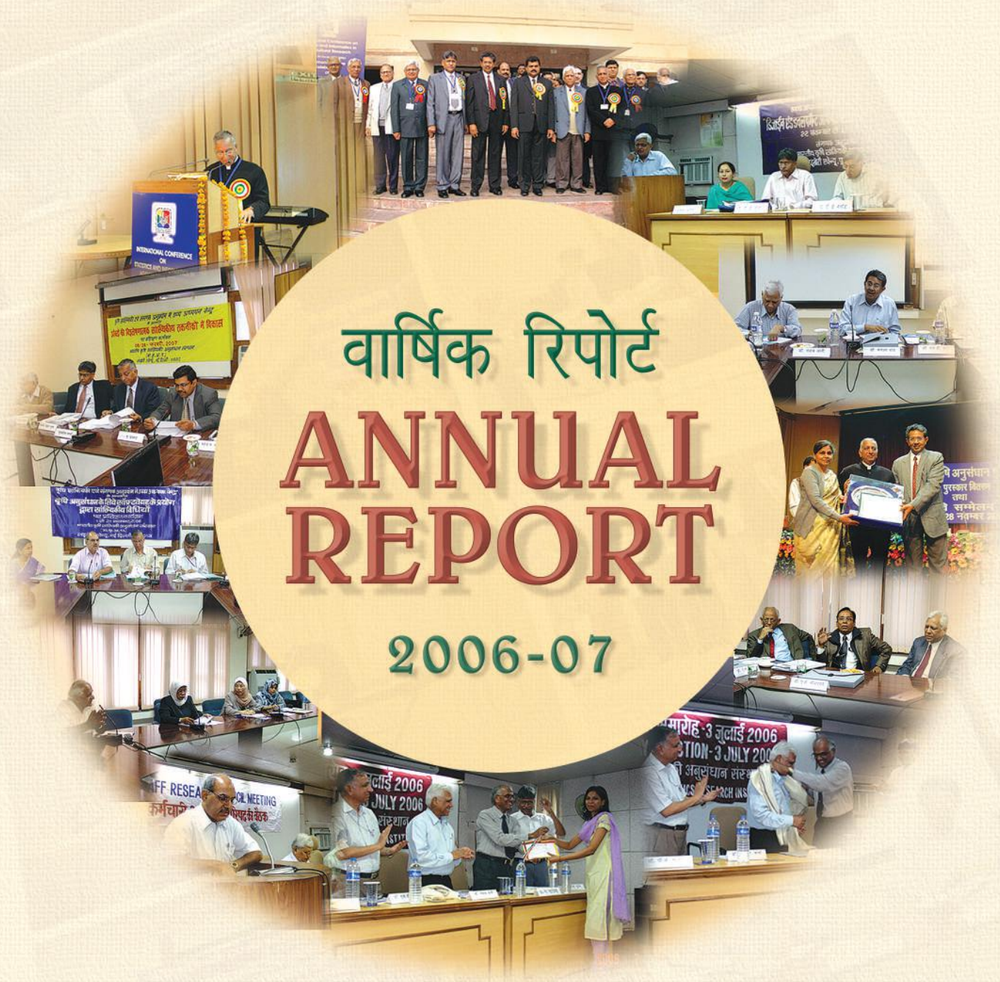
वार्षिक रिपोर्ट ANNUAL REPORT 2006-07



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ANNUAL REPORT
2006-07

भारतीय कृषि सांख्यिकी अनुसंधान संस्थान, भा.कृ.अ.प.,
लाइब्रेरी एवेन्यू, पूसा, नई दिल्ली-110012
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE, ICAR,
LIBRARY AVENUE, PUSA, NEW DELHI- 110 012

Preface

It gives me immense pleasure in bringing out the Annual Report 2006–07 of the Indian Agricultural Statistics Research Institute (IASRI). The Institute made a modest beginning in the year 1930 as a statistical section under ICAR and grew over time into a full fledged Institute headed by a Director in the year 1970. The Institute got its present name in the year 1978. IASRI is a premier Institute in Agricultural Statistics and Computer Application in the country and has been identified as a Centre of Advanced Studies in Agricultural Statistics and Computer Application. The Institute has made many important and original contributions in the disciplines of Agricultural Statistics and Computer Application and because of its blend towards applications, it has made its presence felt in the National Agricultural Research System. The Institute is a repository of information on Agricultural Research Data. The Institute has taken a lead in the country in developing a data warehouse on Agricultural Research Data.

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 human resource development, linkages cultivated/nurtured with various ICAR Institutes, SAUs and other research organisations in India and abroad. 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 and also in achieving the targets set during the year.

The Institute initiated various new studies/projects during the year. These are – 'Neural network based forecast modeling in crops', 'A statistical investigation on production, economic and energy potential of crop sequences in different agro-ecosystems' 'Planning, designing and analysis of experiments relating to AICRP on STCR'and 'A statistical study of rainfall distribution and rainfall insurance'.

A Brain Storming Session on 'Expectation of Various Divisions of ICAR from IASRI' was organised.

Several training programs of different categories like trainings under Center of Advanced Studies, Summer School, Ad-hoc and sponsored National and International training programs were organised.

The Institute also provided consultancy services to various research studies/projects in NARS.

An International Conference on Statistics and Informatics in Agricultural Research ICSI-2006 was organized.

I am happy to note that some of our colleagues received academic distinctions during the year. Dr. VK Sharma received Best Teacher Award of IARI for his outstanding contribution to teaching in the discipline of Agricultural Statistics for the year 2006. Dr. Rajender Parsad, National Fellow was elected as Associate Fellow of National Academy of Agricultural Sciences, New Delhi.

The scientists of the Institute were deputed for presentation of their papers in various national/ international conferences.

To promote Hindi, a poster presentation of research papers in Hindi was organized at the Institute and scientists were also awarded for their outstanding contributions in preparation of Hindi posters.

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 sincere and 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 related activities and Hindi Section for Hindi Translation of the required material.

It is expected that the scientists in NARS will benefit immensely from the information contained in this publication. I shall look forward to any suggestions and comments on the information contained in this publication, which would prove to be very valuable for our future publications.

(SD SHARMA)
Director

Advisors / Directors

Dr. P.V. Sukhatme	...	September 1940 – July 1951
Dr. V.G. Panse	...	August 1951 – March 1966
Dr. G.R. Seth	...	April 1966 – October 1969
Dr. Daroga Singh	...	November 1969 – May 1971
Dr. M.N. Das (A)	...	June 1971 – October 1973
Dr. Daroga Singh	...	November 1973 – September 1981
Dr. Prem Narain	...	October 1981 – February 1992
Dr. S.K. Raheja (A)	...	February 1992 – November 1992
Dr. R.K. Pandey (A)	...	December 1992 – May 1994
Dr. P.N. Bhat (A)	...	June 1994 – July 1994
Dr. O.P. Kathuria	...	August 1994 – May 1995
Dr. R.K. Pandey (A)	...	June 1995 – January 1996
Dr. Bal B.P.S. Goel	...	January 1996 – October 1997
Dr. S.D. Sharma	...	October 1997 onwards

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. (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
	• Stregthening of Reproductive Lab with colour photocopier
	• Installation of Digital Telephone Exchange
2006	• Organisation of International Conference on Statistics and Informatics in Agricultural Research

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 leading 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 उन्नत 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 27 अनुसंधान परियोजनाओं के अन्तर्गत अनुसंधान कार्य किया गया जिनमें से 16 परियोजनाएँ संस्थान द्वारा, 5 ए.पी. सेस फ़ण्ड द्वारा तथा 6 बाह्य एजेन्सियों द्वारा वित्त पोषित थीं। इस वर्ष 7 परियोजनाएँ पूरी हो चुकी हैं तथा 4 नयी परियोजनाएँ आरम्भ की गयीं।

कुछ प्रमुख अनुसंधानिक उपलब्धियाँ इस प्रकार हैं:

- असममित बहु-उपादानीय परीक्षणों के लिए सुपर सेचुरेटेड अभिकल्पनाओं (एस.एस.डी.) की तीन श्रृखलाएँ विकसित की गयीं। इन अभिकल्पनाओं का विभिन्न दक्षता मानकों के आधार पर इष्टतमत्व के लिए मूल्यांकन किया गया। अभिकल्पनाओं के कैटलॉग भी तैयार किये गये।
- अर्ध-प्रसामान्य अथवा प्रसामान्य रूप में 1000 आकार तक के हैडामार्ड मैट्रिसेस ऑनलाइन तैयार करने के लिए वेब आधारित सॉफ्टवेयर विकसित किया गया। 668, 716 तथा 892 आकारों के लिए कोई संरचना विधि उपलब्ध नहीं थी इसलिए इन आकारों की मैट्रिसेस को इस सॉफ्टवेयर में शामिल नहीं किया गया।
- 'डिजाइन रिसोर्सेस' पर क्रमशः 36, 50 और 34 से कम उपचारों की संख्या, ब्लॉकों एवं ब्लॉक आकारों की सभी सम्भव युग्मवार उपचार तुलनाओं के लिए 6574 अपूर्ण द्विआधारी ब्लॉक अभिकल्पनाएँ जोड़ी गईं जबकि औसतन उपचारों की संख्या 20 से ज्यादा न हो। इन अभिकल्पनाओं की A- एवं D-दक्षता भी दी गयी। यह अभिकल्पनाएँ उच्च दक्षता वाली हैं तथा परीक्षणकर्ताओं द्वारा हमेशा इनका उपयोग किया जा सकता है।
- पूर्ण बहु-अनुक्रिया परीक्षणों की ब्लॉक अभिकल्पनाओं के विश्लेषण के लिए एक क्रमवार विश्लेषण विधि विकसित की गयी, जबकि प्रत्येक उपचार के अनुप्रयोग के लिए एक से ज्यादा अनुक्रिया चरों के प्रेक्षण अभिलिखित थे। सर्वोत्तम उपचार की पहचान हेतु युक्लीडियन डिस्टेंस एवं J-प्लॉट पर आधारित विधि विकसित की गईं।
- बहु-प्रतिक्रिया परीक्षणों में आउटलायरों की समस्या के समाधान के लिए, एक ब्लॉक अभिकल्पना में पूर्ण बहु-प्रतिक्रिया परीक्षणों में एकल आउटलायर सदिश का पता लगाने के लिए एक परीक्षण सांख्यिकी विकसित की गयी। यह सांख्यिकी ब्लॉक अभिकल्पना में एकल प्रतिक्रिया चर के लिए कुक-स्टेटिस्टिक के आधार पर विकसित की गयी। उदाहरण के द्वारा प्रस्तावित टेस्ट स्टेटिस्टिक की व्याख्या की गयी।
- तीन धारकों के लिए सेल्फ-कॉम्प्लीमेन्ट्री ग्रुप डिवीजिबल अभिकल्पनाओं की सहायता से 11 से कम पुनरावृत्ति की संख्या एवं ब्लॉकों के आकार वाली एक्सटेन्डेड ग्रुप डिविजिबल (ई.जी.डी.) अभिकल्पनाएँ विकसित की गयीं, जो बिना किसी सूचना की कमी के सभी मुख्य प्रभावों का आकलन पूर्ण दक्षतापूर्वक करती हैं, ऐसी अभिकल्पनाओं के साथ-साथ मुख्य प्रभावों तथा अन्योन्य क्रियाओं का एक कैटलॉग भी तैयार किया गया।

