration trials for testing the validity. This exercise has been carried out for all the crops of various centres.

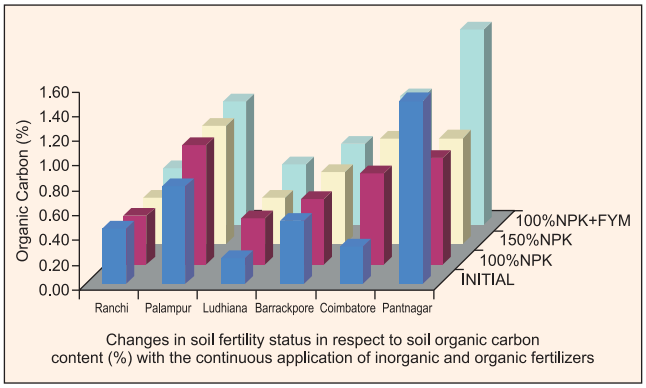
Experiments conducted under AICRP on Long-Term Fertilizer Experiments

The statistical analysis and summarization of results of the data generated from experiments conducted over the years (1971-2007) to study the effect of continuous application of plants nutrients, singly and in combination with organic/inorganic form in different cropping systems, under All India Co-ordinated Research Project on Long Term Fertlizer Experiments (AICRP on LTFE) at different locations have shown the beneficial effect of farm yard manure (FYM) (10-15 t/ha/yr) applied in conjunction with 100% optimal NPK. Perusal of responses computed over un-manured control has revealed its enhanced overall mean response (over 100% NPK) by 9.8 to 56.5% at various locations. Noteworthy beneficial effect of FYM are observed at Ludhiana - maize (overall 52.7% increase over 100% NPK); Palampur - maize & wheat (47.8% & 40%); Bangalore - maize (21.6%); Coimbatore - finger millet & maize (28.4% & 20.1%); Pantnagar - rice & wheat

(34.9% & 31.6%) and Ranchi - soybean & wheat (36.7% & 25.6%). In relatively new locations at Junagadh - groundnut & wheat and Pattambi - rice & rice, the improvement in overall mean responses over 100%NPK with the use of FYM are in the range of 41 to 56.5%, while at Raipur – rice & wheat and Udaipur – maize & wheat the range is 11 to 33%.

Crop-wise 'Yield Sustainability Indices' (YSI), for various treatments worked out to identify progressive practices capable of producing high yields over the years of experimentation have also indicated the need of integrated use of organic manure (FYM) beside recommended NPK level for sustaining high crop yields as higher YSI values relating to 100% NPK+FYM treatment are achieved. Comparative low values of YSI observed under the imbalanced treatments (N and NP) indicates that there may be decline in minimum achievable yield in these treatments, if continued over the years in future.

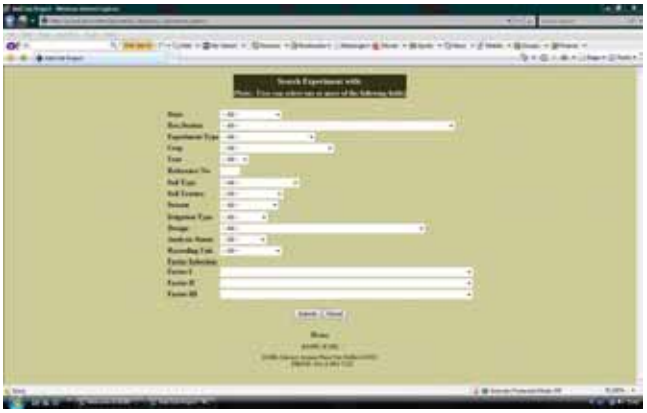
The basic objective of integrated nutrient use is to restore organic matter in soils to maintain soil quality. Soil fertility status in terms of soil organic carbon as affected by continuous cropping and manuring with inorganic and organic fertilizers over the years 1971-2007 is depicted as:



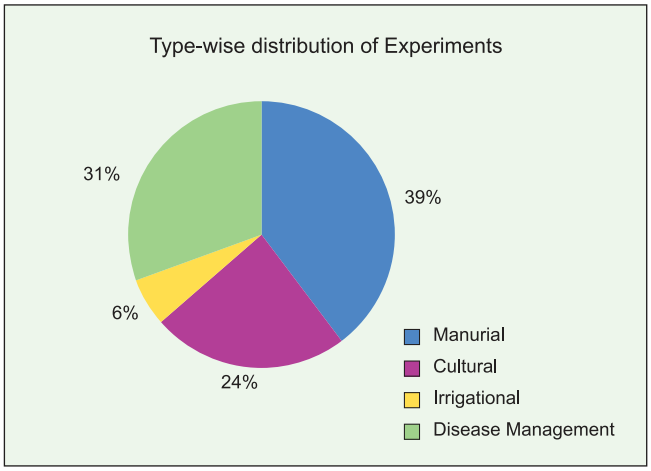
Changes in soil fertility status in respect to soil organic carbon content (%) with the continuous application of inorganic and organic fertilizers

Agricultural Field Experiments Information System

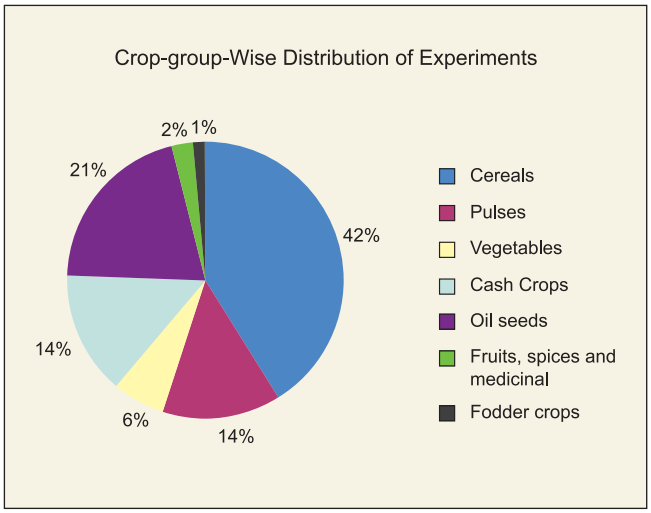
Agricultural Field Experiments Information System (AFEIS) is a web-enabled information system (http://js.iasri.res.in/afeis), wherein information relating to agricultural field experiments (excluding pure varietal trials) conducted in the country are stored and maintained on-line. The objective is to have at a central place, in a compatible form, the results and ancillary information of agricultural field experiments conducted in the past to serve as a reference material for scientists, research workers and planners, etc. in the field of agricultural sciences. Users can generate various real time reports dynamically as per their requirements based on crop, location, treatment factors, soil type, etc. in addition to some most commonly used pre-defined reports. Provision for on-line data analysis has also been made for some of the commonly used designs. The home page and search pages for the information system are:



Presently, the database has information relating to 29,284 agricultural field experiments conducted at various Agricultural Universities, ICAR Research Institutes, Project Directorates, All India Coordinated Research Projects and Directorates of Agriculture of State Governments, etc. Depending upon the nature of the treatments tried, experiments have been classified in various types as Manurial, Cultural, Disease, Pest and Weed Control measures and their combinations with variety, if any. The typewise distribution of experiments reveals that 39% of the experiments in the database has been carrried out with manurial treatments followed by disease management experiments (31%).



Crop groupwise distribution of experiments availabe in database shows that maximum number of experiments are conducted on cereal crops (42%). The number of experiments on pulse and oilseed crops are 14%, 21% respectively.



13,626 experiments from the database are validated and approved for inclusion in the system. For making provisions of data entry of field experiments by the scientists of ICAR Institutions/SAUs *etc*. and as per the discussions held with the Director, Monitoring and Programme Evaluation, ANGRAU, Hyderabad regarding data entry to AFEIS web site by their scientists, user authentication levels under AFEIS are reviewed. In this respect identification of types/ levels of users and accordingly modification in database tables and software development are being undertaken.

Programme 2: FORECASTING AND REMOTE SENSING TECHNIQUES AND STATISTICAL APPLICATIONS OF GIS IN AGRICULTURAL SYSTEMS

Forecasting Crop Yield and Forewarning Diseases using Artificial Neural Networks

Artificial Neural Networks 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 are 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 in India as response or output variable and weather indices as input variables. For disease forewarning, models are developed considering various aspects viz. maximum disease severity, crop age at first appearance of disease and 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. Forecasts are obtained for subsequent years. In this study, Multi Layer Perceptron (MLP) and Radial Basis function (RBF) based neural networks with different hidden layers (one and two) and different number of neurons in a hidden layer with hyperbolic function as an activation function are attempted and compared with weather indices (WI) based regression model. It has been found that MLP performs better in most of the cases in terms of mean absolute percentage error which indicates that neural network models possess considerable potential as an alternative to regression models for forecasting agriculture system. The mean absolute percentage error of various models for forecasting crop yield as well as disease infestation for various crops is presented in the following tables.

Mean Absolute Percentage Error for various models in different crops

Zone	Crop	MLP based ANN Model	RBF based ANN Model	WI based regression model
Central Plain Zone	Rice	2.8	5.4	4.4
	Wheat	2.1	3.1	3.9
	Sugarcane	1.5	6.0	1.8
Eastern Plain Zone	Rice	3.2	2.6	1.9
	Wheat	2.0	3.3	3.7
	Sugarcane	5.2	5.1	5.4
Bundelkhand	Rice	6.3	6.7	4.6

Mean Absolute Percentage Error of various models for forewarning mustard diseases

Character	Variety	ANN(MLP)	ANN(RBF)	Reg (WI)
Alternaria blMight **– Bharatpur 2006-07**				
Maximum Severity	Varuna (on Leaf)	111.0	153.8	150.1
Age at First Appearance		14.0	15.1	14.7
Age at Peak Severity		14.1	27.3	22.3
Maximum Severity	Varuna (on Pod)	113.7	143.6	132.6
Age at First Appearance		15.7	9.2	14.2
Age at Peak Severity		3.9	6.4	5.4
Maximum Severity	Rohini (on Leaf)	184.0	200.6	196.3
Age at First Appearance		12.0	15.5	8.9
Age at Peak Severity		28.3	27.8	26.2
Maximum Severity	Rohini (on Pod)	174.8	220.4	229.6
Age at First Appearance		29.3	28.2	24.7
Age at Peak Severity		19.2	20.7	17.6
Alternaria blight **– Dholi 2004-05**				
Maximum Severity	Varuna(on Leaf)	38.1	29.9	51.9
Age at First Appearance		15.6	9.9	8.4
Age at Peak Severity		5.0	9.6	9.3
Maximum Severity	Pusabold (on Leaf)	32.0	45.9	48.5
Age at First Appearance		7.2	10.9	10.4
Age at Peak Severity		5.9	5.1	7.0
Maximum Severity	Varuna (on Pod)	88.1	75.4	88.9
Age at First Appearance		7.6	12.8	3.9
Age at Peak Severity		4.0	4.9	3.0
Maximum Severity	Pusabold (on Pod)	65.5	82.5	91.8
Age at First Appearance		6.4	11.1	6.9
Age at Peak Severity		3.5	3.3	3.3
Alternaria blight **– Behrampur 2004-05**				
Maximum Severity	Varuna (on Leaf)	60.1	64.4	61.9
Age at First Appearance		18.8	20.1	22.3
Age at Peak Severity		13.8	10.3	9.7
Maximum Severity	Varuna (on Pod)	107.2	81.8	68.1
Age at First Appearance		21.9	19.3	23.3
Age at Peak Severity		6.9	7.8	7.4
Maximum Severity	Binoy (on Leaf)	50.3	40.1	61.0
Age at First Appearance		12.1	12.4	12.4
Age at Peak Severity		10.5	11.9	9.7
Maximum Severity	Binoy (on Pod)	120.4	194.4	182.7
Age at First Appearance		22.3	18.4	12.6
Age at Peak Severity		3.8	3.0	2.9
Powdery mildew **– S.K. Nagar 2006-07**				
Maximum Severity	Varuna	26.5	56.2	35.1
Age at First Appearance		12.2	15.1	20.2
Age at Peak Severity		9.5	13.5	12.8
Maximum Severity	GM2	6.7	50.2	64.7
Age at First Appearance		21.4	15.3	21.7
Age at Peak Severity		12.8	14.1	13.8

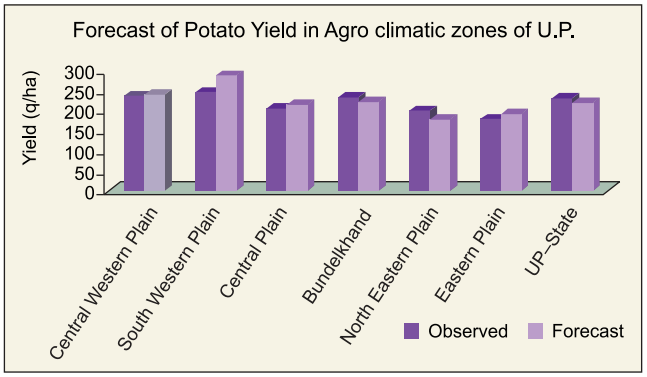
It is found that that disease forewarning models based on MLP architecture are better in 24 cases, RBF architecture are better in 6 cases and weather indices based regression models are better in 12 cases. The results indicate that the neural networks models using MLP architecture can usefully be employed for forecasting crop yield and forewarning diseases.

Weather based Models for Forecasting Potato Yield in Uttar Pradesh

Weather based models for forecasting potato yield in Uttar Pradesh have been developed by using weather data on maximum and minimum temperature and morning and evening relative humidity during the period 1971-2002. The weather indices are constructed and used for development of regression models (RM) and complex polynomials (CP - using Group Method of Data Handling technique). The models are developed at district as well as at zone levels (by pooling the data of various districts within the respective zones). The data for the year 2002-03 is used for validation of models. Using these models, the forecasts are computed at district-level. The district-level forecasts are combined by taking the area under the districts as weights to obtain forecasts at agro-climatic zone/state level. The salient findings are:

- District level models provide better forecast than zone level models in most of the cases indicating that development of district-level models may be preferred only when adequate data are available.
- At state level, the per cent deviations of forecasts from the observed ones are less than 5%.
- It is feasible to obtain reliable forecasts about three/four weeks before harvest.

Forecasts using these models and observed yields for various zones and state as a whole are presented as:



Stochastic Process Modeling and Forecasting through Discrete Nonlinear Time Series Approach

In the versatile nonparametric functional coefficient autoregressive model (FCAR), the coefficient-function changes gradually rather than abruptly and this model is given by

$$Y_t = a_1(U_t) X_{t-1} + a_2(U_t) X_{t-2} + \ldots + a_p(U_t) X_{t-p} + e_t$$

where Y_t is response variable, X_{t-i} , $i=1,2,\ldots,p$ are explanatory variables, U_t is lag d variable, X_{t-d}, and $\{\varepsilon_t\}$ is a sequence of independent random variables with zero mean and unit variance.

The coefficient-functions may be estimated by using Taylor's series expansion in which unknown coefficients are estimated by the method of weighted least squares, weights being the kernel density function. Using the data with U_i around u_0, the following expression is minimized:

$$\sum_{i=1}^{n}\left[Y_i-\sum_{j=1}^{p}\left\{a_j+b_j(U_i-u_0)\right\}X_{ij}\right]^2 K_h(U_i-u_0)$$

where $K(.)$ is a Kernel function and h is the bandwidth. Optimal bandwidth h is selected by Modified multifold cross-validation criterion. The overall average prediction error is given by

$$APE\ (h)=Q^{-1}\sum_{q=1}^{Q} APE_{\ q}(h)$$

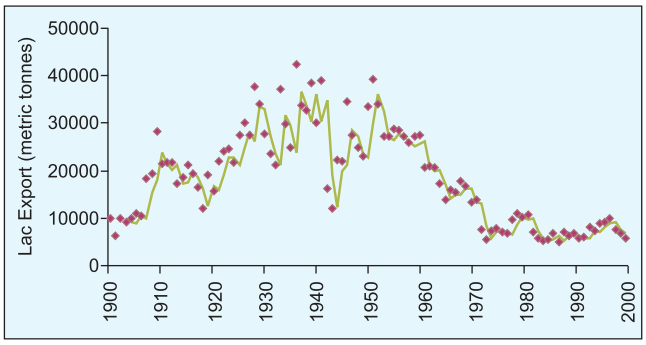
The FCAR model is fitted to annual lac export data of India for the period 1900-2000. The data is obtained from the Shellac and Forest Products Export Promotion Council, Kolkata.

Estimates of parameters are obtained by using computer program written in SAS-IML. The optimum values are found as $p = 4$ and $d = 3$.

The fitted FCAR (*4,3*) model for log data is obtained as

$$\log X_t = \{4.216 + 0.200\,(\log X_{t-3} - 4.150)\}\log X_{t-1} + \{4.423 - 0.2370\,(\log X_{t-3} - 4.150)\}\log X_{t-2} + \{4.381 - 0.040\,(\log X_{t-3} - 4.150)\}\log X_{t-3} + \{4.380 + 0.025\,(\log X_{t-3} - 4.150)\}\log X_{t-4} + \varepsilon_t$$

The fitted FCAR(4,3) model along with data points is exhibited below:



Formulae for one-step and two-step ahead forecasts for fitted SETAR and FCAR models have been derived.

One step and two step ahead forecasts for ARIMA, SETAR and FCAR models are:

One-step and Two-step ahead forecast of lac export

Years	Actual	Forecast by		
		ARIMA model	SETAR model	FCAR model
2001	7015	5083.59 (5372.04)	6621.03 (6167.43)	6903.81 (6985.61)
2002	6819	6222.60 (5024.97)	8019.83 (7138.36)	7768.40 (7670.08)
2003	6632	6221.21 (5405.97)	6775.99 (8148.12)	6990.92 (7801.76)
2004	7301	6188.47 (5347.00)	7621.51 (9198.28)	7292.87 (8676.72)

Values in parenthesis indicate two-step ahead forecast

It is observed that one-step ahead mean absolute prediction error (Mean squared prediction error) for FCAR, ARIMA, SETAR models are 356.91 (260649.92), 2283.68 (13621643) and 514.82 (430166.2) respectively. Similarly, for two-step ahead mean absolute prediction error (Mean squared prediction error) for these respective models are found to be 856.49 (996534.97), 1654.25 (2809782) and 1147.08 (1679664) respectively. This ensures that FCAR model performs better with respect to modeling and forecasting.

In the field of agriculture, quite often the time-series data depicts cyclical patterns. Some examples of such behaviour are: India's annual lac production/export data, India's summer monsoon rainfall data and Population-sizes of several fish species having prey-predator type of interactions. Self-exciting threshold autoregressive (SETAR) family of nonlinear time-series models with more than one threshold is capable of describing cyclical data having sudden rise and fall.

SETAR three-regime model, written as SETAR (3; k_1, k_2, k_3) model, can be expressed as

$$X_t=\begin{cases} a_0^{(1)}+\sum_{i=1}^{k_1}a_i^{(1)}X_{t-i}+\varepsilon_t^{(1)}, & \text{if } X_{t-d}\le r_1 \\ a_0^{(2)}+\sum_{i=1}^{k_2}a_i^{(2)}X_{t-i}+\varepsilon_t^{(2)}, & \text{if } r_1 < X_{t-d}\le r_2 \\ a_0^{(3)}+\sum_{i=1}^{k_3}a_i^{(3)}X_{t-i}+\varepsilon_t^{(3)}, & \text{if } X_{t-d} > r_2 \end{cases}$$

where k_1, k_2, k_3 are orders of three Autoregressive (AR) models; $a_i^{(1)}$, $a_i^{(2)}$, $a_i^{(3)}$ are autoregressive coefficients; $\varepsilon_t^{(1)}, \varepsilon_t^{(2)}, \varepsilon_t^{(3)}$ are the white noise terms; d is the delay

parameter (where the controlled threshold occurs) and r_j, $j = 1, 2$ represent threshold values.

The three operators viz. selection, crossover, and mutation make genetic algorithm an important tool for optimization. When a string (parameter solution) is created by GA, it is evaluated in terms of its fitness, which is the residual sum of squares (RSS). Selection operator of GA is performed to identify good solutions, to make its multiple copies and to eliminate bad solutions from the population. Since selection operator can not create a new solution, the crossover and mutation operators are used in mating pool to create a new population. If a crossover probability p_c is used, 100 p_c% strings in the population are used in the crossover and rest of the population is simply copied to the new population. Diversity in the population can be ensured by mutation operator. It alters a string locally to create a better string (parameter solution). To ensure the chance of entering new chromosomes into the population, mutation with very small probability, say 0.01 is required. In real coded GA, pair of real-parameter decision variable vector is used to create a new pair of offspring vectors and a decision variable vector is perturbed to a mutated vector in a meaningful manner using Simulated Binary Crossover operator.

The data on all-India annual lac production for the period 1930-31 to 2002-03 is considered. The objective function Normalized Akaike Information Criterion (NAIC) given by

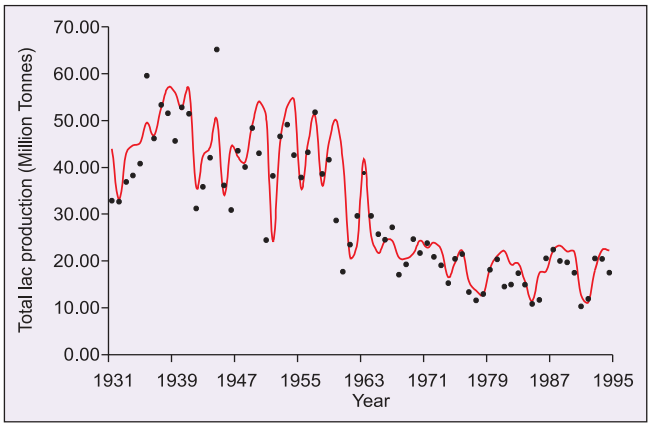
$$NAIC=[AIC(k_1)+AIC(k_2)+AIC(k_3)]/(N-d)$$

is used for selecting the best model by applying GA operators described above. Real-coded GA with SBX (crossover operator) where is applied for estimation of parameters. Computer programs for fitting SETAR three-regime model are developed in C++. The GA parameters viz. population size, crossover probability, and mutation probability for minimization of equation given below are respectively 100, 0.9, 0.01 with number of generations as 100. The best fitted SETAR three-regime model on the basis of minimum NAIC value, viz. 6.23, is

$$X_t = \begin{cases} 12.00 + 0.51\, X_{t-1} + \varepsilon_t^{(1)} & \text{if } X_{t-1} \le 25 \\ 29.94 + 0.39\, X_{t-1} + \varepsilon_t^{(2)} & \text{if } 25 < X_{t-1} \quad 40 \\ 25.01 + 0.60\, X_{t-1} + \varepsilon_t^{(3)} & \text{if } X_{t-1} > 40 \end{cases}$$

with Var $(\varepsilon_t^{(1)})$=2.15, Var $(\varepsilon_t^{(2)})$=4.31 and Var$(\varepsilon_t^{(3)})$=8.61.

To get a visual idea, the fitted SETAR (3; 1, 1, 1) model along with data points is exhibited below:



A mechanistic interpretation of fitted SETAR model is as follows. The above fitted model can be written as

$$X_t - X_{t-1} = \begin{cases} 12.00 - 0.49\, X_{t-1}, & \text{if } X_{t-1} \le 25 \\ 29.94 - 0.61\, X_{t-1}, & \text{if } 25 < X_{t-1} \le 40 \\ 25.01 - 0.40\, X_{t-1}, & \text{if } X_{t-1} > 40 \end{cases}$$

In the lower regime, i.e. $X_{t-1} \le 25$, $X_t - X_{t-1}$ tends to be positive but small, implying slow increase in lac production. In the middle regime, i.e. $25 < X_{t-1} \le 40$, $X_t - X_{t-1}$ tends to be positive but large, implying comparatively faster increase in lac production. However, in the higher regime, i.e. $X_{t-1} > 40$, $X_t - X_{t-1}$ tends to be negative, implying decrease in the lac production. This type of behavior leads to cyclicity, which is in agreement with observed lac production data.

The forecast value for country's lac production has been calculated and presented below for the year 2003-04 to 2007-08 using the fitted model. The forecast performance for hold-out data on the basis of root mean square error and mean absolute error for the fitted SETAR model are computed as 2.71 and 2.27 respectively.

Forecasting for hold-out data of all-India lac production data (metric tonnes) by SETAR three-regime model

Year	Actual	Forecast
2003-04	20.05	20.77
2004-05	21.30	22.05
2005-06	18.00	22.67
2006-07	23.23	21.02
2007-08	20.64	23.64

To sum up, for country's lac production data, it is concluded that three-regime SETAR model has performed satisfactorily for modelling and forecasting purpose.

For multimodal rainfall data, methodology of fitting mixture of distributions to 'body' and 'tail' using statistical learning theory is demonstrated. Three estimators of extreme value index are computed to fit the theoretical tail distribution to the rainfall data. "Structural risk minimization procedure" is applied to fit the 'body 'of the rainfall distribution. As an illustration, the probability distribution of monthly rainfall data for Orissa meteorological subdivision is obtained by combined body-tail estimation method and it is shown that Hill's method has performed the best.

Remote Sensing Based Methodology for Collecting Agricultural Statistics in North-East Hilly Region

At present the Meghalaya state does not have any objective approach for collection of agricultural statistics for various crops. Only approximately 10% of the geographical area of the state is under agriculture, which is scattered throughout the state. Therefore, it is realized that it may be difficult to collect the information about agricultural statistics using only remote sensing data, as identification of these small pockets of agricultural land may lead to large extent of error components. Moreover due to the problem of cloud cover, cloud free satellite data is also not available. Further no cadastral maps and clear-cut village boundaries exists, therefore traditional method of sample survey is not appropriate for providing suitable estimates of area under various crops. Thus, there is need to develop an integrated methodology for collection of agricultural statistics using remote sensing satellite data combined with ground survey and geographical information system (GIS). Thus this study is taken up with the objective of developing remote sensing based sampling methodology for multiple crop acreage estimation in Meghalaya. Under this study major crops of the state like paddy, maize, potato, pineapple, cashewnut are cosidered covering four districts (East Garo Hills, West Garo Hills, East Khasi Hills and Ri-Bhoi) of the state.

The data analysis for Rabi season was completed for all the four districts. Primary data collection is carried out in two districts of Ri-Bhoi and West Garo Hills for the Kharif season. The estimates of area under major crops are obtained on the basis of two season data using the proposed integrated methodology based on ground survey, remote sensing/satellite data and GIS. Analysis using post-stratification considering the layers of cropped area, jhum cultivation layer and Digital Elevation Model (DEM) layer, is also performed.

Programme 3: DEVELOPMENT OF TECHNIQUES FOR PLANNING AND EXECUTION OF SURVEYS AND ANALYSIS OF DATA INCLUDING ECONOMIC PROBLEMS OF CURRENT INTEREST

Spatial Market Integration Studies

Spatial market integration is studied using advanced econometric tools namely Augumented Dickey Fuller technique for testing stationarity of time series, Johansen's Co-integration method for finding the cointegrating vectors and Vector Error Correction mechanism for finding out the speed of adjustment of price series to equilibrium for whole sale market of important cereals (rice, wheat, jowar, bajra, maize), oilseeds (ground nut, mustard), edible oils (coconut oil, ground nut oil, mustard oil) and pulses (gram, moong, arhar, urd, etc.) using time series data on wholesale prices for the period 1996 to 2008. The analysis revealed that the integration among the markets has improved over the recent years. The prices of agricultural commodities tend to converge among a few selected state-level wholesale markets in India. Further, the speed of convergence to the long-run path resulting from a shock in price is slow in case of almost all the selected commodities except paddy and wheat. The minimum support price and procurement policy are effectively implemented in rice and wheat crops which ensured price stability and stronger market integration. Similarly these schemes may be effectively implemented in other crops along with development of infrastructure and market intelligence to ensure better market integration.

There is evidence of high volatility in the wholesale prices of apple and pineapple crops. State level wholesale markets are found to be weakly integrated for these horticulture crops in India as metropolitan markets like Kolkata and Mumbai have failed to show integration with markets operating in other major states. Further, integration in case of fruits like apple and pineapple may be weak for several other markets in India, particularly in non–metro towns /cities /remote

areas, which are poorly connected with other markets due to inadequate road connectivity, availability of timely transport facilities, weak storage facilities etc. The extent of spatial market integration of cereals, oilseeds, edible oils and pulses has improved in recent years from 1996 to 2008, compared to that in earlier years. The prices of agricultural commodities tend to converge among a few selected state-level wholesale markets in India. The analysis for wheat and paddy crops indicates the presence of similar long-run characteristics among the domestic prices except in few state level markets. The short run dynamics captured through VECM shows that the price movements along the long run equilibrium path in paddy are more stable. Greater spatial integration and fast speed of adjustment to any shock in wheat and paddy could be attributable to price policy backed by procurement in most of the states, which ensures greater price stability. Estimates of short run dynamics captured through VECM in case of jowar and maize crops reveal negative and significant error correction coefficients, indicating that the price series are stable in the long run and any deviation caused in their prices by any external shock is adjusted over a period of time. There exists full integration in the markets of groundnut and mustard oils while on the other hand, the integration of oilseed markets is partial and there are higher diversions in the long-run equilibrium path.

Futures Trading

In the area of futures trading, price volatility, price discovery and risk management are studied for important crops, and the contract designs of Indian wheat and maize crops are compared with US contracts.

It has been seen that there exists unidirectional Granger causality from futures to spot markets in case of gram. The volatility of futures market is greater than the spot market volatility. The distribution of spot prices is comparatively more skewed than futures prices. The occurrence of unit roots in the price generation process of spot and futures markets gives a preliminary indication of shocks having permanent or long lasting effect on price series. There is instantaneous transmission of price signals between the markets and the futures prices of one day lag influence spot prices.

Econometric Study of Women Empowerment through Dairying in Selected Districts of Haryana

Based on the analysis of data pertaining to various agricultural and dairy attributed it is observed that dairying is an important component of diversified agriculture in the selected districts (Karnal, Kurukshetra, Bhiwani and Mahendergarh) of Haryana. This sector provided the maximum amount of employment (35-60%) in all the selected blocks for the study. Besides dairying, the household activities provide another important avenue for employment (27-40%). The crop production activities are also another segment, where women are gainfully employed (10-28%). The available evidence indicates that in all the blocks under study, feeding of animals is very important and is responsible for the maximum utilization of time. The contribution of milking of animals and cleaning of stall activities in the time utilization schedule is large. More than 40% of the time among dairy work is devoted for these two activities. Dairying in the state is helpful in the empowerment of women folk in rural areas. Among several attributes studied for examining the extent of empowerment of rural households, the coping capacity of women to the household shocks has highest rank followed by their participation in rural household decision making followed by contribution to household income. It has been seen that dairying in the state has an important role to play in the empowerment of rural women. The spread of education of self and spouse as well as improvement in family income have positive and significant impact on women empowerment. Though, the age of self and spouse are important variables, but very little can be done to make any changes in it. Incentives for educating men and women in rural areas, would improve the level of empowerment of women, which in turn will lead to empowerment of women in Haryana.

Impact of Micronutrients on Crop Productivity and Returns

The analysis of data pertaining to the Site Specific Nutrient Management (SSNM) experiment planned at On Stations under the aegis of Project Directorate of Farming Systems Research reveals that Marginal Value Product (MVP) of micronutrients for kharif (every Year) is positive which implied that farmers will gain from investment on additional doses of micronutrients. The value of MVP of ZnO/$ZnCl_2$ is negative at Palampur centre for maize crop, indicates that the micronutrient is already surplus in the soil. The MVP of micronutrients (applied alternate year) revealed that the expenditure on micronutrients is profitable at Kanpur, Bhubneshwar and Kalyani centres in rice crop, Sehore centre in soyabean

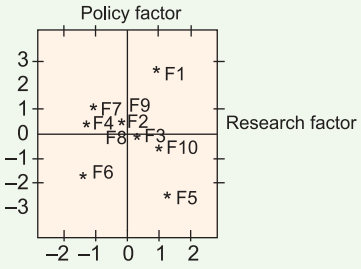
crop and at Thanjavur centre in groundnut crop. While in other centres/crops the additional investment on micronutrients is not advisable. Similar trends are obtained in rabi (every/alternate year) treatments.

Identification of Factors Contributing towards Enhancing Agricultural Productivity

Multidimensional scaling (MDS) approach is used for identifying the factors contributing towards enhancing agricultural productivity pertaining to the subdomain "Plant Genetics and Breeding".

Major factors for enhancing agricultural productivity

F1 = Development of location specific technologies
F2 = Better varieties
F3 = Quality seed availability
F4 = Better agronomic practices
F5 = Adaptation to changing climatic and environmental scenario
F6 = Marketing facilities
F7 = Minimum Support Price (MSP)
F8 = Proper research infrastructure
F9 = Timely availability of inputs
F10 = Promotion of Indigenous Techical Knowledge (ITK)



Major policy and research factors for enhancing agricultural productivity

Figure above suggests that many of the factors mentioned can be viewed as both policy and research factors.

Moreover, emerging areas have been identified through scientometric techniques. For this, using the Web of Science database, the relative position of India in research vis-à-vis other countries (U.S.A., U.K., China and Brazil) over the years 2005 to 2009 have been studied using transformative activity index. Table represented below shows the change in emphasis on researchable areas for the countries viz., India, USA and China over the past five years. From the table below, it can be seen that India is focusing more not only on abiotic and biotic stresses but also on evolving areas such as bioinformatics, molecular assisted selection, transgenics etc.

Transformative activity index of the countries in different areas of Plant Genetics and Breeding

Areas	USA		CHINA		INDIA	
	2005	2009	2005	2009	2005	2009
Abiotic Stress	51	90	70	268	78	291
Marker Assisted Selection (MAS)	78	86	149	105	98	188
Transgenics/ Tissue Culture	101	75	139	121	217	181
Biotic Stress	114	102	112	88	84	116
Pre-Breeding/ Germplasm	104	115	64	78	79	113
Varietal Improvement/ Conventional Breeding	103	110	110	72	121	105
Pollination System/ Mating System	100	127	119	94	47	95
Cytogenetics/Cytology	101	87	88	93	96	87
Gene Expression	103	92	119	128	97	74
Bioinformatics	82	99	56	115	16	58
Genetics/Inheritance	106	105	56	97	53	57
Hybridization	108	83	144	107	77	56
Genetic Evolution/ Mutation	113	111	84	77	70	55
Quantitative Genetics/ Biometrics	134	118	80	49	110	26
Molecular Biology & Genomics	100	94	106	102	106	100

Estimation of Extent of Farming Practices, Resources and Activities with Energy use

National Sample Survey Organisation (NSSO) took up the special study on Indian farmers and conducted a special survey "Situation Assessment Survey of Farmers (SAS)" in 2003 in the rural areas of India as part of NSS 59th round. Several reports have been brought out from the findings of this survey. The estimates so obtained are lacking in their reliability measures and with insufficient use of information available at different stages of sampling which could otherwise be used as weights resulting in better precision of the estimates.

Making use of Projective Geometry Approach, Minimum Variance Linear Unbiased Estimators (MVLUE) are obtained for various parameters viz. (i) extent and seasonal variation of land use in different kinds of farming i.e. cultivation & allied agriculture, orchards & plantation, dairy, fishery and other farming (farming of goats, sheep, piggery, poultry & duckery, bee-keeping and other animal farming), (ii) extent and seasonal

variation of available farming resources i.e. fertilizers, organic manure, improved seeds, pesticides and veterinary services and their use and (iii) extent of farming activities i.e. ploughing, irrigation, harvesting, threshing and others (cooking, lighting, cane crushing and transport) with energy use. The estimates of total land possessed per farmer household (FHH) averaged over seasons (kharif & rabi) in different kinds of farming ranged between 0.008 ha-1.238 ha for all-India and 0.011 ha-0.894 ha in North Eastern Hilly region. Estimated seasonal variations of these lands per FHH for all-India and NEH region ranged between 0.002 ha-0.381 ha and 0-0.320 ha respectively. Farming resources such as fertilizers, organic manure, pesticides and veterinary services are available within the village to 6-93% FHHs, while improved seeds are not available to FHHs even within the reasonable distance (5 km) in most of the states. Percentages of FHHs using fire-wood for cooking, animal power for ploughing & harvesting and electricity for lighting, irrigation & threshing as main sources of energy ranged between 20.6% (Punjab), 92.1% (Rajasthan), 13.7% (Orissa), 90.1% (Jharkhand) and 15.6% (Bihar)-94.5% (Punjab) respectively.

Evaluation of Rationalization of Minor Irrigation Statistics Scheme

Minor irrigation (MI) schemes are very relevant in Indian context. The MI schemes require very low investment. The farmer can spend a small amount and can have assured supply of water. Due to the introduction of large number of MI schemes the area under irrigation has increased substantially. With a view to generate accurate statistics on MI schemes a scheme entitled Rationalization of Minor Irrigation Statistics (RMIS) scheme was initiated in 1987-88. Three census of Minor Irrigation have been conducted so far. The field work for the fourth census has been completed. During Eleventh Five Year Plan, the RMIS Scheme is brought under Central Sector as one of the components of Development of Water Resources Information System scheme of the Ministry of Water Resources. In this context, the Planning Commission felt the need for carrying out an evaluation of the RMIS scheme to assess its effectiveness and usefulness. The Minor Irrigation Statistics Division, Ministry of Water Resources awarded the evaluation study to IASRI with a view to determine whether the objectives of the scheme have been met, examining the methodology, the infrastructure developed, items of data being collected under the scheme etc. and to suggest improvements, if any.

The objectives of the RMIS scheme are examined. The methodology being followed in the scheme is studied and suggestions for improvements are made. The items of data being collected in the scheme are examined and an assessment of data quality is made. Further, the infrastructure developed under the scheme is studied and suitable suggestions are made for improvements in the infrastructure.

Some of the recommendations made are:

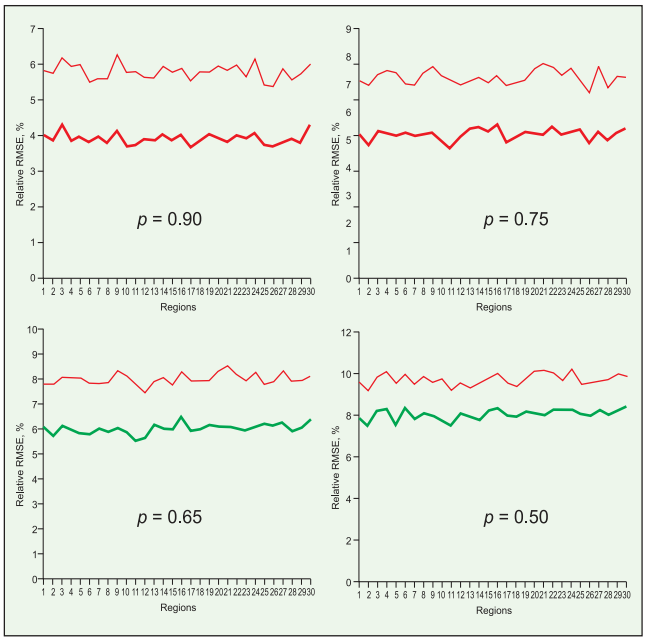
1. The infrastructure available under the RMIS scheme is not adequate and needs to be strengthened. There is shortage of manpower and accommodation, lack of adequate data processing facility and lack of transport.
2. There is a scope for improvement in the training provided to the primary workers. In addition to class-room lectures, the training be made more practical oriented by actual collection of data in some villages. Instructions in the schedules be explained with the help of suitable examples.
3. There is a need for modifications in Schedules. Difficulty is reported in collection of data on items like cost of construction of the scheme, measuring depth of water, depth of well, Irrigation Potential Created/Utilized etc. These aspects need to be looked into.
4. The schedules and instructions manual need to be made bilingual (English and local language).
5. The census of Minor Irrigation be given due publicity in the local areas so as to create awareness among the farmers about its importance.
6. The budget sanctioned under RMIS scheme needs to be released to the states in time. This will help in timely implementation and completion of assigned work of RMIS scheme.
7. Data processing facilities and networking system of RMIS scheme for regular flow of data/information at various levels and timely analysis of data need to be strengthened.
8. Concerted efforts should be made by the Nodal officers implementing minor irrigation schemes, with the help of village officials, for formation of Water

Users Associations under minor irrigation scheme. These bodies may be asked to maintain information about the potential created and potential utilized in the respective minor irrigation schemes under the guidance of village officials.

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**) 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 (a combination of linear mixed model and generalized linear mixed model) that accounts for presence of excess zeros in the data. The proposed approach of SAE works in three steps. First a linear mixed model is fitted for positive values of the variable. In 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 evaluated through simulation studies using both data generated under the model and the real survey data of 59th round of the National Sample Survey Organization on Debt-Investment Survey 2002-03 for rural areas of the State 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.

Region-specific Relative RMSE of the EBLUP (thin line) and proposed estimator (solid line) under model based simulations for different proportion (p) of zeros are presented below:



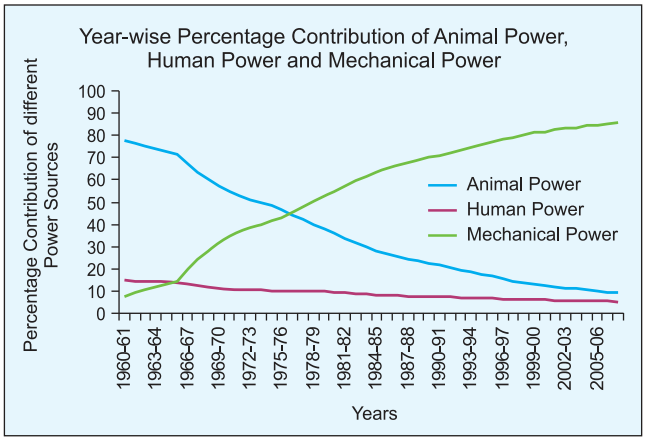
Study on Status and Projection Estimates of Agricultural Implements and Machinery

The 18th Indian Livestock Census was conducted by Department of Animal Husbandry, Dairying and Fisheries (DAHD&F), Ministry of Agriculture, Government of India in 2007, during which information on tractors, power tillers and other power-operated agricultural machinery/implements was not collected. Accordingly, it became important to have projection estimates of these for the future years.

State-wise data on total number of different items of agricultural machinery and implements on which the data had been collected in Indian Livestock Censuses during 1951 to 2003 have been compiled in digital form

into a comprehensive database. During these livestock censuses years, in few states data has not been collected or partly collected.

The percentage contribution of Human Power, Animal Power and Mechanical Power over the years 1960-61 to 2006-07 is:



From Indian Livestock Censuses 1992, 1997 and 2003, on the basis of compiled data on power sources as well as using data on human farm labour, average food grain productivity, state-wise mechanization indicators (ratio of mechanical power to total farm power) have been obtained and correlation coefficients between mechanization indicators with the average food grain productivity have been obtained. Making use of yearly data, the projected population of agricultural machinery and implements for future years at All-India level as well as for Punjab state have been worked out. On the basis of five-yearly data compiled from different Indian Livestock Censuses, projected population of agricultural machinery and implements for future years for Andhra Pradesh, Haryana and Uttar Pradesh states have been obtained.

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 thorough a simulation study on bivariate normal populations for different correlations between Y and X.

Two phase sampling

Estimators of both domain and population totals for an item of interest are developed under two-phase sampling where the domain identity is realized, but the item response is not necessarily available from a phase I sampled unit. The optimality of sampling design is studied considering the probability of item response, the cost of phase I versus phase II sampling, and the item variability in the domains. Through numerical evaluations using a simulation study, the proposed estimators are shown to be more efficient than an already available estimator.

An approximately unbiased estimator of the variance of the ratio estimator under the two-phase sampling which is more efficient than the existing estimators under a super population model with intercept, has been developed.

Multiple objective functions for minimization of sampling variance

The concept of multiple objective functions has been proposed for minimization of sampling variance of the

Yates-Grundy form of the Horvitz-Thompson estimator in an optimal controlled nearest proportional to size sampling scheme. It has been shown empirically that the true sample variance of the proposed procedure compared favorably with that of the existing optimal controlled and uncontrolled high entropy selection procedures.

Agricultural Research Data Book

Agricultural research is a vital input for planned growth and sustainable development of agriculture in the country. The Indian Council of Agricultural Research (ICAR), is an apex scientific organization at national level. It plays a crucial role in promoting and accelerating the use of science and technology programmes relating to agricultural research and education. It also provides assistance and support in demonstrating the use of new technologies in agriculture.

Information pertaining to agricultural research, education and related aspects available from different sources is scattered over various types of published and unpublished records. The Agricultural Research Data Book (ARDB) 2009, which is thirteenth in the series, is an attempt to put together main components/ indicators of such information. The Data Book comprising of 258 Tables, is organized, for the purpose of convenience of the users into eleven sections namely, Natural Resources; Environment; Agricultural Inputs; Animal Husbandry, Dairying and Fisheries; Horticulture; Production and Productivity; Agricultural Engineering & Produce Management; Export & Import; India's Position in World Agriculture; Investment in Agricultural Research & Education; and Human Resources under National Agricultural Research System (NARS). It also contains at the end, list of important National and International Agricultural Research Institutions associated with agricultural research and education along with their addresses, telephone numbers and e-mail addresses. This edition contains latest information/ data as available in the country till up to end of November, 2009.

Programme 4: MODELING AND SIMULATION TECHNIQUES IN BIOLOGICAL SYSTEMS

Statistical Study of Rainfall Distribution and Rainfall based Crop Insurance

The probability distribution of unimodal data sets is generally obtained by using the Pearsonian system. However, its main limitation is that each family requires different functional forms. To this end, a very versatile family of generalized lambda distributions (GLD) is thoroughly studied. The GLD uses one general formula, unlike Pearsonian system in which different Types (depending on the value of kappa) have different functional forms. The variety of shapes offered by GLD are enumerated. Various methods for estimation of parameters of GLD, viz. Method of moments, Method of maximum likelihood, Discretized method, and Starship method are discussed. The goodness of fit is examined by several methods. A brief description is also given of the recently developed GLDEX package, which is freely downloadable. As an illustration, the probability density function of monthly rainfall data for Assam and Meghalaya meteorological subdivision is obtained. For describing multimodal data sets, the promising methodology of "Statistical Learning Theory" is thoroughly studied. The "tail" is estimated through three methods. The threshold value is determined by Parametric bootstrap and Minimum mean square error criteria. Further, the "body" is estimated by nonparametric Structural risk minimization method under correlated structure. Relevant computer programs are developed in SAS and R software packages. As an illustration, monthly rainfall data for meteorological subdivision of Orissa during 1871-2006 is considered. Hill's method performed best for fitting "tail" of the distribution. Finally, estimated "body" of the multimodal distribution is shown to capture the existing multimodality. Drought thresholds for several rainfed crops in different districts are obtained by applying the Modified Barger and Thom methodology. This methodology is then extended to obtain surplus / excess rainfall thresholds also. Performance of the proposed approach is also examined.

Computational Analysis of SNPs in Rice Genome

Rice is the first crop to be sequenced and has a great impact in the field of crop genomics. Rice genome has about 390 million bases and its genomic information is quite useful in elucidating the genome structure and target genes in other crops. A web based information system on functional elements of rice genome has been developed. Online facilities have been created to access the information on Single Nucleotide Polymorphisms (SNPs) at functional elements. Visual graphic display tools have also been developed to annotate SNPs at different functional elements of genome. Web information system on rice functional

elements help facilitate users to extract sequence information on promoter regions, untranslated regions, translation start sites, splice sites, exons, introns, translation stop sites, etc. A special emphasis is given on Splice Store, which is a collection of 5 prime and 3 prime splice sites. Information on classification of splice sites, position weight matrices, Phylogenetic relationships etc. is also provided in the Splice Store. A SNP-centric functional elements database is developed by integrating information on SNPs and functional elements. Online access facilities are provided to study the distribution of SNPs at functional elements of rice genome. Computational analysis of SNPs at genes, exons, 1K upstream, splice sites, coding sequence (CDS) and untranslated regions reveals that more SNPs are present on chromosome 2 followed by chromosome 1. Light Weight Genome Viewer based visual graphic display of functional elements, SNPs on genome and SNPs at various functional elements have also been developed. An online BLAST facility is developed and provided to users for sequence alignment purposes. Few important links for analysis of genome and proteome data are collected and given at one place. A website on Agricultural Bioinformatics Lab (ABL) has been developed to provide the developed tools, on line information systems and important links for analysis of genome and protecting data.

Estimation of Genetic Correlation

The heritability of traits and sample size has pronounced effect on the estimates of standard error and bias and both of them decreases considerably with increase in sample sizes and heritability of the correlated traits for whole range of positive and negative genetic correlation (r_g). The Root Mean Square Error (RMSE) of r_g for lowly heritable traits is found higher in 70% of cases in data sets with gamma sire effects as compared to data sets with normal sire effects. In case of moderately and highly heritable traits the RMSE of r_g are found higher in 95% and 97% of cases respectively in data sets with gamma sire effects as compared to normal sire effects. The RMSE is also found to be deceasing with increase in sample sizes and population r_g for low, moderate and highly heritable traits. It is also observed that for large sample sizes i.e. 500 and above the differences in two RMSE's with gamma and normal sire effects are very small for both moderately and highly heritable traits.

The probabilities of inadmissible estimates are considerably higher in case of gamma sire effects for whole range of genetic correlation for lowly heritable traits and varied from 0 to 20% as compared to 0 to 14%. These probabilities reduce substantially with increase in heritability to 0.5 and varied from 0 to 3% in case of normal sire effects as compared to 0 to 10.5% in case of gamma sire effects. The sample of size of more than 1500, equal to 600 and 500 are essential for obtaining admissible estimates of r_g for low, moderately and high heritable traits respectively. In presence of outliers the estimates of genetic correlation are highly underestimated with the result that the bias increases considerably. The standard error in the presence of outliers also increases considerably and for lowly heritable traits it is found to be ranging from 0.914 to 2.959 and 0.847 to 4.018 in case of gamma and normal sire effects respectively. The standard error in general decreases as the levels of heritability increases except in case of small sample sizes and ranges from 0.199 to 1.701 and 0.163 to 1.179 in case of gamma and normal sire effects respectively. The probability of inadmissible estimates of r_g with normal sire effects increase rapidly in case of lowly heritable traits which ranges from 0.5% to 39.5% in absence of outliers and 8.5% to 47% in presence of outliers. It decreases rapidly with increase in sample size.

The large sample approximation of standard error given by Tallis is always underestimating the standard error even in large samples of size 1000 and above and hence should not be used even for large samples of size upto1500. The predicted standard error by Robertson's formula is always found slightly lower as compared to Tallis expression. Baring small sample size the bootstrap estimates of SE are very close to predicted SE and can be used as an estimate of SE of genetic correlation. The bootstrap estimates of standard error of genetic correlation are found to be very close to the predicted standard error for sample size 500 and above in case of low heritable traits for both positive and negative genetic correlation values. It can be said that the bootstrap estimates of standard error which are close to predicted values and can be used to estimate the standard error instead of approximate formulae given in literature.

Bioprospecting of Genes and Allele Mining for Abiotic Stress Tolerance

A centralized statistical and computational genomics

lab facility for the analysis of genomic data has been developed. Genomic sequence information on abiotic stress related genes of different traits and species was collected from public domain and a library was developed. Phylogenetic analysis of the genes responsible for abiotic stress tolerance traits across species has been studied and further compared for conserved regions through structural visualization. An algorithm has been developed to determine and identify optimum number and combination of molecular markers required for explaining the maximum diversity present in the data. A database on core collection of germplasm for rice, cucumis, lathyrus and mothbean has been designed and data is being populated. A website for the project has been designed and developed (http://bioinformatics.iasri.res.in/BAMAST/BAM.html).

Programme 5: DEVELOPMENT OF INFORMATICS IN AGRICULTURAL RESEARCH

Statistical Package for Animal Breeding 2.1 (SPAB 2.1)

A β–version of Statistical Package for Animal Breeding (SPAB 2.1) has been developed. The package is quite useful for animal breeders for estimation of genetic parameters and for formulating sound breeding strategies and selection processes. This is a modified version of SPAB 2.0 which became functional in 2006.

The new programs added in SPAB2.1 are:

– Application of Sanders correction and calculation of repeatability
– Estimation of heritability for threshold traits
– Recurrent selection and reciprocal recurrent selection
– Genetic advance in closed and open nucleus breeding schemes
– Testing the homogeneity of variance-covariance matrices (Likelihood ratio test)
– D-square analysis (Oblique axis and Iterative mini-max)
– Simulation of sib data
– Bootstrapping for estimation of standard error of genetic parameters
– Skillings and Mack non-parametric test.

All the available programs have been grouped into 11 modules.

Expert System on Wheat Crop Management

Developing a system in a language better understood by the farmers is the need of the hour. It is felt that the “Expert System” will increase its impact and utility in many folds if developed in Hindi. Unicode standard (UTF-8 and UTF-16) are used as these provide a platform by which end user is free from downloading and installing a font on the local machine. Incorporating Unicode into client-server or multi-tiered applications and websites offers significant cost savings over the use of legacy character sets. Unicode enables a single software product or a single website to be targeted across multiple platforms, languages and countries without re-engineering. It allows data to be transported through many different systems without corruption.

For the development, information available on varieties, diseases, insects, cultural practices are translated in Hindi. The database design of the system is accordingly

modified. Inference mechanism is also redeveloped to accommodate Hindi Version of the System. By applying Unicode, two important modules i.e., variety selection module and disease diagnostic module of the expert system have been successfully developed. All the functionality available in the English version of the expert system has been incorporated in this version. The starting page of the variety selection module and disease diagnostic module are:

Home Page of Hindi Module

Web Solutions for Partially Balanced Incomplete Block (PBIB) Designs

A module containing the information about generation of various types of lattice designs along with their association schemes with examples, steps of analyzing these designs using SPSS and SAS, quiz, lecture notes and demonstration. Computer programs have been written for generating cubical designs with parameters $v = 8m$, $b = 8$, $r = 4$, $k = 4m$, $n_1 = m\text{-}1$, $n_2 = 6m$, $n_3 = m$, $\lambda_1 = 4$, $\lambda_2 = 2$, $\lambda_3 = 0$ and tetrahedral PBIB(3) Designs with parameters $v = 6m$, $b = 4$, $r = 2$, $k = 3m$, $\lambda_1 = 2$, $\lambda_2 = 1$, $\lambda_3 = 0$ where $m \leq 2$ and a series of two associate Latin Square design using BIB design with parameters $v = s^2$, $b = 2b^*$, $r = 2r^*$, $k = sk^*$, $\lambda_1 = r^* + \lambda^*$, $\lambda_2 = 2\lambda^*$, where $v^* = s$, b^*, r^* k^* and λ^* are parameters of BIB design. For constructing PBIB designs, following classes of BIB designs have been compiled from the literature and a class library containing computer modules for their generation has been developed:

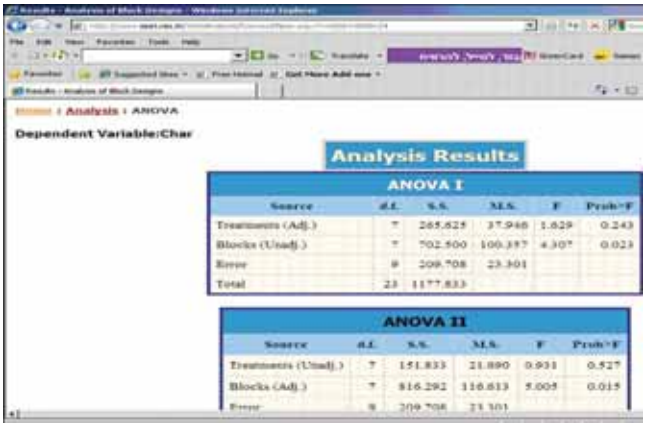
$$v = 4t+1,\ b = 8t+2,\ r = 4t,\ k = 2t,\ \lambda = 2t\text{-}1$$

$$v = 4t+3,\ b = 4t+3,\ r = 2t+1,\ k = 2t+1,\ \lambda = t$$

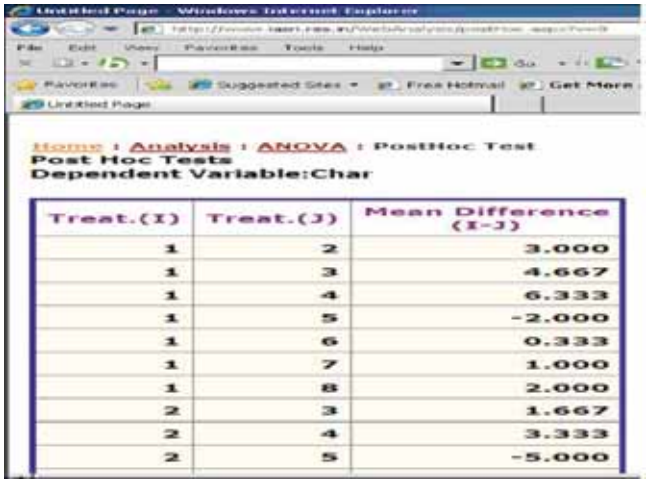
$$v = v,\ b = {}^{v}C_{k},\ r = {}^{v-1}C_{k-1},\ k = k,\ {}^{v-2}C_{k-2}$$

A link (http://www.iasri.res.in/WebAnalysis/index.aspx) for the online analysis of general block design has been provided on the home page of the Institute's website.

The following snapshots explain the steps in analysis of data obtained using a PBIB design.



ANOVA

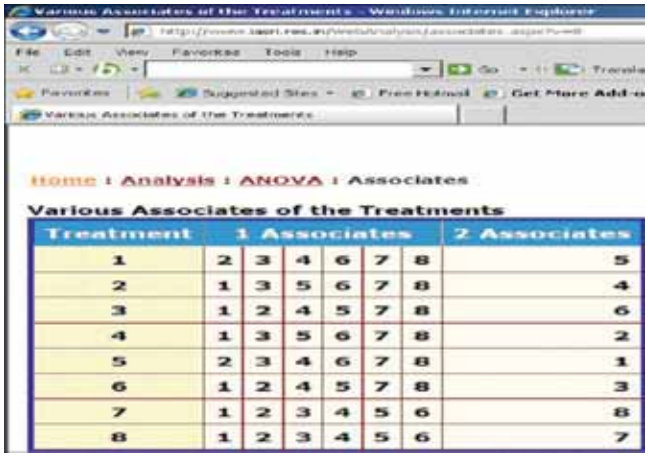


Home : Analysis : ANOVA : PostHoc Test

Post Hoc Tests
Dependent Variable:Char

Treat.(I)	Treat.(J)	Mean Difference (I-J)
1	2	3.000
1	3	4.667
1	4	6.333
1	5	-2.000
1	6	0.333
1	7	1.000
1	8	2.000
2	3	1.667
2	4	3.333
2	5	-5.000

Post Hoc Results



Home : Analysis : ANOVA : Associates

Various Associates of the Treatments

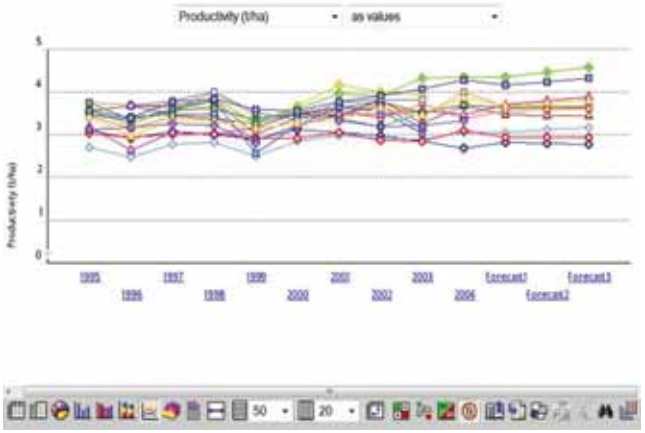
Treatment	1 Associates						2 Associates
1	2	3	4	6	7	8	5
2	1	3	5	6	7	8	4
3	1	2	4	5	7	8	6
4	1	3	5	6	7	8	2
5	2	3	4	6	7	8	1
6	1	2	4	5	7	8	3
7	1	2	3	4	5	6	8
8	1	2	3	4	5	6	7

Treatment Associates

Knowledge Data Warehouse for Agricultural Research

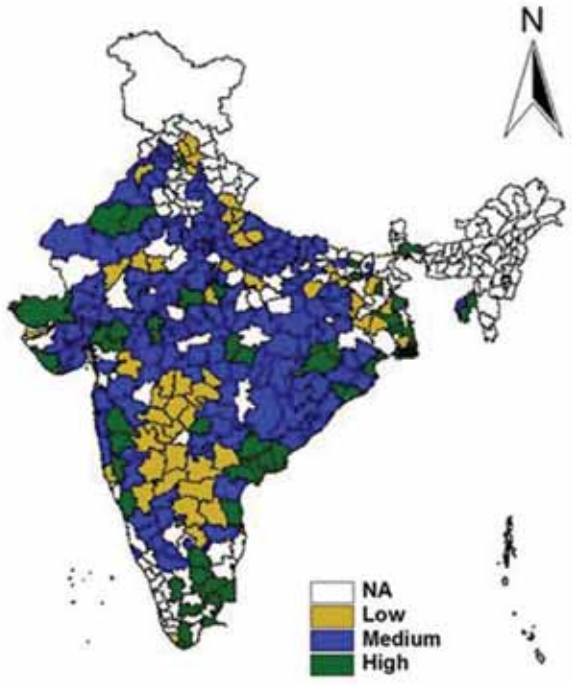
In knowledge data warehouse during the period under report, multidimensional model for the Integrated Data Mart has been designed. Models have been developed and implemented for on-line analysis and prediction / forecasting based on time series data to different data marts. Three types of models i.e. trend, growth, and auto regression are incorporated for this on-line prediction.

Multidimensional models have been designed and implemented for on-line analysis for census data on household assets for number of assets. Website of knowledge data warehouse has been launched and all cubes are published for online analysis by the users.



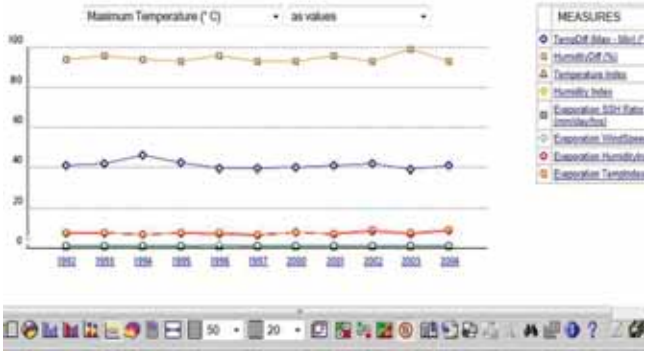
On-line prediction of paddy productivity (t/ha) in different districts of Punjab through auto regression model in knowledge management system

This website has integrated facility of on-line decision support system, information systems, e-documentation, discussion forum, email etc. Thematic spatial maps for different field crops and vegetables have been designed from 1970 onward with respect to different triennium.



Online spatial mapping of groundnut productivity for Triennium Ending (TE) 2000 for India

Numbers of indices have been developed and implemented subject wise for on-line analysis. Simpson's diversification index has been calculated for different districts at regular time interval to observe the crop diversification pattern. Further, Total Factor Productivity (TFP) has been calculated at state level to work out the contributions of research and developments in agriculture for major states of the country.



On-line implementation and analysis of different agro-meteorological indices in knowledge management system

Decision Support System for Manpower Planning-II (PERMIS*net*-II)

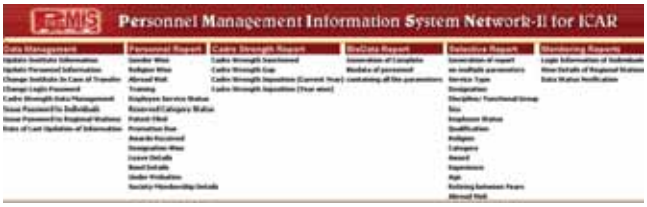
Personnel Management Information System Network-II (PERMISnet-II) for ICAR is higher version of PERMISnet. System has been redesigned and developed using .NET technology. PERMISnet-II has been implemented and enriched with new modules under the institute project Decision Support System for Manpower Planning – PERMISnet. Information coverage in PERMISnet-II system is vast and it contains personal, professional and referential attributes of ICAR personnel along with information on plan wise cadre strength and institutional parameters for different categories of ICAR institutions. System provides exhaustive report modules and different access rights to different type of users which includes Research Manager Personnel, Nodal Officers, Individual users and General users.

PERMISnet-II system has been implemented in ICAR from IASRI server at the address http://permisnet.iasri.res.in/. For implementation, data from earlier PERMISnet system was incorporated into PERMISnet-II system. Brochure was prepared on PERMISnet-II. Training and Launch workshop of PERMISnet-II was organized. Constant support has been provided to nodal officers in implementation of the system. System has been debugged in light of comments received from nodal officers. New functionalities has been added in the system as desired by nodal officers and managers from the Council.

System has been designed in modular approach with different access rights to different users. Information access to different type of users is presented below:

Nodal Officer Module: Nodal officers after authentication can update and manage the data, generate reports corresponding to their institutes. Nodal Officer module has many features under different categorie

- Data Management
- Reports on Personnel Parameters
- Reports on Cadre Strength
- Complete Bio-Data Report of an Individual Personnel
- Selective Report provides the flexibility to generate report based on different combinations of parameters
- Monitoring Reports



Features in Nodal Officer Module

RMP Module: Research Managers at the Council have the privilege to view information at different levels which ranges from single Institute to compiled reports of all ICAR institutions and Subject Matter Divisions. RMP module has many features under different categories

- Institute Report
- Council Reports (Consolidated reports of all ICAR Institutions)
- Divisional Reports (Consolidated reports of Subject Matter Divisions)
- Complete Bio-data Report of an Individual

Features in RMP Module

Selective/ Customized Report: This module is part of nodal officer as well as RMP modules. This module

provides the flexibility to generate report based on different combinations of parameters such as Service Type, Designation, Discipline/ Functional Group, Sex, Qualification, Caste Category, Religion, Abroad Visits, Age, Retiring Age etc. Report can be generated for single institute or all institutions in the category of Subject Matter Divisions, Zone and State.

Individual Users: Individual users after authentication have the following privileges

- View the Bio-data covering all the parameters
- Print the Bio-data
- Change the Password
- Download complete bio-data in MS word format

Individual User Module

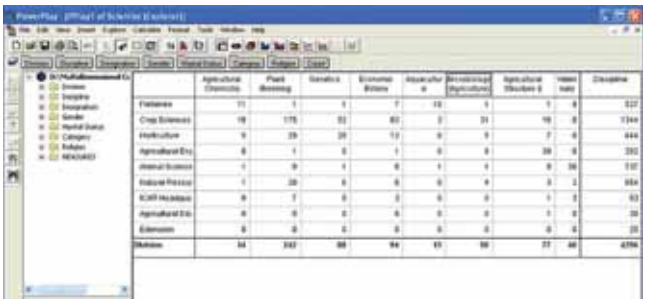
General Users: General users can view general information about ICAR.

- Institute List based on Institute Type (Research Institute, Project Directorate, National Research Centers, Zonal Coordinating Units, National Bureau)
- Subject Matter Division wise list of Regional Station
- Zone wise list of Institutes
- List of Institutes in Difficult Area
- List of the Directors of Institutes
- List of Nodal Officers
- Institutional Organizational Structure Report

Graphical Reports: Module for graphical reports has been added for RMPs. This will facilitate pictorial representation of compiled information.

Graphical Report Module

Multi dimensional Cubes: Access to this module will be provided to RMPs. This will facilitate the policy makers to view the data on multi-dimensional parameters.



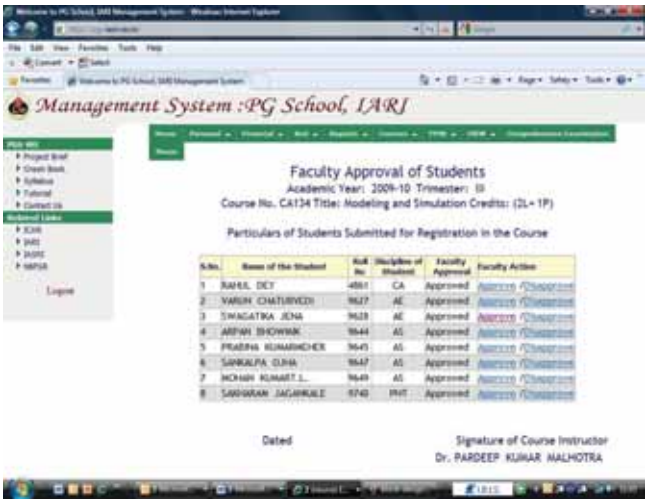
Multi dimensional Cubes

Intranet Solutions for PG School IARI

PG School IARI is a deemed University and has 25 disciplines in which Masters and Doctorate degrees are awarded. The present system for PG School activities involves manual processing of various activities. As the disciplines of PG School are physically scattered, a lot of time is wasted and also requires additional paper work. One has to contact the concerned offices and disciplines of PG School to get or submit a piece of information. The collection and dissemination of information is not readily available. To take the advantage of advances in the Internet technologies and the available network infrastructure a online management system for PG School, IARI has been developed under project " Intranet Solutions for PG School, IARI". The system helps in achieving the PG School objectives by giving online access to various resources. The system is available to students, faculty members, scientists and administrative staff of PG School, IARI, It has five sub modules for management of Courses, Students, Faculty, Aministration and e-Learning.

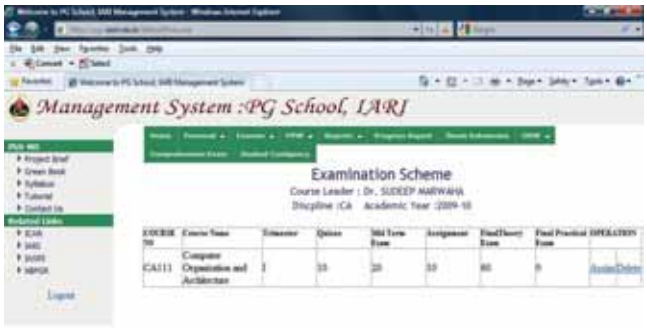
The system has over 300 web pages for different functionalities. The system has workflows for student admission, faculty registration, inducting guide from faculty, for becoming professor from guide, adding / modifying/deleting courses under different disciplines, offering courses in trimesters, allocating faculty to courses, allotting guide to students, advisory committee of students, PPW of students, student trimester registration, ORW of students, fees, fellowship and grade allotment. The system has discipline wise reports for getting information about students, faculty,

professor, courses, courses offered in each trimester. The system has been implemented from the academic year 2009-10. At present the system has 267 registered students and 412 faculty members.



Screen shot of the system showing students registered for a course

The system has 536 courses listed in 23 disciplines. All the students have been registered online for I, II trimesters of academic year 2009-10. The online capability of the system allowed the students, faculty members and administrators to publish and retrieve the information from their respective disciplines. This has helped the users of the system to save their time and efforts. The time so saved may be utilized for other development activities of the PG School, scientific research and better education.



Screen shot of the system showing Examination Scheme for a course

An eLearning Solution for Agricultural Education using *MOODLE*

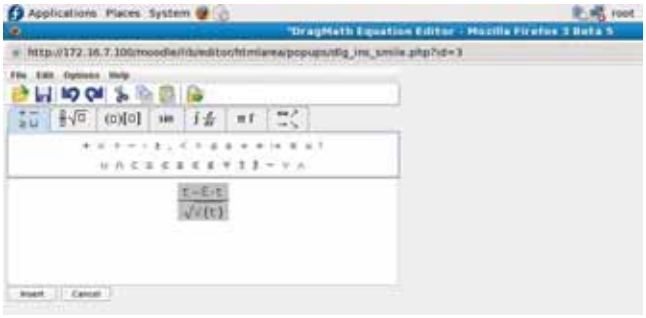
In the course "Elementary Statistical Methods" under the discipline of Agricultural Statistics, the standardized contents (Chapters, Glossary, Quiz, Power point presentations) for various lessons are prepared. The lessons covered are: Testing of Hypothesis: Normal, t, Chi - square and F – Test, Sampling distributions: t, Chi-square and F. A page from the lesson "Testing of Hypothesis" is depicted as:

A page from the Lesson "Testing of Hypothesis"

In the course "Fundamentals of computers and programming" under the discipline of Computer Applications in Agriculture, the standardized course contents are prepared on the following topics: Fundamentals of Programming, Problem Solving, Flow charts and Algorithms, Constants and Variables, Data Types in C and Strings and Arrays in C. A page from the lesson "Problem Solving, Algorithms and Flowcharts" is depicted as:

A page from the Lesson "Problem Solving, Algorithms and Flowchart"

The contents of the Lessons "Fundamentals of Programming", "Flow charts and Algorithms", Number Systems" and "Testing of Hypothesis" are integrated with the eLearning site. The equations for these lessons are prepared using the DRAGMATH Equation Editor integrated with MOODLE. Construction of an equation using the editor is shown below:



Constructing an equation in MOODLE using DRAGMATH Equation Editor

The website (http://elearnagri.iasri.res.in) is being maintained and back up is being taken up regularly. The common template for course material collection from faculty members of IASRI has been designed and has been mailed to all the scientists/faculty members of the institute for preparing the courses they are teaching. The proceedings of the workshop conducted under the project have been published under the Workshop Series of the institute.