- नीड़ित ब्लॉक अभिकल्पना सेटअप में उप-ब्लॉकों के प्रेक्षणों में नजदीकी निकटवर्ती सहसम्बन्ध संरचना तथा बड़े ब्लॉकों में उप-ब्लॉक वर्गीकरण की अवगणना करते हुए शून्य सहसम्बन्ध संरचना के लिए नीड़ित ब्लॉक अभिकल्पनाएँ प्राप्त की गयीं।
- 2-कलर माइक्रोअरे परीक्षणों के लिए दक्ष अभिकल्पनाएँ प्राप्त की गयीं तथा माइक्रोअरे परीक्षणों से विभिन्न जीनों की पहचान करने के लिए अरे प्रभावों को यादृच्छिक रूप में लेते हुए, मिश्रित प्रभावों के मॉडलों पर आधारित विश्लेषणात्मक प्रक्रिया विकसित की गयीं।
- इन्डो-गैन्गेटिक प्लेन्स में राइस-व्हीट कन्सोरटियम के द्वारा संचालित किसान सहभागी अनुसंधान परीक्षणों से प्राप्त ऑकड़ों के विश्लेषण के लिए रैखिक मिश्रित प्रभाव मॉडलों एवं उप-प्लॉटों पर आधारित विश्लेषणात्मक प्रक्रिया विकसित की गयीं।
- कृषि वानिकी परीक्षणों के द्वारा यह ज्ञात हुआ कि वृक्ष, वर्ष तथा इसकी अन्योन्य क्रिया (वृक्ष × वर्ष) का मुख्य फसल जौ की उपज पर सार्थक प्रभाव पड़ा। फसल की उपज पर सिरिस, नीम और शीशम का प्रभाव लगभग एक जैसा था परन्तु बबूल के प्रभाव से अधिक था। इसी प्रकार, चने के 6 वर्षों के आँकड़ों का प्रयोग करके मिश्रित विश्लेषण से ज्ञात हुआ कि वृक्ष, दूरी, वर्ष, वृक्ष × वर्ष एवं दूरी × वर्ष का उपज पर सार्थक प्रभाव पड़ा।
- NN तथा AR(1) त्रुटि संरचनाओं के सहसम्बन्ध गुणांक के विभिन्न मानों के लिए क्लेटवर्दी (1973) में उपलब्ध 21 BIB की दक्षताओं, $v \leq 10$ के लिए जी.डी. अभिकल्पनाओं तथा 18 चक्रीय अभिकल्पनाओं पर कार्य किया गया।
- सांख्यिकीय एवं एल्गोरिथमिक पद्धति के द्वारा पुनरावृत्त मापक अभिकल्पनाओं में उपचारों के समुन्त आकलन के लिए SPRMD (स्टेटिस्टिकल पैकेज फॉर रिपिटेड मेजरमेन्ट्स डिजाइन्स) में एक निविष्टि आँकड़ा प्रबन्धन माड्यूल विकसित किया गया।
- दो आउटलाइंग प्रेषणों की उपस्थिति में सभी द्विआधारी प्रसरण सन्तुलित ब्लॉक अभिकल्पनाएँ रॉबस्ट पाई गईं। उपचार कन्ट्रास्ट की जाँच के लिए एक रॉबस्ट परीक्षण प्रक्रिया विकसित की गयी। इस परीक्षण प्रक्रिया को परीक्षणात्मक आँकड़ों में भी अनुप्रयुक्त किया गया।
- विभिन्न फसल प्रणालियों में प्रयुक्त फासफोरस की मात्रा तथा बारम्बारता के निर्धारण सम्बन्धी परीक्षणों के सांख्यिकीय विश्लेषण से ज्ञात हुआ कि विभिन्न क्षेत्रों में एकान्तर वर्षों के विभिन्न मौसमों में विभिन्न फसल अनुक्रमों जैसे - चावल-चावल, चावल-मूँगफली, चावल-गेहूँ, चावल-चना में फासफोरस के अधिकतम उपयोग के लिए P_2O_5 की विभिन्न दरें प्रति हेक्टेयर डालना किफायती हो सकता है।
- स्टेट स्पेस मॉडलों के उपयोग से फसल पूर्वानुमान पर किये गये आकलन के अन्तर्गत महाराष्ट्र तथा अखिल भारतीय स्तर पर कपास के क्षेत्रफल उत्पादन तथा उत्पादकता के लिए 30 वर्षों (1970-71 से 1999-2000) के आँकड़ों का उपयोग करके चर-घातांकी मसृषकारी मॉडल, एरिमा तथा स्टेट स्पेस मॉडलों का विकास किया गया। वर्ष 2000 के बाद के वर्षों के अधि कतर पूर्वानुमानों में चर घातांकी तथा एरिमा मॉडलों की अपेक्षा स्टेट स्पेस मॉडल बेहतर पाये गये।
- मेघालय में कृषि सांख्यिकी के एकत्रीकरण हेतु सुदूर संवेदन आधारित पद्धति विकसित करने हेतु अध्ययन के अन्तर्गत राज्य की 6 महत्वपूर्ण फसलों - आलू, अदरक, अनानास, केला, मक्का और धान की सुदूर संवेदन एवं सर्वेक्षण आँकड़ों की संयुक्त सूचना के द्वारा कृषि सांख्यिकी की संरचना करने के प्रयास किये गये।
- निजी क्षेत्रों की सर्वेक्षण क्षमताओं के मूल्यांकन पर अध्ययन के अन्तर्गत एक प्रारम्भिक रिपोर्ट तैयार की गयी जिसमें सार्वजनिक/निजी क्षेत्रों की एजेंसिज की सर्वेक्षण क्षमताओं के मूल्यांकन हेतु एक प्रश्नावली है जो परामर्शदाताओं के लिए उपयोगी है।
- बागबानी फसलों के क्षेत्रफल एवं उत्पादन के आकलन के लिए एक वैकल्पिक पद्धति विकसित करने हेतु मार्गदर्शी अध्ययन के अन्तर्गत महाराष्ट्र एवं हिमाचल प्रदेश के विभिन्न जिलों में प्राथमिक आँकड़ों के एकत्रीकरण का कार्य किया गया।
- कपास उत्पादन के सरकारी एवं ट्रेड आकलकों में विचरण के कारणों की जांच हेतु अध्ययन के अन्तर्गत महाराष्ट्र की राज्य सरकार द्वारा कपास के क्षेत्रफल एवं उत्पादन के आकलन हेतु अपनाई गयी प्रतिचयन अभिकल्पनाओं एवं आकलन प्रक्रिया (सरकारी आकलन) की समीक्षा की गयी।
- फसल राजस्व बीमा के अन्तर्गत क्षतिपूर्ति एवं बीमा-किस्तों (प्रीमियम) दरों की माप हेतु एक अर्थमितीय पद्धति पर अध्ययन किया गया। कर्नाटक एवं उत्तर प्रदेश राज्यों की राजस्व बीमा-किस्त

की दरों की तुलना से ज्ञात हुआ कि कर्नाटक राज्य की तुलना में उत्तर प्रदेश में अधिकतर फसलों के लिए बीमा-किस्त की दरें कम थीं।