SPAR 3.0

Programs were developed for the following modules (a) Basic Statistics (Descriptive Statistics) (b) Data Management (c) Three-Way Cross Analysis (d) North Carolina I, II, III (e) Line × Tester (with /without) parents (f) Some sub-modules of Web online help of SPAR 3.0 completed using C#/ASP.NET in .NET Technology.

Project Information & Management System of ICAR (PIMS-ICAR)

To check duplication in research projects both at divisional as well as inter divisional level, Project Information & Management System of ICAR (PIMS-ICAR) has been developed and hosted at http://pimsicar.iasri.res.in . The system will act as a decision support system and would be quite useful to academicians, planners, policy makers, scientists/technologists and other stake holders in the field of agricultural sciences and technology.

The Requirement Analysis is completed on the basis of existing RPF-I, II, and III. The designing of the database is completed according to requirement analysis. To check duplication of research projects, Keyword Based Approach and Ontology Based Approach are considered for the development of the mechanism. PIMS-ICAR is launched on the net in August 2009 for testing purpose. A mechanism for duplication detection of research is developed and part of the same is translated into the system. The system can now extract Keywords from the title, objective, and activities of the project and can match across all the ongoing projects. Nodal Officers for PIMS-ICAR have been identified in 87 ICAR institutions. A workshop of Nodal Officers in Delhi based Institutes and nearby Delhi was organized and the suggestions and observations of the Nodal Officers of PIMS-ICAR were noted during the workshop. A reference guide for data management has been prepared and distributed to the Nodal Officers. Some of the input forms have been revised according to the feedback from the workshop. The ProjectID and Password are issued to the Principal Investigator of all the projects at IASRI. The data of the projects is being entered. As desired by DDG (Agricultural Engineering), ICAR a brief proforma is designed for submission of research projects data for checking duplication of research in the ICAR as per RPF-I. This proforma is sent to Directors of all the ICAR Institutions for seeking their comments/suggestions. Suggestions received have been incorporated into the system.

Expert System on Seed Spices

The system is being developed for 10 seed spices in collaboration with National Research Centre on Seed Spices, Ajmer. Two modules of the system are developed. The system can be considered as a

Home Page of Expert System on Seed Spices

combination of ten expert systems. Each seed spice crop has four different modules of variety selection, crop protection, cultural practices and harvest. In addition to this one separate module for knowledge management has been added.

Expert system for Maize Crop

Expert System for maize crop aims at developing a web enabled knowledge base system for effective dissemination of maize knowledge and technology. The system is conceived as a model of existing Expert System of Extension. For this, information is collected in electronic and/or printed forms on maize varieties, management of maize diseases, cultivation of maize, integrated pest management, management and harvesting of baby corn and post harvesting technology. The compilation of maize information is done in

Homepage of Expert System of Maize

consultation with the experts from Directorate of Maize Research (DMR), New Delhi. The material received is studied to identify the characters to be included in the system for variety, disease, insect and weed. The investigators at DMR are also encouraged to take the pictures of the maize crop from the field at regular intervals. This has enriched the system with the photos for different stages of crop growth and also provided the pictures for identification of diseases and pests. The system has an online knowledge acquisition module for maize experts. Post Harvesting Technology subsystem is also developed and integrated with the existing system.

4

Library and Documentation

The Library of IASRI is one of the Regional Libraries of NARS (National Agricultural Research System) of the country. The Library has an excellent print and electronic resource base in the fields of Agricultural Statistics, Computer Applications, Agricultural Economics and allied sciences to support teaching, research and consultancy in the relevant areas. This is a sole referral library in Agricultural Statistics and Computer Applications in India. It caters to the information needs of students, faculty, researchers, scientists and trainees etc. not only of IASRI but also from different Institutes of ICAR and State Agricultural Universities under NARS both in conventional as well as electronic format.

The Library Advisory Committee plays an important role in management of the Library and it clears proposals relating to enrichment of resources of the library such as books, journals, on-line bibliographical, statistical, abstract and CD-ROM databases as well as infrastructural development etc. The Library Advisory Committee for the year 2009-10 was as under:

Dr. VK Bhatia	Chairman
Dr. VK Gupta	Member
Dr. UC Sud	Member
Dr. PK Batra	Member
Dr. Rajender Parsad	Member
Dr. PK Malhotra	Member
Dr. Ranjana Agrawal	Member
Dr. Prajneshu	Member
Dr. Amit Kumar Vasisht	Member
Sh. AK Chaturvedi	Member
Capt. Mehar Singh	Member
Sh. Krishan Kumar	Student Representative
Dr. (Mrs.) P Visakhi	Member Secretary

The internal administration and organization of the Library & Information System is supervised by Dr. (Mrs.) P. Visakhi, Librarian under the guidance of Dr. P.K. Malhotra as Scientist-in-Charge, Library.

The Full text of M.Sc. and Ph.D. Theses added during the period have been digitized and added in online digital format. Library has updated its well featured website http://lib.iasri.res.in which is accessible across the world in all 365 days.

Physical Verification of Library Holdings: Stock of library documents have been verified by the Committee specially constituted for the purpose by Competent authority and preliminary report has been received in library for further necessary action.

During the year, the library provided following services to its users.

Reprographic Service (Manuals)

Periodicals

- Indian Journals - 39 (Print)
- Foreign Journals - 49 (Print)
- Computerized Services
  - On-line Catalogue - OPAC
  - Archival Database (Digitized Thesis and Old & Fragile Journals) - 2
  - On-line Journals - 40
  - On-line Bibliographical Database - 7
  - CD-ROM Database (On-line and Off-line) - 25
  - Internet Search
  - On-line Enquiry (OPAC)
  - Current Awareness Service (New Arrivals)
  - On-line Reservation of Documentation
  - On-line User Profile Service

The following Computer Activities were undertaken:

- All resources added during the year in the library have been classified, catalogued and bar-coded and updated in the Library Bibliographical Database using “Alice for Windows” Library Management software.
- Library users were given hands-on training whenever necessary on the use of library computerized services/resources.
- All trainees of the short term training programmes held in the Institute were given lectures and Hands-on training on “On-line Library Information Services”.

Library subscribed/renewed the following Biblio-graphical, Statistical and Abstracting on-line portals during the period:

– MathSciNet (http://www.ams.orgmathscinet.com)
– Indiastat.com(http://indiastat.com)
– Indian Harvest (http://lib.iasri.res.in/cmie.asp)
– Developing Library Network (http://delnet.nic.in)
– Sciencedirect (http://www.sciencedirect.com)
– Consortium for e-resources in Agriculture (CeRA) (http://www.cera.jccc.in)

Statistics Relating to the Library

Item	Number
Number of books added (English)	69
Number of books added (Hindi)	11
Number of grey literature added	125
Number of Indian journals subscribed	39
Number of Foreign journals subscribed	49
Number of on-line journals subscribed (Indian and Foreign)	40
Number of electronic and printed theses added	17
Number of publications issued from the library	14,500
Number of users visited library website	31,000
Number of articles (E+P) received from DELNET	47
Number of books received on inter-library loan through DELNET	25
Number of outside users accessed e-services in library premises (NARS)	600
Number of publications lent out on inter-library loan	115
Number of readers visited and consulted the library	15,900
Number of scientific and technical papers reprographed (pages)	11,500
Number of CD-ROM added	40
Number of articles provided under CeRA document delivery	300
Services including digital format internet/databases access searches	75,000

5

Technology Assessed and Transferred

- **Directorate of Sorghum Research, Hyderabad**

  α-designs have been suggested for the AVHT and IVHT trials conducted under the aegis of All India Co-ordinated Sorghum Improvement Programme. These designs are resolvable block designs and have been generated through computer aided search. The parameters and layouts of different α-designs recommended are:

(i) $v = 33$, $b = 9$, r = 3, $k = 11$, A-efficiency = 0.9682, D-efficiency = 0.9860 (IVHT)

REPLICATION 1

Block-1	1	4	7	10	13	16	19	22	25	28	31
Block-2	2	5	8	11	14	17	20	23	26	29	32
Block-3	3	6	9	12	15	18	21	24	27	30	33

REPLICATION 2

Block-1	1	5	9	10	15	17	21	23	26	29	33
Block-2	2	6	7	11	13	18	19	24	27	30	31
Block-3	3	4	8	12	14	16	20	22	25	28	32

REPLICATION 3

Block-1	1	4	9	11	14	18	20	24	27	30	32
Block-2	2	5	7	12	15	16	21	22	25	28	33
Block-3	3	6	8	10	13	17	19	23	26	29	31

Different randomized layouts of this design were provided for 16 locations.

(ii) $v = 28$, $b = 12$, $r = 3$, $k = 7$, A-efficiency = 0.9603, D-efficiency = 0.9812 (AVHT shallow soil)

REPLICATION 1

Block-1	1	5	9	13	17	21	25
Block-2	2	6	10	14	18	22	26
Block-3	3	7	11	15	19	23	27
Block-4	4	8	12	16	20	24	28

REPLICATION 2

Block-1	1	6	11	16	19	22	28
Block-2	2	7	12	13	20	23	25
Block-3	3	8	9	14	17	24	26
Block-4	4	5	10	15	18	21	27

REPLICATION 3

Block-1	1	8	12	14	18	23	27
Block-2	2	5	9	15	19	24	28
Block-3	3	6	10	16	20	21	25
Block-4	4	7	11	13	17	22	26

(iii) v = 16, b = 6, r = 3, k = 8, A-efficiency = 0.9683, D-efficiency = 0.9859 (AVHT deep soil)

REPLICATION 1

Block 1	1	3	5	7	9	11	13	15
Block 2	2	4	6	8	10	12	14	16

REPLICATION 2

Block 1	1	4	5	8	10	12	13	16
Block 2	2	3	6	7	9	11	14	15

REPLICATION 3

Block 1	1	4	6	8	9	11	14	15
Block 2	2	3	5	7	10	12	13	16

Splice Site Collection & Rice Genome

- A web-based functional elements information system and SNP-centric functional elements database of rice genome (http://bioinformatics.iasri.res.in/BAMAST/ BAM.html) has been developed for the users. Visual graphic display tool (genome browser) for annotation of functional elements on rice genome has also been developed. Some screen shots for the Information System are:

6

Education and Training

For human resource development programmes, the Institute conducts post graduate teaching and in-service courses in Agricultural Statistics and Computer Applications. Institute has M.Sc. and Ph.D. programmes in Agricultural Statistics since 1964 and M.Sc. in Computer Application since 1985-86. A brief description of human resource development during the year through degree courses, certificate courses, ad-hoc training programmes, customised national and international training programmes are given in the sequel.

DEGREE COURSES

The Institute continued to conduct the following degree courses in collaboration with the Post Graduate School of Indian Agricultural Research Institute (IARI) which has the status of a Deemed University:

(i) Ph.D. (Agricultural Statistics)
(ii) M.Sc. (Agricultural Statistics)
(iii) M.Sc. (Computer Application)

Both Ph.D. and M.Sc. students are required to study courses not only in Agricultural Statistics but also in Agricultural Sciences like Genetics, Agronomy, Agricultural Economics, etc. The courses in Mathematics, Agricultural Statistics and Computer Application are offered at this Institute while the courses in Agricultural Sciences are offered at IARI.

The eligibility qualification for admission to Master's degree in Agricultural Statistics is a Bachelor's degree with atleast 60% marks or its equivalent overall grade point average (OGPA) in Agriculture/Horticulture/Forestry/Agroforestry/Sericulture/Agricultural Marketing/B.Sc. (10+2+3 System). For admission to Master's degree in Computer Application, the eligibility qualification is a Bachelor's degree with atleast 60% marks or its equivalent overall grade point average (OGPA) in Agriculture/Computer Science/Agricultural Engineering/B.Sc. (Horticulture), Veterinary Science, Home Science, B.Sc. (Forestry)/B.Sc. with Maths./Statistics/Physics/Biology/B.Sc. (10+2+3 System).

Further, for admission to Doctor's degree in Agricultural Statistics, the eligibility qualification is a Master's degree with atleast 60% marks or its equivalent overall grade point average (OGPA) in Agricultural Statistics/Statistics/ Mathematical Statistics/Bio-Statistics of IVRI/ Professional Statisticians' Certificate Course (PSCC) from IASRI.

Number of students admitted/completed various courses are:

(a) **Ph.D. (Agricultural Statistics)**

Admitted	:	7
Completed	:	3

(b) **M.Sc. (Agricultural Statistics)**

Admitted	:	8
Completed	:	5

(c) **M.Sc. (Computer Application)**

Admitted	:	8
Completed	:	8

Brief of research work carried out by students who completed various courses during 2009-10 is as follows:

Ph.D. (Agricultural Statistics)

i) Dharm Nath Jha

A study on spatial regression models under measurement errors framework

Measurement Errors (ME) in explanatory variables of classical regression model makes the estimators of regression coefficients biased and inconsistent. Further for the variables of interest of geographical in nature, regression coefficients do not remain fixed over space and usual regression analysis takes no account of spatial location in its analysis. Therefore, a new technique called Geographically Weighted Regression (GWR) is used in which estimates of regression coefficients are based on local relation instead of global relations among spatial variables of interest. Estimation of regression coefficients when spatial explanatory variables with ME are fixed or random in GWR model is expected to provide efficient estimates as compared to corresponding usual regression model. A Functional Spatial Regression (FSR) model and a Structural Spatial Regression (SSR) model under ME have been proposed for estimation of regression coefficients in case of spatial variables. Explanatory variables under FSR model are assumed to be fixed while it is random in case of SSR model. Modified estimates of regression coefficients are proposed following Ordinary Least Squares (OLS), Generalized Least Squares (GLS), Maximum Likelihood Estimation (MLE) and Method of Moment Estimation (MME) approaches. Through spatial simulation it has been shown that proposed estimators are unbiased, consistent and comparatively more efficient than corresponding usual estimators.

Guide: Dr. Anil Rai

ii) Nurnabi Meherul Alam

Some contributions to design and analysis of mixture experiments

Experiments in which the response is a function of the proportions of the components (constituents) present in the mixture and not of the total amount of the mixture, are called mixture experiments. A lot of literature is available for single factor mixture experiments. There, however do occur experimental situations in which the experimenter is interested in studying the effect of mixtures of two or more independent factors simultaneously. Such type of experiments are known as multifactor mixture experiments.

In agricultural experiments, the behavior of different ingredients is generally quadratic in nature, therefore, designs for multifactor mixture experiments have been obtained so as to fit the second order response surface model. A method for obtaining unique parameter estimates for the second order model for multifactor mixture experiments has been developed. Methods have been developed to construct designs with number of runs less than those required for usual kronecker product designs from single factor mixture experiments. Simultaneously it has been taken care of that it is possible to fit the second order mixture models.The designs generated from these methods of constructions have been evaluated with G-efficiency and/or relative A-efficiency and perpoint relative A-efficiency. A catalogue of designs has been prepared for $n \leq 4$; $p_i \leq 4$, where n is the number of factors and p_i is the number of constituents for i^{th} factor.

For multifactor mixture experiments, situations may arise where restrictions are imposed on one or more than one components of different factors. Four methods of construction of designs for multifactor mixture experiments under restricted region using transformation/projection of response surface designs

have been given. Methods of construction of designs for multifactor mixture experiments have been given for the cases where upper bound or lower bound restrictions are imposed on one component of each factor and both lower bound and upper bound restrictions are imposed on some of the components for each factor. SAS code for obtaining designs for multifactor mixture experiments has been developed and catalogue of designs has been prepared for $n \leq 3$; $p_i \leq 4$.

In many mixture experiments the product characteristics depend not only on the proportions of the components in the blend but also on the processing conditions. Two types of models for multifactor mixture experiments in the presence of process variable(s) have been given. Based on these models three methods of construction of designs for multifactor mixture experiments in the presence of process variable(s) have been constructed so that one can estimate the model parameters orthogonally and the G-efficiency of the resulting design is high.

Guide: Dr. PK Batra

iii) Dwijesh Chandra Mishra

On some aspects of estimation of genetic parameters under selection pressures and model inadequacy

Classical statistical methods generally used in the analysis of data assume that the data is a random sample. This assumption is generally violated and the data is a result of continuous selection of individuals. The means and variances of random variables are thus different for selected individuals than those in the unselected one. This, therefore, advocates the use of special statistical techniques wherein the effects of selection are incorporated in the procedures of estimation of genetic parameters.

In addition to selection, estimates of genetic parameters are also influenced by not considering complete linear model. For a given set of experimental data, the estimates of variance components are affected by both statistical procedures and analytical linear models being used. Previous studies reported biases when using incorrect models. Therefore, model inadequacy also demands special statistical techniques to quantify this bias for different values of true genetic parameters.

Further the underlying distribution of the observations may not be normal and as such traditional methods may not be suitable to tackle the problems arising from the non-normality. Inspite of the non normality of the data, there may be some abnormal or aberrant observations in the data or some data may be missing which also demands the search for robust methods of estimation of genetic components of variances and covariances.

In the present investigation, consequence of estimation of variance components has been discussed when data comes from selected population. Expressions for estimating variance components and consequently heritability are developed after incorporating the effects of selection in the model. Proposed method has been compared with the existing methodologies for estimation of variance components like Analysis of Variance Estimation (ANOVA), Maximum Likelihood Estimation (MLE), Restricted Maximum Likelihood Estimation (REML) and Minimum Variance Quadratic Estimation (MIVQUE) with the help of simulated data for different population parameters. It has been demonstrated that the use of proposed methodology results in gain in precision of estimate of heritability over the existing traditional methodologies.

Problems related with estimation of variance components have also been discussed, when model is inadequate. An explicit expression of bias of the estimate of heritability has been developed in the case of model inadequacy. Results of proposed method along with the existing methodologies for estimation of variance components like ANOVA, MLE, REML and MIVQUE are obtained in different cases of model inadequacies. Simulated data generated by taking suitable parameters for half-sib as well as full-sib genetic models has been used. It has been demonstrated that bias and MSE of the estimates decrease with increasing the number of significant fixed effects in the model.

A comparative study has been made to examine the influence of outliers, missing observations and non-normality on the estimates of genetic parameters in the presence of selection pressure and model inadequacies by using a robust estimator called RAVE estimator for half-sib model.

Guide: Dr. VK Bhatia

M.Sc. (Agricultural Statistics)

i) Arpan Bhowmik

A study on logistic regression modeling for classification in agriculture

Classification and prediction in agricultural systems are quite useful for planning purposes. In this study, logistic regression modeling has been employed for classification purposes in the field of agriculture. The data pertains to the area of agricultural ergonomics with dependent variable as the presence or absence of discomfort for the farm labourers in operating farm machineries along with associated quantitative and qualitative regressors. From the different possible variable subset datasets, only appropriate logistic regression models that best fit these datasets have been selected for further study. Relevant goodness of fit and predictive ability measures have been utilized for evaluating the fitted models. A single best regressor i.e. load given to the farm machinery during operation has also been identified by employing variable selection based on collinearity diagnostics and stepwise logistic regression. Comparison made between the length of confidence intervals of estimates from Maximum Likelihood Estimation (MLE) and quadratic bootstrap methods upon the original sample using the single best regressor revealed that the latter is better than the former as quadratic bootstrap estimates has smaller length of confidence intervals. In addition, resampling based estimation method viz. quadratic bootstrap has been applied for estimating the unknown parameters in a simple logistic regression model under a simulation study whose parameter estimates has less bias than that obtained using the conventional MLE procedure without increase in their corresponding estimated variances. Also when the classificatory performances of the logistic regression models (using the best regressor) fitted using both MLE and quadratic bootstrap approaches are compared, the results came out to be at par under the two approaches. Classifications of the hold-out datasets revealed that results obtained using logistic regression models are found to be better when compared to those obtained from discriminant function analysis method. Moreover, when comparisons are made among the MLE based logistic regression models, the model with the single best regressor come out to be the best. The study revealed that logistic regression modeling can be employed as a viable alternative for classification purposes in the field of agriculture.

Guide: Dr. Ramasubramanian V

ii) Sankalpa Ojha

A study on outliers in multi-response experiment

Outlier(s) in a set of data is (are) defined to be an observation that is inconsistent with the rest of the data. If the data set contains outliers the conclusion drawn from the experiments may be wrong. Outliers may arise in the experimental setup where observations are taken on more than one response. Cook-statistic has been developed for two likely situations of occurrence of outliers in multi-response experiments. In the first situation, more than two outlier observation vectors have been considered. For developing Cook-statistic, mean-shift outlier model has been considered, that is, mean of each of the outlying observations has been shifted from the mean of the clean observations. A general expression of Cook-statistic for detecting any t outlier observation vectors has been obtained. Two upper bounds of Cook-statistic have also been obtained. These upper bounds help to reduce the computation of all possible set of t outlier observations vectors. It is concluded that if these upper bounds are not statistically significant, then there is no need to compute all possible set of vectors. Developed statistic is applied to real experimental data. For applying to data only two outlier observations vectors have been considered. A pair of such vector is identified as outliers. In the second case the situation where observations from all the responses may not be outlier is considered. A general expression of Cook-statistic has been obtained for detecting any k observations from each of any t observation vectors as outliers. Appropriate expressions for some particular cases are obtained. The developed statistic is then applied to the same data set by considering that any two observations from each of any two observation vectors are outliers. SAS codes have been written for applying the above procedures for detection of outliers in multi-response experiments.

Guide: Dr. Lalmohan Bhar

iii) N Mohondas Singh

Some empirical investigations on statistical properties of growth curves

Growth is an important phase in the life of animals which influences different forms of production such as milk, meat, etc. in the later ages. The relationship between body weight and age is important particularly in meat producing animals. Since a series of weight-age data points are analytically difficult to interpret, it is, therefore, desirable to study statistically the growth of animals.

On the basis of bootstrap samples the distributions of the goodness of criteria R^2 (Determination Coefficient), RMSE (Root Mean Square Error) and ARR (Absolute Reduction Ratio) are found to be non normal. Based on these statistical measures Von bertalanffy model is selected as the best model to describe growth pattern in given body weight data of goat.

Inheritance of growth curves is critical for understanding evolutionary change and formulating efficient breeding plans. The growth parameters are important in the sense that they are good indicators of the growth pattern. The genetic parameters of growth parameters are necessary to examine the potential usefulness of the growth parameters as selection criteria. So it is important to have the complete information of genetic parameters of the curve parameters. In the present study the statistical properties of the genetic parameters of the growth curve parameters have been discussed and the distributions of these genetic parameters are found to be non-normal. The genetic correlation between the mature weight and maturity rate has been found to be moderately negatively correlated which indicates the selection of animals having higher maturity rate could lead to lighter mature weight. The heritability of mature weight are found to be highly heritable indicating that the mature weight can be used for selection purposes.

Guide: Dr. AK Paul

iv) Ankur Biswas

Variance estimation using Jackknife method in ranked set sampling under finite population framework

In experimental settings where measuring an observation is expensive, but ranking a small subset of observations is relatively easy, Ranked Set Sampling (RSS) can be used to increase the precision of the estimators. The majority of research in RSS has been concerned with estimating the mean in the context of infinite population. Estimating the variance in case of RSS has been found to be cumbersome in the context of finite population. Therefore, an attempt was made to develop variance estimation procedures using Jackknife method in RSS under finite population framework. Three different variance estimation procedures have been developed. The efficiency of these developed variance estimation procedures has been compared among themselves through a simulation study. The performance of variance estimation procedure following cycle based approach has been found to be at par with strata based approach for varying number of cycles as well as for varying ranks. The variance estimation procedures following cycle based approach and strata based approach have performed better than the variance estimation procedure following unit based approach for varying number of cycles as well as for varying ranks.

Guide: Dr. Tauqueer Ahmad

v) Prabina Kumar Mehar

A study on multivariate outlier detection and its application in breeding data

Identification and proper treatment of multivariate outliers have become increasingly important in the area of agricultural statistics, particularly, in breeding data analysis. In literature methods are available for detection of multivariate outliers and their treatments have been considered. Four methods of multivariate outlier detection (one commonly used & three computer intensive methods) have been considered. These methods are compared for their performance based on probability of identified outliers from outlier distribution (correct outliers) as well as probability of outliers from "clean data" distributions (wrong outliers). Also the performance of all the methods has been assessed by considering shift outliers alone, scale outliers alone and both shift and scale outliers in the samples generated through simulations. The probabilities have been calculated over thousand simulations. The average probabilities of correct outliers and wrong outliers along with their standard errors are also obtained. The method which identifies high average probability of correct outliers and low average probability of wrong outliers has been judged as the best one. The identified best procedure has been applied on real data obtained from multi-location trial multivariate data on maize. Multivariate outliers are then treated by deletion followed by multiple imputations. The treated data is further analyzed for identifying stable maize genotypes.

Guide: Dr. AR Rao

M.Sc. (Computer Application)

i) Rakesh Kumar Meshram

Information system for varietal experiments (ISVE)

The All India Coordinated Wheat Improvement Project

(AICWIP) has a main mandate of accelerating the process of varietal development. But the lack of information on the availability of best varieties is one of the main reasons for its limited use. Sometimes, the farmers may not be aware of the right variety, right time and right locations etc. Due to this constraint, farmers may not be able to get expected results after using it. As varieties are zone specific, hence proper selection of the varieties according to their locations is very important for better yield. Information System for Varietal Experiments (ISVE) is a Web-based Information System to provide information to extension personnel, students, researchers, etc. ISVE has a simple query and report generation module to provide the information about zone, centres, variety, trial type, trial series etc. even in the printable formats.

The software has one level of authentication i.e. administrator. Administrator has the privilege to add, modify or delete information from the database. Users can ask questions regarding any information or about the software to the concerned experts by sending an e-mail. Users can also view some frequently asked questions (FAQs).

ISVE has been developed using ASP.NET. It is an easy and effective tool to develop web based applications. Back End is developed using SQL Server 2000. It is the Relational Database Management System (RDBMS) widely used for its simplicity and ease in operation.

Guide: Dr. VK Mahajan

ii) Ramjilal Sharma

Online information system for intercropping experiments (OISIE)

OISIE is an attempt to add a new web based user-friendly, information system for Intercropping experiments. It is developed for information management of all the intercropping experiments conducted in India.

OISIE has been designed using three-layered architecture. Client Side Interface Layer is in HTML and JavaScript, Server Side Application Layer uses Java Server Pages (JSP) and Java Database Connectivity. Database Layer is implemented using Microsoft SQL Server 2000. OISIE can be implemented as a network-based system with a server at a central location. OISIE can run at any node of the Internet through a web browser. Security features are provided in such a way that only authorized person can access the database. There is provision for administrator to insert, update and delete the information.

OISIE provides information regarding Intercropping experiments including experimental site history, location details, design details, objective of the experiment, treatment details, soil types and their texture, season in which the experiment is conducted, basal condition details which in turn includes sowing dates, seed rates, spacing, basal manuring, preparatory cultivation, planting methods, irrigation details date of harvest for both main crop and inter crop and some general information's like disease and pest attack, crops condition, etc.

OISIE also provides search facility for centre information, experiment information, treatments applied, main crop and inter crop information, fertilizer doses, design information, experimental data in case of unanalyzed experiments and results in case of analyzed experiments.

User can also view customized results on various aspects of the intercropping experiments and can interact with concerned people through e-mail. On-line help is also provided to help administrators and users both.

Guide: Dr. IC Sethi

iii) Robin Singh

Software for online analysis of split-plot designs

Split plot design is often used by the experimenters, where ever the objective is to compare two or more factors requiring different plot sizes for operational difficulties. Factor(s) which require larger plot size are applied to the bigger plot called main plot and the one which require smaller plot size are applied to the smaller plot called sub-plot. The experimenter may also have treatments either in the main plot or in sub-plot which are not part of factorial set up and are called control or extra treatments. From the review of literature on software's available for data analysis, it appears that no software is readily available to the agricultural experimenter for carrying out the analysis of data generated under such type of experiments, particularly in situations when there are more than two factors and a control/extra treatments.

The software developed has the facility to analyze split plot design upto four factors with or without control treatments. The control/extra treatments are provided in the sub plots. It also provides facility to create new data files for analysis using split plot design up to four factors with or without control/extra treatments.

Guide: Sh. HS Sikarwar

iv) Ashutosh Karna

Software for fitting of distributions

An indigeneous software has been developed that can fit certain number of discrete and continuous distributions as per the real life situations and fit the theoretical data using Kolmogorov - Smirnov and Chi-Square tests of goodness of fits, once the parameter have been estimated (broadly using MLE techniques). The software has been developed using Visual C# 2008 language with ASP.NET 3.5 framework. Data file formats supported by this software are .txt and .xls. In addition to fitting of distribution, the software can also be used interactively to draw *Quantile-Quantile* plot for continuous distributions; and computing various special functions (including Gamma, Beta, and Incomplete Gamma etc.) at runtime. A user friendly help file with step-by-step method for using the software has also been provided.

Guide: Dr. RC Goyal

v) Ragini Singh

Development of statistical package for analysis of cropping system experiments

Statistical Package for Analysis of Cropping System Experiments (SPACSE) is a web based software for the analysis of the data collected from farmers' field trials at various NARP Zone level and the data collected from On-Station trials. The intent of SPACSE is to provide an easy-to-use statistical analysis facility for the novice user. SPACSE supports randomized complete block designs.

SPACSE provides the analysis and consolidated report for grain yield, straw yield, *N* uptake of grain yield, *N* uptake of straw yield, *P* uptake of grain yield, *P* uptake of straw yield, *K* uptake of grain yield and *K* uptake of straw yield for On-farm experiments. It provides the analysis and consolidated report for grain yield and straw yield for On-station experiments. The result for analysis include character analyzed, crop-sequence, year, type of experiment, variety, treatment details and raw and converted data, ANOVA, mean table, standard error and critical difference for cropping systems experiment. The consolidated report for On-farm experiments is year-wise and for On-station trials is experiment wise. There is no restriction on the number of replications and treatments.

The overall design of the system can be regarded as three-layered architecture. Client Side Interface Layer is implemented in HTML and JavaScript. Server Side Application Layer is implemented in Java Server Pages and Java Database Connectivity. Database Layer is implemented in Microsoft SQL Server 2000. SPACSE can be implemented as a network-based system so that information is available on-line.

Guide: Dr. IC Sethi

vi) Sarita Patle

Web based software for estimation of regression coefficient

A sample survey is a process for collecting data on a sample of observations which are selected from the population of interest using a probability-based sample design. Statistical software, mostly, assumes that the observations are selected independently and that each observation has the same probability of being selected and does not take into account few common characteristics of survey data: (i) clustering of observations, (ii) stratification, etc.

Therefore, a web based Software for Estimation of Regression Coefficient (SERC) for survey data has been developed. This software can upload the data from MS-excel/ MS-access files. Data files can be opened, deleted and saved as done in other web applications. SERC has the two analyses modules i) descriptive statistics (mean, variance, and coefficient of variance), ii) estimation of regression coefficient and estimate of its variance. SERC can analyze the data if it is obtained using simple random sampling and stratified sampling designs. On line help is provided regarding formulae used for various sampling schemes and using SERC. SERC is developed using ASP.NET.

Guide: Dr. VK Mahajan

vii) Amreshsing Ashoksing Rajput

Development of decision support system for surface runoff estimation

Computation of surface runoff is difficult as it depends upon several factors concerned with atmospheric and watershed characteristics. To facilitate this, a Decision Support System for Surface Runoff Estimation (SURE) has been developed which is a web based software. SURE provides estimate of surface runoff based on Curve Number, Rational, Infiltration, Cooks and Empirical methods. The intent of SURE is to provide an easy-to-use hydrological program for the novice uses. SURE provides amount of available water through rainfall that help in the design of control structures required to reduce soil erosion. SURE also maintains information about different land use patterns, different treatment patterns, soil type, different zones and stations etc. This will help user for location specific estimation of surface runoff. It will generate reports for zones and stations, curve number and rational method according to user query.

The overall design of the system can be regarded as three-layered architecture consisting of Client Side Interface Layer, Server Side Application Layer and Database Layer. There is provision to insert and update the information.On-line help is provided for both administrator and user. SURE will be implemented as a network-based system so that information is available on-line.

Guide: Dr. PK Malhotra

viii) Mali Snehal Sukhadev

Development of decision support system for sprinkler irrigation system (SISD)

SISD is a Web-based Decision Support System to assist the user in designing sprinkler irrigation system. SISD has online report generation module to provide the layout of area to be irrigated per day, specifications of sprinkler irrigation system etc. even in the printable formats.

The software has one level of authentication i.e. administrator. Administrator has the privilege to add, modify or delete information from the database. Users are free to get information using this software. Users can ask questions regarding any information or about the software to the concerned experts by sending an e-mail; this facility is included in the software itself.

SISD is developed using ASP.NET. Database part is developed using SQL Server 2000.

Guide: Dr. RC Goyal

CERTIFICATE COURSE

Senior Certificate Course in Agricultural Statistics and Computing: 7 participants

The institute continued to conduct Senior Certificate Course in Agricultural Statistics and Computing, organized for the benefit of research workers engaged in handling statistical data collection, processing, interpretation and employed in research Institute of the Council, State Agricultural Universities and State Government Departments, etc. and foreign countries including SAARC countries with the main aim to train the participants in the use of latest statistical techniques as well as use of computers and software packages. The course is comprised of two independent modules of three months duration each. The main topics covered under the course include Statistical Methods and Official Agricultural Statistics, Use of Computers in Agricultural Research, Sampling Techniques, Econometrics and Forecasting Techniques, Design of Experiments and Statistical Genetics.

A participant receiving the certificate during Valedictory Function of Senior Certificate Course in Agricultural Statistics and Computing

During the period the course was organised during 06 July 2009 to 26 December 2009 (Module–I: 06 July 2009 to 26 September 2009 and Module–II: 12 October 2009

to 26 December 2009). Two officers participated in Module–I only, one officer participated in Module–II only and four officers participated in both the modules.

NATIONAL/INTERNATIONAL TRAINING PROGRAMMES

Programme under Centre of Advanced Faculty Training

A twenty one days training programme on Recent Advances in Web Technologies for Information Management in Agriculture was organized during 16 February - 08 March 2010. Fourteen participants from ICAR Institutes and State Agricultural Universities attended the training programme. Ms. Anu Sharma was the Course Director and Sh. SB Lal was Co-Course Director of the training programme. This training was organized to provide knowledge in designing and development web applications and services using Microsoft .NET technology with advanced scripting language like Javascript, Cascading Style Sheets and AJAX.

Inaugural function of Training Programme on 'Recent Advances in Web Technologies for Information Management in Agriculture'

Summer/Winter School Organized

21 days Winter School on Bioinformatics and Statistical Genomics was organised during 17 November–07 December 2009. The main objective was to train individuals at the interface of genomic, computational and statistical sciences. The course was structured in a series of modules on preliminaries, introduction to LAMP technology, bioinformatics and statistical genomics, covering important topics on biological

Valedictory function of Winter School on 'Bioinformatics and Statistical Genomics'

databases, sequence alignments, genome browsers, SNPs, comparative genomics, machine learning approaches, HMMs, proteomics, QTLs, marker assisted selection, analysis of molecular variance (AMOVA), whole genome association (WGA) and bioinformatics software and tools. A total of 25 participants from ICAR institutes / SAUs representing 13 states, cutting across different disciplines like Molecular Biology & Biotechnology, Biochemistry, Breeding & Genetics, Computer Application, Statistics and Microbiology, participated in the Winter School. Dr. B.C. Barah, Director, NCAP was the Chief Guest for the inaugural session and Dr. Arvind Kumar, Deputy Director General (Education), ICAR was the Chief Guest for the valedictory session. Dr. A.R. Rao was the Course Director for the Winter School.

International Training Programmes

- An International training programme on Experimental Designs and Data Analysis for the CAC Staff at Tashkent was organized by Dr. Rajender Parsad as Course Director during 01-05 June 2009 while he was invited as Consultant Biometrician with Computer and Biometrics Services Unit, ICARDA, Syria. Sh. Khaled–EI–Shamma from ICARDA, Syria acted as Course Co-Director. There were 8 participants in this training programme who were research staff of International Water Management Institute, International Potato Center and International Center for Agricultural Research in Dry Areas at Tashkent Office. The course material was distributed to the participants in the form of E-manual.

A view of International Training Programme on 'Experimental Designs and Data Analysis' at Tashkent

- An International training Programme on Advances in Design and Analysis of Experiments at ICARDA, Aleppo Syria was organized by Dr. Rajender Parsad as Course Director during 08-19 November 2009 while he was invited as Consultant with its Computer and Biometrics Services Unit. Sh. Khaled-El-Shamma from ICARDA, Syria acted as Course Co-Director. The training programme was attended by 15 participants from National Agricultural Research Systems of Iraq, Iran, Azerbaijan, Sudan, Jordan, Uzbekistasn, Lybia and Syria. The course material was distributed to the participants in the form of E-manual.
- An International Training Programme on Applications of Remote Sensing and GIS in Agricultural Surveys sponsored by Afro Asian Rural Development Organization (AARDO) was organized at the Institute, during 06-25 November 2009. Dr. Anil Rai was the Course Director of the training programme. There were 08 participants from China, Ethiopia, Pakistan, Sudan, Syria and Nigeria.

International Training Programme on 'Applications of Remote Sensing and GIS in Agricultural Development' is in progress

Other Training Programmes

- A training programme on Data Analysis with Statistical Tools sponsored by Central Statistical Organization, Ministry of Statistics and Programme Implementation, Government of India was organized for 23 ISS Probationers of XXIX batch during 13 April–08 May 2009. The training programme was inaugurated by Dr. MM Pandey, DDG (Engg.), ICAR. The training programme aimed at familiarizing the participants with the advances in data analytical techniques for drawing statistically valid inferences from data and to acquaint the participants with the use of statistical packages for data analysis and provide a hands on experience. Entire course contents were structured in the following broad headings viz. Computer Usage and Statistical Software Packages; Statistical Methods and Statistical Inference; Design of Experiments; Multivariate Analytical Techniques; Statistical Modelling and Forecasting Techniques; Sample Surveys and Other Useful Statistical Techniques such as Spatial Statistical Analysis, Remote Sensing and GIS, Data Mining, Artificial Neural Networks, etc. The course material was distributed to the participants in the beginning of the training programme in the form of reference manual in two volumes. Dr. Pronab Sen, Chief Statistician and Secretary, Ministry of Statistics and Programme Implementation, Government of

A participant receiving the certificate from Chief Guest during Valedictory Function of Training Programme on 'Data Analysis with Statistical Tools'

India was the Chief Guest in the Valedictory Function. He distributed the certificates to the participants along with a copy of E-manual. Dr. Rajender Parsad was the Course Director and Dr. Krishan Lal was the Course Co-Director for this training programme.

- A refresher course on Applications of Information Technology in Statistical Computing and Data Dissemination Techniques for in-service ISS officers and senior officers of State Governments/UT for CSO was organised at the Institute during 26-30 October 2009. Dr. R.C. Goyal was the Course Director for the training program. 13 participants attended the training programme.

Inaugural function of Refresher Course on 'Application of Information Technology in Statistical Computing and Data Dissemination Techniques'

- A refresher 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. The 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 Course Co- Director of the programme. The topics covered in the training programme were Importance and problem of small area estimation, different approaches used in small area estimation, small area estimation under mixed model, small area estimation using NSSO data and use of R package. 25 participants attended the training programme.

Valedictory function of Refresher Training Programme on 'Small Area Estimation'

- A refresher training course on Research Methodology for Official Statistics sponsored by CSO, Ministry of Statistics and Programme Implementation, Govt. of India for twelve Indian Statistical Service (ISS) officers and statistical personnel was organized during 01-06 February 2010. Some of the topics covered were Analysis of complex surveys, Models in survey sampling, Imputation techniques, Variance estimation techniques, Small area estimation techniques, Applications of remote sensing and GIS in survey sampling and analysis of survey data using SPSS, SAS, R and SSDA softwares etc. Dr. UC Sud was Course Director and Dr. Tauqueer Ahmad was Co-Course Director for this training course.

Director, IASRI welcoming the Chief Guest during valedictory function of Refresher Training Programme on 'Research Methodology for Official Statistics'

- Two days computer training on the topics MS Word, MS Excel and Role of IT in the Functioning of Finance Division was organised during 16-17 February 2010 under "Special training programme on financial matters" for the officials of ICAR Hqrs.'. 25 participants attended the training programme.
- A refresher training programme on Agricultural Statistical System in India, for 14 Statistical

Personnel of States/UTs/PSUs of Ministry of Statistics & Programme Implementation, Government of India was organised during 15-19 March 2010. It was funded by Central Statistical Organisation (CSO), Ministry of Statistics & Programme Implementation, Government of India. Brief Outline/Course Curriculum of the programme were System of collection of agricultural statistics in India, Cost of cultivation of principal crops in India, Land use and area statistics, Agricultural prices, wages and market intelligence, Agricultural census, Irrigation statistics, Crop forecasting and crop estimation and Animal husbandry statistics. Dr. KK Tyagi was the Course Director and Dr. AK Gupta was the Course Co-Director of the programme.

FACULTY MEMBERS OF P.G. SCHOOL, IARI IN AGRICULTURAL STATISTICS

S. No.	Name	Year of induction
1.	Dr. VK Bhatia, Director and Professor (Agricultural Statistics)	1987
2.	Dr. VK Gupta, National Professor	1984
3.	Dr. Prajneshu, Principal Scientist	1984
4.	Sh. SD Wahi, Principal Scientist	1987
5.	Dr. Ranjana Agrawal, Principal Scientist	1988
6.	Dr. UC Sud, Principal Scientist	1995
7.	Dr. KK Tyagi, Principal Scientist	1995
8.	Dr. Rajender Parsad, Principal Scientist	1995
9.	Dr. Anil Rai, Principal Scientist	1995
10.	Dr. Seema Jaggi, Senior Scientist	1995
11.	Dr. Chandrahas, Principal Scientist	1996
12.	Dr. PK Batra, Principal Scientist	1996
13.	Dr. Aloke Lahiri, Senior Scientist	1998
14.	Dr. Amit Kumar Vasisht, Principal Scientist	1998
15.	Dr. Lalmohan Bhar, Senior Scientist	1998
16.	Dr. Amrit Kumar Paul, Senior Scientist	1998
17.	Dr. Tauqueer Ahmad, Senior Scientist	1998
18.	Dr. AR Rao, Senior Scientist	1998
19.	Dr. Ramasubramanian V, Senior Scientist	1999
20.	Dr. Girish Kumar Jha, Senior Scientist (at IARI)	1999
21.	Dr. Cini Varghese, Senior Scientist	2000
22.	Dr. Prachi Misra Sahoo, Scientist	2002
23.	Dr. RL Sapra, Principal Scientist (at IARI)	2002
24.	Dr. Krishan Lal, Principal Scientist	2003
25.	Dr. Hukum Chandra, Scientist	2003
26.	Sh. Amrender Kumar, Scientist	2003
27.	Md. Wasi Alam, Scientist	2003
28.	Dr. Prawin Arya, Scientist	2003
29.	Dr. Himadri Ghosh, Senior Scientist	2004
30.	Dr. Anil Kumar, Scientist	2010

A view of Valedictory Session of Refresher Training Programme on Agricultural Statistical System in India

During the Inaugural Session Sh. SK Das, Director General, CSO was the Chief Guest. In the Valedictory Session, Dr. BBPS Goel, Former Director, IASRI was the Chief Guest and Dr. VK Gupta, National Professor, ICAR presided over the session.

Research Fellowship

During 2009-10, 15 Ph.D. and 34 M.Sc. students received Research Fellowship. 13 Ph.D. students received IARI Scholarship @ Rs.10,500 /- p.m. in addition to Rs.10,000/- per annum as the contingent grant and 2 Ph.D. students received CSIR Fellowship @ Rs.12,000 /- p.m. in addition to Rs. 20,000/- per annum as the contingent grant.

13 M.Sc. students received ICAR Junior Research Fellowship @ Rs. 8640/- p.m. besides Rs. 6000/- per annum as the contingent grant and 21 M.Sc. students received IARI Scholarship @ Rs. 7560/- p.m. besides Rs. 6000/- per annum as the contingent grant.

FACULTY MEMBERS OF P.G. SCHOOL, IARI IN COMPUTER APPLICATION

S. No.	Name	Year of induction
1.	Dr. SD Sharma, ADG (HRD)	1996
2.	Dr. PK Malhotra, Professor (Computer Application)	1991
3.	Dr. RC Goyal, Principal Scientist	1995
4.	Dr. VK Mahajan, Principal Scientist	1996
5.	Sh. Harnam Singh Sikarwar, Scientist (SG)	1997
6.	Md. Samir Farooqi, Scientist	2001
7.	Dr.(Smt.) Alka Arora, Scientist	2001
8.	Smt. Shashi Dahiya, Scientist	2001
9.	Smt. Sangeeta Ahuja, Scientist	2002
10.	Dr. Sudeep Marwaha, Scientist	2002
11.	Sh. KK Chaturvedi, Scientist	2002
12.	Sh. SN Islam, Scientist	2004
13.	Sh. SB Lal, Scientist	2004
14.	Smt. Anshu Bharadwaj, Scientist	2004
15.	Smt. Anu Sharma, Scientist	2004
16.	Smt. Rajni Jain, Sr. Scientist (at NCAP)	2007

COURSES TAUGHT DURING THE ACADEMIC YEAR 2008–09

Code	Title	Course Instructors
	Trimester – III	
	Agricultural Statistics	
AS-103	Elementary Sampling & Non- Parametric Methods (2+1)	KK Tyagi & Asha Saksena
AS-163	Statistical Inference (4+1)	Rajender Parsad, Hukam Chand & LM Bhar
AS-164	Design of Experiments – I (3+1)	Seema Jaggi & VK Gupta
AS-166	Statistical Genetics – I (3+1)	VK Bhatia
AS-302	Advanced Design of Experiments – II (2+1)	PK Batra & Krishan Lal
AS-304	Advanced Sample Survey – II (2+1)	UC Sud & Hukum Chandra
AS-307	Forecasting Techniques (1+1)	Chandrahas & Ramasubramanian V
AS-370	Recent Advances in the Field of Specialisation (1+0)	VK Gupta
AS-299	Seminar (1+0)	Seema Jaggi
	Computer Application	
CA-131	Data Base Management System (2+2)	RC Goyal, Sudeep Marwaha & Anu Sharma
CA-132	Data Structures and Algorithms (2+1)	KK Chaturvedi
CA-134	Modeling and Simulation (2+1)	PK Malthotra & Anshu Bhardwaj
CA-135	Computer Networks (2+1)	SN Islam & Alka Arora
CA-299	Seminar (1+0)	Anu Sharma

COURSES TAUGHT DURING THE ACADEMIC YEAR 2009–10

Code	Title	Course Instructors
	Agricultural Statistics	
	Trimester – I	
AS-101	Elementary Statistical Methods (2+1)	KK Tyagi & AK Gupta
AS-150	Mathematical Methods – I (4+0)	Cini Varghese & Himadri Ghosh
AS-160	Probability Theory (2+0)	PK Batra & Anil Kumar
AS-161	Statistical Methods – I (2+1)	Seema Jaggi & Ramasubramanian V
AS-167	Applied Multivariate Analysis (2+1)	Ranjana Agrawal & AR Rao
As-168	Econometrics (2+1)	AK Vasisht & Prawin Arya
AS-169	Planning of Surveys / Experiments (2+1)	KK Tyagi & Aloke Lahiri
AS-200	Design of Experiments – II (1+1)	Rajender Parsad & Cini Varghese
AS-201	Sampling Techniques – II (1+1)	Tauqeer Ahmad & Prachi Misra Sahoo
AS-202	Statistical Genetics – II (1+1)	SD Wahi & AK Paul
AS-203	Regression Analysis (1+1)	LM Bhar & Ramasubramanian V
AS-204	Linear Models (2+0)	Krishan Lal & VK Gupta
AS-206	Optimization Techniques (1+1)	UC Sud & Prajneshu
AS-299	Seminar (1+0)	Anil Kumar
AS-370	Recent Advances in the Field of Specialization (1+0)	UC Sud
	Trimester – II	
AS-102	Elementary Design of Experiments (2+1)	Aloke Lahiri & DK Sehgal
AS-151	Mathematical Methods in Statistics – II (4+0)	NK Sharma, Anil Kumar & Cini Varghese
AS-162	Statistical Methods – II (2+1)	Seema Jaggi & Ramasubramanian V
AS-165	Sampling Techniques – I (3+1)	Tauqueer Ahmad & Prachi Mishra Sahoo
AS-170	Statistical Modeling (2+1)	Prajneshu
AS-171	Bioinformatics – I (3+1)	AR Rao, Hukum Chandra & KV Bhatt
AS-205	Advanced Statistical Inference (1+1)	Krishan Lal & UC Sud
AS-207	Stochastic Processes (3+0)	Himadri Ghosh
AS-301	Advanced Design of Experiments – I (2+1)	LM Bhar & VK Gupta
AS-303	Advanced Sample Survey – I (2+1)	Hukum Chandra & Anil Rai
	Computer Application	
	Trimester – I	
CA-100	Introduction to Computer Application (1+1)	VH Gupta
CA-111	Computer Organization and Architecture (3+0)	Sudeep Marwaha & Alka Arora
CA-112	Fundamentals of Computer Programming in C (2+1)	KK Chaturvedi & Md S Farooqi
CA-114	Mathematical Foundations in Computer Application (4+0)	PK Batra, NK Sharma & HS Sikarwar
CA-211	Compiler Construction (2+1)	SB Lal
CA-212	Computer Graphics (2+1)	Pal Singh & Sangeeta Ahuja
CA-213	Artificial Intelligence (2+1)	Rajni Jain & Sudeep Marwah
CA-214	Internet Technologies & Applications (2+1)	Alka Arora, Anu Sharma & SB Lal
CA-215	Software Engineering (2+0)	Anu Sharma & Rajni Jain
CA-299	Seminar (1+0)	Anu Sharma
	Trimester – II	
CA-101	Computer Fundamentals & Programming (3+1)	Pal Singh & SN Islam
CA-121	Object Oriented Programming & Design (2+1)	Sangeeta Ahuja
CA-122	Operating System (2+1)	HO Agarwal
CA-123	Numerical Analysis (2+1)	HS Sikarwar
CA-124	System Analysis & Design (2+1)	RC Goyal
CA-221	Data Warehousing and Data Mining (2+1)	Anil Rai & Rajni Jain
CA-224	GIS and Remote Sensing Techniques (2+1)	Prachi Misra Sahoo & Md S Farooqi
CA-225	Data Analysis in Agriculture (1+2)	VK Mahajan
CA-299	Seminar (1+0)	Anu Sharma & Shashi Dahiya

Note: Figures in the parentheses indicate the number of credits (Lectures + Practicals)

EENADU, 06-10-2009

సదస్సును ప్రారంభిస్తున్న ఎన్‌జీ రంగా వ్యవసాయ విశ్వవిద్యాలయం డైరెక్టరు యల్లమందారెడ్డి

ప్రయోగ ఫలితాల్లో కచ్చితత్వం ముఖ్యం

ఎన్.జి.రంగా విశ్వవిద్యాలయం డైరెక్టర్

తిరుపతి (వెటర్నరీ యూనివర్సిటీ), న్యూస్‌టుడే: తిరుపతి ప్రాంతీయ వ్యవసా పరిశోధన స్థానంలో 'పరిశోధన, ప్రయోగ రచనా విశ్లేషణ పద్ధతులు' అంశ రెండు రోజుల సదస్సు సోమవారం ప్రారంభమైంది. ఈ సదస్సును ఆచార్య ఎ జి రంగా వ్యవసాయ విశ్వవిద్యాలయం డైరెక్టర్ బి.యల్లమందారెడ్డి ప్రారంభించా ప్రయోగాల్లో ఆధునిక విశ్లేషణ పద్ధతులను అవలంబించి మెరుగైన, కచ్చితమైన ఫలితాలు అందివ్వాలని ఆయన శాస్త్రవేత్తలకు సూచించారు. ఈ కార్యక్రమానికి హాజరయిన ఇండియన్ అగ్రికల్చర్ స్టాటిస్టికల్ రీసెర్చ్ ఇన్‌స్టిట్యూట్ సీనియర్ ప్రొఫెసర్ వి.కె.గుప్తా మాట్లాడుతూ పరిశోధన గణాంకాలు ఎన్నో అంశాలను ప్రభావితం చేస్తాయని వివరించారు. స్వల్ప వర్షపాతం నమోదయ్యే ప్రాంతాల శాస్త్రవేత్తలకు పలు సూచనలు ఇచ్చారు. సదస్సులో తిరుపతి ఏడీఆర్ రాజారెడ్డి, ఏఎన్‌జీఆర్‌ఏ ప్రొఫెసర్ రాజేంద్రప్రసాద్, ఎస్వీఏజీ అసోసియేట్ డీన్ సుధాకరరావు, సదస్సు ఆహ్వాన కార్యదర్శి రమేంద్రారెడ్డి పాల్గొన్నారు.

స్థానికం
సాక్షి
విశాఖపట్నం

పరిస్థితులను బట్టి పరి

వ్యవసాయ ప్రయో

మంగళవారం | అక్టోబర్ | 6 | 2009
సాక్షి 24/7
తిరుపతి
5

కచ్చితమైన ఫలితాలకు
సాంఖ్యక రచనా పద్ధతులు అవలంబించాలి

CHENNAI
THE HINDU • TUESDAY, OCTOBER 6, 2009

Stress on use of statistical tools

TIRUPATI: Dr. V.K. Gupta, professor at Indian Agricultural Statistical Research Institute (IASRI), a unit of ICAR has on Monday underscored the need to use the advanced and suitable statistical analytical tools for designing experiments in agricultural research and in analysing their results. He was addressing farm scientists from southern and scarce rainfall zones of Andhra Pradesh after iaugurating a two day workshop at the Regional Agricultural Research Station, Tirupati on Monday.

- Special Correspondent

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Awards and Recognitions

AWARDS

- Dr. Hukum Chandra received Cochran-Hansen Prize 2009 from International Association of Survey Statisticians.

Dr. Hukum Chandra receiving Cochran-Hansen Prize

- Dr. AK Vasisht received the Best Research Paper Award for the paper entitled "An analysis of volatility of agricultural prices - A case study of maize" in the national level Workshop cum Seminar on "Indian Commodity Market Derivatives & Risk Management - The Road Ahead" held at Pondicherry University, Puducherry during 11-12 September 2009.
- Dr. Himadri Ghosh received Mrs. Bhargavi and Professor CR Rao Award for Best Poster Presentation on "Application of statistical learning theory for fitting multimodal distribution to rainfall data" in the International Conference on Frontiers of Interface between Statistics and Sciences held at C.R. Rao Advanced Institute of Mathematics, Statistics and Computer Science (AIMSCS), University of Hyderabad, Hyderabad during 30 December 2009 to 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.YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP) on 20 March 2010.

- Expert System on Wheat Crop Mangement for bridging the gap between experts and farmers by providing knowledge based redressal information, received Manthan Award South Asia 2009 for best e-content and best e-learning solution. The project was the only winner from India, out of 380 nominations from seven countries. The details of award are available at http://www.manthanaward.org/section_synopsis.asp?id=190&pno=2

Expert System on Wheat Crop Mangement Team with Manthan Award South Asia

- डॉ. रंजना अग्रवाल को भारत सरकार, सूचना एवं प्रसारण मंत्रालय के प्रकाशन विभाग द्वारा आयोजित भारतेंदु हरिश्चन्द्र पुरस्कार योजना के अंतर्गत वैज्ञानिक लेखों की पुस्तक (पांडुलिपि) "विज्ञान में ताक झाँक" के लिये 29 मार्च 2010 को बाल एवं किशोर साहित्य वर्ग में प्रथम पुरस्कार (संयुक्त) मिला ।
- The Division of Computer Application participated in Krishi Vigyan Mela held during 04-06 March 2010 at IARI, New Delhi. The stall was decorated with posters of various web-based applications and stand alone software developed at the Institute to disseminate the knowledge to visitors and farmers. The "Expert System on Wheat Crop Management" was shown to farmers through touch screen computers and laptops. By virtue of this IASRI received a "Praise-Reward for Excellent Performance" under ICAR Institute Category.

RECOGNITION

Dr. VK Bhatia

- Chief Guest of the Winter School on Decision Making in Agriculture using Data Mining on 27 October 2009 at NCAP, New Delhi.
- Chief Guest of the National workshop on Applicable Statistics organised by Department of Statistics, MD University, Rohtak on 28 March 2010.

Dr. VK Gupta

63rd Annual Conference of ISAS held at Department of Statistics, Mathematics and Computer Application, Rajendra Agricultural University, Samastipur, Pusa, Bihar during 03-05 December 2009

- Chaired, Dr. VG Panse Memorial lecture delivered by Dr. BK Sinha, Visiting Professor, Indian Statistical Institute, Kolkata on A Reflection on the Choice of Covariates in Agricultural Experiments.
- Chaired, session of Society's Research Work during 2009 on Statistical Evaluation of Variation in Socio-Economic Development in the States of Eastern Region presented by Sh. SC Rai.

XII Annual Conference of Society of Statistics, Computer and Applications held at Department of Statisics, Shiksha Bhawan, Vishva Bharti, Shantiniketan, West Bengal during 24-26 February 2010

- Chaired the session of Keynote Address on Statistics for Assessment of Climate Change delivered by Dr. MN Das.
- Chaired the presentations during the symposium on Statistics in Studying the Impact of Climate Change.

Dr. Rajender Parsad

- Invited as Consultant with the Computer and Biometrics Services Unit, ICARDA, Syria during 01-05 June 2009 and 08-19 November 2009 for conducting International Training Programme on Experimental Designs.
- Chairman, contributed paper session during XII Annual Conference of Society for Statistics, Computer and Applications held at Department of Statistics, Siksha Bhavana, Visva Bharati during 23-25 February 2010.
- Chairman, invited talk during National Workshop on Applicable Statistics held at Department of

Statistics, M.D. University, Rohtak during 28-30 March 2010.

- Discussant in the technical session on Introduction to Mixture Experiments: Standard Models and Estimability during the Dissemination Workshop on Mixture Experiments: Theory and Applications held at BCKV, Kalyani during 21-22 December 2009.

Dr. Anil Rai

- Advisor for Third Census of Handlooms and Issue of Photo ID Card to Weavers conducted by NCAER, New Delhi.

Dr. Aloke Lahiri

- Chaired a contributed paper session on Statistics in Agriculture at the XII Annual Conference of Society for Statistics, Computer and Applications at Department of Statistics, Siksha Bhavana, Visva Bharati during 24-26 February 2010.

Dr. Anil Kumar

- Nominated as Member of Board of Studies for the Discipline of Statistics of Kumaun.
- Acted as a judge in the poster session of Symposium IV on Socio-Economics and Marketing of the International Buffalo Conference on Optimizing Buffalo Productivity through Conventional and Noval Technologies at NASC Complex, New Delhi on 03 February 2010.

Offices in Professional Societies/Research Journals

Aligarh Journal of Statistics

Dr. Tauqueer Ahmad	Member, Editorial Board

Annals of Agricultural Research

Dr. Cini Varghese	Member, Editorial Board

Bureau of Indian Standards, New Delhi

Dr. VK Gupta	Member, Management and Systems Division Council
Dr. VK Bhatia	Member, Management and Systems Division Council
Dr. Rajender Parsad	Member, Management and Systems Division Council

Computer Society of India

Dr. PK Malhotra	Member, Managing Committee
Dr. Alka Arora	Member, Managing Committee

Department of Educational Measurement and Evaluation of National Council of Educational Research and Training

Dr. Rajender Parsad	Nominated Member of Advisory Board

Farming Systems Research and Development Association

Dr. Anil Kumar	Joint Secretary Member, Editorial Board

Forum for Interdisciplinary Mathematics

Dr. VK Gupta	Vice-President
Dr. Rajender Parsad	Joint Secretary

Indian Journal of Applied Statistics

Dr. Prajneshu	Member, Editorial Board

Indian Society of Agricultural Marketing

Dr. AK Vasisht	Member, Executive Council

Indian Society of Agricultural Statistics

Dr. VK Gupta	Vice President Chair Editor, JISAS
Dr. VK Bhatia	Secretary Associate Editor, JISAS
Dr. Rajender Parsad	Joint Secretary Associate Editor, JISAS
Dr. Prajneshu	Associate Editor, JISAS
Dr. PK Malhotra	Joint Secretary Associate Editor, JISAS
Dr. AK Vasisht	Member, Executive Council
Dr. UC Sud	Member, Executive Council Associate Editor, JISAS
Dr. VK Mahajan	Member, Executive Council
Dr. Hukum Chandra	Member, Executive Council

Institute of Applied Statistics and Development Studies

Dr. VK Gupta	Member, Governing Body
Dr. VK Bhatia	Member, Governing Body
Dr. Prajneshu	Member, Governing Body
Dr. Rajender Parsad	Member, Governing Body

International Indian Statistical Association - INDIA Joint Statistical Meeting (IISA-INDIA JSM) 2000 Trust

Dr. VK Bhatia	President

International Statistical Institute, Netherlands

Dr. VK Gupta	Elected Member
Dr. Rajender Parsad	Elected Member

International Journal of Agricultural and Statistical Science

Dr. Anil Kumar	Member, Editorial Board

Journal of Statistical Planning and Inference

Dr. VK Gupta	Associate Editor

Journal of Statistical Theory and Practice

Dr. VK Gupta	Associate Editor
Dr. Prajneshu	Associate Editor

Ministry of Statistics & Programme Implementation

Dr. VK Bhatia	Member, Empowered Committee for Awards and Fellowship for Outstanding and Meritorious Research Work in Statistics
Dr. VK Gupta	Member, Screening Committee for Awards and Fellowship for Outstanding and Meritorious Research Work in Statistics

National Centre of Agricultural Economics and Policy Research, New Delhi

Dr. VK Gupta	Member, Institute Management Committee

National Council of Applied Economic Research (NCAER), New Delhi

Dr. Anil Rai	Member, Advisory Committee

Pusa AgriScience, Journal of IARI, PG School

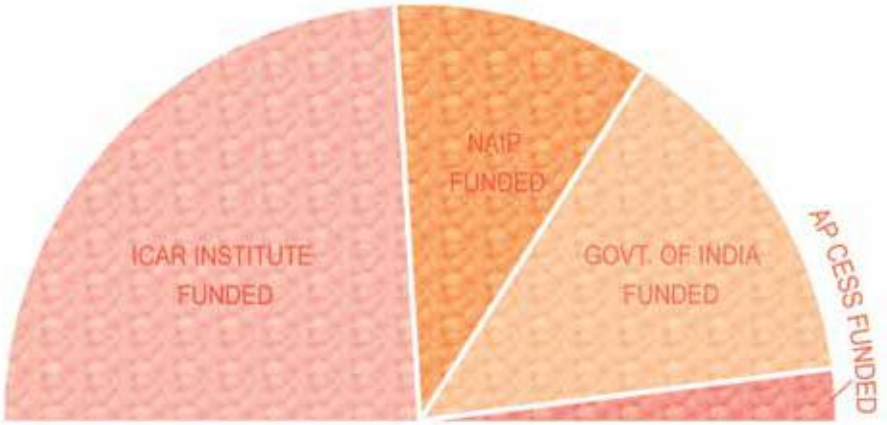
Dr. Rajender Parsad	Member, Editorial Board

Society of Statistics, Computer and Applications

Dr. VK Gupta	Executive President
Dr. VK Bhatia	Vice President Member, Editorial Board
Dr. Rajender Parsad	Secretary
Dr. Aloke Lahiri	Joint Secretary
Dr. LM Bhar	Joint Secretary

Swadeshi Science Movement of Delhi

Dr. Sushila Kaul	Member, Executive Council Member, Editorial Board



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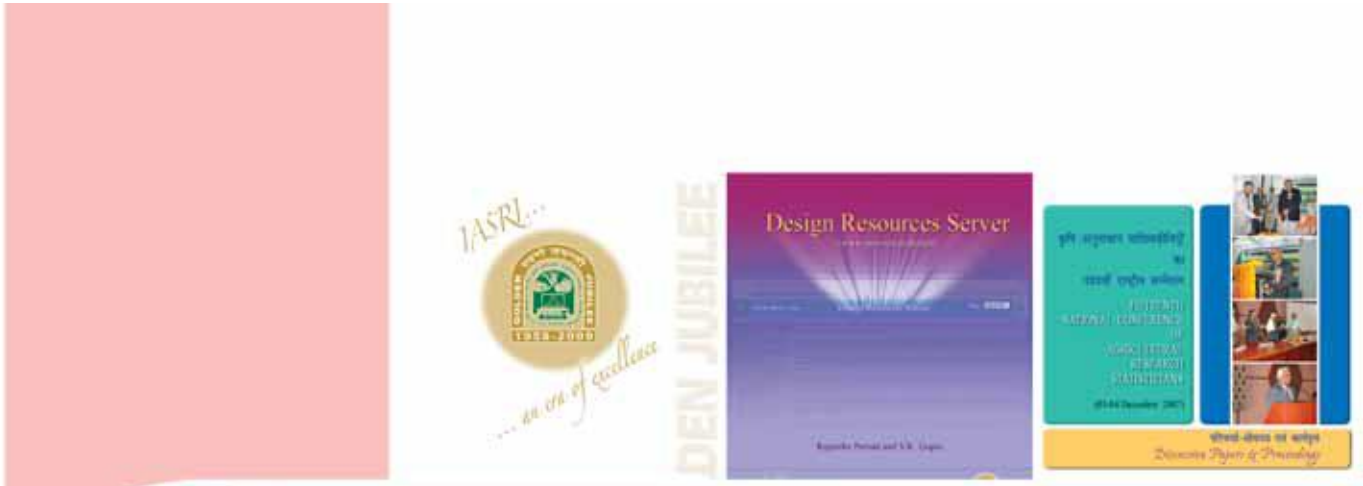
Linkages and Collaboration in India and Abroad including Outside Funded Projects

S. No.	Title	Collaborative/ Funding Agency	Date of Start	Date of Completion
1.	Planning, designing and analysis of experiments relating to AICRP on Soil Test Crop Response (STCR) correlation	Project Co-ordinator (STCR), Indian Institute of Soil Science, Bhopal	01 March 2007	31 March 2010
2.	Planning, designing and analysis of experiments planned ON-STATION under PDFSR	Project Directorate of Farming System Research, Modipuram	01 April 2007	31 March 2012
3.	Planning, designing and analysis of ON-FARM experiments under PDFSR	Project Directorate of Farming System Research, Modipuram	01 April 2007	31 March 2012
4.	Planning, designing and analysis of data relating to experiments conducted under AICRP on LTFE	Project Coordinator (LTFE) IISS, Bhopal	01 April 2007	31 March 2012
5.	Developing remote sensing based methodology for collecting agricultural statistics in Meghalaya	SAC, Ahmedabad and NESAC, Shillong	01 October 2007	30 September 2010
6.	Development of forecasting module for podfly, *Melanagromyza obtusa* Malloch in late pigeonpea	Indian Institute of Pulses Research, Kanpur	01 July 2007	30 June 2012
7.	Computational analysis of SNPs at functional elements of rice genome	NRC on Plant Biotechnology, New Delhi	01 September 2007	11 January 2010
8.	Strengthening, refining and implementation of expert system on wheat crop management	DWR, Karnal/IARI, New Delhi	25 August 2007	24 February 2010

S. No.	Title	Collaborative/ Funding Agency	Date of Start	Date of Completion
9.	Study on status and projection estimates of agricultural implements and machinery	Central Institute of Agricultural Engineering, Bhopal	01 March 2008	31 March 2010
10.	Weather based models for forecasting potato yield in Uttar Pradesh	Department of Agricultural Statistics & Crop Insurance, Directorate of Agriculture, Lucknow, U.P.	01 November 2007	30 April 2009
11.	Expert system on seed spices	NRCSS, Ajmer	01 February 2009	31 July 2010
12.	Expert system for maize crop	Directorate of Maize Research, New Delhi	01 April 2009	30 September 2010
13.	Experimental designs for agricultural research involving sequences of treatments	AP-Cess Fund, ICAR	01 January 2008	31 December 2009
14.	Visioning, Policy Analysis and Gender (V-PAGe) - Sub-Programme II : Technology forecasting	NCAP, New Delhi NAARM, Hyderabad (NAIP Funded)	01 June 2007	31 May 2012
15.	Visioning, Policy Analysis and Gender (V-PAGe) Sub-Programme III : Policy analysis and market intelligence	NCAP, New Delhi; IARI, New Delhi; NAARM, Hyderabad; NRCWA, Bhubaneshwar; Yes Bank, Agri-Watch (NAIP Funded)	01 June 2007	31 May 2012
16.	Risk assessment and insurance products for agriculture	NCAP, New Delhi (NAIP Funded)	01 October 2008	31 March 2012
17.	Bioprospecting of genes and allele frequency for abiotic stress tolerance	NRCPB, New Delhi (NAIP Funded)	04 May 2009	31 March 2012
18.	Strengthening statistical computing for NARS	NDRI, Karnal; IVRI, Izatnagar; MPUA&T, Udaipur; DWM, Bhubaneshwar; ICAR RC NEHR, Barapani; UAS, Bangalore; NAARM, Hydrabad; CIFE, Mumbai (NAIP Funded)	20 April 2009	31 March 2012
19.	Stochastic process modelling and forecasting through discrete non-linear time series approach	DST, New Delhi	01 March 2008	28 February 2011
20.	Whole Genome Association (WGA) analysis in common complex diseases: An Indian initiative	UDSC, NII, Delhi University, AIIMS, DMC (DBT Funded)	29 September 2008	28 September 2013
21.	Study to investigate the causes of variation between official and trade estimates of cotton production	Ministry of Agriculture, New Delhi	01 October 2006	15 May 2009
22.	Sampling methodology for estimation of meat production in Meghalaya	Ministry of Agriculture, Department of Animal Husbandry, Dairying & Fisheries, New Delhi	01 May 2009	30 April 2011
23.	Evaluation of rationalization of minor irrigation statistics (RMIS) scheme	Ministry of Water Resources, New Delhi	25 July 2009	23 December 2010
24.	Estimation of slum and slum like population in India	National Building Organisation, Ministry of Housing and Urban Poverty Alleviation, New Delhi	01 October 2009	31 January 2010
25.	Prioritization of rainfed area in the country	CRIDA, Hyderabad and National Agricultural Rainfed Authority, Ministry of Agriculture, New Delhi	01 January 2010	31 October 2010



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List of Publications

Research Papers

1. Abeynayake, NR and Jaggi, Seema (2009). A review of block designs with neighbour effects. *Sri Lankan J. Appl. Statist.*, **10**, 85-103.
2. Arnab, R and Sud, UC (2009). A note on variance estimation of ratio estimate in two phase sampling. *Model Asst. Statist. Appl.*, **5(1)**, 51-60.
3. Arora, Alka, Upadhyaya, Shuchita, Jain, Rajni (2009). Post processing of clusters for pattern discovery: Rough set approach. *J. Ind. Soc. Agril. Statist.*, **63(2)**, 181-188.
4. Behera, SK, Paul, AK and Wahi, SD (2010). Estimation of heritability of mastitis disease using ANOVA method. *IUP J. Genet. Evol.*, **3(1)**, 24-29.
5. Bhardwaj, SP and Vasisht, AK (2009). Price volatility and integration in spot and future markets. *Ind. J. Agril. Mktg.*, **23(1)**, 46-57.
6. Bhardwaj, SP and Vasisht, AK (2009). Strategic measures to meet market challenges in the changing scenario of liberalization. *Ind. J. Agril. Mktg.*, **23(3)**, 42-54.
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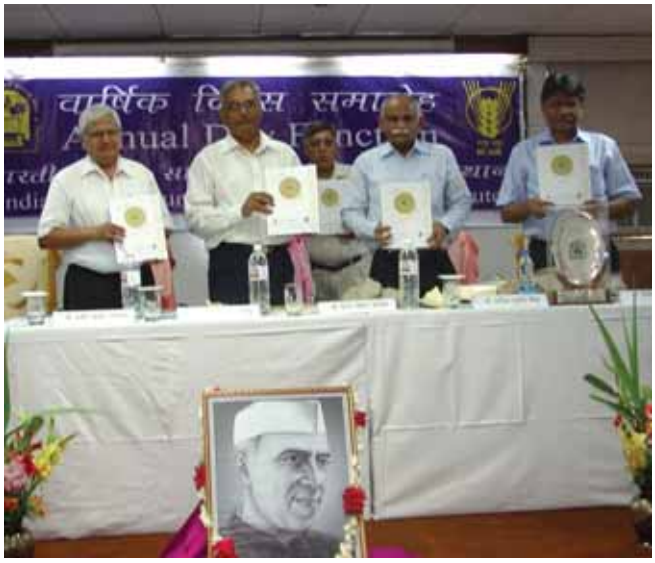