- भारत में प्रमुख फलों एवं सब्जियों की मांग एवं आपूर्ति की लोच के आकलन का अर्थमितीय अध्ययन किया गया। परिणामों से ज्ञात हुआ कि भारत के शहरी एवं ग्रामीण क्षेत्रों के परिवारों में विभिन्न वर्षों में विभिन्न सब्जियों एवं फलों के उपभोग की प्रवृति में बढ़ोतरी हुई।
- फसलों में न्यूरल नेटवर्क आधारित पूर्वानुमान मॉडलिंग पर अध्ययन के अन्तर्गत उत्तर प्रदेश के पूर्वी मैदानी क्षेत्र (इलाहाबाद, वाराणसी, फैजाबाद एवं बलिया); केन्द्रीय मैदानी क्षेत्र (कानपुर, लखनऊ, फतहपुर एवं हरदोई) एवं बुन्देलखण्ड क्षेत्र (झांसी, बाँदा एवं जलौन) में चावल और गेहूँ की उपज के पूर्वानुमान के लिए बहुस्तरीय पर्सेप्ट्रॉन (एम.एल.पी.) आर्कीटेक्चर की सहायता से मॉडल विकसित किये गये, जिसमें फसल उपज को आश्रित चर तथा अधिकतम व न्यूनतम तापमान, वर्षा एवं प्रातः कालीन सापेक्ष आर्द्रता के आँकड़ों को निविष्टि चरों के रूप में लिया गया। अध्ययनाधीन जिलों के लिए चावल एवं गेहूँ के पूर्वानुमान प्राप्त उपज के निकट पाए गये। नाशीजीवों की संख्या की पूर्वचेतावनी के लिए, नागपुर में कपास में अमेरिकन बॉलवार्म (1985-2001) तथा पिंक बॉलवार्म (1985-95) एवं कानपुर में अरहर में हेलिकोवपा आर्मीगेरा (1983-2002) साप्ताहिक पश्च मौसम चरों को निविष्टि चर लेकर (कपास को नाशीजीवों के लिए 1-2 सप्ताह तथा एच. आर्मीगेरा के लिए 1-5 सप्ताह) मॉडल विकसित किये गये। अधिकतर पूर्वानुमान वास्तविक संख्या के निकट पाये गये।
- न्यूरल नेटवर्क के उपयोग से सम्पादन एवं आरोपण पर एक अन्य अध्ययन में, न्यूरल नेटवर्क एवं समाश्रयण के उपयोग से आरोपण की तुलना की गयी। समाश्रयण आरोपण की तुलना में न्यूरल नेटवर्क आरोपण अधिक बेहतर पाया गया।
- जीनोटाइप × वातावरण सम्बन्धी आँकड़ों के अप्रसामान्य होने पर अप्राचलिक स्थायित्व युक्तियों के कार्यनिष्पादन पर सांख्यिकीय अन्वेषण नामक अध्ययन के अन्तर्गत उपज एवं स्थायित्व की जीनोटाइप के चयन के लिए उपयोगी विभिन्न चयन युक्तियाँ विकसित की गयीं। ज्ञात हुआ कि जीनोटाइप की बढ़ती संख्या के लिए पावर में वृद्धि हो रही थी। कुछ नयी अप्रचालिक स्थायित्व युक्तियाँ भी विकसित की गयीं।
- स्थायी एवं रॉबस्ट गुच्छ प्रक्रियाओं पर अन्वेषण नामक अध्ययन के अन्तर्गत गुच्छ विधियों के विभिन्न संयोजनों के प्रति अप-वर्गीकरण की बारम्बारता तथा दूरी माप प्राप्त किये गये। प्रतिशत अप-वर्गीकरण के संदर्भ में, प्रस्तावित चर चयन विधि तथा विभिन्न गुच्छ विधियों पर आउटलायरों के प्रभाव की भी जांच की गयी।
- जटिल रोगों आनुवांशिक नेटवर्क्स एवं विकास में क्रियाशील एस.एन.पी. की पहचान एवं वैधीकरण पर अध्ययन के अन्तर्गत ऐरेबिडोप्सिस एवं मानव जातियों की सम्बद्ध साइट्स पर एस.एन.पी. की पहचान के लिए एक नयी प्रक्रिया विकसित की गयी।
- कृषि अनुसंधान, शिक्षा एवं अन्य सम्बन्धित पहलुओं पर विभिन्न स्रोतों से उपलब्ध सूचनाओं को कृषि अनुसंधान डाटा पुस्तिका 2006 के रूप में संकलित किया गया जो इस श्रृंखला की दसवीं कड़ी है।
- पशु प्रजनन 2 के लिए एक सांख्यिकीय पैकेज (एस पी ए बी 2) विकसित किया गया।
- गेहूँ फसल प्रबन्धन पर विशेषज्ञ सलाह उपलब्ध कराने के लिए एक विशेषज्ञ तंत्र विकसित किया गया।
- निसेजनेट परियोजना के अन्तर्गत सॉफ्टवेयर एप्लीकेशन के दो सेट विकसित किये गये (एक सहभागी संगठनों के स्थानीय सर्वर पर आँकड़ों के प्रबन्धन के लिए और दूसरा भा.कृ.सां.अ.सं., नई दिल्ली में केन्द्रीय सर्वर पर आँकड़े एकीकरण के लिए) भा.कृ.सां.अ.सं. में केन्द्रीय सर्वर पर एक पूछताछ/रिपोर्ट पर उपलब्ध सिस्टम देश, राज्य, विश्वविद्यालय और/अथवा कॉलेज स्तर पर भी सूचना उपलब्ध कराने की क्षमता रखता है।
- सर्वेक्षण आँकड़ों के विश्लेषण, सर्वेक्षण आँकड़ों के प्रबन्धन, आरोपण, प्रतिचयन विधियों की क्लास लाइब्रेरीज के माड्यूलों के लिए सॉफ्टवेयर का विकास नामक परियोजना के अन्तर्गत पुनःउपयोगी क्लास लाइब्रेरीज के रूप में प्रतिस्थापन्न सहित तथा प्रतिस्थापन्न बिना प्रतिचयन योजनाओं के लिए विस्तृत सांख्यिकी एवं निर्गम (आउटपुट) माड्यूल्स विकसित किये गये।
- नये आँकड़ों के मानों तथा भा.कृ.अनु.प. की आवश्यकताओं के अनुसार परमिसनेट-II को अद्यतन किया गया।

संस्थान के वैज्ञानिकों द्वारा राष्ट्रीय एवं अन्तरराष्ट्रीय स्तर के जर्नलों

में 48 शोध-पत्र, 25 लोकप्रिय लेख, 4 पुस्तक अध्याय, 6 परियोजना/तकनीकी रिपोर्टें और 2 ई-पुस्तकें प्रकाशित की गयीं।

संस्थान की संशोधित भावी योजना - विज़न-2025 को भी अन्तिम रूप दिया गया।

भारतीय कृषि अनुसंधान परिषद् की 'राजर्षि टण्डन राजभाषा पुरस्कार योजना' के अन्तर्गत संस्थान ने प्रथम पुरस्कार प्राप्त किया।

संस्थान द्वारा प्रकाशित हिन्दी पत्रिका सांख्यिकी विमर्श 2006-07 को भारतीय कृषि अनुसंधान परिषद् का गणेश शंकर विद्यार्थी (द्वितीय) पुरस्कार प्रदान किया गया।

संस्थान में परीक्षण अभिकल्पना प्रभाग के प्रधान एवं प्रोफेसर (कृषि सांख्यिकी) डॉ. वी.के. शर्मा को वर्ष 2006 के दौरान कृषि सांख्यिकी विषय के अध्यापन में उत्कृष्ट योगदान के लिए भा.कृ.अ.सं., नई दिल्ली द्वारा उत्कृष्ट अध्यापक पुरस्कार से सम्मानित किया गया।

भा.कृ.अनु.प. के राष्ट्रीय अध्येता, डॉ. राजेन्द्र प्रसाद को 01 जनवरी, 2007 से राष्ट्रीय कृषि विज्ञान अकादमी का 'एसोसिएट फैलो' चुना गया।

राष्ट्रीय अध्येता डॉ. राजेन्द्र प्रसाद को 24 मई से 28 जून, 2006 के दौरान (सी.आई.एम.एम.वई.टी.) मैक्सिको में राइस व्हीट कन्सोर्टियम फॉर इन्डो-गैन्गेटिक प्लेन्स द्वारा संचालित किसान सहभागी अनुसंधान परीक्षणों के विश्लेषण पर अनुभव प्राप्त करने के लिए अध्ययन दौरे पर प्रतिनियुक्त किया गया। उन्हें दिनांक 13-16 फरवरी, 2007 के दौरान काठमांडू, नेपाल में आयोजित राइस-व्हीट कन्सोर्टियम फॉर इन्डो-गैन्गेटिक प्लेन्स की 14वीं क्षेत्रीय तकनीकी समन्वय समिति की बैठक में सहभागिता करने हेतु भी प्रतिनियुक्त किया गया।

संस्थान के वैज्ञानिकों को विभिन्न राष्ट्रीय/अन्तरराष्ट्रीय सम्मेलनों में अपने शोध-पत्र प्रस्तुत करने हेतु प्रतिनियुक्त किया गया।

हिन्दी को प्रोत्साहन देने के लिए संस्थान में एक शोध-पत्र पोस्टर प्रस्तुति प्रतियोगिता आयोजित की गयी और जिसमें हिन्दी पोस्टर तैयार करने के लिए वैज्ञानिकों को पुरस्कृत किया गया।

भारतीय कृषि सांख्यिकी संस्था की स्थापना की हीरक जयन्ती के अवसर पर भा.कृ.सां.अ.सं., नई दिल्ली द्वारा 27-30 दिसम्बर, 2006 के दौरान सांख्यिकी एवं सूचना में कृषि अनुसंधान पर अन्तरराष्ट्रीय सम्मेलन- ICSI, 2006 आयोजित किया गया। सम्मेलन में 155 पोस्टर प्रस्तुत किये गये। सम्मेलन में अनेक महत्वपूर्ण संस्तुतियाँ की गयीं।

सम्मेलन के आरम्भ में दिनांक 26 दिसम्बर, 2006 को 'हॉटस्पॉट ज्योइन्फॉरमेटिक्स' तथा 'रिग्रेशन डायग्नोस्टिक्स' पर दो पूर्व-सम्मेलन कार्यशालाऐं आयोजित की गयीं।

निसेजनेट के लिए विकसित एप्लीकेशन सॉफ्टवेयरों की संस्थापना तथा क्रियान्वयन के लिए एक दो-दिवसीय ऑन-साइट प्रशिक्षण आयोजित किया गया तथा यह सॉफ्टवेयर समस्त 42 सहभागी संस्थाओं के लिए LAN पर प्रचालित किया गया।

भा.कृ.अनु.प. के परमिसनेट ऐण्ड इन्टेलीजेन्ट रिपोर्टिंग सिस्टम पर एन.ए.एस.सी. परिसर, पूसा, नई दिल्ली में एक दो दिवसीय कार्यशाला आयोजित की गयी।

मलेशिया के सांख्यिकी विभाग के तीन सदस्यों के शिष्ट मण्डल के लिए एक अध्ययन दौरा आयोजित किया गया।

विभिन्न वर्गों के लिए अनेक प्रशिक्षण कार्यक्रम जैसे - उच्च अध्ययन केन्द्र के अन्तर्गत प्रशिक्षण, ग्रीष्म कालीन स्कूल, राष्ट्रीय एवं अन्तरराष्ट्रीय प्रायोजित एवं तदर्थ प्रशिक्षण कार्यक्रम आयोजित किये गये।

संस्थान की शिक्षण एवं प्रशिक्षण से सम्बन्धित गतिविधियां, जिनमें समस्त स्नातकोत्तर अध्यापन कार्यक्रमों का नियोजन, आयोजन एवं समन्वयन सम्मिलित है, भारतीय कृषि अनुसंधान संस्थान के पी.जी. स्कूल के सहयोग से चलायी गयीं। इस वर्ष कुल 12 छात्रों {4 पी.एच.डी. (कृषि सांख्यिकी), 5 एम.एस.सी. (कृषि सांख्यिकी) एवं 3 एम.एस.सी. (संगणक अनुप्रयोग)} ने अपना डिग्री पाठ्यक्रम पूरा किया। 12 नए छात्रों {2 पी.एच.डी. (कृषि सांख्यिकी), 5 एम.एस.सी. (कृषि सांख्यिकी) एवं 5 एम.एस.सी. (संगणक अनुप्रयोग)} को प्रवेश दिया गया।

भारत एवं सार्क देशों सहित विदेश के अनुसंधान संस्थानों/विश्वविद्यालयों में सांख्यिकीय आँकड़ों के संकलन, विश्लेषण एवं विवेचना के कार्य में लगे शोधकर्ताओं के लाभार्थ 'कृषि सांख्यिकी एवं संगणन' में एक उच्च प्रमाण-पत्र पाठ्यक्रम आयोजित किया गया। इस प्रमाण-पत्र पाठ्यक्रम में 6 अधिकारियों ने सहभागिता की।

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। पुस्तकालय की सेवाओं को पूरी तरह से डिजिटाइज्ड कर दिया गया है जो पुस्तकालय की वेबसाइट (http://lib.iasri.res.in) पर उपलब्ध है। इस पुस्तकालय में उपलब्ध सभी संसाधनों और सेवाओं के लिंक दिये गये हैं।

1

Executive Summary

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

A number of research projects were undertaken during the year in different Divisions of the Institute namely Sample Survey, Design of Experiments, Biometrics, Forecasting Techniques, Econometrics and Computer Applications. Research was carried out under 27 research projects in the Institute, of which 16 were Institute funded, 5 AP Cess funded and 6 funded by outside agencies in various thrust areas. This year, 7 projects were completed and 4 new projects were initiated.