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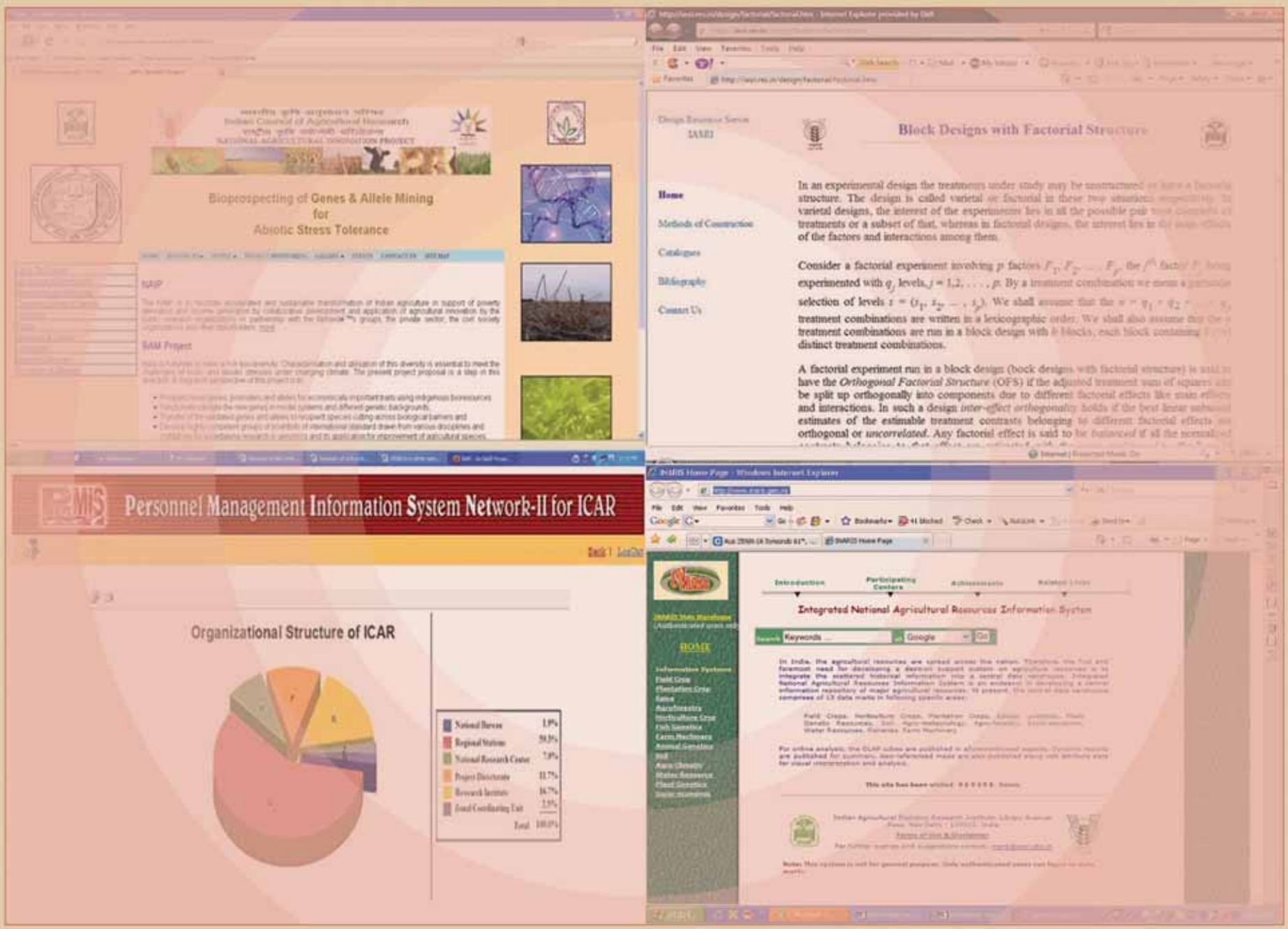
- पी. विशाखी एवं विजय बिन्दल । पाठ्य आदतों पर इंटरनेट का प्रभाव-भारतीय कृषि अनुसंधान संस्थान मानद विश्वविद्यालय के संदर्भ में, 49-54 ।


Bioprospecting of Genes & Allele Mining
for
Abiotic Stress Tolerance
NAIP
SAM Project
Design Resource Server
IASRI
Block Designs with Factorial Structure
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Personnel Management Information System Network-II for ICAR
Organizational Structure of ICAR
Integrated National Agricultural Resources Information System

10

Consultancy and Advisory Services

Advisory services for researchers in NARS were pursued rigorously; ten training programmes were conducted as consultancy (details given in Chapter 6) and two research studies were undertaken in consultancy mode.

Advisory Services Provided

- **Dr. Deo Pandey, Scientist (Plant Breeding), Department of Plant Breeding & Genetics, CSKHPKV, Palampur**

  Advised on the analysis of data pertaining to an experiment conducted to evaluate 48 varieties of rice using an α-design with parameters $v = 48$, $b = 18$, $r = 3$, $k = 8$. The data were collected on 17 characters namely days to 50% flowering, days to maturity, plant height at maturity(cm), total tillers/plant at maturity, effective tillers/plant at maturity, panicle length, spikelets/panicle, grains/panicle, grain yield/plant(g), 1000-grain weight(g), protien content(%), amylase content(%), gel consistency (mm), grain length, grain breadth, length breadth ratio and gelatinization temperature. He was advised on analysis of variance, pairwise comparison of genotypes, estimation of genotypic variances and genotypic correlation, estimation of heritability coefficient, genetic advance, divergence analysis, path analysis and phenotypic correlations.

- **Dr. R Madhusudhana, Senior Scientist (Plant Breeding), MAS Lab, Project Directorate of Sorghum Research, Rajendranagar, Hyderabad**

  Advised on the analysis of data pertaining to an experiment conducted with 175 RILs in two rabi and two kharif seasons in three replications.

- **Sh. OV Ramana, Technical Officer at National Research Centre on Sorghum, Hyderabad**

  Advised on how to perform principal component analysis, cluster analysis, using SPSS. Design Resources server was also demonstrated to him. The working of SPAR 2.0 was also explained to him.

- **Dr. Shiv Datt, Senior Scientist (Genetics), Regional Research Station, Pali, Central Arid Zone Research Institute, Jodhpur**

  Advised on generation of randomized layout of an augmented randomized complete block design for 35 test and 3 check entries in 6 blocks.

- **Chanchal Pramanik, M.Sc. (Agricultural Statistics) student, Department of Statistics & Mathematics, Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad**

  Advised on generation of the randomized layout of a square lattice design with 196 treatments in 3 replications. He was also advised on the steps of analysis of data using the link Resolvable Block Design on the page "Analysis of Data" available on the Design Resources Server.

- **Dr. Subhadra Singh, Senior Scientist, Department of Genetics, CCS HAU, Hisar**

  Advised on the use of α-design with parameters v = 105, b = 30, r = 2, k = 7 for the experiment conducted to evaluate 105 RILs of wheat crop.

- **Dr. Anupma, Senior Scientist, Division of Agricultural Chemicals, IARI, New Delhi**

  Advised on the use of a fractional factorial plan in 72 runs arranged in 4 blocks each of size 18 for a $3^3 \times 5^6$ factorial experiment pertaining to preparation of super absorbent composites with maximum water absorption characteristics and enhanced stability and moisture absorption behaviour in plant growth media with an aim to achieve maximum and fast rate of absorbency utilizing minimum possible concentration of monomer, crosslinker and alkali.

  The various factors along with their levels are:

Factor	Number of Levels
Nature of alkali (A)	3
Duration of alkali exposure (B)	3
Temperature of reaction (C)	3
Concentration of alkali (D)	5
Backbone: Clay ratio (E)	5
Monomer concentrations (F)	5
Crosslinker concentration (G)	5
Initiator concentration (H)	5
Volume of water (I)	5

The suggested fractional factorial plan is

Block -1

A	B	C	D	E	F	G	H	I
0	0	0	0	0	0	0	0	0
1	1	1	4	4	4	4	4	4
2	2	2	2	2	2	2	2	2
0	1	1	3	1	2	2	0	2
1	2	2	1	2	3	0	4	3
2	0	0	2	3	1	4	2	1
0	2	1	2	4	0	1	2	3
1	0	2	3	2	4	2	3	1
2	1	0	1	0	2	3	1	2
0	1	2	2	3	1	1	3	2
1	2	0	0	1	2	2	1	3
2	0	1	4	2	3	3	2	1
0	0	0	3	2	0	4	1	2
1	1	1	1	3	4	2	2	0
2	2	2	2	1	2	0	3	4
0	0	2	4	4	2	1	2	0
1	1	0	2	2	3	2	0	4
2	2	1	0	0	1	3	4	2

Block 2

0	2	0	1	4	1	3	3	4
1	0	1	2	2	2	1	1	2
2	1	2	3	0	3	2	2	0
0	2	1	2	3	0	2	4	1
1	0	2	0	1	4	3	2	2
2	1	0	4	2	2	1	0	3
0	1	2	2	2	1	0	1	0
1	2	0	0	3	2	4	2	4
2	0	1	4	1	3	2	3	2
0	2	0	1	2	4	2	2	2
1	0	1	2	3	2	3	0	0
2	1	2	3	1	0	1	4	4
0	1	1	0	2	2	0	2	1
1	2	2	4	0	0	4	3	2
2	0	0	2	4	4	2	1	3
0	0	2	1	0	2	2	4	1
1	1	0	2	4	3	0	2	2
2	2	1	3	2	1	4	0	3

Block 3

0	0	2	4	3	2	2	1	4
1	1	0	2	1	0	3	2	2
2	2	1	0	2	4	1	3	0
0	1	1	3	2	2	3	2	4
1	2	2	1	3	3	1	0	2
2	0	0	2	1	1	2	4	0

0	2	0	4	2	1	2	2	2
1	0	1	2	0	2	0	3	3
2	1	2	0	4	3	4	1	1
0	1	2	2	2	4	3	4	3
1	2	0	3	0	2	1	2	1
2	0	1	1	4	0	2	0	2
0	2	1	2	0	3	2	1	4
1	0	2	3	4	1	0	2	2
2	1	0	1	2	2	4	3	0
0	2	0	4	1	4	0	0	1
1	0	1	2	2	2	4	4	2
2	1	2	0	3	0	2	2	3

Block 4

0	0	2	1	1	2	4	2	3
1	1	0	2	2	0	2	3	1
2	2	1	3	3	4	0	1	2
0	0	0	0	2	3	1	4	2
1	1	1	4	0	1	2	2	3
2	2	2	2	4	2	3	0	1
0	1	2	2	0	4	4	0	2
1	2	0	3	4	2	2	4	0
2	0	1	1	2	0	0	2	4
0	2	1	2	1	3	4	2	0
1	0	2	0	2	1	2	0	4
2	1	0	4	3	2	0	4	2
0	1	1	0	4	2	2	3	2
1	2	2	4	2	0	3	1	0
2	0	0	2	0	4	1	2	4
0	0	0	3	3	3	3	3	3
1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	2	2

- **Dr. Sunil Jha, Senior Scientist, Division of Post Harvest Technology, IARI, New Delhi**

  Advised on the analysis of data pertaining to an experiment conducted to study the firmness of 8 hybrid mango cultivars at different storage days (first day to 15 days at unequal intervals). The experiment was conducted using 3 replications. Due to unequal days interval, the data were non-orthogonal with three classifications. The data were analyzed using three way classified data. In the analysis hybrids, storage days and their interaction were found to be significant.

- **Ph.D. (Animal Genetics and Breeding) student from NDRI, Karnal**

  Advised on fitting of Multiphasic Logistic Function on milk yield of Karanfries cows over time period. The steps for fitting the function using SAS were also explained.

- Two collaborative studies namely (i) Survey of agricultural accidents for the year 2004-05 in a large sample of villages selected on the basis of statistical consideration with AICRP on ESA (Ergonomics & Safety in Agriculture) and (ii) Assessment of post harvest losses of crops/commodities with AICRP on PHT have been undertaken.

Projects undertaken in Consultancy Mode

- "Evaluation of rationalization of minor irrigation statistics scheme", funded by the Ministry of Water Resources, Govt of India. The items of data being collected in the scheme were examined and an assessment of data quality was made. Further, the suggestions for improvements in methodology and infrastructure developed, were made. The draft report of the study has been finalized and submitted to the funding agency. The comments received on the draft report have also been incorporated and report re-submitted to the funding agency. A presentation on the details of evaluation was made to the Ministry of Water Resources, Govt. of India.

- "Estimation of urban slum population in the country and capacity building", funded by the Ministry of Housing and Urban Poverty Alleviation, Government of India. Under this project state wise models have been developed for estimation of reasonable estimates of urban slum population of cities/ towns based on 2001 census. These models are based on information from important census variables after their transformation to a new set of independent explanatory variables. In case of smaller states multilevel model was fitted after incorporation of state effect in the model. Further, projections of the slum population in different years were obtained based on the basis of population projections of urban sector of each state after incorporation of estimated correction factor for slum population.

जागरण YAHOO! INDIA

अब इंटरनेट से गेहूं उत्पादकों की किस्मत चमकेगी

May 13, 12:16 am

मनोज चौधरी, करनाल

गेहूं उत्पादक किसानों के लिए अच्छी खबर है। वह दिन अब दूर नहीं जब वे घर बैठे ही गेहूं के नए बीज, उगाने की विधि, खाद-पानी का समय और फसल में लगने वाली बीमारी के बारे में आसानी से जान सकेंगे। गेहूं फसल प्रबंधन के लिए वैज्ञानिक दक्ष तंत्र बनाने में जुट गए हैं। यह कम्प्यूटरीकृत सिस्टम अंग्रेजी में है, लेकिन हिंदीभाषी किसानों की सुविधा के मद्देनजर इसे हिंदी में तैयार कर इंटरनेट पर डाला गया है।

इंटरनेट पर डाले जाने वाला दक्ष तंत्र नई दिल्ली स्थित भारतीय कृषि सांख्यिकी अनुसंधान संस्थान का प्रोजेक्ट है। इसे भारतीय कृषि अनुसंधान संस्थान, नई दिल्ली व गेहूं अनुसंधान निदेशालय, करनाल के साझे प्रयास से तैयार किया जा रहा है। इसके लिए करनाल की राष्ट्रीय डेयरी अनुसंधान संस्थान, हरियाणा कृषि विभाग और हरियाणा कृषि विश्वविद्यालय के अंतर्गत आने वाले कृषि विज्ञान केंद्र, इफको, शाम्पसन रायटर सहित कई विभागों का भी विशेष सहयोग लिया जाएगा। एक्सपर्ट सिस्टम को 15 से अधिक वैज्ञानिक और 30 विद्यार्थियों ने तैयार किया है।

एक्सपर्ट सिस्टम का खुलासा मंगलवार को गेहूं अनुसंधान निदेशालय में आयोजित दो दिवसीय कार्यशाला में किया गया। कार्यशाला का उद्घाटन सिस्टम के मुख्य अन्वेषक डा. एसएन इस्लाम ने किया। उन्होंने बताया कि गेहूं पर विकसित यह देश का पहला एक्सपर्ट सिस्टम है। किसान इंटरनेट पर घर बैठे गेहूं फसल की सभी जानकारियां आसानी से ले सकेंगे।

संस्थान के परियोजना निदेशक डा. जगशेरन ने बताया कि एक्सपर्ट सिस्टम से किसान गेहूं के बीज, बोने की विधि और काटने की विधि के साथ-साथ लगने वाली बीमारियों की जानकारी हासिल कर सकेंगे। कार्यशाला के आयोजक डा. रणधीर सिंह ने बताया कि इस पद्धति की मदद से सभी गेहूं उत्पादक किसानों को आसानी से उच्च तकनीक पहुंचाई जा सकती है। हिंदी प्रभारी डा. जानेंद्र सिंह ने कहा कि दक्ष तंत्र के हिंदी में विकसित होने से गेहूं के किसानों को आर्थिक लाभ भी प्राप्त होगा।

कार्यशाला के पहले डा. जी सिंह, डा. आरएस छोकर, समीर पाराशी, डा. एके शर्मा, केएस बाबू, डा. नावेद साबीर, डा. सुभाष चंद, डा. केके चतुर्वेदी, डा. रश्मी अग्रवाल, डा. कीर्ति शर्मी, डा. आरके राय, डा. शिवधर, डा. आरपीएस वर्मा, डा. अनुज कुमार, एएजी अग्रवाल, डा. आरके गुप्ता व हरनाम सिंह मौजूद रहे।

बीज चयन से कटाई तक मिलेगी जानकारी

अमर उजाला
बृहस्पतिवार, 14 मई 2009

गेहूं अनुसंधान निदेशालय ने बनाया दक्ष तंत्र; करीब 15 वैज्ञानिकों ने किया फार्मूला

कार्यशाला में किसानों की सुविधा के लिए बनाए गए दक्ष तंत्र की जानकारी देते हुए मुख्य वक्ता।

करनाल, 12 मई (हरिभू)। : गेहूं उत्पादन करने वाले किसानों को अब दर-दर की ठोकरें नहीं खानी पड़ेंगी। गेहूं की किस प्रजाति का बीज कम पानी में अधिक फसल देगा तथा किस प्रजाति के बीज को अगेती व पछेती में बीजा जा सकेगा इसकी जानकारी अब किसानों को घर बैठे मिल उपलब्ध होगी। हालांकि इस जानकारी को अंग्रेजी भाषा में संजोया गया है लेकिन इसे हिंदी में बदला जा रहा है ताकि आम किसान भी इस सिस्टम का लाभ उठा सके। गेहूं फसल प्रबंधन के लिए एक दक्ष तंत्र बनाया गया है, जिसे भारतीय कृषि अनुसंधान नई दिल्ली, गेहूं अनुसंधान निदेशालय करनाल तथा भारतीय कृषि सांख्यिकी अनुसंधान संस्थान ने मिलकर तैयार किया है। इसे करीब 15 वैज्ञानिकों ने 30 छात्रों के सहयोग से बनाया है। आज इसी तंत्र पर एक कार्यशाला का आयोजन किया जाएगा, जिसमें कई वैज्ञानिक हिस्सा लेंगे। इस दक्ष तंत्र में खास बात यह होगी कि किसानों को गेहूं प्रजाति के बारे में सोका गेहूं की कटाई तक कब, क्या उपाय करने होंगे और किस तरह से फसल को सींचा जा सकेगा, इसकी जानकारी उपलब्ध हो पाएगी।

मुख्य अन्वेषक डा. एस एन. इस्लाम ने बताया कि गेहूं पर विकसित यह देश का पहला एक्सपर्ट सिस्टम है। कार्यक्रम में मुख्य अतिथि के तौर पर मौजूद परियोजना निदेशक डा. जगशेरन ने कहा कि यह कार्यशाला कुछ अलग है और इसमें सभी प्रतिभागियों के सहयोग से इस दक्ष तंत्र को प्रभार कार्यकर्ताओं और किसानों के लिए प्रभावशाली तरीके से विकसित किया गया है। अब भारत अन्य विकसित देशों के समकक्ष आ गया है और कम्प्यूटर पर माउस क्लिक करने मात्र से ही किसान घर बैठे गेहूं संबंधी जानकारी हासिल कर सकते हैं। इस सिस्टम को आसानी से अपडेट किया जा सकता है। इसे स्थानीय भाषाओं में बदलने का प्रयास जारी है। इस दक्ष तंत्र में गेहूं पर सभी समस्याओं के हल दिए गए हैं। स्थानीय आयोजक डा. रणधीर सिंह ने बताया कि इस पद्धति की मदद से सभी गेहूं उत्पादकों को जानकारी से उच्च तकनीक पहुंचाई जा सकती है। हिंदी प्रभारी डा. जानेंद्र सिंह ने जानकारी दी कि इस दक्ष तंत्र को हिंदी में विकसित कर जन-जन तक पहुंचाया जाएगा।

वैज्ञानिकों - किसा

करनाल।

गेहूं अनुसंधान निदेशालय में हो गई इस कार्यशाला में देश त्र के संबंध में किसानों के कार्यशाला में जहां संबंधित वेबसाइट के संबंध में बेहत किसानों में शामिल राजकु भारत में होती तो भारत व देश में अशिक्षा के कारण भार्गव ने कहा कि इस तकनीक है। इससे जहां धन की बचत हो

11

QRT, RAC, Management Committee and IRC

Quinquennial Review Team (QRT)

A Quinquennial Review Team (QRT) was constituted by the Director General, Indian Council of Agricultural Research (ICAR), New Delhi to review the work done by the Institute for the period 2001-05. The QRT report of the Institute for the period 2001-05 has been approved by the Council and Council's comments and plan of action for implementation were received and action taken report on the recommendations of the QRT was sent to the Council.

Research Advisory Committee (RAC)

The composition of Joint Research Advisory Committee (RAC) of the Indian Agricultural Statistics Research Institute (IASRI) and National Centre for Agricultural Economics and Policy Research (NCAP) constituted for a period of three years w.e.f. 29 January 2007 is as follows:

1. Dr. PV Shenoi — Chairman
   Former Special Secretary, (DAC)
   Shantiprem, 20-C, First Main Road
   Raj Mahal Villa Extension
   Stage-II, Block-I, Bangalore-560 094
2. Dr. SS Acharya — Member
   Honorary Professor
   33, Shahi Complex, Sector -11
   Udaipur-313 002 (Rajasthan)
3. Dr. Rahul Mukerjee — Member
   Professor
   Indian Institute of Management
   Joka Diamond Harbour Road
   P.O. Alipur, Kolkata-700 027 (W.B.)
4. Dr. AK Nigam — Member
   A-2/605, Shoba Aqua Marine
   Bellander, Outer Ring Road
   Bangalore-560 037
5. Dr. AP Gore — Member
   Bakul, 40 Empress Garden View Society
   Sopan Baug, Pune-411 001

6. Dr. SM Jharwal — Member
Chairman
National Pharmaceutical Pricing Authority, Department of Chemicals & Petrochemicals, Ministry of Chemicals & Fertilizers, Govt. of India, 3rd Floor
YMCA Culture Centre Building
1, Jai Singh Road, New Delhi-110 001

7. Dr. Rajeeva L Karandikar — Member
Professor
Chennai Mathematical Institute
Plot H 1, CIPCOT IT Park, Padur P.O.
Siruseri-603 103 (Tamil Nadu)

8. Prof. VK Bhatia — Member Secretary
Director
Indian Agricultural Statistics Research Institute (IASRI)
Library Avenue, Pusa Campus
New Delhi-110 012

9. Dr. Ramesh Chand — Member
Director
National Centre for Agricultural Economics and Policy Research (NCAP)
Library Avenue, Pusa Campus
New Delhi-110 012

10. Dr. Lal Krishna — Member
Assistant Director General (ESM)
Indian Council of Agricultural Research
Krishi Bhawan, New Delhi-110 114

The 11th meeting of the Research Advisory Committee of IASRI and 3rd meeting of the Joint Research Advisory Committee (RAC) of IASRI and NCAP was held on 16 January 2010 under the Chairmanship of Dr. PV Shenoi, former Special Secretary, Ministry of Agriculture and Co-operation, New Delhi.

The meeting was attended by all the members except Dr. Rahul Mukerjee, Dr. SM Jharwal, Dr. Rajeeva L Karandikar and Dr. Lal Krishna. Dr. VK Gupta, National Professor, ICAR, Dr. Ramesh Chand, National Professor, ICAR, HDs from IASRI and Principal Scientists from NCAP also attended the meeting as special invitees.

A view of 11th meeting of the Research Advisory Committee

Dr. VK Bhatia, Director, IASRI presented the achievements, functions, and future research programs of IASRI. The details of the training and teaching activities of IASRI were also presented by him.

Dr. BC Barah, Acting Director, NCAP presented the achievements, functions, impact and future research programs of NCAP. He also presented new policy initiatives undertaken by NCAP.

After these presentations, Chairman made opening remarks. He invited the suggestions from all the members on presentations made on the research achievements and future programs of both the Institutes and after discussions, the following actionable points emerged:

1. Both IASRI and NCAP should involve themselves in macro-studies having national importance. Micro studies should only be taken up for developing methodologies.
2. Both IASRI and NCAP should concentrate on the basic research in the problems arising from the real applications in agricultural research and also on novel applications of statistical, econometric and informatics tools. These Institutes should not involve themselves in data generation or providing estimates as there are several other government agencies for performing these tasks.

3. IASRI should continue rigorously pursuing the efforts in applications of Design of Experiments in National Agricultural Research System.
4. The research efforts in small area estimation may be strengthened.
5. Both IASRI and NCAP should prepare the index on food security, land degradation, etc. on macro level for state/country rather than district level indices.
6. IASRI should impart trainings only in the advanced level of statistical techniques and for basic principles of statistical techniques, it is suggested to explore the possibility of utilizing the strength available with different SAUs and General Universities for its outreach activities such as sensitizing the agricultural researchers in the statistical techniques and their potential applications in agricultural sciences.
7. Vacant scientific positions at IASRI and NCAP should be filled on priority basis and for this concerned authorities may be approached.
8. Combining the disciplines of Agricultural Statistics and Computer Applications in ASRB Examinations would affect the quality of research. The authorities in ASRB need to be informed urgently and requested to take remedial measures on priority.

Institute Management Committee

The Director of the Institute, who is In-charge of the overall management of the Institute, is assisted in the discharge of his functions by the Institute Management Committee (constituted by the Council) by providing a broad-based platform for decision making process by periodically examining the progress of the Institute activities and by recommending suitable remedial measures for bottlenecks, if any. The present Institute Management Committee comprises of:

1. Prof. VK Bhatia — Chairman
   Director, IASRI (ICAR)
   New Delhi-110 012
2. Director (Agriculture) — Member
   Government of Delhi, ITO
   New Delhi-110 001
3. Sh. VK Singh — Member
   Director, Agriculture Statistics
   Government of Uttar Pradesh
   Lucknow, Uttar Pradesh
4. Dr. HS Gupta — Member
   Director
   IARI, New Delhi-110 012
5. Prof. Devi Prasad Tripathi — Non-Official Member
   General Secretary &
   Chief Spokesman
   National Congress Party
   C-9/9782, Vasant Kunj
   New Delhi-110 070
6. Sh. Madhusudan Sathe — Non-Official Member
   Yashodhan, 2071
   Vijay Nagar Colony
   Near SP College
   Pune-411 030
7. Finance and Accounts Officer — Member
   IARI, Pusa, New Delhi-110 012
8. Dr. PK Agarwal — Member
   National Professor, ICAR
   IARI, Pusa, New Delhi-110 012
9. Dr. Madhuban Gopal — Member
   National Fellow
   Department of Chemicals
   IARI, New Delhi-110 012
10. Dr. RK Mahajan — Member
    Principal Scientist (Agril. Stat.)
    Division of Germplasm Evaluation
    NBPGR, Pusa, New Delhi-110 012
11. Dr. RL Sapra — Member
    Principal Scientist (Agril. Stat.)
    Division of Genetics
    IARI, Pusa, New Delhi-110 012
12. Dr. SK Tandon — Member
    Assistant Director General (Engg.)
    KAB-II, ICAR, Pusa
    New Delhi-110 012
13. Head of Office — Member Secretary
    IASRI (ICAR)
    New Delhi-110 012

The 58th Meeting of the Insitute Management Committee was held on 13 January 2010 under the Chairmanship of Dr. V.K. Bhatia, Director, IASRI. The following agenda items were discussed:

- Confirmation of proceedings of the 57th meeting of the Management Committee held on 17 January 2009.

- Review of action taken on recommendations of the 57th meeting of the Management Committee held on 17 January 2009.
- Significant research achievements with respect to Project Information and Management System of ICAR (PIMS-ICAR) and Expert System on Wheat Crop Management were presented by the scientists of the Institute.
- Proceedings of Institute Research Committee meeting.
- Budget estimates for the year 2009-10 and actual expenditure incurred upto 31 December 2009 in respect of Plan/Non-plan of the Institute.
- Reconstitution of Institute Grievance Committee.
- To review the allotment rules of IASRI staff quarters.
- Any other item with the permission of the Chair.

58th meeting of the Management Committee is in progress

Some specific recommendations with respect to research and teaching activities of the Institute were:

1. Members expressed their serious concern about the large number of vacant scientific personnel positions. They felt that necessary proposal may be sent to the Council for recruitment and placement of scientists at the Institute on priority basis so that research and teaching activities can be carried out smoothly.
2. The declining number of students in M.Sc. and Ph.D. in Agricultural Statistics and Computer Application was viewed seriously by all the members and it was decided that Academic Council, PG School, IARI may be approached to allow the students from Mathematical/Statistical Sciences to take remedial courses during early morning of summer vacations so as to enable them to complete their respective degrees in stipulated period.

Institute Research Committee

The Institute Research Committee (IRC) is an important forum to guide the scientists in the formulation of new research projects and to review the progress of on-going research projects periodically. It also monitors the follow up action on the recommendations of the Quinquennial Review Team (QRT), Research Advisory Committee (RAC) in respect of technical programmes of the Institute. Dr. V.K. Bhatia, Director is the Chairman and Dr. Rajender Parsad, In-charge (RCMU) is the Member Secretary of the IRC.

Two meetings of the Institute Research Committee (IRC) were held during 18–20 August 2009 and 19–20

A view of Institute Research Committee meeting

February 2010. In the first meeting 05 new research projects were approved and progress of 46 (37 Institute funded, 02 in collaboration with other Institutes, 06 outside funded and 01 AP cess funded) ongoing research projects were discussed and 04 research projects were declared completed. In the second meeting one new research project was approved and progress of 46 (35 Institute funded, 02 in collaboration with other Institutes and 09 outside funded) ongoing research projects were reviewed and 11 research projects were declared completed.

Two meetings of the Institute Research Committee (special) were held on 06 July 2009 and 02 January 2010 to discuss and modify the six monthly achievements and targets fixed by the scientists of the Insitute before sending them to the Council.

12

Papers Presented and Participation of the Institute at the Conferences/Workshops, Etc.

RESEARCH PAPERS PRESENTED

National Seminar on "Prioritization of Interventions in Rainfed Areas for Sustainable Livelihoods" at NASC Complex, New Delhi during 23-24 April 2009

- Rai, Anil. Livelihood status of different agro-climatic zones in India.

Technical Session in the Coordination Committee Meeting of AICRP on FIM held at College of Agricultural Engineering & Post Harvest Technology (CAEPHT), Central Agricultural University, Ranipool, Gangtok (Sikkim) during 04-06 May 2009

- Tyagi, KK. Status and projection estimates of agricultural machinery and implements.

Group Meeting of STCR (AICRP) held at ANGRAU, Hyderabad during 06-07 June 2009

- Lahiri, Aloke. Design and analysis of STCR experiments and layout of the new experiment.

USDA-ERS Workshop at Washington DC during 09-10 June 2009

- Vasisht, AK and Dahlgran, Roger A. Contract designs and trading bans on India's futures contract.

SAE 2009 Conference on "Small Area Estimation" held at Elche, Spain during 29 June - 01 July 2009

- Chandra, Hukum. Small area estimation of proportions in business surveys.

2nd National Conference on "Innovation in Indian Science Engineering and Technology" held at NPL, New Delhi during 17-19 July 2009

- Kaul, Sushila. India's economic reforms and agriculture sector.
- Kaul, Sushila. Historical review implementation and benefits of ISO 9001 certification in different sectors including agriculture.

Workshop on "Improvement of Agricultural Statistics" held at NASC Complex organized by

Directorate of Economics and Statistics during 11-12 August 2009

- Ahmad, T. Causes of variation between official and trade estimates of cotton production: A statistical investigation.
- Sahoo, Prachi Misra. Remote sensing and GIS based methodology for crop acreage estimation in north eastern hilly regions.

20th Columbian Statistics Symposium by National University of Columbia held at Coastal city of Santa Marta during 11-15 August 2010

- Chandra, Hukum. Small area estimation.

57th Session of International Statistical Institute (ISI 2009) Conference in association with the Department of Economics and Statistics at Durban, South Africa during 16-22 August 2009

- Chandra, Hukum and Chambers, R. Small area estimation under transformation to linearity.
- Chambers, R, Chandra, H, Salvati, N and Tzavidis, N. Outlier robust small area estimation.

Workshop on "Improvement of Statistical System in Kerala State" organized by Kerala State Planning Board in association with the Department of Economics and Statistics on 20 August 2009

- Sud, UC. Small area estimation-Some applications in India.

National Level Workshop cum Seminar on "Indian Commodity Market Derivatives and Risk Management-The Road Ahead" held at Puducherry during 11-12 September 2009

- Bhardwaj, SP and Vasisht, AK. Price discovery in commodity markets - A case study of gram.
- Vasisht, AK and Bhardwaj, SP. An analysis of volatility of agricultural prices – A case study of maize.

National Symposium on "Advances in Geo-Spatial Technologies with Special Emphasis on Sustainable Rainfed Agriculture" and Annual Convention of Indian Society of Remote Sensing (ISRS) 2009 held at Nagpur during 17-19 September

- Kapoor, Nitika and Sahoo, Prachi Misra. Extraction of information under cloud cover from satellite image using kriging.
- Kundu, Seema and Sahoo, Prachi Misra. Web based mapping using ARCIMS.

Seminar on "Commodity Derivative Markets: Opportunities and Challenges" organized by Takshashila Academia of Economic Research Limited (TAER) and Institute of Studies in Industrial Development (ISID) held at New Delhi on 30 October 2009

- Vasisht, AK. An econometric analysis of efficiency of agricultural commodity futures market and price discovery.

23rd National Conference of Indian Society of Agricultural Marketing held at CRIDA, Hyderabad during 12-14 November 2009

- Bhardwaj, SP and Vasisht, AK. Strategic measures to meet marketing challenges in the changing scenario of liberalisation.
- Bhardwaj, SP. Innovative models to reap market incentives.
- Vasisht, AK and Bhardwaj, SP. Price dynamics of agricultural commodity futures and its impact on demand-supply situation of agricultural commodities.

63rd Annual Conference of ISAS held at RAU, Pusa, Bihar during 03-05 December 2009

Technical Address

- Bhatia, VK. Growth of quantitative genetics and estimation of genetic parameters.

Invited Talks

- Bhatia, VK. Bio-informatics in agriculture. Symposium on Statistical and Computational Genomics.
- Parsad, Rajender, Gupta, VK and Sarkar, Ananta. Design and analysis of microarray experiments. Symposium on Statistical and Computational Genomics.
- Bhatia, VK. Modelling climate effects. Symposium on Statistical and Informatics Perspectives of Climate Change.
- Parsad, Rajender, Gupta, VK and Malhotra, RS. Experimental designs for mitigation and adaptation strategies of climate change. Symposium on Statistical and Informatics Perspectives of Climate Change.

- Rai, Anil, Chaturvedi, KK and Malhotra, PK. Spatio-temporal data mining for monitoring of climate change. Symposium on Statistical and Informatics Perspectives of Climate Change.

Contributed Papers

- Wahi, SD and Rao, AR. Some investigations on sampling variance of genetic correlation.
- Paul, AK, Singh, Mohan Das and Wahi, SD. Some investigation on the statistical properties of goodness of fit criteria of non-linear growth curves through bootstrap technique.
- Arnab, R and Sud, UC. A note on variance estimation of ratio estimator under two phase sampling.
- Singh, Jagbir. Estimation from independent sub samples of a population.
- Arya, Prawin, Vasisht, AK, Shivaramane, N and Singh, DR. Market investigation in coarse cereals in India: A case of maize and jowar.
- Kaul, Sushila. Implications of global warming on agricultural production in India.
- Agrawal, Ranjana, Chandrahas and Kausav, Aditya. Use of discriminant function analysis for forecasting wheat yield.
- Ramasubramanian, V, Bhatia, VK, Kumar, Amrender, Pal, Satya and Premi, Sarvesh Kumar. Forecasting technological needs in genetics and plant breeding for sustainable agriculture.