Some of the salient research achievements were:

- Three series of Super Saturated Designs (SSDs) were generated for asymmetrical factorial experiments. The SSDs generated were also evaluated for optimality on the basis of different efficiency criterion. Catalogues of designs were prepared.
- Web enabled software was developed for online generation of Hadamard matrices in a semi-normalized or a normalized form up to the order

1000. No construction method is available for orders ***668***, ***716*** and ***892*** and, therefore, these orders have not been implemented.

- 6574 incomplete binary block designs for making all possible pair wise treatment comparisons for number of treatments, blocks and block sizes smaller than 36, 50 and 34, respectively such that average replication number of treatments was not more than 20 were added on the DESIGN RESOURCES. The A- and D- efficiency of the design generated was also given. These designs have high efficiency and can always be used by the experimenter.
- A step wise procedure for the analysis of block designs was developed for complete multi-response experiments where corresponding to the application of a treatment, observations on more than one response variable were recorded. A method based on Euclidean distance and J-plot was developed for identification of best treatment.
- To tackle the problem of outlier(s) in multi-response experiments, a test statistic was developed for detection of a single outlier vector in complete multi-response experiments run in a block design. This statistic was developed on the lines of Cook-statistic for single response variable in a block design. Proposed test statistic was illustrated with the help of an example.
- Extended Group Divisible (EGD) designs for three factors that permit the estimation of all main effects with no loss of information were obtained using self-complementary GD designs with replication number and block size smaller than 11. A catalogue of such designs along with efficiencies for main effects and interactions was prepared.
- Nested block designs for nearest neighbour correlation structure within sub-blocks of a block in a nested block design setup and for zero correlation structure in bigger blocks ignoring the sub-block classification were obtained.
- Efficient designs for 2-colour microarray experiments were obtained and analytical procedure based on mixed effects model considering array effects as random to identify differentially expressed genes from microarray experiments were developed.
- Analytical techniques based on linear mixed effects models and biplots were developed for the analysis of data from Farmers Participatory Research Trials conducted by Rice-Wheat Consortium for Indo-Gangetic Plains.
- From agroforesty experiments, it was observed that tree, year and its interaction (tree × year) had significant impact on the yield of main crop barley. The impact of siris, neem and shisham was more or less same but more than babul on the yield of crop. Similarly the combined analysis of gram from 6 years data indicated significant effect of tree, distance, year, tree x year and distance × year on the yield.
- Efficiencies of 21 BIB, 26 GD designs for $v \leq 10$ and all 18 cyclic designs reported in Clatworthy (1973) were worked out for NN and AR(1) error structures for different values of correlation coefficient.
- In statistical and algorithmic approach for improved estimation of treatments effects in repeated measurements designs, an input data management module was developed in SPRMD (Statistical Package for Repeated Measurements Designs).
- All binary variance balanced block designs were robust against the presence of two outlying observations. A robust testing procedure for testing the treatment contrasts was developed. This testing procedure was also applied to experimental data.
- Statistical analysis of experiments on determining level and frequency of phosphorus application in different cropping systems, revealed that for judicious use of phosphorus for various crop sequence like rice-rice, rice-groundnut, rice-wheat, rice-gram, its application at the different rate of application of P_2O_5 per hectare applied in either season in alternate years might be economical for different locations.
- In the study on crop forecasting using state space models, exponential smoothing models, ARIMA and state space models were fitted for acreage, production and yield of Cotton crop in Maharashtra and at all-India level using 30 years data (1970–71 to 1999–2000). State space models were found better than exponential and ARIMA models for most of the forecast of subsequent years.
- Under the study developing remote sensing based methodology for collecting agricultural statistics in Meghalaya, attempts were initiated to generate agricultural statistics of six important crops potato, ginger, pineapple, banana, maize and paddy of the state by combining the information of remote sensing and survey data.
- Under the study on assessment of survey capabilities of private sector, the inception report

was prepared which contained a questionnaire for assessment of survey capabilities of the public/ private sector agencies and useful for consultancy wing

- Under the pilot study to develop an alternative methodology for estimation of area and production of horticultural crops, the work related to primary data collection in different districts of Maharashtra and Himachal Pradesh was carried out.
- Under the study to investigate the causes of variation between official and trade estimates of cotton production, the sampling designs and estimation procedure adopted by the State Government, Maharashtra for estimation of area and production of Cotton (Official estimate) were reviewed.
- The study on an econometric approach for measurement of indemnity and premium rates under Crop Revenue Insurance was completed. A comparison of estimated revenue premium rates for Karnataka and Uttar Pradesh state showed that the majority of crop strata were having low premium rates in Uttar Pradesh in comparison to Karnataka state.
- An econometric study of estimation of elasticities of demand and supply of major fruits and vegetables in India was completed and the results showed that there was an increasing trend in proportion of households consuming various vegetables and fruits over the years in the urban as well as rural India.
- In the study on neural network based forecast modeling in crops, models using multilayer perceptron (MLP) architecture for forecasting rice and wheat yields for eastern plain zone (Allahabad, Varanasi, Faizabad and Ballia), central plain zone (Kanpur, Lucknow, Fatehpur and Hardoi) and Bundelkhand zone (Jhansi, Banda, and Jalaun) of Uttar Pradesh were developed taking crop yield as output variable and data on maximum and minimum temperatures, rainfall and morning relative humidity as input variables. The forecasts obtained for rice and wheat were in agreement with the observed ones for most of the districts considered. For forewarning pests count, viz. American bollworm (1985–2001) and pink bollworm (1985–1995) for Nagpur in Cotton and *Helicoverpa armigera* (1983–2002) for Kanpur in Pigeon pea, models were developed with weekly lagged weather variables (1–2 weeks for Cotton pests and 1–5 weeks for *H. armigera*) as input variables. Forecasts were found close to the observed ones in most of the cases.
- In another study on editing and imputation using neural networks, accuracy of imputing missing values using neural network and regression imputation procedures was studied. Performance of neural network imputation were found better than regression imputation.
- Under the study on statistical investigation on the performance of non-parametric stability measures when the genotype by environment data is non-normal, different simultaneous selection measures useful for selecting genotypes for yield and stability were developed It was noticed that for increasing number of genotypes the power was increasing. Some new nonparametric stability measures were also developed.
- Under the study some investigations on stable and robust clustering procedures, the frequency of misclassification against different combinations of clustering methods and distance measures were obtained. The effect of outliers on the proposed variable selection method as well as on different clustering methods were also examined in terms of percentage misclassification.
- Under the study on identification and validation of functional SNPs in complex diseases, genetic networks and evolution, a new procedure was developed to identify SNPs at splice sites of Arabidopsis and Human species.
- Information pertaining to agricultural research, education and related aspects available from different sources were compiled together in the form of Agricultural Research Data Book 2006 which was tenth in the series.
- A Statistical Package for Animal Breeding 2 (SPAB 2), was developed.
- An expert system was developed that would provide expert advice on wheat crop management.
- For the NISAGENET project, two sets of application software were designed and developed - one for data management at local server of the participating organizations and other one for data integration at the central server located at IASRI, New Delhi. At the central server at IASRI a query/ reports system having capability to provide information at country, state, university and/or college level was also implemented.
- Under the project development of software for the analysis of survey data modules on data management, imputation, class libraries for

sampling methods, Descriptive statistics and output modules were developed for sampling schemes with and without replacement in the form of reusable class libraries.

- PERMISnet-II was updated with new data values as well as with fresh requirements of ICAR.

Scientists of the Institute published 48 research papers in National and International refereed journals along with 25 popular articles, 4 book chapters, 6 project/ technical reports and 2 e-books.

Revised perspective plan of the Institute Vision-2025 was also finalised.

Institute received first prize under the aegis of 'Rajrishi Tondon Rajbhasha Puraskar Yojna' of Indian Council of Agricultural Research.

'Sankhyaki Vimarsh 2006–07' hindi patrika published by the Institute received Ganesh Shankar Vidhyarthi (second) prize of Indian Council of Agricultural Research.

Dr. V.K. Sharma, Head, Division of Design of Experiments & Professor (Ag. Stat.) received the Best Teacher Award of IARI, New Delhi for his outstanding contribution to teaching in the discipline of Agricultural Statistics for the year 2006.

Dr. Rajender Parsad, National Fellow, ICAR was elected as Associate Fellow of National Academy of Agricultural Sciences, New Delhi from 01 January 2007.

Dr. Rajender Parsad, National Fellow, was deputed for a study visit on hands-on experience on analysis of farmer participatory research trials conducted by Rice-Wheat Consortium for Indo-Gangetic plains to CIMMYT, Mexico from 24 May to 28 June 2006. He was also deputed for participating in 14th Regional Technical Coordination Committee Meeting of Rice-Wheat Consortium for Indo-Gangetic plains held at Kathmandu, Nepal during 13–16 February 2007.

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

To promote Hindi, a poster presentation was organized at the Institute and scientists were also awarded for their outstanding contributions in preparation of Hindi posters.

An International Conference on Statistics and Informatics in Agricultural Research ICSI2006 was organized by IASRI, New Delhi during 27–30 December 2006 to mark the Diamond Jubilee Celebration of the foundation of Indian Society of Agricultural Statistics. 155 posters were presented during the conference. Many important recommendations have emerged from the conference.

As a prologue to the conference, two pre-conference workshops on "Hotspot Geoinformatics" and "Regression Diagnostics" were organized on 26 December 2006.

For installation and implementation of application softwares developed for NISAGENET, 2 days onsite trainings were organized and the software was made operational at the LAN of all the 42 participating organisations.

A two days workshop was organized on PERMISnet and Intelligent Reporting System of ICAR at NASC Complex, Pusa, New Delhi.

A study visit for three member delegation from Department of Statistics, Malaysia was organised.

Several training programs of different categories like trainings under Center of Advanced Studies, Summer School, Ad-hoc and sponsored National and International training programs 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 this year, a total of 12 students [4 Ph.D. (Agricultural Statistics), 5 M.Sc. (Agricultural Statistics) and 3 M.Sc. (Computer Application)] completed their degrees. 12 new students [2 Ph.D. (Agricultural Statistics), 5 M.Sc. (Agricultural Statistics) and 5 M.Sc. (Computer Application)] were admitted.

A 'Senior Certificate Course in Agricultural Statistics and Computing' was organised for the benefit of research workers engaged in handling statistical data collection, processing, interpretation and employed in research Institutions/Universities of India and Foreign including SAARC countries. Six officials participated in this Certificate Course.

The Library of the Institute with a status of Regional Library under NARS, played a vital role in meeting the information needs of the in-house users as well as users from other research organisations. The library services have been totally transformed into digital form with the launch of elaborated and well featured website of Library (http://lib.iasri.res.in) with link to all resources and services available in Library.

2

Introduction

Brief History

The Institute made a modest beginning in 1930 as a small Statistical Section in the then Imperial Council of Agricultural Research to assist the State Departments of Agriculture and Animal Husbandry in planning 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 researches 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 yield by crop cutting experiments. The result was such that, 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. An important landmark in the development of the Institute was the installation of an IBM 1620 Model-II Electronic

Computer in 1964. Another major landmark for the Institute was the signing of a Memorandum of Understanding with Indian Agricultural Research Institute (IARI), New Delhi in 1964, consequent to which new courses leading to M.Sc. and Ph.D. degrees in Agricultural Statistics were started in collaboration with IARI in October 1964. 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 main thrust of the Institute is to conduct basic, applied and adaptive research in Agricultural Statistics and Computer Application, to develop trained manpower and to disseminate knowledge and information produced so as to meet the methodological challenges of agricultural research and also to improve the quality of agricultural research in the country. Through the untiring and concerted efforts of the scientists, 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 and has made several important contributions in the strengthening of the National Agricultural Statistics System, which has a direct impact on the national policies. The methodology for agricultural crop insurance based on small area statistics is one of the recent important contributions of the Institute.

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. A third generation computer Burroughs B-4700 system was installed in March 1977. A large number of computer programs for specific problems as also general purpose application softwares were developed. 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 ER Mapper, PC ARC/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.

The LAN at IASRI has steadily been strengthened and the three buildings of IASRI have been connected using fiber optics cable as backbone and connectivity has been established for 413 nodes, the LAN being switch manageable. E-mail and Internet facilities are being provided to the scientists/technical/administrative staff of IASRI. The Intranet services consisting of E-mail, notice board, details of the account holders, search facility, etc. are also available over the LAN to all the users. The notice board facility is being used for information dissemination among the users of the Institute.

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, new software and upgrades. Currently the internet services are being provided through three secure servers, two of them being high-end servers with multiple CPU capabilities on a 2 Mbps leased line with 1.5 Mbps bandwidth provided under the NATP projects. The computing environment in the Institute has latest PCs, note book computers, laser printers both colour and B/W inkjet printers, scanners, CD-writers and video projectors. Software packages that are needed for application development, statistical data analysis, network securities, etc. are being made available to the scientists and staff of the Institute. Some of the important softwares that are available in the Institute are SAS, SPSS, SYSTAT, GENSTAT, GLIM, Data warehouse software – Cognos, SPSS clementine,

Irwin, MS Office, MS Visual Studio, Macro-Media, MS Project, STAR3, E-views, Gauntlet Active Firewall, Trend Micro Antivirus, etc. The latest versions of software package STATISTICA NEURAL NETWORKS, Gauss Software, Minitab 14, Maple 9.5, Matlab Eviews Std 5.0, Systat, Statistica, Sigma Plot and Lingo Super have been recently added to the library of software packages. Web Statistica software package has also been added to the list of software packages. All the administrative and accounts sections of the Institute have been provided with PCs, printers and UPS.

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.

The Institute functioned as a Centre of Advanced Studies in Agricultural Statistics and Computer Application during October, 1983 to March 1992 under the aegis of the United Nations Development Programme (UNDP). This programme aimed at developing a Centre of Excellence with adequate infrastructure and facilities to undertake advanced training programmes and to carry out research on various aspects of Agricultural Statistics and Computer Application. Under this programme, a number of distinguished statisticians and computer experts from abroad visited the Institute with a view to interacting with the scientists of the Institute, giving seminars/ lectures and suggesting improvements in the research programmes of the Institute.

A course leading to M.Sc. degree in Computer Application in Agriculture was initiated from the session 1985–86, which was subsequently changed to M.Sc. (CA) from the session 1993–94. The Institute has so far produced 163 Ph.D. and 277 M.Sc. students in the discipline of Agricultural Statistics and 73 M.Sc. students in the discipline of Computer Application.

For the benefit of statisticians and other workers for whom the knowledge of statistics is essential, the Institute had been organizing four professional courses in statistics namely Professional Statisticians' Certificate Course (PSCC), Senior Certificate Course (SCC), Junior Certificate Course (JCC) and Post Graduate Diploma in Agricultural Statistics. The PSCC and SCC courses were of one year duration while JCC was of six months duration. The Post Graduate Diploma Course was of one year duration, in which the students were required to conduct research for one year. These courses were providing a linkage of the Institute with State Departments of Agriculture and Animal Husbandry. Due to some reasons these courses were discontinued. In view of growing demand from various quarters, the Institute revived the Senior Certificate Course in 'Agricultural Statistics and Computing' in 1997 with appropriate changes in the course curriculum keeping in view the demand of trained manpower in Agricultural Statistics having adequate knowledge in Computer Application.

The Institute has achieved international recognition for its high quality research and teaching work in the field of Agricultural Statistics and Computer Application. 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.

The Standing Finance Committee had approved the X Plan budget of the Institute. The total outlay of Rs. 825 lakhs was sanctioned under the X Plan budget of the Institute.

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)

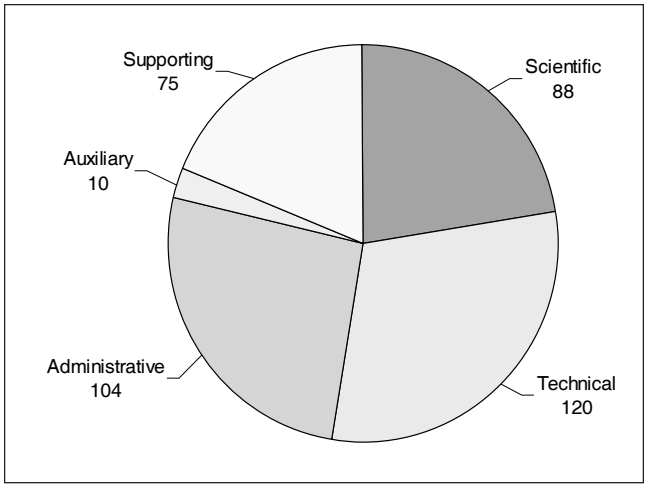
Cells

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

Staff Position (as on 31 March 2007)

Manpower	No. of posts sanctioned	No. of posts filled
Director	1	1
Scientific	130	87
Technical	234	120
Administrative	109	*104
Auxiliary	14	10
Supporting	85	75
Total	**573**	**397**

*After reduction the cadre strength of three administrative posts (three Steno Grade-III) would be effective from the date of superannuation.



Staff Strength in Position as on 31 March 2007

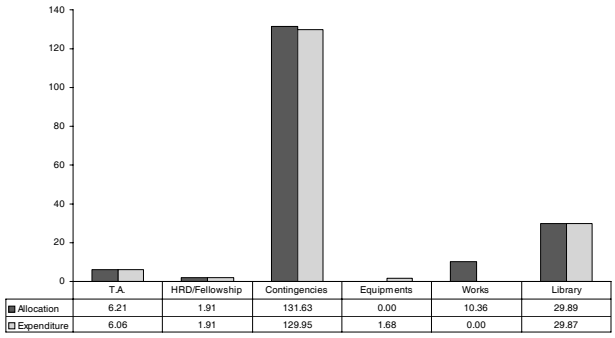
Financial Statement

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 the plan and non-plan is furnished below:

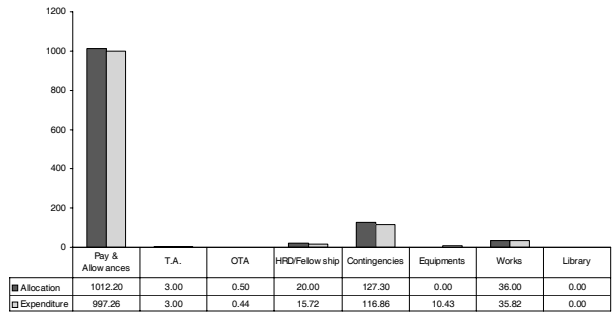
Budget Allocation vis-à-vis Utilization (2006–07)

(Rupees in Lakhs)

Head of Account	Allocation		Expenditure	
	Plan	Non-Plan	Plan	Non-Plan
Pay & Allowances	0.00	1012.20	0.00	997.26
TA	6.21	3.00	6.06	3.00
OTA	0.00	0.50	0.00	0.44
HRD/Fellowship	1.91	20.00	1.91	15.72
Contingencies	131.63	127.30	129.95	116.86
Equipments	0.00	0.00	1.68	10.43
Works	10.36	36.00	0.00	35.82
Library	29.89	0.00	29.87	0.00
Total	**180.00**	**1199.00**	**169.47**	**1179.53**