Workshop of AICRP on LTFE held at IGKV, Raipur during 06-08 December 2009

- Sehgal, DK. Superimposition/bifurcation of treatments in long term fertilizer experiments.

CSISA Experimental Platform Meeting held at ICAR-RCER Patna during 14-16 December 2009

Invited Talk

- Parsad, Rajender. Designs of experiments with emphasis on CSISA experimental platform.

International Conference on Artificial Intelligence (IICAI 09) held at Tumkur, Bangalore during 16-18 December 2009

- Sudeep. Disease and pest identification in crops – A semantic web approach.
- Arora, Alka, Upadhyaya, Shuchita, Jain, Rajni. Approach for mining multiple patterns from clusters.

Humanising Work and Work Environment 2009 Conference held at Kolkata during 17-19 December 2009

- Gite, LP, Tiwari, PS, Khadatkar, Abhijit (CIAE) Tyagi, KK, Bathla, HVL and Kher, KK. Farm machinery accidents in Indian agriculture.

69th Annual Conference of ISAE held at GND University, Amritsar during 17-19 December 2009

- Kaul, Sushila. Urbanization and its implications for agriculture production.

International Conference-FSES, 2009 held at IIT, Kharagpur during 17-19 December 2009

- Vasisht, AK. On adoption pattern and factors influencing the adoption of RCTs in Indo-Gangetic plains of India.

Dissemination Workshop on "Mixture Experiments: Theory and Applications" jointly organized by Department of Statistics, Calcutta University and Department of Statistics, Kalyani University at BCKV, Kalyani during 21-22 December 2009

Invited Talks

- Batra, PK, Alam, N and Parsad, Rajender. Designs for multi-factor mixture experiments.
- Parsad, Rajender and Gupta, VK. Design resources server.
- Parsad, Rajender. Applications of experiments with mixtures methodology.
- Lal, Krishan and Gupta, VK. Efficient mixture designs with process variables in agriculture.

7th International Triennial Calcutta Symposium on "Probability & Statistics" held at the University of Calcutta during 28-31 December 2009

- Chandra, H and Chambers R. Small area estimation for skewed data in presence of zeros.

International Conference on "Frontiers of Interface between Statistics and Sciences" held at C.R. Rao AIMSCS University of Hyderabad Campus, Hyderabad during 30 December 2009 to 02 January 2010

- Ghosh, Himadri. Application of statistical learning theory for fitting multimodal distribution to rainfall data.

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, Eldho, 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.
- Mehta, SC, Pal, Satya and Kumar, Vinod. Weather based models for forecasting potato yield in Uttar Pradesh.

International Conference on Statistics, Probability, Operations Research, Computer Science and Allied Areas held at Andhra University, Visakhapatnam during 04-08 January 2010

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. Efficient mixed level supersaturated designs. Session on Design of Experiments.
- Parsad, Rajender, Gupta, VK, Bhar, LM and Subrata K Behera. Block designs with factorial treatment structure for cropping systems research. Session on Design of Experiments.
- Prajneshu and Ghosh, Himadri. Statistical modelling. Session on Statistical Modeling.

Contributed Paper

- Ghosh, Himadri. Nonlinear parametric mixture time-series modelling.

International Applied Statistics Conference 2010 held in Colombo, Sri Lanka during 08-09 January 2010

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

National Meet of Tractor and Agricultural Machinery Manufacturers held 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 Conference on "Optimization and its Application" held at Banaras Hindu University on 17 February 2010

Invited Talk

- Prajneshu. Fuzzy regression models.

11th International Conference of the International Academy of Physical Sciences held at University of Allahabad on 20 February 2010

Invited Talk

- Prajneshu. Nonlinear time–series models.

XII Annual Conference of Society for Statistics, Computer and Applications held at Department of Statistics, Siksha Bhavana, Visva Bharati during 24-26 February 2010

Invited Talks

- Gupta, VK, Bhar, LM, Parsad, Rajender and Kole, Basudev. 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, Ramasubramanian, V, Chandrahas 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.
- Ramasubramanian, V, Bhatia, VK, Garg, KG, Kumar, Suresh, Kumar, Amrender and Kumari, Jyoti. Technological scenario in plant genetic and breeding using scientometrics.

National Symposium on "Lifestyle Floriculture: Challenges and Opportunities" held at Dr. YS Parmar University of Horticulture and Forestry, Nauni, Solan (HP) during 19-21 March 2010

- Gupta, AK. Estimation of area, production and productivity of flowers.

1st IFIP International Conference on "Bioinformatics" held at Sardar Vallabhbhai National Institute of Technology, Surat during 25-28 March 2010

- Bhardwaj, Ankush, Avanti, S, Pandey, Bharati and Rao, AR. A functional elements SNPs information system of rice genome.
- Saini, Vandna, Pandey, Bharati, Bhardwaj, Ankush and Rao, AR. In-silico analysis of splice sites of rice genome.

National Workshop on "Applicable Statistics" held at Department of Statistics, M.D. University, Rohtak during 28-30 March 2010

Invited Talks

- Bhatia, VK. Application of statistics for growth of quantitative genetics and estimation of genetic parameters.
- Prajneshu. Nonlinear statistical models and their applications.
- Parsad, Rajender. Applications of experiments with mixtures.

PARTICIPATION

- NAIP meeting at Krishi Anusandhan Bhawan-II, New Delhi on 15 April 2009.
- Meeting of round table on Global Economic Slow Down and Indian Agriculture at IARI, New Delhi on 24 April 2009.
- 10th ESRI India users conference on Geography in action held at Noida, National Capital Region Delhi during 28-29 April 2009.
- Global rice modeling initiative at IRRI organised by Soil Science Division, IRRI, Philippines at NCAP, New Delhi on 30 April 2009.
- 2nd Dayanatha Jha Memorial lecture on Emerging trends in Indian agriculture: What we can learn from this?" delivered by Dr. Ashok Gulati, Director in Asia, IFPRI held at NCAP, New Delhi on 02 May 2009.
- Sensitization meeting regarding project on Bioprospecting of genes and allele mining for abiotic stress tolerance held at NASC Complex, New Delhi during 05-06 May 2009.
- Coordination Committee meeting of AICRP on FIM at College of Agril. Engg. and Post Harvest Technology (CAEPHT), Central Agril. University, Gangtok (Sikkim) during 04-06 May 2009.
- Second meeting of Prof. Vaidyanathan Committee held at NASC Complex, Pusa, New Delhi during 05-06 May 2009.
- Meetings of Advisory Panel of Third census of handlooms and issues of photo identity cards to weavers and allied workers held at NCAER, New Delhi on 12 and 14 May 2009.
- Discussion regarding National achievement surveys at different stages of school education under Serva Shiksha Abhiyan (SSA) held at NCERT, New Delhi on 20 May 2009.
- Meeting with Dr. P.K. Mohanty, Jt. Secy & Mission Director, Jawahar Lal Nehru National Urban Renewal Mission, Ministry of Housing & Urban Poverty Alleviation on 27 May 2009.
- Meetings on Estimation of harvest and post harvest losses held at CIPHET, Ludhiana on 09 April 2009 and held at CTCRI, Trivandrum during 29-31 May 2009.
- Meetings of the Empowered Committee for Implementation of the Scheme Awards & Fellowships and Outstanding and Meritorious Research Studies in Statistics at New Delhi on 03 June, 10 September, 10 December 2009 and 04 March 2010.
- Vichar Manch on Issue on the Balckburner by Smt. Shashi Mishra, Ex-Secretary, ICAR held at NASC Complex on 03 June 2009.
- Foundation Day of NAAS and lecture of Prof. Sukhdeo Throat, Chairman UGC on Higher Education and XI Plan Approach and Strategies at NASC Complex, New Delhi on 04 - 05 June 2009.
- Meeting with Dr. Sanjay Sharma, Principal System Analyst, NIC held at Krishi Bhawan, New Delhi on 05 June 2009 to discuss village level census data of East Khasi Hills districts of Meghalaya.
- Meeting under the Chairmanship of Economic and Statistical Adviser, DES held at Krishi Bhawan, New Delhi on 10 June 2009 regarding the discussion on testing of alternative methodology suggested by IASRI in a few states for estimation of area and production of horticultural crops besides other horticulture related issues.
- Application of Statistical Methods Technical Committee meeting ISO/TC69 convened by

Department of Standards, Ministry of Science, Technology and Innovations, Government of Malaysia at Kuala Lumpur, Malaysia during 13-19 June 2009. India has represented in this Committee as a Participating Member and as Member of Indian Delegate.

- Meetings regarding updation of tables in ARDB 2009 with Sh. RC Sethi, Addl RGI at RGI Office on 16 June 2009; with DDG (Engg.), ICAR on 25 June 2009; with Dr. NPS Sirohi, Prof. Agril. Engg., IARI; Dr. KM Bajurbaruah, Dy. DG (Animal Sciences) on 22 July 2009.
- International Conference on Climate change: Law, policy and governance held at India Habitat Centre, New Delhi on 19 June 2009.
- Meeting with Mr. Sanjay, Dy. Advisor (Stat), DES to discuss the availability of crop cutting data at unit level, held at Shastri Bhawan, New Delhi on 24 June 2009.
- Meeting of the sub-committee of National Youth Readership Study 2009 held at NCAER, New Delhi on 26 June 2009.
- Meeting of Consortium Implementation Committee of Risk assessment and insurance products for agriculture held at NCAP, New Delhi on 29 June 2009.
- Director's Meet with Deputy Director General (Agricultural Engineeringg) at ICAR, Krishi Anusandhan Bhawan-II, New Delhi on 15 July 2009.
- Inaugural Ceremony of Indian Council of Agricultural Research (ICAR) Foundation Day and Directors' conference at NASC Complex, New Delhi on 16 July 2009.
- First meeting of the Standing Committee for 17th Conference of Central and State Statistical Organizations (COCSSO) held at CSO, Sardar Patel Bhawan, New Delhi on 23 July 2009.
- Meeting under the Chairmanship of Secretary, Ministry of Statistics & Programme Implementation to discuss the issues regarding Estimation of Slum Population in the Country at New Delhi on 23 July 2009.
- Short term training program on Soft computing (SofCom'09) held at Center for Soft Computing Research, Indian Statistical Institute, Kolkata during 27-31 July 2009.
- Meeting for the project on Sampling methodology for estimation of meat production in Meghalaya, with Director (Animal Husbandry) and other official of Directorate of Animal Husbandry, Shillong, Meghalaya at Shillong during 28-29 July 2009 and with Advisor (Statistics), Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture, Govt of India at DMS Complex, New Delhi on 16 April 2009.
- Workshop-cum-Brainstorming session on Remote sensing and GIS for accelerating growth in agricultural research and development held at IIRS, Dehradun on 31 July 2009.
- Discussions with concerned officials regarding study on Evaluation of rationalization of minor irrigation statistics scheme held at Hubli during 06-08 August 2009.
- 15th meeting of Statistical Methods for Quality and Reliability Sectional Committee MSD-3 in Bureau of Indian Standards (BIS) at New Delhi on 12 August 2009.
- Lecture on Collaboration and Partnership the Future of Higher Education by Dr. Gordon Gee, President of Ohio State University at NASC Complex, New Delhi on 13 August 2009.
- Workshop on Information technology application in horticultural crops held at CPRI, Shimla during 24-25 August 2009.
- Meeting with Dr. Surendra Singh, Project Coordinator, AICRP on FIM, for reviewing the progress of the project on Study on status and projection estimates of agricultural implements and machinery on 25 August 2009.
- Workshop on Study on assessment of future human capital requirements in agriculture organized by the Institute of Applied Manpower Research in collaboration with NAARM held at India Habitat Centre, New Delhi on 26 August 2009.
- Inaugural ceremony of launch of NAIP Consortium on Strengthening of Digital Library and Information Management and NARS (e-granth) at National Research Centre on Plant Biotechnology, New Delhi on 27 August 2009.
- 48th All India Wheat and Barley Research Worker's Meet held at IARI, New Delhi during 28-31 August 2009.

- Fifth meeting of the panel for Basic Statistical Methods (MSD 3/P-1) at New Delhi on 06 September 2009.
- 2nd meeting of the Working Group for the Construction of index numbers of area, production and yield of agricultural crops held at Krishi Bhawan under the chairmanship of ESA, Ministry of Agriculture, Govt. of India on 17 September 2009.
- Meeting on Profile of Indian scientists in six major scientific agencies under the Chairmanship of Sh. Rakesh Chetal, Advisor, DST held at India International Centre (Annex), New Delhi on 17 September 2009.
- 4th meeting of the Technical Committee on FASAL held at Krishi Bhawan under the chairmanship of Principal Advisor, DES, Ministry of Agriculture, Govt. of India on 23 September 2009.
- Lecture on Reconstructing Indian Population History by Dr. Lalji Singh, Director, Centre for Cellular and Molecular Biology, Hyderabad at NASC, New Delhi on 25 September 2009.
- Meeting on PERMISnet-II with Finance Advisor and his staff, and Deputy Secretary (ICAR) held at Krishi Bhawan on 05 October 2009.
- Meeting of the Ad-hoc Board of Studies in Agricultural Statistics of CCS University, Meerut on 13 October 2009.
- First meeting of the Advisory Committee on Recruitment of Official Statisticians through Indian Statistical Service (ISS) and Subordinate Statistical Service (SSS) held at Ministry of Statistics and Planning, National Academy of Statistical Administration, Greater Noida, U.P. on 14 October 2009.
- First CAC meeting of ICAR-NAIP funded Network project on bioprospecting of genes and allele mining for abiotic stress tolerance at NASC Complex, New Delhi on 21 October 2009.
- Monitoring Committee meeting of CeRA sponsored by National Agricultural Innovation Project, ICAR, New Delhi held at CIBA, Chennai on 21 October 2009.
- Brainstorming session on Agricultural waste management convened by Dr. NSL Srivastava, Joint Director, SPRERI, Gujarat held at NASC Complex, New Delhi during 23-24 October 2009.
- Winter School as a Chief Guest, on Decision making in agriculture using data mining held at National Centre for Agricultural Economics & Policy Research (NCAP), New Delhi on 27 October 2009.
- Meeting of Mid-Term Review (MTR) of the Department of Agricultural Research & Education (DARE)/ICAR for the 11th Five Year Plan at IARI, New Delhi on 28 October 2009.
- 61th meeting of MSD 3:3 held at New Delhi on 12 November 2009.
- Workshop on Sampling design and methodology to assess the socio-economic conditions of fishers and fish farmers in India held at Central Institute of Brackishwater Aquaculture (CIBA) Chennai during 12-14 November 2009.
- Training programme on IT-based decision support systems for multi-media content development held at NAARM, Hyderabad during 17-27 November 2009.
- HLCC meeting held at Chandigarh under the Chairmanship of Principal Secretary to Govt. of Haryana, Agriculture Department, Chandigarh on 20 November 2009.
- Workshop of Networking of agricultural economist under V-PAGe held at TNAU, Coimbatore on 21 November 2009.
- Workshop on Achieving food security in India: Improving competition, markets and the efficiency of supply chains held at Hotel Claridges, New Delhi on 24 November 2009.
- Meeting to discuss the issues related to upgradation of Automatic Weather Station (AWS) and Automatic Rain Gauges Stations (ARGs) for expansion of Weather Based Crop Insurance Scheme (WBCIS) under the chairmanship of Secretary (Agriculture & Cooperation) at Krishi Bhawan, New Delhi on 25 November 2009.
- Meeting with Advisor, DES, Ministry of Agriculture to discuss technical & financial aspects of the project on Study to develop an alternative methodology for estimation of cotton production held at Krishi Bhavan, New Delhi on 27 January 2010.
- 19th Group Workers meeting of AICRP (STF) held at BSKKV, Dapoli during 14-17 December 2009.
- Meeting of Technical Committee of Direction (TCD) for improvement of Animal Husbandry and Dairying

Statistics at Orissa, Bhubaneshwar during 17-19 December 2009.

- Workshop-cum-Training Programme on Bioinformatics applications in crop science held at IARI during 21-23 December 2009.
- Inaugural function of Platinum Jubilee Symposium and 74th Annual Convention of Indian Society of Soil Sciences at Dr. B.P. Pal Auditorium, IARI, New Delhi on 22 December 2009.
- 81st Annual General Meeting of the ICAR Society at NASC, New Delhi-110012 on 23 December 2009.
- 379th meeting of the Academic Council at IARI, New Delhi on 24 December 2009 .
- PMAC Review Meeting for NAIP project V-PAGe held at NCAP, New Delhi on 30 December 2009.
- 5th workshop of AICRP on Ergonomics and safety in agriculture (ESA) held at DBSKKV, Dapoli (Maharashtra) during 06-08 January 2010.
- Short term training programme on Knowledge discovery in data bases: Data, Information and Knowledge (DInK'10) held at Center for Soft Computing Research, Indian Statistical Institute, Kolkata during 11-15 January 2010.
- Global Meet on Green Revolution II held at Hotel Lalit, New Delhi during 08-09 February 2009.
- National conference on Futures of commodity futures market held at Hotel La Meridian, New Delhi on 09 February 2010.
- 48th Convocation of IARI on 13 February 2010.
- Training programme on Technical and Administrative support for consortia based research in agriculture held at NAARM, Hyderabad during 22-27 February 2010.
- Seminar by Kenneth M Quinn, President, Council of Advisors of the WFP held at NASC Complex, New Delhi on 24 February 2010.
- Seminar on Climate change - Role of cooperatives held at NCUI, New Delhi on 25 February 2010.
- Seminar on The Union Budget 2010-11: Reform and development perspectives organised by NCAER,CPR, ICRIER,IDF & NIPFP held at Shangri-La Hotel, New Delhi on 06 March 2010.
- Training programme on Climate change, environmental sustainability and agricultural development held at IARI, New Delhi during 09-29 March 2010.
- ICAR Zonal Technology Management & Business Planning and Development meeting–cum–workshop, 2009-10 North Zone held at IARI, New Delhi during 19-20 March 2010.
- Workshop-cum-Brainstorming session on Future technological needs for rainfed agriculture in India held at CRIDA, Hyderabad on 19 March 2010.
- Workshop on ICT initiatives of the NAIP with special reference to the uniformity guidelines for ICAR websites held at NBPGR, New Delhi on 19 March 2010.
- 33rd meeting of HLCC organized by Board of Revenue for Rajasthan, Ajmer held at Jaipur on 22 March 2010.
- Review meeting of Visioning, Policy Analysis and Gender (V-PAGe) at NCAP, New Delhi on 26 March 2010.
- Workshop on Risk assessment in agriculture held at TNAU, Coimbatore during 26-30 March 2010.

Related to Professional Societies

- Editorial Board meeting of Annals of Agricultural Research, the Journal of the Indian Society of Agricultural Sciences at Division of Agronomy, IARI, New Delhi.
- Executive Council meetings of Indian Society of Agricultural Sciences at KAB II of ASRB, New Delhi.
- An Executive Council meeting of Indian Society of Agricultural Statistics.
- Executive Council meetings of the Society of Statistics, Computers and Applications.
- Governing Body meeting of the Institute of Applied Statistics and Development Studies, Lucknow.

Trainings

- Sh. S.N. Islam participated in Training Programme on Entrepreneurship Development under Sustainable Farming System held at ICAR Research Complex for NEH Region, Sikkim Centre, Tadong, Gangtok during 25 May-14 June 2009 .
- Mohd. Samir Farooqi participated in Training Programme on Procurement Related Matters and Financial Management under NAIP held at NASC Complex during 12-13 August 2009.

- Sh. VH Gupta participated in the Winter School on Decision Making in Agriculture using Data Mining organized at NCAP, New Delhi during 27 October-16 November 2009.
- Dr. PK Malhotra attended the Special Training Programme for Vigilance Officers of ICAR Institutes organised at IISR, Calicut during 22-24 February 2010.
- Ms. Alka Arora and Ms. Shashi Dahiya attended Hands-on Training and Orientation Program held on Drupal at DIPA, ICAR, New Delhi during 9-12 March 2010.

Invited Lectures Delivered at Other Organisations

Dr. VK Bhatia

- A lecture on Functions and activities of IASRI during a workshop for four faculty members from University of Foreign Trade, Hanoi, Vietnam with funding from Swiss Agency for Development and Co-operation Bern (IDC) on 23 April 2009.
- A lecture on Statistical genomics and estimation of genetics parameters under a Continuing Education Programme on Biostatistical Methods for Life Sciences at Defence Institute of Physiology and Allied Sciences (DIPAS), Defence Research and Development Organization (DRDO), Delhi during 14 -18 September 2009.
- A lecture on Sampling design and methodology to assess the socio-economic conditions of fishers and fish farmers in India at Central Institute of Brackishwater Aquaculture, Chennai during 12-14 November 2009.

Dr. Rajender Parsad

- An invited lecture on Statistical designing and analytical techniques for varietal trials to the participants of the training programme in the area of Vegetable Variety Development and Evaluation for the officials of Ministry of Agriculture, Iraq sponsored by Food & Agriculture Organization of United Nations held at Division of Vegetable Science, IARI, New Delhi during 15 September - 14 October 2009.
- Four invited lectures on Design of experiments and Design resources server to the participants of the training programme on Statistical Analysis and Interpretation of Agroforestry Experimental Data organized under the aegis of All India Co-ordinated Research Project on Agro-forestry at National Research Centre for Agroforestry, Jhansi during 11-13 February 2010.
- An invited lecture on Multivariate techniques: An overview to the participants of the training programme on Climate Change, Environmental Sustainability and Agricultural Development organized under the aegis of Centre of Advanced Faculty Training at Division of Agricultural Economics, IARI, New Delhi during 09-29 March 2010.
- 15 lectures on Introduction to statistical concepts, Tests of significance based on t, $\chi 2$ and F-tests, GenStat: An overview, Analysis of variance, Correlation and regression, Fundamentals of design of experiments, Completely randomized designs, Randomized complete block designs and Latin square designs, Designs for factorial experiments, Split and strip plot designs, Response surface designs and Designs for Eeperiments with mixtures, Design resources server, Analysis of covariance, Diagnostics and remedial measures in designed experiments, Multivariate tecnhiques: An overview to the participants of the training programme on Experimental Designs and Data Analysis organized for the CAC Staff at ICARDA, Tashkent during 01-05 June 2009.
- 34 lectures on Introduction to statistical concepts, Tests of significance based on t, $\chi 2$ and F-tests, GenStat: An overview, Analysis of variance, Correlation, Regression, Fundamentals of designs of experiments, Completely randomized designs and Randomized complete block designs, Row-column designs, Designs for factorial experiments, Split plot designs, Strip plot designs, Resolvable block designs, Augmented designs, Designs for experiments with mixtures, Design resources server, Analysis of covariance, Diagnostics and remedial measures in designed experiments, Non-parametric tests, Analysis of muti-environment trials data, GGE biplot presentation, Multivariate analysis of variance, Principal component analysis, Cluster analysis, etc. to the participants of an International training programme on Advances in Design and Analysis of Experiments held at ICARDA, Aleppo Syria during 08-19 November 2009.

Dr. UC Sud

- Two lectures on Properties of estimator and estimation of non responses in training programmes on Sample Surveys and Organization of Large Scale Sample Surveys held at National Academy of Statistical Administration (NASA) organized by NASA, CSO, Ministry of Statistics and Programme Implementation, Greater Noida during 07-18 December 2009 and 08-19 March 2010.

Dr. KK Tyagi

- A lecture on Different aspect of sampling to the participants of a Methodological Training Programme on Impact Assessment of Improved Agricultural Technologies organized at NCAP, New Delhi during 26-28 August 2009.

Sh. OP Khanduri

- A lecture on Agricultural Field Experiments Information System to the participants of the Training Programme on Farming Systems held at Division of Agronomy, IARI, New Delhi.

Dr. Anil Rai

- A lectures in a Refresher Training Course on SPSS for Senior ISS officers from 22-26 March 2010 held at Ministry of Statistics and Programme Implementation, New Delhi.

Dr. Seema Jaggi

- A lecture on Application of Excel and SPSS package for data analysis to the participants of the Summer School on Tools and Techniques for Planning, Monitoring, Evaluation and Impact Assessment of Extension Programmes held at Division of Agricultural Extension, IARI, New Delhi during 21 July-10 August 2009.
- A lecture on Design of experiments for life sciences and Illustration of analysis through SPSS to the participants of Training Programme on Biostatistical Methods for Life Sciences under Continuing Education Programme held at Defence Institute of Physiology and Allied Sciences (DIPAS), Defence Research and Development Organization (DRDO), Delhi during 14-18 September 2009.
- Two lectures on Statistical methods for microbiology and SPSS for analysis of experimental data to the participants of the Winter School organized by Division of Microbiology, IARI, New Delhi during 17 November 07-December 2009.
- Three lectures on Testing of hypothesis, SPSS: An overview and Statistical designs for field experiments to the participants of the Training Programme on Methodological Advances in Extension Research held at Division of Agricultural Extension, IARI, New Delhi during 05-25 February 2010.
- Two lectures on Experimental designs for psychological research and Testing of hypothesis to the participants of the Training Programme on Application of Statistics in Research under continuing Education Programme held at Defence Institute of Psychological Research (DIPR), Defence Research and Development Organization (DRDO), Delhi during 15-19 February 2010.
- Two lectures on SPSS for regression analysis to the participants of Refresher Training Programme on SPSS for ISS officers and senior officers of the states/UTs organized by Ministry of Statistics and Programme Implementation, Government of India during 22-26 March 2010.

Dr. Ashok Kumar

- Two lectures on Economic surplus model and Yield gap analysis to the participants of the training programme on Methodological Advances in Extension Research held at the Division of Agricultural Extension, IARI, New Delhi during 05-25 February 2010.
- One lecture on Consumer, producer and economic surplus models and its application in agriculture to the participants of a Training Programme on Climate Change, Environmental Sustainability and Agricultural Development organised at IARI, New Delhi during 09-29 March 2010.

Dr. AR Rao

- A lecture on Multivariate analysis for life sciences to the participants of training programme on Biostatistical Methods for Life Sciences under Continuing Education Programme held at Defence Institute of Physiology and Allied Sciences (DIPAS), Defence Research and Development Organization (DRDO), Delhi during 14-18 September, 2009.
- A lecture on Test plot design and statistical analysis for vegetable research trial to the participants of the training programme in the area of Vegetable Variety Development and Evaluation for the officials of Ministry of Agriculture, Iraq sponsored by Food &

Agriculture Organization of United Nations held at Division of Vegetable Science, IARI, New Delhi during September 15 - October 14, 2009.

- A lecture on Overview of Bioinformatics and Potential application of data mining in Bioinformatics in a winter school on Decision making in agriculture using data mining during 27 October–16 November 2009 at NCAP, New Delhi.
- A lecture on Statistical approaches in molecular crop breeding to the participants of Winter School on Molecular marker-assisted crop breeding: principles, methods and applications held at Genetics division, IARI, New Delhi on 18 January 2010.
- A lecture on Statistical genomics in crop improvement to the participants of the training programme Molecular marker assisted breeding for crop improvement held at Division of Genetics, IARI on 23 February, 2010.
- A lecture on Principal components and factor analysis to the participants of the training programme on Application of Statistics in Research under continuing Education Programme held at Defence Institute of Psychological Research (DIPR), Defence Research and Development Organization (DRDO), Delhi during 15-19 February, 2010.
- A lecture on Multivariate Analysis for Extension Research to the participants of the training programme on Methodological Advances in Extension Research held under the aegis of Centre of Advanced Faculty Training at Division of Agricultural Extension, IARI, New Delhi during 05-25 February, 2010.
- A lecture on Multivariate and factor analysis to the participants of refresher training programme on SPSS for ISS officers and senior officers of the states/UTs organized by Ministry of Statistics and Programme Implementation, Government of India during 22-26 March, 2010.

Dr. Prachi Misra Sahoo

- A lecture on Remote sensing for crop acreage and production estimation in hilly region in a Winter School on Remote Sensing with Special Emphasis on Hyperspectral Remote Sensing held at IARI, New Delhi during 30 March-23 April 2009.
- Two lectures on Least square analysis and Time series analysis for Post Graduate Course in Remote Sensing and GIS in the Centre for Space Science and Technology Education in Asia and the Pacific (CSSTEAP) affiliated to United Nations held at Indian Institute of Remote Sensing (IIRS), Dehradun.

Dr. Cini Varghese

- A lecture on Cross over designs and Designs for bioequivalence trials to the participants of Training Programme on Biostatistical Methods for Life Sciences under Continuing Education Programme held at Defence Institute of Physiology and Allied Sciences (DIPAS), Defence Research and Development Organization (DRDO), Delhi during 14 -18 September 2009.
- A lectures on Application of MS-Excel for data analysis to the participants of the Summer School on Tools and Techniques for Planning, Monitoring, Evaluation and Impact Assessment of Extension Programmes held at Division of Agricultural Extension, IARI, New Delhi during 21 July -10 August 2009.
- A lecture on Test plot designs and statistical analysis of data under vegetable trials for International Trainings of Food and Agricultural Organization at Horticulture Division, IARI, New Delhi on 25 September 2009.
- Two lectures on Application of MS excel for data analysis to the participants of the Training Programme on Methodological Advances in Extension Research held at Division of Agricultural Extension, IARI, New Delhi during 5-25 February 2010.
- Three lectures on Probabilty distributions, Change over designs and designs for bioequivalence trials and Data analysis using SPSS to the participants of the Training Programme on Application of Statistics in Research under continuing Education Programme held at Defence Institute of Psychological Research (DIPR), Defence Research and Development Organization (DRDO), Delhi during 15-19 February 2010.

Dr. Sudeep

- A lecture on MySql server in the Workshop-cum-Training Programe organized under AgroWeb project at DIPA, New Delhi on 11 March 2010.

Mohd. Samir Farooqi

- A lecture on Statistical procedures in IPM under PG-Course Principles and Practices of IPM PATH-123 held at NCIPM on 15 October 2009 .
- A lecture on An overview of SPSS in the CAS Training on Climate Change Environmental Sustainability and Agricultural Development held at Economics Division of IARI on 16 March 2010.

Dr. Tauqueer Ahmad

- Two lectures on Designing of questionnaires/ schedules and Planning and execution of sample surveys for four faculty members of Vietnam University of Foreign Trade as part of the training programme organized by IIFT held at Indian Institute of Foreign Trade (IIFT), New Delhi on 09 May 2009.
- Two lectures on Variance estimation-I and Variance estimation-II in Training Programmes on Sample Surveys and Organization of Large Scale Sample Surveys held at National Academy of Statistical Administration (NASA) organized by NASA, CSO, Ministry of Statistics and Programme Implementation, Greater Noida during 07-18 December 2009 and 08-19 March 2010.

Sh. N Sivaramne

- A lecture on Econometric techniques held at National Power Training Institute, Faridabad on 9 February 2010.
- Two lectures on Project analysis techniques and Probit and Tobit regression models held at Division of Agricultural Extension, IARI during 18-22 February 2010.

Sh. Amrender Kumar

- A lecture on Classificatory techniques including LDA and Bayesian approach in a Winter School on Decision Making in Agriculture using Data Mining held at NCAP, New Delhi during 27 October–16 November 2009 .

Dr. Ramasubramanian V

- A lecture on Price forecasting: Statistical methods with emphasis on time-series modeling held at National Institute of Agricultural Marketing, Jaipur on 25 September 2009.

Sh. KK Chaturvedi

- A lecture on Development of Decision Support System using .Net framework in a Workshop-cum-Training on Risk Assessment in Agriculture held at TNAU, Coimbatore during 26-30 March 2010.

VISIT ABROAD

Dr. VK Bhatia

- Visited as a participating member and as member of Indian Delegate of Technical Committee on Application of Statistical Methods (ISO/TC69 Technical Committee meeting) convened by Department of Standards, Ministry of Science, Technology and Innovations, Government of Malaysia at Kuala Lumpur, Malaysia during 13-19 June 2009.
- Visited Tunisia, Africa to participate in the Conference on Implementing the Strategy for Improving Agricultural Statistics in Africa during 01-05 February 2010.

Dr. AK Vasisht

- Visited University of Arizona, Tucson, USA on a Study Visit on Futures Trading in Agricultural Commodities during 25 March- 24 May 2009.

Dr. Rajender Parsad

- Invited as Consultant with the Computer and Biometrics Services Unit, ICARDA, Syria
  - To conduct a training programme on Experimental Designs and Data Analysis for CAC Staff at Tashkent during 01–05 June 2009.
  - To conduct a two week training programme on Advances in Design and Analysis of Experiments for the participants from National Agricultural Research Systems of Iraq, Iran, Azerbaijan, Sudan, Jordan, Uzbekistasn, Lybia and Syria during 08–19 November 2009.

Dr. Hukum Chandra

- Deputed to attend SAE 2009 - Small Area Estimation, 2009 Conference held at Elche, Spain during 29 June - 01 July 2009.
- Deputed to attend ISI 2009 - 57th Session of the International Statistical Institute Conference held at Durban, South Africa during 16 – 22 August 2009.

Radio Talk/TV Interview

- डॉ. रंजना अग्रवाल ने 02.04.2009 को आकाशवाणी के राष्ट्रीय चैनल पर प्राचीन भारतीय गणितज्ञ आर्यभट्ट पर रेडियो वार्ता प्रसारित की ।

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Workshops, Conferences, Meetings, Seminars and Annual Day Organized

Workshops organised as part of Golden Jubilee celebrations of the Institute

- A workshop was organised on Design of Experiments on 29 April 2009. Dr. Rajender Parsad was the Convener and Dr. Krishan Lal was the Co-convener of the workshop. The workshop was inaugurated by Dr. AK Singh, DDG (NRM) and Dr. MM Pandey, DDG (Engg.), Indian Council of Agricultural Research (ICAR) was the Guest of Honour for the Inaugural session. Dr. A. Subba Rao, Director, IISS Bhopal; Dr. AK Dixit, Head, Division of Agricultural Chemicals, IARI, New Delhi; Dr. Madhuban Gopal, National Fellow, Division of Agricultural Chemicals, IARI, participated in the workshop along with other eminent statisticians and experimenters from ICAR Institutes and SAUs. Dr. HS Gaur, Dean and Joint Director, Education, IARI, New Delhi Chaired the Valedictory session and delivered the Valedictory Address. Following recommendations were emerged:

1. The utility of efficient and appropriate designs for the objectives of the study should be disseminated in a language that can be easily understood by the experimenters so that they can take advantage of the research in design of experiments, which in turn would help them in better understanding and then adoption. This would help them make agricultural research globally competitive.
2. Travel workshops should be organized as an outreach activity of the Institute, at different ICAR Institutes and SAUs for a better dissemination of research in Design of Experiments.
3. The participants appreciated the efforts put in developing the Web Resources for E-leaning and E-dissemination and advisory, particularly the Design Resources Server and suggested that the rigorous efforts should be put in to make Design Resources Server to reach to every scientist in NARS, particularly through mobile workshops.

4. Brainstorming sessions and one-two days workshops should be organized on thematic areas cutting across the various Subject Matter Division (SMDs) of ICAR so as to improve the quality of agricultural research.
5. The participants appreciated the efforts made in developing several information systems. It was suggested that with the help of various DDGs of different SMDs of ICAR, efforts should be made for continuously updating the systems online so as to harness the benefits of these efforts. It was also suggested that weather data and soil data may be superimposed on these information systems and develop specific recommendations as per the specifications. The recommendations should not be broad based and should be realistic.
6. The innovative research findings should be properly publicized by reporting in ICAR Newsletter and ICAR Reporter, etc.

Inaugural function of Workshop on 'Design of Experiments'

- A Workshop was organised on Applications of small area estimation techniques on 18 May 2009. Dr. UC Sud was the Convener and Dr. Hukum Chandra was the Co-Convener of the workshop. Dr. Padam Singh, Former Member National Statistical Commission, Government of India was the Chairman of the inaugural session. Dr. Pranob Sen, Secretary, (Ministry of Statistics and Programme Implementation) and Chief Statistician of India was the Chief Guest and Dr. MM Pandey, DDG Engineering, ICAR was the Guest of Honour for the workshop. The following recommendations emerged on the basis of deliberations in the workshop:

1. The small area estimates are being applied without understanding the estimates or their limitations, so it is always advisable to take care of this point before using the estimates. There should be debate between statisticians producing the estimates and people generating the auxiliary data.
2. For the benefit of SAE practitioners the material of this workshop should be uploaded on IASRI website.
3. IASRI is a leading Institute in the country for conducting research in the area of SAE. IASRI should make efforts so that the SAE techniques are applied by the implementing agencies more frequently.
4. Institute should conduct such trainings/ workshops for some discipline specific group more frequently.
5. Research efforts are needed to generate estimates at small area level for derived parameters.
6. There is a need to make a bridge between, IASRI, National Sample Survey Organization (NSSO), Central Statistical Organization (CSO) and Registrar General of India (RGI) etc. so that researched data producer and data users can come together.

Inaugural function of Workshop on
'Application of Small Area Estimation Techniques'

- A Workshop on Expert systems in agriculture was organized on 12 June 2009. Agricultural scientists in NARS who are the domain experts and the computer scientists involved in developing expert systems attended the workshop. Dr. Sudeep was the Convener for the workshop. Dr. Kiran D. Kokate,

DDG (Extension), ICAR inaugurated the workshop. He emphasized on the use of knowledge driven systems in general and expert systems in particular for knowledge dissemination to the farmers. He cited many examples wherein expert systems are used by farmers for solving their problems. Dr. PK Malhotra presented the attempts made by IASRI in this area. Dr. Sudeep presented the major objectives of the workshop and demonstrated the Java based Expert Systems at IASRI. The team from IIT, Kanpur demonstrated the Agropedia portal developed under the NAIP project and discussed its various functionalities. Mr. KK Chaturvedi discussed the functionalities of Expert System on Wheat Crop Management. Dr. Rajni Jain and Mrs. Alka Arora presented the use of data mining approach to build rules for solving problems in agriculture. Other participants from DRR Hyderabad, CPRI Shimla, VPKAS Almora also explained their work in the area of expert systems.

Following are the recommendations from the workshop:

- Web based Expert Systems have a potential to become the effective extension tools for knowledge dissemination from scientists to farmers.
- In order to increase its usage by farmers this technology should be publicized among the farmers.
- Organizations within ICAR and outside should join hands to provide farmer centered contents for the expert systems.
- IASRI being the central institute can provide the expert system technology to other domain institutes for developing expert systems in their respective domains.

Dr. Kiran Kokate receiving the memento from Dr. VK Bhatia at the inaugural function of the Workshop on 'Expert Systems in Agriculture

- A Workshop on Remote sensing and GIS for decision support in agriculture was organised on 18 June 2009. Dr. Anil Rai was the Convener of the workshop. Dr. AK Singh, DDG (NRM), ICAR inaugurated the workshop.

Inaugural function of Workshop on
'Remote Sensing and GIS for Decision Support in Agriculture'

- A Workshop on Statistical and computational issues in Genomics was organized on 22 June 2009. A total of 22 participants cutting across different disciplines in Agriculture from ICAR Institutes and SAUs have participated in the workshop. Dr. AR Rao was the Convener of this workshop. Dr. MM Pandey, DDG (Engineering), ICAR inaugurated the workshop.

Inaugural function of Workshop on
'Statistical and Computational Issues in Genomics'

Workshops organised under Research Projects

- A training cum workshop for the project "Strengthening, Refining and Implementation of

Expert System on Wheat Crop Management" was organized in collaboration with Directorate of Wheat Research(DWR), Karnal; Indian Agricultural Research Institute (IARI), New Delhi and National Center for Integrated Pest Management, New Delhi at DWR, Karnal during 12-13 May 2009. Altogether 80 people including extension specialists, farmers, extension workers, officials from Department of Agriculture and KVKs, Scientists from DWR, NDRI and specialists from CCSHAU participated in the workshop. The workshop details were highlighted in six Hindi Newspapers.

- Brainstorming session on Future Technological Needs in Genetics and Plant Breeding for Sustainable Agriculture was organised on 15 May 2009 under V-Page project at Division of Genetics and Plant Breeding, IARI, New Delhi. Dr. Ramasubramanian V acted as as Coordinator for the workshop.
- A workshop on Remote sensing and GIS for accelerated growth of agricultural research and development was organised on 29 July 2009 at Indian Institute of Remote sensing Deheradun under V-PAGe project. Dr. Anil Rai acted as as Coordinator for the workshop.
- Personnel Management Information System Network (PERMIS*net*-II) was implemented for ICAR. Launching workshop of the system was organized on 22 July 2009 at NASC Complex. Workshop was attended by 192 personnel, which include personnel from Council, nodal officers from ICAR institutes and IASRI personnel. System was released by Sh. Anil Kumar Upadhyay, Special Secretary (DARE) & Secretary, ICAR. Overview of the system was presented in the workshop. PERMIS*net*-II is enhanced version of PERMISnet, and is developed using .NET framework. System has been designed and developed with different access rights for different types of users, which include managers at Council level, nodal officers at institutes, individual personnel and general users. System contains information on personal and professional parameters of ICAR employees along with details on cadre strength and institutional parameters.

A view of launch of PERMISnet II

- A one day workshop on Evaluation of Rationalization of Minor Irrigation Statistics Scheme was Organised at NAAS, NASC Complex, New Delhi on 17 November 2009. Dr. UC Sud was the Convener of the workshop.

A view of Workshop on
'Evaluation of Rationalization of Minor Irrigation Statistics Scheme'

Travel Workshops organised as Outreach Activity of the Institute

- Three travel workshops on Experimental Designs were organized in collaboration with ANGRAU, Hyderabad for sensitizing the scientists and students of ANGRAU on the Advances in Design of Experiments and Analysis of Experimental Data. Dr. Rajender Parsad from IASRI co-ordinated these travel workshops. The first workshop was organized at ANGRAU, Hyderabad during 16-17 June 2009. This workshop was attended by 93 participants. The second workshop was organized at RARS, Tirupati during 05-06 October 2009 and attended by 92 participants. The third workshop was organized at RARS, Ankapalle on January 06, 2010. Sixty

participants from North Coastal Zone, West Godavari Zone and High Altitude Zone attended this workshop. During these workshops, views of the participants were also taken on statistical problems encountered by them during their experimentation. The major issues that came up were:

(i) How to compare two watersheds of 100ha each with untreated and treated water sheds?

(ii) How to compare 2 treatments like organic farming and existing farming practices using non-replicated field scale experiments with large plot size?

(iii) How to design experiments for drip and sprinkler irrigation systems?

(iv) How to handle large variation in both directions of experimental plots due to soil depth, elevation under rainfed conditions?

(v) How to analyze the data from on-farm trials conducted over years?

(v) How to take samples for estimation of yield per hectare from large plots in experiments on cultivator's fields?

(vi) How to handle large variation in both directions of experimental plots due to soil depth, elevation under rainfed conditions? and

(vii) How to handle the variability within plots?

A view of Travel Workshop on 'Design of Experiments'

The participants also felt that in future programmes, separate homogeneous groups according to the disciplines should be formed and examples from disciplines pertaining to that group should be included for a given group. The travel workshops were widely covered in news papers.

- संस्थान द्वारा "भारत में फसल आकलन सर्वेक्षण" विषय पर दिनांक 07 नवम्बर, 2009 को एक-दिवसीय कार्यशाला का आयोजन किया गया। इस कार्यशाला के आयोजन में डा. उमेश चन्द्र सूद ने संयोजक तथा डा. कृष्ण कान्त त्यागी ने सह-संयोजक के रूप में कार्य किया। यह कार्यशाला दो तकनीकी सत्रों में आयोजित की गई:

तकनीकी सत्र-1

(i) भारत में फसल आकलन सर्वेक्षण-दृष्टिपात

(ii) फसल आकलन सर्वेक्षण-आंकड़ों की गुणवत्ता

(iii) फसल उत्पादन आकलन-वर्तमान परिदृश्य

तकनीकी सत्र-2

(i) फसल कटाई प्रयोग की विधि

(ii) सुदूर संवेदन पद्धति एवं भौगोलिक सूचना तंत्र द्वारा फसल क्षेत्रफल का आकलन

(iii) फसल आकलन सर्वेक्षण - उत्तर प्रदेश राज्य के अनुभव

(iv) लघु क्षेत्र स्तर पर फसल उपज आकलन

भारत में फसल आकलन सर्वेक्षण

कार्यशाला की मुख्य अनुशंसाएँ

(1) फसल पैदावार के आकलन के लिए राज्य सरकारों द्वारा आयोजित फसल कटाई परीक्षणों (सी.सी.ई.) की संख्या बढ़ रही है, जिससे आँकड़ों की गुणवत्ता पर विपरीत प्रभाव पड़ रहा है । अत: फसल कटाई परीक्षणों (सी.सी.ई.) की संख्या को कम करने के प्रयास करने चाहिए। इसके लिए जिला स्तर से कम स्तर पर अर्थात सामुदायिक विकास खंड/ग्राम पंचायत स्तर पर लघु क्षेत्र आकलन तकनीकों का प्रयोग किया जाना चाहिए ।

(2) कृषि मंत्रालय द्वारा फसल उत्पादन के लिए अपनाई जाने वाली विधि के स्थान पर उचित सांख्यिकीय तकनीकों का प्रयोग करके एक उद्देश्यात्मक विधि का प्रयोग करने की आवश्यकता है ।

(3) फसल कटाई सर्वेक्षण के संचालन के अन्तर्गत, अनाज के उत्पादन के साथ-साथ फसल अवशेषों के उत्पादन को भी मापा जाना चाहिए एवं

(4) पहाड़ी/उत्तर पूर्वी पहाड़ी राज्यों में, जहाँ ज्यादातर क्षेत्र दुर्गम हैं, वहाँ भौगोलिक सूचना तंत्र (जी.आई.एस.) उपकरणों के साथ सूदूर संवेदन तकनीकों का प्रयोग करके फसल क्षेत्र आकलन किये जाने चाहिऐं।

Other Symposia/Workshops

- A half day session of lectures and visit to library and GIS & Remote Sensing Lab was organised on 23 April 2009 for 4 faculty members of Vietnam University of Foreign Trade as part of the training programme organized by Indian Institute of Foreign Trade, New Delhi. The lectures were delivered on Crop Acreage and Production Estimation, Overview of Sampling Techniques and Determination of Sample Size.
- Brainstorming Sessions on Establishment of Centre of Agricultural Bioinformatics were organised:
  - Under the Chairmanship of Dr. HP Singh, DDG (Horticulture), Dr. MM Pandey, DDG (Engineering) and Dr. KD Kokate, DDG (Extension), ICAR and other experts in the field of biotechnology and bioinformatics also participated on 26 August 2009 at IASRI, New Delhi.
  - Under the Chairmanship of Dr. Mangala Rai, Secretary, DARE & Director General, ICAR, with other experts in the field of biotechnology and bioinformatics New Delhi on 22 September 2009 at NASC, New Delhi.

Dr. Mangala Rai, Secretary, DARE and Director General, ICAR addressing the participants of Brain Storming Session on 'Establishment of Centre of Agricultural Bioinformatics'

- Symposium on Statistical and Informatics Perspectives of Climate Change was organised during 63rd Annual Conference of ISAS at Rajendra Agricultural University, Samastipur, Bihar during 03-05 December 2009 Dr. PK Malhotra was the Convener for the Symposium.
- Symposium on Statistical and Computational Genomics was organised on 03 December 2009 during 63rd Annual Conference of Indian Society of Agricultural Statistics held at Department of Statistics, Mathematics and Computer Application, Rajendra Agricultural University, Samastipur, Pusa, Bihar. Dr. Rajender Parsad and Dr. BM Prasanna were the Conveners for the Symposium.
- 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 (Convener: Dr. Hukum Chandra and Co-Convener: Dr. UC Sud)
  - Recent Advances in Sample Surveys (Convener: Dr. U.C. Sud and Co-Convener: Dr. Hukum Chandra)
  - Statistical Modelling (Convener: Dr. Prajneshu and Co-Convener: Dr. Himadri Ghosh)
  - Recent Advances in Statistical Genetics (Convener: Dr. VK Bhatia and Co-Convener: Dr. AK Paul)
- A symposium on Statistics for Studying the Impact of Climate Change was organized on 25 February 2010 during XII Annual Conference of Society for Statistics, Computer and Applications at Department of Statistics, Siksha Bhavana, Visva Bharati during 23-25 February 2010. Dr. Rajender Parsad and Dr. Kashinath Chatterjee were the Conveners for the Symposium.
- A workshop on Orthogonal arrays and mixture experiments was organized during 15-17 March 2010 by Dr. VK Gupta, ICAR National Professor jointly with Dr. Rajender Parsad. The main speakers were from IASRI, New Delhi and the discussants were from Indian Statistical Institute, Kolkata; Indian Statistical Institute, Delhi; Kolkata University, Kalyani University and IARI, New Delhi. The basic purpose

A view of Workshop on
'Orthogonal Arrays and Mixture Experiments'

Dr. Murari Singh receiving the Memento from
Dr. Prajneshu at the Golden Jubilee Seminar

of the workshop was to bring leading statisticians and stake holders together so as to enable to disseminate the recent research findings on orthogonal arrays and mixture experiments into the research in agricultural sciences so as to help to improve the quality of agricultural research. It also aimed to create a school of researchers who can undertake basic research in Design of Experiments and their applications in agricultural sciences so as to improve the status of experimentation in agricultural research.

The introductory session was chaired by Shri SK Das, Director General, CSO, New Delhi. Dr. VK Bhatia, Director, IASRI, Dr. Bikas Sinha, Professor, ISI, Kolkata and Former Member, National Statistical Commission, Dr. Aloke Dey, INSA Senior Scientist, New Delhi gave their introductory remarks. Dr. VK Gupta talked about the purpose and coverage of the workshop.

It was unanimously felt by all the participants that such workshops are quite useful and should be organized regularly. These workshops are helpful in developing the subject and the capabilities of the scientists. The main advantages of such disseminations are that there is a judicious mix of theory and application, particularly applications in agriculture. It was also felt that the scope of the workshop may be enlarged by including more statisticians active in the topic of research.

- A Hindi workshop on 'Karyalaya ke karya main sanganak ka prayog' was also organized on 29 March 2010 for Technical/Administrative staff of the Institute.

Seminars

Salient outcomes from the completed research projects undertaken in different aspects of Agricultural Statistics and Computer Application were presented in the seminars organized regularly at the Institute. Open seminars were also organized for new research projects proposals. Outline of Research Work (ORW) seminars, Course seminars and Thesis seminars were delivered by the students of M.Sc. and Ph.D., Agricultural Statistics and M.Sc., Computer Application.

During the period under report, a total of 94 seminar talks were delivered. Out of these, 67 were student seminars, 18 by scientists of the Institute and 09 by guest speakers as follows:

Guest Seminars as a part of the celebrations for the Golden Jubilee Year of the Institute

- Dr. VK Sharma, Emeritus Scientist, ICAR. Prediction in seemingly unrelated regression models on 27 May 2009.
- Dr. Murari Singh, Professor Department of Mathematics and Statistics Concordia University, Canada. Spatial-Temporal error structured for lentil yield in suplimental irrigation trials on 16 June 2009.
- Dr. KC Raut, Former Scientist, IASRI, New Delhi. My experiences in IASRI on 30 June 2009.

Other Guest Seminars

- Dr. RC Agarwal, Principal Scientist NBPGR. Indian IT act 2000 and cyber security on 20 May 2009.
- Dr. PK Gupta, Emeritus Professor, Ch. Charan, Singh University, Meerut. Advances in quantitative genetics on 23 November 2009.

- Prof. Prem Narain, Former Director, IASRI. Quantitative genetics in modern era on 30 November 2009.
- Dr. Ramanna V. Davuluri, Director, Comutational Biology, The Vista Cancer Centre,The Vista Institute, (USA). Bio-informatics & computational biology in post genomics era on 18 January 2010.
- Dr. Sat Gupta, Professor of Statistics, North Carolina,(USA). Usefulness of two steps optimal randomised response model on 20 January 2010.
- Dr. Bikas Sinha, Former Member, National Statistical Commission. Data integration techniques on 17 March 2010.

ANNUAL DAY CELEBRATIONS

The Annual Day of the Institute was celebrated on 02 July 2009 in which Dr. Madan Mohan Pandey, DDG (Engg.), ICAR was the Chief Guest. Dr. Anil Kumar Singh, DDG (NRM), ICAR delivered the Nehru Memorial Lecture entitled Bridging the Statistical Divide.

A view of tree plantation by Dr. AK Singh DDG (NRM), ICAR at Annual Day Function

Annual Report of the Institute and PAYBITAX Package Ver 1.0 were released on the Annual Day. As a part of Golden Jubilee Celebrations of the Institute a publication entitled *IASRI... an Era of Excellence* consisting of messages from leaders in Agricultural Science, Statistical Science and other well wishers along with 17 articles on various topics was also released by the Chief Guest.

Nehru Memorial Gold Medal for the year 2005-08 was awarded to Sh. Sanjay Kumar Prasad, M.Sc. (Agricultural Statistics) student.

Chief Guest awarding Nehru Memorial Gold Medal to the best student of M.Sc. (Agricultural Statistics)

Study Visit

- One day Study Visit was organized on 13 October 2009 at Institute on Functions and Activities of Institute for the participants of 63rd regular course of International Statistical Education Centre (ISEC), Kolkata on Official Statistics and Related Methodology conducted by National Academy of Statistical Administration (NASA) from 05 October to 13 November 2009.

Dr. VK Bhatia, Director addressing the participants of 63rd Course of ISEC during their Study Visit to the Institute

The participants were from seven countries. Dr. Seema Jaggi was facilitator for this visit.

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Distinguished Visitors

INDIAN

Dr. Mangala Rai
Secretary, DARE & Director General, ICAR
New Delhi

Dr. SP Tiwari
DDG (Education), ICAR, New Delhi

Dr. HP Singh
DDG (Horticulture), ICAR, New Delhi

Dr. AK Singh
DDG (NRM), ICAR, New Delhi

Dr. MM Pandey
DDG (Engineering), ICAR, New Delhi

Dr. KD Kokate
DDG (Extension), ICAR, New Delhi

Dr. Arvind Kumar
DDG (Education), ICAR, New Delhi

Dr. Pronab Sen
Chief Statistician and Secretary
Ministry of Statistics and
Programme Implementation
Government of India

Dr. PV Shenoi
Former Special Secretary (DAC)
Shantiprem, 20-C, First Main Road
Raj Mahal Villa Extension
Stage-II, Block-I, Bangalore

Dr. Bikas Kumar Sinha
Former Member, National Statistical Commission and
Professor, Indian Statistical Institute, Kolkata

Dr. AP Gore
Member, National Statistical Commission, Bakul
40 Empress Garden View Society Sopan Baug, Pune

Dr. Padam Singh
Former Additional Director General
ICMR, New Delhi

Sh. SK Das
Director General,
Central Statistical Organisation, New Delhi

Dr. SS Acharya
Former Chairman, CACP, Govt. of India
33, Shahi Complex,
Sector - 11, Udaipur, Rajasthan

Dr. AK Nigam
Executive President
IASDS, A-2/605, Shobha Aqua Marine
Bellander, Outer Ring Road, Bangalore

Dr. Aloke Dey
INSA, Senior Scientist
Indian Statistical Institute, New Delhi

Dr. PK Gupta
Emeritus Professor
Ch. Charan Singh University, Meerut, UP

Dr. PK Agrawal
ICAR National Professor
IARI, New Delhi

Dr. A Subba Rao
Director, IISS, Bhopal

Prof. Prem Narain
Former Director, IASRI, New Delhi

Dr. BBPS Goel
Former Director, IASRI, New Delhi

Dr. SD Sharma
ADG (HRD-I), Education Division, ICAR, New Delhi

Dr. AK Srivastava
Former Joint Director, IASRI, New Delhi

Dr. SK Tandon
ADG (Engineering), ICAR, New Delhi

Dr. HS Gaur
Dean and Joint Director (Education), IARI, New Delhi

Sh. AK Srivastava
DDG (FOD), NSSO, Faridabad

Dr. BB Singh
DDG (FOD), Allahabad

Sh. VK Singh
Director, Department of Agriculture, UP

Sh. Rajiv Lochan
Advisor, Directorate of Economics & Statistics
Ministry of Agriculture
Krishi Bhawan, New Delhi

Dr. S.M. Jharwal
Principal Advisor, DAC, Ministry of Agriculture
Krishi Bhawan, New Delhi

Dr. Vidya Dhar
DDG & Agriculture Census Commissioner
Government of India, New Delhi

Prof. MC Agrawal
Professor(Statistics),
Department of Statistics
University of Delhi, New Delhi

Sh RC Ray
Economic and Statistical Advisor
Directorate of Economics and Statistics
Ministry of Agriculture, Krishi Bhawan, New Delhi

Sh. AK Mathur
Adviser (Statistics),
Department of Animal Husbandry
Dairying and Fisheries, Ministry of Agriculture
Krishi Bhawan, New Delhi

Dr. TBS Rajput
Project Director, Water Technology Centre
IARI, New Delhi

Dr. GM Bhoopathy
DDG, Central Statistical Organisation, New Delhi

Dr. Ramesh Chand
Director, NCAP, New Delhi

FOREIGN

Prof. JN Srivastava
CNS Research, Professor (Emeritus)
Colorado State University, USA

Dr. Sat Gupta
Professor of Statistics, North Carolina, USA

Dr. Murari Singh
Professor
Department of Mathematics and Statistics
Concordia University, Canada

Dr. Ramanna V Davuluri
Director, Comutational Biology
The Vista Cancer Centre
The Vista Institute, USA

Dr. A David Marshall
Deputy Director, Statistics Division, FAO, Rome

Dr. Naman Keita
Senior Statistician, Statistics Division
FAO, Rome

Prof. Rohan Rajapakse
Executive Dierctor
Sri Lanka Council for Agricultural Research Policy
Sri Lanka

Mr. Ranjith Wijethilake
Secretary,
Ministry of Agriculture Development and
Agrarian Service, Sri Lanka

Dr. KNG Pushpkumara
Scientist,
Sri Lanka Council for Agricultural Research Policy
Sri Lanka

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IASRI Personnel

Indian Agricultural Statistics Research Institute (IASRI) consists of Scientific, Technical and Administrative personnel headed by the Director. The Heads of different Divisions/ In-Charge of Cells and other officers at managerial positions during 01 April 2009 to 31 March 2010 are:

Director
Dr. VK Bhatia

ICAR National Professor
Dr. VK Gupta

Head, Division of Biometrics
Dr. Prajneshu

Head, Division of Forecasting Techniques
Dr. (Mrs.) Ranjana Agrawal

Head, Division of Computer Applications
Dr. PK Malhotra

Head, Division of Design of Experiments
Dr. PK Batra (upto 28 April 2009) (Actg.)
Dr. Rajender Parsad (w.e.f. 29 April 2009 AN)

Head, Division of Sample Survey
Dr. UC Sud

Head, Division of Econometrics
Dr. AK Vasisht (upto 02 March 2010 FN)
Dr. SP Bharadwaj (w.e.f. 02 March 2010 AN) (Actg.)

Professor (Agricultural Statistics)
Dr. VK Bhatia

Professor (Computer Application)
Dr. PK Malhotra

In-charge, Research Coordination and Management Unit and Member Secretary, IRC
Dr. VK Mahajan (upto 06 June 2009)
Dr. Rajender Parsad (w.e.f. 11 June 2009)

Warden, Sukhatme Hostel
Dr. Krishan Lal (upto 01 September 2009)
Dr. (Mrs.) Ranjana Agrawal (w.e.f. 02 September 2009)

Vigilance Officer
Dr. PK Malhotra

Welfare Officer
Dr. PK Batra

In-charge, National Agricultural Science Museum
Shri RP Jain (upto 27 March 2010)
Dr. (Mrs.) Sushila Kaul (w.e.f. 28 March 2010)

Librarian
Dr. (Mrs.) P Visakhi

Officer on Special Duty
Sh. AK Chaturvedi (upto 31 December 2009)

Chief Administrative Officer and Head of Office
Capt. Mehar Singh

Finance and Accounts Officer
Sh. Krishan Kumar

Liaison Officer
Dr. Jagbir Singh

Public Information Officer
Sh. AK Chaturvedi (upto 31 December 2009)
Sh. Nika Ram (w.e.f. 01 January 2010)

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Any Other Relevant Information

National Agricultural Science Museum

The National Agricultural Science Museum (NASM), situated at NASC Complex, Dev Prakash Shastri Marg, Opposite Dasghara Village, Pusa Campus, New Delhi came into existence during 2004 and was inaugurated by H.E. Hon'ble President of India, Dr. A.P.J. Abdul Kalam on 03 November, 2004.

The NASM is looked after by a Central Management Committee constituted at the ICAR Headquarter level and is comprised of:

Dr. MM Pandey	Deputy Director General (Engg.)	Chairman
Dr. P Chandra	Assistant Director General (PE)	Member
Sh. VP Kothiyal	Director (Works)	Member
Sh. Rabindra Patra	Director (Finance)	Member
Sh. PK Jain	Under Secretary (GAC)	Member
Dr. VK Bhatia	Director, IASRI	Member Secretary

A Sub-Management Committee under the Chairmanship of Director, IASRI has also been constituted and is comprised of:

Dr. VK Bhatia	Director	Chairman
Dr. PK Malhotra	Head (CA)	Member
Dr.(Mrs.) Ranjana Agrawal	Head (FT)	Member
Dr. RC Goyal	Pr. Scientist & Nodal Officer	Member (Till 28.02.2010)
Sh. RP Jain	Scientist & In-charge	Member Secretary (Till 29.03.2010)
Dr. Sushila Kaul	Scientist & In-charge	Member Secretary (From 30.03.2010)
Capt. Mehar Singh	CAO	Member
Sh. Krishan Kumar	F&AO	Member

Under the guidance of this Committee, the day-to-day activities of the Museum, relating to up-keep and maintenance, are looked after by the Scientist Incharge, technical and administrative staff of IASRI, New Delhi.

Interesting information on agriculture-for farmers, agriculture students, college and school children as well as general public is available. The exhibits in the museum are a combination of electronics, computer hardware/software, mechanical devices, art and science objects. Special feature of this Museum is to provide complete knowledge on the agricultural subjects through audio, video, slides and computer medium using touch screen facility.

The Museum is open to visitors on all days from 10.30 a.m. to 4.30 p.m. except Monday - the weekly holiday. It is NOT closed even for lunch break. This grand Museum is fully air-conditioned. There is a nominal entry fee of Rs. 5 per head but the groups of students nominated by schools, colleges and farmers are exempted from entrance fee.

During the period under report many prominent persons visited the Museum which included Hon'ble Prime Ministers/Ministers of various countries, Head of Agricultural/Research Departments, etc. Besides this, farmers belonging to different parts of India also visited Museum and gained vital knowledge from the exhibits displayed in the Museum. In all 19,485 visitors visited the Museum and 3,914 tickets were sold. The functioning of the Museum was appreciated by all the visitors, especially by high dignitaries and foreigners. A team of Lok Sabha TV channel visited Museum for the entire coverage of the Museum and Incharge, Museum was interviewed by the team and the same was telecasted on its channel programme "Surkhiyon Se Pare" on 01 December 2009. Some of the distinguished visitors are:

Australia	Robert Bertrand Schwartz, Senior Manager, Plant Biosecurity
	Colin Grant, Executive Manager Plant Division, Department of Agriculture, Fisheries and Forestry
Bangladesh	MD Delowar Hossain, Chief Scientific Officer, Plant Pathology Division, Bangladesh Agricultural Research Institute
	Md. Hasanul Haque, Project Director, Agricultural Extension Component (AEC), Department of Agriculture Extension
Cambodia	Hean Vanhan, Deputy Director General, General Directorate of Agriculture(GDA), Ministry of Agriculture, Forest and Fisheries (MAFF)
	Nigin Chhay, Cambodia National IPM Coordinator & Chair, APPPC-IPM Committee, Phnom Penh, Department of Rice Crop (MAFF)
China	Xia Jingyuan, Director General, National Agro-Technical Extension and Service Centre, Ministry of Agriculture
	Fuxiang Wang, Director, Plant Quarantine Division, National Agro-Technical Extension and Service Centre, Ministry of Agriculture
	Yang Puyun, Deputy Director, Pest Control Division, National Agro-Technical Extension and Service Centre, Ministry of Agriculture
	He Pengfei, Programme Official, General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ)
	Lau Siu Ki Clive, Senior Agricultural Officer (Regulatory), Agriculture, Fisheries and Conservation Department, Hong Kong, Special Administrative Region
	Huang Chao Yin, Forestry Bureau, Council of Agriculture
Ethopia	Tigistu Gebremeskel Abza, Ministry of Agriculture & Rural Development
FAO (Thailand)	Johannes W Ketelaar, Chief Technical Adviser, FAO Inter-Country Programme for IPM and Pesticide Risk Reduction in South and South East Asia
	Piao Yongfan, Senior Plant Protection Officer and Secretary of APPPC, FAO Regional Office for Asia and the Pacific Maliwan Mansion, Thailand
	Nongyao Ruenglertpanya, Secretary, FAO Regional Office for Asia and Pacific Maliwan Mansion, Thailand
	Prapin Lalitpat, Consultant, FAO Regional Office for Asia and Pacific Maliwan Mansion
FAO/ROME	Peter E Kenmore, Secretary IPPC and Deputy Director, Plant Production and Protection Division, Agriculture and Consumer Protection Department
	Jean-Pierre Chiaradia-Bousquet, Senior Legal Officer, LEGA
Georgia	A team of Scientists (10-15 members) from the University of Georgia
India	Farookh Abdullah, Hon'ble Minister of New and Renewable Energy, Government of India
Indoensia	Hari Priyono, Director General, Indonesian Agricultural Quarantine Agency, Ministry of Agriculture
	Suwanda, Director of Centre for Plant Quarantine, Indonesian Agency for Agricultural Quarantine, Ministry of Agriculture
	Soekirno, Director of Horticulture Crop Protection, Ministry of Agriculture
	Herdradjat N, Director of Estate Crops Protection, Ministry of Agriculture
	Heru Wahyupraja, Head for Quarantine of Import Plant, Centre for Plant Quarantine, Agency for Agricultural Quarantine, Ministry of Agriculture

	Antarjo Dikin, Head of Division for Cooperation and Public Relation, Indonesian Agricultural Quarantine Agency
Lao, PDR	Siriphonh Phithaksoun, Deputy Director of Plant Quarantine Division, Department of Agriculture, Ministry of Agriculture and Forestry
Malaysia	Suranthran Perissamy, Department of Crop Science
	Wan Normah Wan Ismail, Director, Crop Protection & Plant Quarantine Division, Department of Agriculture
	Yip Kin San, Principal Assistant Director, Enforcement and Plant Protection Section, Department of Agriculture
	Fatimah Binti Md. Anwar, Principal Assistant Director, Pesticieds Control Division
	Michael Ranges Nyangob, Assistant Director of Agriculture, Plant Quarantine Division
	Ho Haw Leng, Principal Assistant Director, Import and Export Control Section, Crop Protection & Plant Quarantine Division
	Chang Yeng Wai, Deputy Director, Legislation & International Affairs, MAQIS
	Halimi Mahmud, Pesticied Control Division, Department of Agriculture, Ministry of Agriculture and Agro-Based Industry
Myanmar	Phyu Phyu Lwin, Manager (Senior Entomologist), Plant Protection Division, Myanmar Agriculture Service
Nepal	Dinesh Pariyal, Principal Scientist
	Suresh Kumar Shrestha, Sr. Scientist, Nepal Agricultural Research Orgainization
	Badri Bishal Karmacharya, Programme Director, Directorate of Plant Protection, Department of Agriculture, Ministry of Agriculture and Co-operatives
New Zealand	Tim Knox, Director Border Standards, MAF Biosecurity New Zealand, Ministry of Agriculture and Forestry
	John Hedley, Principal Adviser, International Coordination-Plants, Biosecurity New Zealand, Ministry of Agriculture and Forestry
Nigeria	Vaatyough Hyacinth Mamfe, National Space Research and Development Agency, Fedral Ministry of Science and Technology
	Zubair Ayodeji Opeyemi, National Space Research and Development Agency
Pakistan	Tasneem Ahmad, Adviser & Director General, Department of Plant Protection, Ministry of Food & Agriculture, Governement of Pakistan
	Azam Khan, Department of Plant Protection, Malir Halt
Papua New Guinea	Jeffrey Waki, PNG National Agricultural Research Institute
Philippines	Larry R Lacson, Chief, Plant Quarantine Service, Bureau of Plant Industry
	Jesie Binamira, Philippine National IPM Programme Officer & ASEAN IPM Knowledge Network Director, Department of Agriculture
Republic of Korea	In-Tae-BAE, Director General, National Plant Quarantine Service, Ministry of Food, Agriculture, Forestry and Fisheries (MIFAFF)
	Young-Tae-KIM, Deputy Director, Bilateral Negotiation and Cooperation Division, MIFAFF
	Young-Chul JEONG, Deputy Director, International Quarantine Cooperation Division, National Plant Quarantine Service, MIFAFF
	Kyu-OCK YIM, Researcher, International Quarantine Cooperation Division, National Plant Quarantine Service, MIFAFF
Sri Lanka	Marvya Gunasena, Chairman, Sri Lanka Council of Agricultural Research and Policy (CARP)
	Panduka Weerasinghe, General Manager, CARP
	RB Wijekoon, Director, CARP
	Nirmala de Zoysa, Assistant Director, CARP, Enirisinghe Srimathie Chandrika Edirisinghe, Plant Genetic Resources Centre
	Ranjith Wijethilake, Secretary, Ministry of Agriculture Development and Agrarian Services
	Rohan Rajapaske, Executive Director, CARP
	KNG Pushpakumara, CARP and a Sr. Scientist
	K Piyasena, Deputy Director, Plant Protection Service, Gannoruwa, Peradeniya
Sudan	Saida Babeker Alzain, Range and Pasture Administration
Syria	Sabah Abou Kalam, Planning and Statistics Directorate, Ministry of Agriculture & Agrarian Reforms
	Ala'o Moafak Al Theib, Ministry of Agriculture, Al Badia, Project Damascus
Taiwan	Chen Shu, Division of Plant Germplasm, Taiwan Agricultural Research Institute
Tanzania	H.E. Mizengo Kayanza Pinda (MP), Prime Minister of the United Republic of Tanzania accompanied with 30 Member Delegation
Thailand	Udorn Unahawutti, Senior Expert on Plant Quarantine, Department of Agriculture
	Walaikorn Rattanadechakul, Senior Agricultural Scientist, Plant Protection Research and Development Office, Department of Agriculture
	Tasanee Pradyabumrung, Senior Standards Officer, Office of Commodity and System Standards, National Bureau of Agricultural Commodity and Food Standards, Ministry of Agriculture and Cooperatives
	Prateep Arayakittipong, Standards Officer, office of Commodity and System Standards, National Bureau of Agricultural Commodity and Food

	Standards, Ministry of Agriculture and Cooperatives
	Ratchanok Mikaew, Biotechnology Research and Development Office, Department of Agriculture
Uganda	Cyprian Ebong, Director, Quality Assurance
	James Ogwant, Director, Crops Resources Research Institute
	John Ociti, Chief Accountant
	George Maiteki, Director, Ngetta Zonal Agricultural Research and Development Centre
	Japheth Magyembe, Co-ordinator, Competitive Grants Scheme
	Regina Musaazi, Monitoring and Evaluation Officer from National Agricultural Research Organization (NARO)

A visit of an International delegation to National Agricultural Science Museum

Vietnam	Dam Quoc Tru, Deputy Director General, Plant Protection Department (PPD)
	Ngo Tien Dung, Coordinator Vietnam National IPM Programme, Plant Protection Department, Ministry of Agriculture and Rural Development
Zambia	Stephen Wambulwa Muliokela, Executive Director, Golden Valley Agricultural Research Trust (GART)
	Namukolo Mukutu, Chairman, Board of Trustees of GART
	Barry Coxe, Member, Board of Trustees of GART
	Douglas Moono, Head, Research & Development, GART,
	GS Pandey, Dairy Development Specialist, GART

Research Coordination and Management Unit (RCMU)

RCMU is responsible for documentation and dissemination of scientific output of the Institute through IASRI News and Annual Report, etc. It also organizes National Conferences of Agricultural Research Statisticians once in three years and conducts meetings of Senior Officers (SOM) every month. The Unit also assists the Research Advisory Committee (RAC) and Quinquennial Review Team (QRT), Consultancy Processing Cell (CPC), Institute Technology Management Committee (ITMC), Institute Technology Management Unit (ITMU) and Planning Monitoring and Evaluation (PME) Cell. The unit is also responsible for correspondence with ICAR, ICAR Institutes, SAUs and other organizations in India and abroad. The other functions of the Unit are: to examine the new research project proposals before these are considered by the Institute Research Committee (IRC) in respect of importance of problem, its design and final requirements; to monitor the progress of on-going research projects and to bring out half yearly monitoring progress reports; to prepare annual action plan, activity milestones, SFC memo, monthly targets and progress of the Institute, half yearly scientific targets and achievements, quarterly performance review, to maintain the Research Project Files (RPF), combined SFC memo of IASRI and NCAP, monthly progress of identified thrust areas and also their submission to ICAR. The Unit also provides help in Art, Photography and Reprographic Services. The unit also brings out quarterly newsletters, Annual Report of the Institute and other research and dissemination bulletins.