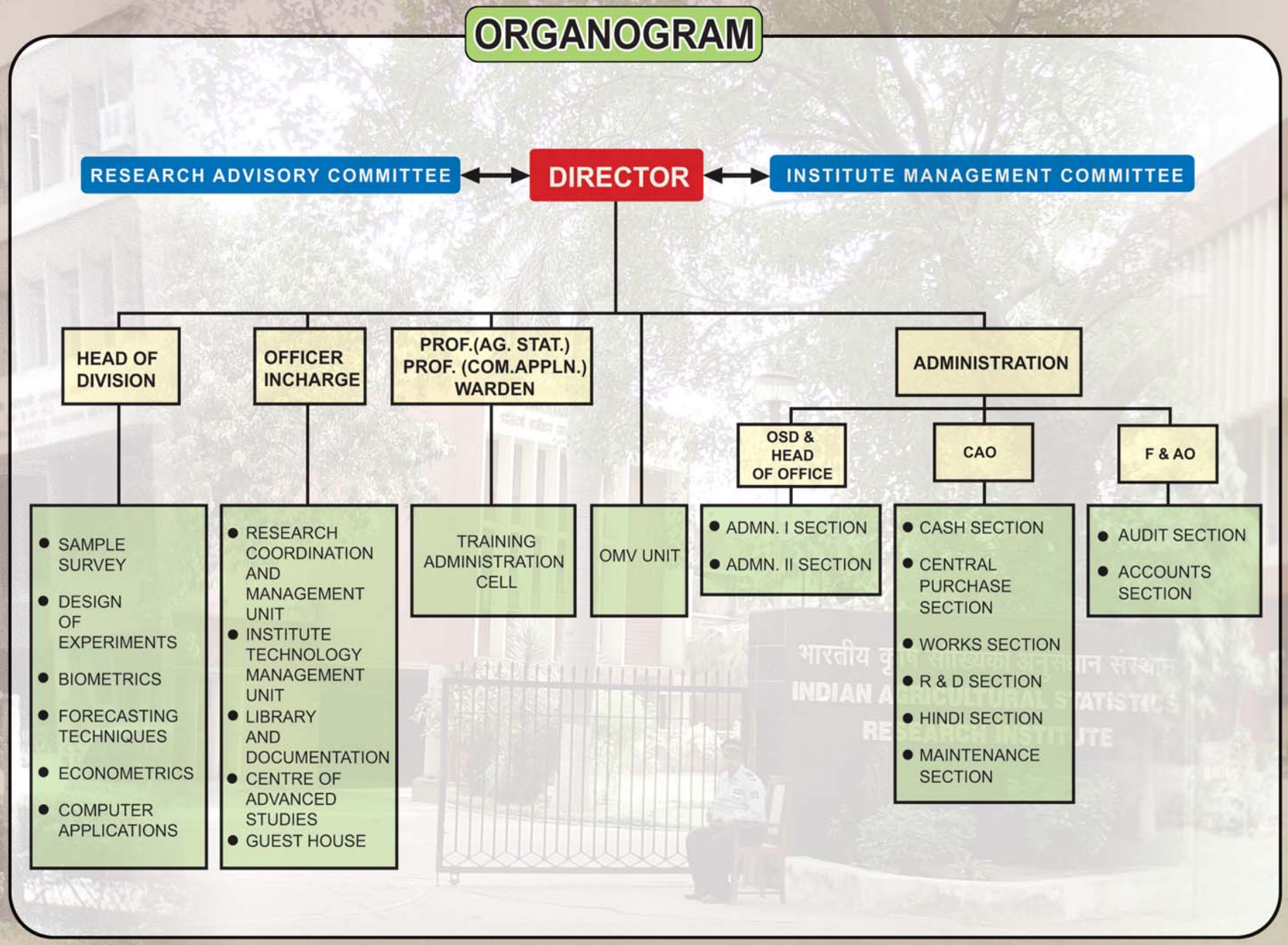


Budget for the Year 2006-07 (Plan)

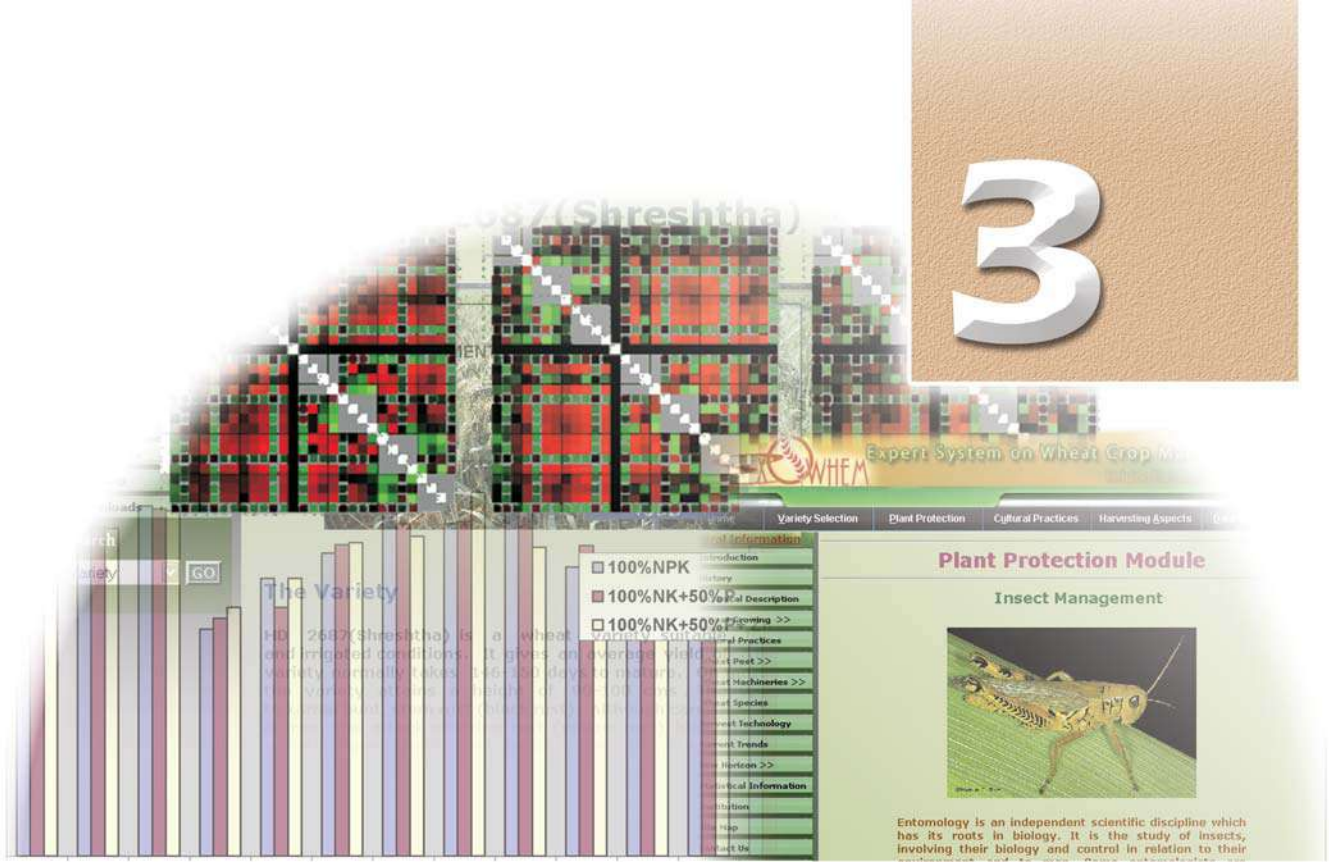


Budget for the Year 2006-07 (Non-Plan)

ORGANOGRAM


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


Brainstorming Session on
Expectations of
different Divisions of ICAR from
IASRI
11 July 2006
Agri-Informatics



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

Designs for Single Factor and Multi-Factor Experiments and their Applications in Agricultural Systems Research (National Professor Scheme)

In multi-factor experiments, where only a few of the factors are important and active, supersaturated designs are useful. A Supersaturated Design (SSD) is essentially a fractional factorial design in which the degrees of freedom for all its main effects and the intercept term exceed the total number of distinct factor level combinations of the design. SSDs are also fractional factorial designs of which the number of columns for allocating factors are greater than those

for ordinary orthogonal designs. Because of their run size economy, these designs can be broadly exploited to screen active factor main effects when experimentation is expensive and the number of factors is large.

Since the number of runs in these designs are smaller than the number of factors, the column-wise orthogonality is disturbed. So, it is pertinent to study the optimality property of the design and select the one that has the highest efficiency in terms of least disturbance in orthogonality. This is the major issue of concern.

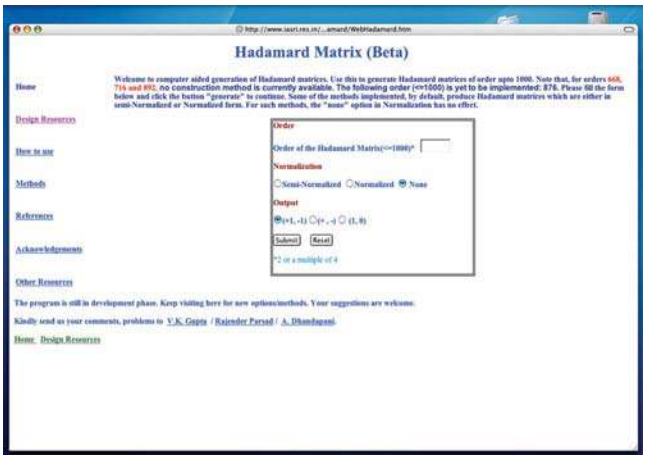
Although two-level factor designs are considered in screening experiments, designs with multi-level factors are also useful in many situations. It may be undesirable to reduce the factor levels to two if it would result in severe loss in information. Mixed-level designs are often requested in experimentation because some factors must be with lower level while other factors must be with higher levels. There has been some activity in the literature for generating SSDs for asymmetrical factorials. In case of mixed level designs, the component wise orthogonality is disturbed and therefore one has to choose a design in which this disturbance is least.

Accordingly, three series of SSDs have been generated for asymmetrical factorial experiments. The methods derive from the use of resolvable orthogonal arrays and Kronecker Product of Hadamard matrices. Orthogonal arrays of strength two given by Bose and Bush (1952) and Addelman and Kempthorne (1961) have been used. The series of designs generated are $t.s^k//st$, $t.s^{m-1}// t.s$, $2 \le t \le \delta$ and $t.2^{p(n-1)}// tn$ respectively. The methods of construction are illustrated with the help of examples.

The SSDs generated for asymmetrical factorials have been evaluated for optimality on the basis of two important criteria, viz., f_{NOD}-*efficiency* and χ^2-*efficiency*. The lower bounds to these efficiencies have been obtained for the designs generated. Some designs attain the lower bound and are, therefore, optimal. Other designs have high efficiencies. Catalogues of designs have been prepared.

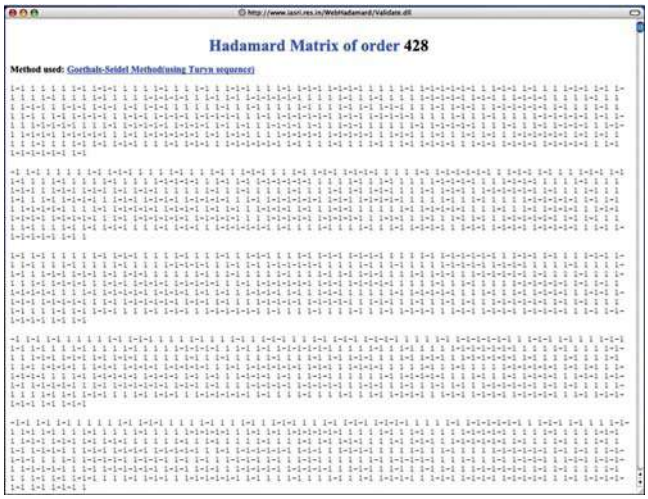
A simple method of generating SSDs for asymmetrical factorials is also given. This also helps to generate $t.s^m// N$ designs, $t < s$. These designs are generated from orthogonal arrays of strength two. These designs are optimal/have high efficiency.

Hadamard matrices have a tremendous potential for applications in many fields particularly in fractional factorial designs. Hadamard matrices play an important role in generation of SSDs for two-level factors experiments. These are also useful in generating SSDs for multi-level and mixed-level factorial experiments. These are also potentially used in generating orthogonal main effect plans for asymmetrical factorials and other fractional factorial designs. It is, therefore, pertinent to generate Hadamard matrices at least up to a reasonable order say 1000.



Software has been developed for the generation of Hadamard matrices in a semi-normalized or a normalized form up to the order 1000. No construction method is available for orders ***668***, ***716*** and ***892*** and, therefore, these orders have not been implemented. Three different types of outputs in the form of (+1, –1); (+, –); and (0, 1) are possible. The software also describes the method by which a Hadamard matrix is generated. The details of the methods have not been implemented in the software as yet. This software is an on-line generation of the Hadamard matrix and is the first of its kind ever developed to generate Hadamard matrices up to the order of 1000 on-line. For some methods Hadamard matrices of order greater than 1000 can also be generated. The software has been posted at www.iasri.res.in/design.

Hadamard matrices have useful applications in communications, cryptography, experimental designs particularly in the generation of balanced incomplete block designs, weighing designs, fractional factorial designs, supersaturated designs, variance estimation in large scale complex surveys, etc. The importance of this software would be realized when we generate



orthogonal arrays and fractional factorial plans are also generated.

Efficient Design of Experiments for Quality Agricultural Research (National Fellow Scheme)

In agricultural experiments generally data on more than one character is observed. The experiments situations where corresponding to the application of a treatment, observations on more than one response variable are recorded, are known as multi-response experiments. There is a tendency among the experimenters to analyze these experiments for each response variable separately as if the responses observed were independent. As many analyses as the numbers of response variables are carried out. Another common way of analyzing the data from multi-response experiments is to convert the data into univariate by defining an index. The index may be net returns, total calories, total energy, etc. or some weighted average of all the response variables, the weights being the relative importance of the response variables, decided in consultation with the subject matter specialist. Sometimes, the first principal component score is taken as an index. The first principal component may, however, not explain a significant part of the variability in the data. While observing several response variables in an experiment, the basic need is to exploit the correlations present among the several variables because these correlations contain a lot of information. On the contrary, if the data were analyzed, as if the variables were independent, then the advantage of the correlation structure is lost. It would, therefore, be advantageous to make treatment comparisons on the basis of several correlated responses observed on each experimental unit. There is, therefore, a need to develop suitable and appropriate multivariate procedures of analysis of data from multi-response experiments laid out in possibly incomplete block designs. This can be handled using multivariate analysis of variance (MANOVA). Keeping in view the above, a step wise procedure for the analysis of general block designs for complete multi-response experiments has been developed.

If the treatments are found to be significantly different through MANOVA, then the next question is to test the hypothesis regarding some treatment contrasts, particularly making all the possible pair wise treatment comparisons. To answer this question, the expressions of sum of squares and cross products matrix due to desired treatment contrasts for complete multi-response experiments conducted using block designs have been derived.

If two treatments are found to be significantly different in the pair wise treatment comparisons, then we need to identify the better treatment from the two significantly different treatments. To answer this question, a procedure based on J-plot and Euclidean distance of the treatment means has been developed for identification of best treatment in complete multi-response situations. Merits and demerits of the procedure developed have also been discussed. When the responses are incomplete, then there is a need to further develop the theory.

The response observed from would be markedly different from the response from all other plots. This response may be abnormally high or abnormally low. Such responses are termed as outlier(s). The analysis of data in the presence of outlier(s) may give misleading results. To tackle the problem of outlier(s) in multi-response experiments, a test statistic has been developed for detection of a single outlier vector in complete multi-response experiments run in a block design. This statistic has been developed on the lines of Cook-statistic for single response variable in a block design. Proposed test statistic has been illustrated with the help of an example.

For cost effective utilization of experimental resources, it is desired that the experiment be run in minimum possible number of experimental units. To ensure that all possible pairwise treatment comparisons are possible in a block design, the minimum number of experimental units required is equal to one less than

the sum of the number of blocks and treatments. The basic problem with the use of designs with minimum number of experimental units in agricultural experimentation is that they do not provide an estimate of error. Therefore, to get an estimate of error, some modifications in these designs are required to be made, possibly by adding some more experimental units. Keeping in view the above, a catalogue of block designs with $n = v + b - 1 + i$, $i = 4, 5, 6, 7, 8$, has been prepared, where v is the number of treatments, b is the number of blocks, k is the block size and n is the total number of experimental units. Block contents along with lower bounds to A- and D-efficiencies are also given in the catalogue.

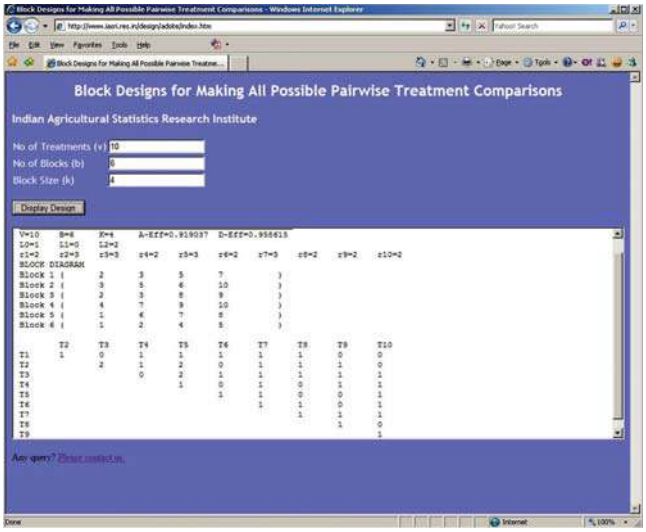
In crop sequence experiments, instead of a mono crop, crop sequences comprising of two or more crops are grown in the respective cropping seasons. The two cropping seasons considered here are *Kharif* followed by *Rabi*. Generally there are two major crops grown, one in each of the *Kharif* and *Rabi* seasons. Generally two different sets of treatments are applied; the treatments belonging to one set are applied to the *Kharif* crop and the other set of treatments are applied to the *Rabi* crop. In these experiments, the interest of the experimenter is in direct effects of treatments applied in *Kharif* and *Rabi* season, residual effects of *Kharif* treatments and the interaction between the residual effects of *Kharif* treatments and direct effects of *Rabi* treatments, extended group divisible (EGD) designs are useful for such experiments. EGD designs are obtained as the Kronecker Product of incidence matrices of two or more block designs with specified parameters. It is also seen that there is a loss of information on the main effects, the direct effects of *Kharif* and *Rabi* treatments and the residual effects of *Kharif* treatments, as well as the interaction of the residual effects of *Kharif* treatments and the direct effects of *Rabi* treatments. Indeed it may be possible to obtain designs with desired efficiency of the main effects and interactions, but it is not always possible to obtain designs with no loss of information on all the main effects. From experimenters' interest, it is desirable to generate designs that permit estimation of the main effects with full efficiency. In view the above, extended group divisible EGD designs for three factors that permit the estimation of all main effects with no loss of information have been obtained using self-complementary GD designs with $r, k \leq 10$ and a catalogue of such designs along with efficiencies for main effects and interactions have been prepared. In all these designs, first factor is at 2 levels.

Nested partially balanced incomplete block (NPBIB) designs are useful for the experimental situations with two blocking systems such that the second system of blocks is nested within the first system of blocks. Such experimental situations are common in quality evaluation of farm produce. Two new methods of construction of NPBIB designs based on latin square association scheme and rectangular association scheme have been obtained. A catalogue of designs obtainable from these methods of construction has also been prepared. Some results on non-existence of NPBIB designs based on group divisible association scheme have been obtained.

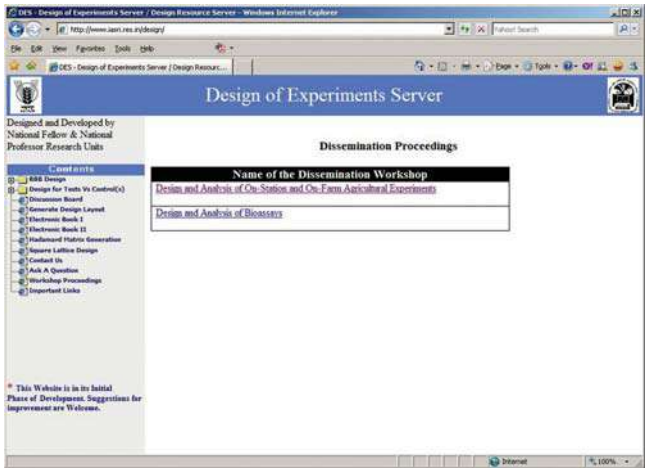
Most of the literature on nested block designs is for the experimental situations where errors within sub-blocks and between sub-blocks within blocks are independent. There, however, do occur experimental situations in which the assumption of independence of observations gets violated; observations within sub-blocks or between sub-blocks within blocks or both may be correlated. The observations between any two blocks are generally assumed as independent. To make the exposition clear about the correlation structure for nested block designs: Consider an experimental situation where v treatments are to be compared via n experimental units arranged in a nested block set up involving b_1 blocks; there are q mutually exclusive sub-blocks nested within each block, so that $qb_1 = b_2$ is the total number of sub-blocks. Let k_1 be the bigger-block size and $k_2 = k_1/q$ be the sub-block size so that total number of observations is $n = b_1k_1 = b_2k_2$. Let the observations be arranged in such a way that the first k_2 observations come from first sub-block nested within first bigger block, second k_2 observations come from second sub-block nested within the first bigger block, likewise last k_2 observations come from the last sub-block of the last bigger block. All the observations are arranged according to the positions of occurrences within a sub-block. The correlation structure that may exist among the observations is of Kronecker product type and is of the form $I_{b_1} \otimes \Phi_q \otimes \Omega_{k_2}$; the first part denotes that observations from any two different bigger blocks are independent, second part denotes the correlation structure of the observations between sub-blocks nested within a bigger block and the last part represents the correlation structure among the observations within a sub-block. Further, it is assumed that the correlation structure along with correlation

values is same for all the sub-blocks and blocks. Φ_q and Ω_{k_2} may be any one of the nearest neighbour (NN), autoregressive of order 1 (AR(1)), equi-correlated or no correlation structures. When $\Phi_q = I_q$ and $\Omega_{k_2} = I_{k_2}$ then it reduces to the set up with uncorrelated error structure. Nested incomplete block designs for the parametric restriction of v (number of treatments) $d \leq 10$, n (total number of experimental units) $d \leq 100$, k_1 (bigger block size) < v, b_1 (number of blocks) $= n/k_1$, k_2 (sub-block size) is a factor of k_1 and b_2 (number of sub-blocks) $= b_1(k_1/k_2)$ have been obtained with zero correlation structure between the units of the different sub-blocks nested within a bigger block and for nearest neighbour correlation structure between the observations within a sub-block. Nested block designs for nearest neighbour correlation structure within sub-blocks of a block in a nested block design setup and for zero correlation structure in bigger blocks ignoring the sub-block classification have also been obtained.