Consultancy Processing Cell (CPC)

As per the ICAR Rules and Guidelines for Training, Consultancy, Contract Research and Contract Services 1997 a Consultancy Processing Cell (CPC) has been functioning at the Institute since 16 August 1997. This Cell was reconstituted w.e.f. 17 August 2009 with the following composition:

Dr. Prajneshu, HD (Biometrics)	Chairman
Dr. PK Malhotra, HD (CA)	Member
Dr. Rajender Parsad, HD (DE) and Incharge (RCMU)	Member
Chief Administrative Officer and Head of Office	Member
Finance and Accounts Officer	Member
Sh. PP Singh, Technical Officer	Member Secretary

The functions of the Cell are:

- To give broad guidelines for consultancy work
- To bring out consultancy information system, catalogues periodically

- To identify and prepare list of consultants in different fields; the consultants could be retired Scientist/ Officer of proven experience
- To prepare a roster of available human resources on the basis of time schedule
- To identify team for specific consultancy assignments and periodic reviews of progress
- To prepare consultancy proposals as per prescribed flow chart

Nine consultancy trainings/ Five consultancy services received by Consultancy Processing Cell were finalized and got approved.

Planning, Monitoring and Evaluation (PME) Cell

To facilitate all activities related to priority setting, monitoring and evaluation a Planning, Monitoring and Evaluation (PME) Cell is working at the Institute. This Cell was reconstituted w.e.f. 16 September 2009 with the following composition :

Dr. PK Malhotra, HD (CA)	Nodal Officer
Dr. Rajender Parsad, HD (DE) and Incharge (RCMU)	Member
Dr. UC Sud, HD (SS)	Member
Dr. Ashok Kumar, Principal Scientist	Member
Dr. Dharm Raj Singh, Scientist	Member
Sh. Samir Farooqi, Scientist	Member
Sh. PP Singh, Technical Officer (T-7-8)	Member Secretary

The terms of reference of the Cell are:

- Sensitization of policy makers, managers, scientists and others about the need for research priority assessment
- Prioritization of Institute's programmes
- Tracking of current resource allocations
- Interface with ARIS, SREP, ATMA, IVLP, TAR and KVK for research, extension education and other services
- Facilitate monitoring and evaluation of research projects of the Institute/SAU
- Participation in monitoring and evaluation (site-level) activities of NATP/NAIP
- Impact analysis, especially that of research and extension activities

Institute Technology Management Committee (ITMC)

As per the 'ICAR Guidelines for Intellectual Property Management and Technology Transfer/ Commercialization' a Institute Technology Management Committee (ITMC; short title for Institute Intellectual Property Management and Technology Transfer/Commercialization Committee, IIPM&TCC) has been constituted for addressing Intellectual Property (IP) related matters of the Institution as detailed in the ICAR Rules and Guidelines for Training, Consultancy, Contract Research and Contract Services, 1997. The composition of the ITMC is:

Dr. VK Bhatia Director, IASRI	Chairman
Dr. Amit Kumar Vasisht (upto 02 March 2010) HD (Econometrics), IASRI	Member
Dr. Anil Rai Principal Scientist, IASRI (Technical Expert–A Scientist of the Institute)	Member
Dr. Seema Jaggi Senior Scientist, IASRI (Technical Expert–A Scientist of the Institute)	Member
Dr. Madhuban Gopal Principal Scientist and National Fellow, IARI (IPR Expert–A Scientist from ICAR Institute in the Zone	Member
Dr. Rajender Parsad, HD (DE) and Incharge, RCMU, IASRI	Member Secretary

A joint meeting of Institute Technology Management Committee (ITMC) and Institute Technology Management Unit (ITMU) was held on 27 January 2010 to discuss the mode of expenditure and further requirement for XI Plan Scheme "Intellectual Property Management and Transfer/Commercialization of Agricultural Technology Scheme (Up scaling of existing components i.e. Intellectual Property Right (IPR) under ICAR Headquarter Scheme on management on information services)".

Institute Technology Management Unit (ITMU)

As per the 'ICAR Guidelines for Intellectual Property Management and Technology Transfer/ Commercialization' an Institute Technology Management Unit (ITMU; short title for Intellectual Property Management and Technology Transfer Commercialization Unit at Institute level IPM&TTU) for management of its IP/ Deemed IP and transfer/commercialization of technologies has been constituted for pursuing all IP protection, maintenance and transfer/commercialization related matters at the institute level as per these guidelines and any other administrative or policy decisions taken in the ICAR from time to time. This will seek any specific, case-to-case basis advice/

assistance from the Zonal Agro-Technology Management Centres (ZTMCs) at the zonal level. The composition of the ITMU is as given below:

Dr. Rajender Parsad HD (DE), Incharge (RCMU)	Officer Incharge
Dr. Tauqueer Ahmad, Senior Scientist	Member
Sh. PP Singh, Technical Officer	Member

Institute Joint Staff Council

The Institute has a Joint Staff Council (IJSC) to promote harmonious relations and secure the best means of co-operation between the Council/IASRI as employer and the general body of its employees in matters of common concern for ensuring a high degree of efficiency in the service. The Institute Joint Staff Council of the Institute is:

Dr. VK Bhatia	Director	Chairman
Official-side Representatives		
Dr. PK Malhotra	HD (CA)	Member
Dr. Rajender Parsad	HD (DE) and Incharge RCMU	Member
Dr. PK Batra	Principal Scientist and Welfare Officer	Member
Dr. KK Tyagi	Principal Scientist	Member
Sh. Krishan Kumar	F&AO (Ex-Officio)	Member
Head of Office		Member-Secretary
Staff-side Representatives		
Sh. Raj Pal	SSSGr-II	Secretary
Sh. DPS Mann	Assistant	Member
Sh. MM Maurya	Technical Officer	Member
Sh. Satya Pal Singh	Technical Officer	Member
Sh. KB Sharma	UDC	Member
Sh. Ashok Kumar	SSSGr-II	Member

IASRI Employees Co-operative Thrift and Credit Society Limited

The Society, registered with the Registrar, Co-operative Societies, Delhi Administration, Delhi continued its activities during 2009-10 in similar manner as during the past years by advancing regular and emergent loan to its members and looking after their welfare. The source of funds of the society is Share money (value of each share is Rs. 50), compulsory deposit (Rs. 200 per month from each member) and fixed deposits. The present strength of members is 330. The Management Committee of the Society for the period 2009-2012 is as follows:

Sh. UC Bandooni	President
Miss Vijay Bindal	Vice-President
Sh. Pratap Singh	Secretary
Sh. Pradeep Kumar	Treasurer
Mrs. VL Murthy	Member
Mrs. Satinder Pal	Member
Sh. Manoj Kumar	Member
Sh. GM Pathak	Member
Sh. Sudarshan Sharma	Member
Sh. Parbhu Dayal	Member
Sh. Rajnath	Member

- The Society has advanced Rs. 93,19,400 (Rupees Ninety three lakh ninteen thousand four hundred only) to its members as loan.
- An amount of Rs. 751 (Rupees Seven hundred fifty one only) each was given as gift to members on their retirement from the Institute.
- The financial help of Rs. 2000 (Rupees two thousand only) was extended from the member welfare fund of the society to Sh. K.P. Singh for his medical treatment.

Institute Grievance Committee

The Grievance Committee of the Institute (constituted as per ICAR rules) provides the employees a forum to ventilate their grievances relating to official matters and for taking remedial measures. The Grievance Committee of the Institute constituted for a period of two years w.e.f. October 2007 is as follows:

Official-side Representative	
Dr. VK Bhatia	Chairman
Dr. Prajneshu	Member
Sh. AK Chaturvedi	Member
Sh. Krishan Kumar	Member
Sh. Narender Kumar	Member Secretary
Staff-side Representative	
Sh. Pal Singh	Member
Sh. Vijay Pal Singh	Member
Sh. Basant Kumar	Member
Sh. Charan Singh	Member

Two meetings of the Grievance Committee of the Institute were held on 26 June and 26 October 2009. The Grievance Committee of the Institute was reconstituted with the approval of the Management Committee of the Institute for a period of two years

w.e.f. 02 March 2010 as follows:

Official-side Representative	
Dr. VK Bhatia	Chairman
Dr. Ranjana Agrawal	Member
CAO	Member
F&AO	Member
AAO (Admn. II)	Member Secretary
Staff-side Representative	
Sh. Pal Singh	Member
Sh. Vijay Pal Singh	Member
Sh. Chander Vallabh	Member
Sh. Charan Singh	Member

ICAR Staff Welfare Fund Scheme

The employees of the Institute have constituted a ICAR Staff Welfare Fund previously known as Benevolent Fund from their own contributions to provide relief to the families of the employees who die in harness and are left in an indigence condition. A gift of Rs. 600 is being given to each retiring employees of the Institute. During the year, a sum of Rs. 55258 was collected from members. Gifts of Rs. 9600 were distributed to sixteen retiring personnel of the Institute and a sum of Rs. 4800 @ Rs 400 was given for the farewell of fourteen retiring personnel agreed for taking farewell. A relief of Rs. 20000 was provided to Sh. Janak Kumar being injured during ICAR Zonal Sports Meet.

The Committee of the Institute for ICAR Staff Welfare Fund Scheme was reconstituted for a period of two years w.e.f. 07 November 2009 as follows:

Dr. PK Batra, Welfare Officer	Chairman
Chief Administartive Officer	Vice-President
F&AO	Member
Secretary, IJSC	Member
Dr.(Mrs.) Seema Jaggi	Member
AAO (Admn.-II))	Member

Women Cell

A Women Cell has been set up at the Institute on 27 January 2000. The cell functions for the welfare of women in general. It caters to the issues pertaining to the grievances of women employees. The present compositions of Women Cell is:

Dr. Ranjana Agrawal	Principal Scientist & HD (FT)	Chairperson
Dr. Seema Jaggi	Senior Scientist	Member
Ms. Vijay Bindal	Technical Officer	Member
Smt. Sushma Banati	Senior PS	Member
Smt. Sushma Gupta	Asstt. Admn. Officer	Convenor

Complaint Committee

A Complaint Committee has been set up at the Institute on 18 August 2006 for the prevention of sexual harassment of women at work place. The present composition of this committee is:

Dr. Ranjana Agrawal	Principal Scientist and HD (FT)	Chairperson
Smt. Meera Mathur	Technical Officer (CSIR)	Member (3rd Party)
Sh. SK Sublania	MTO (T-9)	Member
Smt. Satinder Pal	Technical Officer	Member
Sh. Fabian Minz	UDC	Member

Hostel Activities

There are three well furnished hostels, viz. Panse Hostel, Sukhatme Hostel and International Training Hostel to cater the residential requirements of the trainees and students of M.Sc., Ph.D. courses and Senior Certificate Course (SCC) at the Institute within its premises. Officers and trainees of the various other refresher, short-term and ad-hoc training courses organised at the Institute are also provided residential accommodation at the Panse Hostel-cum-Guest House. Boarding and lodging arrangements are made available for the guests who stay in Guest House from different Departments/Organisations. Ample facilities exist for the cultural activities and sports for the hostel inmates.

Sukhatme Hostel mess is run by the students on Co-operative basis. The general management of the Sukhatme Hostel is vested with the Warden, who is assisted by the Prefect and other students. A General Body meeting of IASRI hostel inmates was held on 28 October 2009 under the Chairmanship of Dr. Ranjana Agrawal, Principal Scientist and Warden. For smooth functioning of the hostel activities, the Executive Committee members elected for the session 2009-10 are:

Prefect	Ankur Biswas
Mess Secretary/Assistant Prefect	Arpan Bhowmik
Cultural Secretary	Nishikant Taksande & Sandip Sadhu
Maintenance Secretary	Manoranjan Das
Cashier	Arijit Saha
Health Secretary	Debasish Dutta
Sports Secretary	Rupam Kumar Sarkar
Common Room Secretary	AKM Samimul Alam
Computer Lab Secretary	Sandipan Samanta
Auditors	Mahondas Singh, Hironmoy Das & Sudhir Srivastava
Mess Observers Committee	Sankalpa Ojha, Sashi Shekhar & Mrityunjoy Mondal
Warden's Nominee	Eldho Varghese

On the eve of the Annual Day of the Institute on 02 July 2009, a sports week was organised in Sukhatme Hostel wherein students at IASRI participated in various sports like table-tennis, badminton and musical chair, etc.

International Training Hostel

Newly built, International Training Hostel was Inaugurated by Hon'ble Dr. Mangala Rai, Secretary, DARE & Director General, ICAR on 09 July 2009.

Inauguration of International Training Hostel

Number of Floors	:	Two, Ground Floor and First Floor
Number of Rooms	:	12
Area of Ground Floor	:	531 square metre
Area of First Floor	:	531 square metre
Available Amenities		
Ground Floor	:	Office, Lounge, Common Room, Dinning Hall, Pantry, Kitchen, 4 Rooms, Caretaker Room
First Floor	:	8 Rooms
Amenities Available	:	Two Beds, Side Table, Two Study Tables, Two Chairs, Dressing Table, Cupboard, Television, Air Conditioner, Geyser and Blower

A total of 617 Trainees/Guests from ICAR Instiutes, SAU's/Officials from Central/State Governments/ Private Organisations and Foreign Trainees from various institutes were satyed at ITH and about 2362 guests were stayed at Panse Guest House during the period. Smt. Sushma Banati is the Incharge of the Guest Houses of the Institution and she is assisted by Sh. Sunil Kumar.

Recreation and Welfare Club

The Institute has a Recreation and Welfare Club which provides facilities for indoor and outdoor games to promote social and friendly relations among the members and general recreation and welfare of its members. The club organises sport tournaments annually at Institute level for different games/events. The functioning of the Recreation and Welfare Club is monitored by Institute Sports Committee and Sh V.K. Mishra is appointed as acting Secretary.

Sports Activities

For organizing different activities relating to sports meet, Institute Sports Committee has been constituted as follows:

Dr. VK Bhatia	President
Dr. KK Tyagi	Vice President
Dr. PK Batra	Member
Capt. Mehar Singh	Member
Sh. Arun Kumar Chaturvedi	Member
Sh. Krishan Kumar	Member
Sh. RS Tomar	Member
Smt. Vijaya Laxmi	Member
Sh. DPS Mann	Member
Sh. RK Saini	Member
Sh. Amar Singh	Member
Sh. Rambhool	Member
Sh. KB Sharma	Member
Sh. Ashok Kumar	Member
Sh. MM Maurya	Member
Sh. Raj Kumar Verma	Member
Sh. Raj Pal	Member
Smt. Satinder Pal	Member
Sh. VK Mishra	Convenor

During the period under report the Institute Sports Contingent participated in Inter-Zone Sports Meet 2009-10 organized by NDRI, Karnal during 12-15 December 2009 and secured Championship Trophy in Table Tennis (Team Events-Men). Institute also partcipated in ICAR Zone II (Central Zone) Inter-Institutional Sports Meet 2010 organized by NBSS&LUP, Nagpur during 04-08 March 2010 and achieved Championship Trophy in Kabaddi and Table Tennis (Team Events-Men) Winner and Runner-up position in Chess (Men)-Individual event. Shri OP Khanduri was Chef-de-Mission.

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भारतीय कृषि सांख्यिकी अनुसंधान संस्थान में राजभाषा के बढ़ते चरण

भारतीय कृषि सांख्यिकी अनुसंधान संस्थान में वर्ष-दर-वर्ष हिन्दी के प्रगामी प्रयोग में अभिवृद्धि हो रही है । राजभाषा नीति को संस्थान में सुचारु रूप से कार्यान्वित किया जा रहा है। राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम में निहित लक्ष्यों को इस संस्थान में लगभग पूरा कर लिया गया है । संस्थान द्वारा समस्त प्रशासनिक कार्य शत-प्रतिशत हिन्दी में और यथाआवश्यक द्विभाषी हो रहा है । वैज्ञानिक कार्यों में भी हिन्दी के प्रयोग को प्रोत्साहित किया जाता है । न केवल मात्रात्मक रूप में बल्कि हिन्दी के प्रयोग में गुणवत्ता की ओर भी ध्यान दिया जा रहा है।

संस्थान के पूर्वानुमान तकनीक प्रभाग की अध्यक्षा, डॉ. रंजना अग्रवाल को भारत सरकार, सूचना एवं प्रसारण मंत्रालय के प्रकाशन विभाग द्वारा आयोजित "भारतेन्दु हरिश्चन्द्र पुरस्कार योजना" के अन्तर्गत उनकी पाण्डुलिपि "विज्ञान में ताक-झाँक" के लिए 29 मार्च 2010 को माननीया केन्द्रीय सूचना एवं प्रसारण मंत्री द्वारा प्रथम पुरस्कार (संयुक्त रूप से) प्रदान किया गया ।

प्रतिवेदनाधीन अवधि में संस्थान में राजभाषा कार्यान्वयन समिति की तिमाही बैठकें नियमित रूप से आयोजित की गयीं। इन बैठकों में राजभाषा अधिनियम 1963 की धारा 3(3) के अनुपालन को सुनिश्चित करने, राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम की विभिन्न मदों, हिन्दी पत्रिका के प्रकाशन, कार्यशालाओं के नियमित आयोजन, हिन्दी पखवाड़े के आयोजन इत्यादि पर विस्तार से चर्चा हुई ।

इस वर्ष में संस्थान के कर्मियों के लिए चार कार्यशालाएँ आयोजित की गयीं । पहली कार्यशाला 24 से 26 जून 2009 के दौरान "हिन्दी आशुलिपि प्रशिक्षण" पर आयोजित की गयी। इस प्रशिक्षण कार्यशाला में हिन्दी शिक्षण योजना कार्यालय के सहायक निदेशक (टंकण/आशुलिपि), श्री सुरेश चन्द्र शर्मा, सुश्री ऊषा शर्मा तथा सुश्री आशा ने प्रतिभागियों को "हिन्दी आशुलिपि" पर प्रशिक्षण दिया तथा अभ्यास करवाया । द्वितीय कार्यशाला 22 तथा 23 सितम्बर 2009 को "हिन्दी वर्तनी एवं व्याकरण" विषय पर आयोजित की गयी । इस कार्यशाला में भारतीय कृषि अनुसंधान संस्थान के पूर्व सम्पादक (हिन्दी), श्री अनिल कुमार दुबे तथा

भारतीय कृषि अनुसंधान संस्थान की सहायक निदेशक (राजभाषा), सुश्री सीमा चोपड़ा ने व्याख्यान दिये तथा अभ्यास करवाया । इस वर्ष की तृतीय कार्यशाला "भारत में फ़सल आकलन सर्वेक्षण" विषय पर 07 नवम्बर 2009 को आयोजित की गयी । इस कार्यशाला का उद्घाटन भारत सरकार, रसायन एवं उर्वरक मंत्रालय, औषध निर्माण विभाग, राष्ट्रीय औषध मूल्य निर्धारण प्राधिकरण के अध्यक्ष, डॉ. एस.एम. झारवाल द्वारा किया गया । चतुर्थ कार्यशाला 29 मार्च 2010 को "कार्यालय के कार्य में संगणक का प्रयोग" विषय पर आयोजित की गयी।

"हिन्दी मासिक प्रगति रिपोर्ट का प्रपत्र भरने तथा प्रेषण एवं आवती रजिस्टरों के उचित रखरखाव" के लिए संस्थान के कर्मियों के लिए 12 जनवरी 2010 को एक प्रशिक्षण कार्यक्रम आयोजित किया गया ।

संस्थान में कार्यरत सभी हिन्दीतर भाषी अधिकारियों/कर्मचारियों द्वारा हिन्दी ज्ञान सम्बन्धी प्रशिक्षण पूरा किया जा चुका है । आज तक की स्थिति के अनुसार, संस्थान में अब कोई ऐसा हिन्दीतर भाषी अधिकारी/कर्मचारी शेष नहीं रह गया है जिसे हिन्दी ज्ञान सम्बन्धी प्रशिक्षण दिया जाना शेष हो । इसके अतिरिक्त, "हिन्दी शिक्षण योजना" के अन्तर्गत संस्थान में हिन्दी आशुलिपि के प्रशिक्षण का लक्ष्य भी संस्थान द्वारा पूरा कर लिया गया है तथा केवल दो नव-नियुक्त टंककों द्वारा हिन्दी शिक्षण योजना के अन्तर्गत जनवरी 2010 में आयोजित हिन्दी टंकण परीक्षा दी गयी है ।

संस्थान में वार्षिक कार्यक्रम में निहित लक्ष्यों को पूरा करते हुए संस्थान के अधिकारियों/कर्मचारियों द्वारा अपनी ओर से लिखे जाने वाले सभी पत्र तो हिन्दी अथवा द्विभाषी रूप में लिखे ही गये साथ ही, 'क', 'ख' तथा 'ग' क्षेत्रों से अँग्रेज़ी में प्राप्त पत्रों के उत्तर भी शत-प्रतिशत हिन्दी में अथवा द्विभाषी रूप में दिये गये । 'क' तथा 'ख' क्षेत्रों की राज्य सरकारों एवं उनके कार्यालयों और ग़ैर-सरकारी व्यक्तियों के साथ पत्राचार शत-प्रतिशत हिन्दी में अथवा अपेक्षानुसार द्विभाषी रूप में ही किया गया । संस्थान के विभिन्न वैज्ञानिक प्रभागों तथा प्रशासनिक अनुभागों द्वारा आयोजित की जाने वाली बैठकों की कार्यसूची तथा कार्यवृत्त शत-प्रतिशत हिन्दी में अथवा द्विभाषी रूप में जारी किये गये ।

भारत सरकार, गृह मंत्रालय, राजभाषा विभाग द्वारा जारी वार्षिक कार्यक्रम के अनुसार अपना कार्य शत-प्रतिशत हिन्दी में करने के लिए आठ अनुभागों को विनिर्दिष्ट करने का लक्ष्य संस्थान द्वारा पहले ही प्राप्त कर लिया गया है । संस्थान में अपना कार्य शत-प्रतिशत हिन्दी में करने के लिए दस अनुभाग पहले से ही विनिर्दिष्ट हैं ।

प्रशासनिक कार्य के अतिरिक्त संस्थान में वैज्ञानिक प्रकृति के कार्यों में भी हिन्दी के उपयोग को प्रोत्साहित किया जाता है। वैज्ञानिकों ने अपनी परियोजना रिपोर्टों के सारांश द्विभाषी रूप में दिये, विद्यार्थियों द्वारा अपने शोध-प्रबन्धों में द्विभाषी रूप में सार प्रस्तुत किये गये। वैज्ञानिकों एवं तकनीकी कर्मियों द्वारा हिन्दी में शोध-पत्र प्रकाशित किये गये । संस्थान की वैज्ञानिक डॉ. रंजना अग्रवाल द्वारा 02 अप्रैल 2009 को आकाशवाणी के राष्ट्रीय चैनल पर प्राचीन भारतीय गणितज्ञ "आर्यभट्ट" पर रेडियो-वार्ता प्रस्तुत की गयी । संस्थान की वेबसाइट द्विभाषी है जिसको समय-समय पर अद्यतन किया गया ।

गृह मंत्रालय, राजभाषा विभाग द्वारा जारी तथा परिचालित विभिन्न नकद पुरस्कार योजनाएँ संस्थान में लागू हैं । संस्थान के कर्मियों ने इन योजनाओं में भाग लिया ।

संस्थान में 01 से 14 सितम्बर 2009 के दौरान हिन्दी पखवाड़े का आयोजन किया गया। इस दौरान आयोजित कार्यक्रम/प्रतियोगिताएँ इस प्रकार हैं : काव्य-पाठ, शिक्षक दिवस, डॉ. दरोगा सिंह स्मृति व्याख्यान, प्रभागीय चल-शील्ड, प्रश्न-मंच, अन्ताक्षरी, वाद-विवाद, हिन्दी श्रुतलेख एवं शब्दार्थ लेखन प्रतियोगिता (हिन्दीतर भाषियों के लिए), हिन्दी वर्तनी प्रतियोगिता एवं शोध-पत्र-पोस्टर-प्रदर्शन प्रतियोगिता । 05 सितम्बर 2009 को शिक्षक दिवस का आयोजन किया गया तथा इस अवसर पर मुख्य अतिथि, डॉ. पदम सिंह जी को सम्मानित किया गया । 14 सितम्बर 2009 को हिन्दी दिवस के अवसर पर "डॉ. दरोगा सिंह स्मृति व्याख्यानमाला" का 18वाँ व्याख्यान संस्थान के पूर्व निदेशक, डॉ. रमा कान्त पाण्डेय द्वारा "जलवायु परिवर्तन और भारतीय कृषि" विषय पर दिया गया । हिन्दी पखवाड़े के समापन समारोह के अवसर पर समारोह के मुख्य अतिथि, भारतीय कृषि अनुसंधान परिषद् के उप-महानिदेशक (कृषि अभियांत्रिकी), डॉ. मदन मोहन पाण्डेय द्वारा सफल प्रतियोगियों को पुरस्कृत किया गया ।

संस्थान द्वारा हिन्दी पत्रिका, "सांख्यिकी-विमर्श" के पाँचवें अंक का प्रकाशन किया गया। इस अंक में संस्थान के कीर्तिस्तम्भ, संस्थान की स्वर्ण-जयन्ती यात्रा के कुछ अंश एवं इस वर्ष किये गये अनुसंधान व अन्य कार्यों के संक्षिप्त विवरण के साथ-साथ कृषि सांख्यिकी एवं संगणक अनुप्रयोग से सम्बन्धित विभिन्न लेखों एवं शोध-पत्रों को भी प्रस्तुत किया गया है । संस्थान में आयोजित डॉ. दरोगा सिंह स्मृति व्याख्यानमाला के अन्तर्गत 18वें वैज्ञानिक व्याख्यान को आमन्त्रित ज्ञानवर्धक लेख के रूप में इस पत्रिका में सम्मिलित किया गया है । अन्त में पाठकों के लिए दैनिक स्मरणीय सांख्यिकीय एवं संगणक अनुप्रयोग से सम्बन्धित शब्द-शतक हिन्दी व अँग्रेज़ी में दिया गया है ।

List of Approved On-going Research Projects

DEVELOPMENT AND ANALYSIS OF EXPERIMENTAL DESIGNS FOR AGRICULTURAL SYSTEM RESEARCH

1. Designs for single factor and multi-factor experiments and their applications in agricultural systems research. (ICAR National Professor Scheme)
   VK Gupta
2. A statistical investigation on production, economic and energy potential of crop sequences in different agro-ecosystem.
   Anil Kumar
3. Planning, designing and analysis of experiments planned ON STATION under the Project Directorate of Farming Systems Research.
   Anil Kumar, Aloke Lahiri, OP Khanduri
4. Planning, designing and analysis of ON FARM research experiments planned under Project Directorate of Farming Systems Research.
   NK Sharma, PK Batra, OP Khanduri
5. Planning, designing and analysis of data relating to experiments conducted under AICRP on long-term fertilizer experiments.
   DK Sehgal, Krishan Lal, SMG Saran, Shashi Dahiya
6. Planning, designing and analysis of experiments relating to AICRP on STCR.
   Aloke Lahiri, VK Gupta, A Subba Rao, Y Muralidharudu (IISS, Bhopal), Rajender Parsad, Abhishek Rathore (IISS, Bhopal).
7. Designs for mixture experiments in agriculture.
   Krishan Lal, VK Gupta, PK Batra, Lalmohan Bhar
8. Agricultural field experiments information system.
   PK Batra, OP Khanduri, DK Sehgal, Rajender Parsad, Sudeep
9. Experimental designs for agricultural research involving sequences of treatments. (Lal Bahadur Shastri Young Scientist Award Project).
   Cini Varghese, Seema Jaggi
10. Genaralized row-column designs for agriculture.
    Cini Varghese, Seema Jaggi

FORECASTING AND REMOTE SENSING TECHNIQUES AND STATISTICAL APPLICATIONS OF GIS IN AGRICULTURAL SYSTEMS

11. Neural network based forecast modeling in crops.
    Amrender Kumar, Ramasubramanian V, Ranjana Agrawal
12. Stochastic process modeling and forecasting through discrete nonlinear time series approach.
    Himadri Ghosh, Prajneshu

13. Use of discriminant function and principal component techniques for weather based crop yield forecast.
Chandrahas, Ranjana Agrawal, SS Walia

14. Weather based models for forecasting potato yield in UP.
SC Mehta, Satya Pal, Vinod Kumar, (Krishi Bhawan Lucknow)

15. Development of Forecasting module for podfly, *Melanagromyza obtusa* Malloch in late pigeonpea.
SK Singh (IIPR, Kanpur), Ranjana Agrawal, Amrender Kumar

16. A study on editing and imputation using neural networks.
Ramasubramanian V, Ranjana Agrawal, SB Lal

DEVELOPMENT OF TECHNIQUES FOR PLANNING AND EXECUTION OF SURVEYS AND ANALYSIS OF DATA INCLUDING ECONOMIC PROBLEMS OF CURRENT INTEREST

17. Developing remote sensing based methodology for collecting agricultural statistics in North-East hilly region.
Prachi Misra Sahoo, Anil Rai, Tauqueer Ahmad, Samir Farooqi

18. Study on status and projection estimates of agricultural implements and machinery.
KK Tyagi, Jagbir Singh, KK Kher, VK Jain, Surendra Singh (CIAE, Bhopal)

19. Evaluation of rationalization of minor irrigation statistics scheme (Ministry of Water Resources, Govt. of India).
VK Bhatia, UC Sud, DC Mathur, Hukum Chandra, SB Lal

20. Small area estimation for zero inflated data.
Hukum Chandra, HVL Bathla, UC Sud

21. Sampling methodology for estimation of meat production in Meghalaya (Department of Animal Husbandry, Dairying & Fisheries, Ministry of Agriculture, Govt. of India).
Hukum Chandra, UC Sud, AK Gupta and DC Mathur

22. Impact of micronutrients on crop productivity and returns.
SP Bhardwaj, Rajendra Kumar, Ashok Kumar, Anil Kumar

23. Estimation of extent of farming practices, resources and activities with energy use.
Jagbir Singh, KK Tyagi, KK Kher, AK Gupta, VK Jain

24. Risk assessment and insurance products for agriculture (NAIP Component-I: Consortium Partner)
NCAP, New Delhi: PK Joshi, BC Barah
IASRI, New Delhi: Anil Rai, PK Malhotra, KK Chaturvedi, Ramasubramanian V

25. An econometric analysis of groundwater markets in Indo-Gangetic Plains of India.
DR Singh, AK Vasisht, Prawin Arya , Ashok Kumar, Mahender Singh

26. Visioning, Policy Analysis and Gender (V-PAGe) Sub-Prog. III: Policy analysis & market intelligence (NAIP Component–I: Consortium Partner).
VK Bhatia, AK Vasisht, DR Singh, Ashok Kumar, SP Bhardwaj, Prawin Arya, Sushila Kaul, Pratap Singh (NCAP, New Delhi), NP Singh (IARI, New Delhi), Anil Rai, KK Chaturvedi

27. Visioning Policy Analysis and Gender (V-PAGe) Sub-Prog. II: Technology forecasting (NAIP Component–I: Consortium Partner).
VK Bhatia, Ranjana Agrawal, Ramasubramanian V, Amrender Kumar, Satya Pal, Anil Rai, KK Chaturvedi, Girish Kumar Jha (IARI, New Delhi)

28. An econometric study of women empowerment through dairying in selected districts of Haryana.
Sushila Kaul, SP Bhardwaj, Sanjeev Panwar

29. Econometric study of long-run effect of public investment in irrigation on food grains productivity.
Ashok Kumar, SP Bhardwaj

MODELING AND SIMULATION TECHNIQUES IN BIOLOGICAL SYSTEMS

30. A statistical study of rainfall distribution and rainfall insurance.
Asha Saksena, Prajneshu, Himadri Ghosh

31. Computational analysis of SNPs at functional elements of rice genome.
AR Rao, Anu Sharma, SB Lal, Trilochan Mohapatra (NRCPB, New Delhi)

32. Empirical investigations on estimation of genetic correlation.
SD Wahi, AR Rao

33. Whole Genome Association analysis in common complex diseases: An Indian initiative (DBT Fuded)
BK Thelma (UDSC, New Delhi), Ramesh C. Juyal (NII, New Delhi), Sanjay Jain (DU, Delhi),
AR Rao (IASRI, New Delhi), Ashok Kumar (AIIMS, New Delhi), Ajit Sood (DMC, Ludhiana)

34. Bioprospecting of genes and allele frequency for abiotic stress tolerance (NAIP Component-IV: Consortium Partner)
NRCPB, New Delhi: T Mohapatra
IASRI, New Delhi: AR Rao, SB Lal, Sudeep

DEVELOPMENT OF INFORMATICS IN AGRICULTURAL RESEARCH

35. Web solutions for partially balanced incomplete block designs.
Anu Sharma, Cini Varghese, Seema Jaggi

36. Statistical Package for Animal Breeding 2.1 (SPAB 2.1).
IC Sethi, SD Wahi

37. Knowledge data warehouse for agricultural research.
Anil Rai, PK Malhotra, Seema Jaggi, KK Chaturvedi, Prachi Misra Sahoo, Mohd. Samir Farooqi

38. Strengthening, refining and implementation of expert system on wheat crop management.
SN Islam, HO Agarwal, Mohd. Samir Farooqi, KK Chaturvedi, HS Sikarwar

39. Decision support system for manpower planning – PERMISnet.
Alka Arora, Balbir Singh, Samir Farooqi, Shashi Dahiya, Anil Rai

40. Intranet solutions for PG School, IARI.
Sudeep, Hari Om Agarwal, Pal Singh

41. Machine learning approach for data mining.
Anshu Bharadwaj, Shashi Dahiya, Rajni Jain (NCAP, New Delhi).

42. An eLearning solutions for agricultural education using MOODLE.
Shashi Dahiya, Anshu Bharadwaj, KK Chaturvedi, Seema Jaggi, Cini Varghese

43. Project information and management system of ICAR (PIMS-ICAR).
RC Goyal, PK Malhotra, VH Gupta, Sudeep, Alka Arora, Pal Singh

44. National information system on agricultural education network in India (NISAGENET-III).
RC Goyal, VH Gupta

45. Software for survey data analysis.
SB Lal, Anu Sharma, VK Mahajan, Hukum Chandra, Anil Rai

46. Development of expert system on seed spices.
SN Islam, Hari Om Agarwal (IASRI,New Delhi), RK Kakani, Krishna Kant, OP Aishwat, MA Khan, GK Tripathi (NRC on Seed Spices, Tabiji, Ajmer)

47. Development of web enabled statistical package for agricultural research (SPAR 3.0).
Sangeeta Ahuja

48. Development of gender information system for agriculture.
HK Dash, M Srinath and Sabita Mishra (NRCWA, Bhubneshwar),
SB Lal, Anu Sharma, Anil Rai (IASRI, New Delhi)

49. Expert system for maize crop (Collaboration with Directorate of Maize research).
Hari Om Agarwal, Sudeep, Harnam Singh Sikarwar

50. Strengthening Statistical Computing for NARS (NAIP Component-I: Consortium Leader with 08 other Consortium Partners).
VK Bhatia (Consortium Leader), Rajender Parsad (Consortium PI), PK Malhotra, VK Gupta, VK Mahajan, Seema Jaggi, Samir Farooqui, Ramasubramanian V, LM Bhar, AK Paul, N Shivaramne