Nested block designs are useful for the experimental situations, where there are two sources of variation in the experimental units and one is nested within another. There may, however, arise a situation when there exists another source of variations among the units in sub-blocks of an incomplete block design. To be clearer, consider a field experiment which is conducted at several locations using a nested block design where locations are taken as blocks and harvesting time is taken as sub-blocks. But harvested samples from each sub-block are to be analyzed for their content in laboratory by different technicians. To control variation due to technicians, this may be taken as another blocking factor. Hence, nesting of units within sub-blocks may be required. Doubly nested incomplete block designs are useful for such situations. An exhaustive catalogue of doubly nested balanced incomplete block (DNBIB) designs for number of treatments $v \leq 20$ and $r \leq 20$ is available in the literature. A DNBIB design may not exist for all parametric combinations or even if it exists it may require large number of replications which the experimenter may not be able to afford. To deal with such situations, a new class of designs called doubly nested partially balanced incomplete block (DNPBIB) designs has been introduced. Some general methods for construction of doubly nested partially balanced incomplete block designs are obtained using DNBIB designs, nested balanced incomplete block (NBIB) designs and partially balanced incomplete block designs. A catalogue of 2- and 3-associate DNPBIB designs for $v \leq 20$ and $r \leq 30$ has also been prepared. The usefulness of these designs in obtaining block designs for tetra-allel crosses has also been illustrated.



For the benefit of the experimenters and practicing statisticians, Design Resources Server has been strengthened by uploading 6574 block designs for making all possible pair wise treatment comparisons for $v \leq 35$, $b \leq 50$, $k \leq 34$ such that average replication number of treatments is not more than 20 and $v > k$ have been added on the DESIGN RESOURCES SERVER linked with the website of the Institute. For given v, b, k user can generate the layout of these designs.



Dissemination workshop proceedings and links to other URL where the literature on Designs of Experiments is available has been placed at the Design resources server.

To study productivity, profitability, sustainability, quality and input-use efficiencies of different crops and cropping systems under organic farming in different agro-ecosystems, experiments were conducted at Cropping Systems Research centres under **Planning, Designing and Analysis of Experiments Planned On Stations under the Project Directorate for Cropping Systems Research.**

The experiments were planned and conducted under four types of research programmes: (i) development of new cropping systems, (ii) nutrient management in cropping systems, (iii) development of system based management practices and (iv) sustainable resource management.

The data of about 325 experiments pertaining to 2005–06 crop year were received during 2006–07. Designs adopted for conduct of experiments during this year were RBD, split-plot, split-split plot, strip plot, factorial RBD, $3^2 \times 2$ partially confounded with one control in each of the three blocks per replication, BIB design, unreplicated design and group balanced block design. Data was analysed as per design adopted. For unreplicated experiments data was analysed taking years as replications.

In an experiment on sustainable production management in rice-wheat cropping system at Masodha (U.P.) during 1999–2006, application of 10 t FYM/ha and use of plant protection measure (weedicide + one hand weeding) along with the recommended dose of fertilizer to both the crops gave the highest yield of rice (53.57 q/ha) and wheat (44.57 q/ha) whereas minimum yield of both the crops (44.30 q/ha and 37.24 q/ha) was obtained with only recommended dose of fertilizers.

At another CSR centre Siruguppa (Karnataka) an unreplicated experiment was initiated since 2003–04 to study the organic farming in high value crops in rice-sesamum cropping system. Based on three years data, it was observed that application of 100% NPK + secondary and micro nutrients (as per soil test) recorded highest grain yield of rice and sesamum closely followed by fertilizer application applied as 1/3 recommended dose (RD) of N through FYM + 1/3 RD of N through Vermi Compost + 1/3 RD of N through Neem Cake or as 50% NPK + 50% N through FYM + inorganic micro nutrients (as per soil test).

In the On Farm research programme, mainly 3 types of experiments, viz. (Expt. 1: Response of nutrients, Expt. 2: Diversification and/or intensification of cropping system and Expt. 3: Sustainable production system) had been undertaken at 32 On-Farm centres under **Planning, Designing and Analysis of On Farm Research Experiments Planned under the Project Directorate for Cropping Systems Research**. The data of 123 experiments (at 2066 farmers' field) conducted during 2005–06 at 29 on-farm centres were processed for statistical analysis.

Under the Response of Nutrients experiments, trials were conducted for 5 years with different cropping systems at various centres from 1999–2000 to 2004–05 with recommended fertilizer doses. Response

ratios for rice and wheat in the rice-wheat cropping sequences at various NARP zones were evaluated and given in table below:

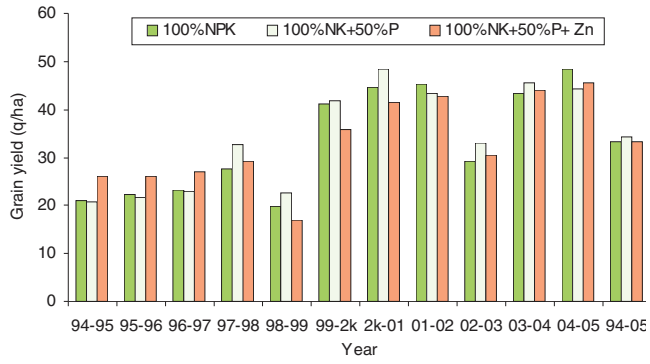
State/NARP Zone	Crop	Average yield (kg/ha) Control	Average Response Ratio		
			N	P	K
Haryana/Eastern	Rice	3195	18.35	10.63	3.81
	Wheat	1964	15.57	8.28	3.82
Jharkhand/	Rice	1830	6.78	12.28	39.63
Western Plateau	Wheat	667	4.38	11.97	56.17
Orissa/East &	Rice	3817	12.23	27.13	8.95
South Eastern Coastal	Wheat	1419	6.86	8.50	8.95
Punjab/	Rice	3871	16.04	18.39	7.00
Western Plain	Wheat	2836	11.71	13.40	17.16
U.P./Bundelkhand	Rice	1474	11.49	19.32	8.79
	Wheat	1158	5.22	14.59	9.91
North Eastern Plain	Rice	1773	10.43	13.58	10.85
	Wheat	1697	8.13	13.15	10.37
Uttaranchal/	Rice	2343	5.93	13.79	13.27
Western Plain	Wheat	2092	4.58	15.18	15.13

It was observed from the table that highest response ratio of N for rice crop found to be 18.35 at Eastern Zone whereas minimum 5.93 was observed at Western Plain (Uttaranchal) and for wheat crop these were 15.57 at Eastern Zone (Haryana) and 4.58 at Western Plateau (Jharkhand) respectively. The response of P to rice and wheat crop varies from 10.63 to 27.13 and 8.28 to 15.18 respectively. The lowest response 3.81 of K to rice crop was obtained at Eastern Zone (Haryana) and highest of the order 39.63 at Western Plateau (Jharkhand).

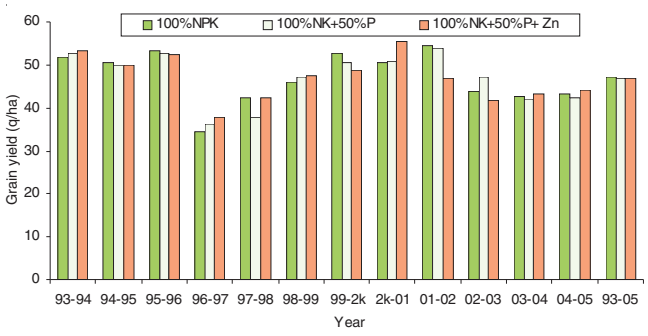
Under **Planning, Designing and Analysis of Data relating to Experiments conducted under AICRP on Long-Term Fertilizer Experiments,** at all the centres 100% NPK+FYM treatment was found most sustainable producing maximum yield or equivalent to that obtained with 150% NPK.

With the well recognized role of organic manure in maximizing the yield responses so as to break off the yield barriers, mid course superimposition of FYM levels at 0, 2.5, 5 and 10 t ha^{-1} yr^{-1} in one of the replications of 150% NPK treatment under nested two way set up was planned and implemented at most of the locations w.e.f. *kharif*/*rabi* 2005–06.

The pooled analysis of superimposed treatments data of Ludhiana centre with nested two way model showed that reduction of P application from 100% to 50%, 150% to 100% and its complete omission under the respective original treatments viz. 100% NPK, 150% NPK and 100% NPK(-S) did not have any adverse effect on the productivity of both the crops of maize and wheat during the years 1993–2005, thus indicating that costly phosphatic fertilizer could be economized while making the fruitful use of soil P build up and the results are depicted below:



Effect of superimposed treatments under 100% NPK original treatment on grain yield of maize at Ludhiana (1994-2005)



Effect of superimposed treatments under 100% NPK original treatment on grain yield of wheat at Ludhiana (1993–2005)

Under **Combined Analysis of Experiments on Long Range Effect of Continuous Cropping and Manuring on Soil Fertility and Yield Stability,** analysis was performed to study the stability of nineteen fertilizer treatments on grain yield. The analysis of data (1981–2002) revealed that treatments T_8 (80, 0, 40), T_{12} (80, 80, 40) and T_{14} (120, 0, 40) were more stable over other treatments for *kharif* season of rice-rice cropping system at Karamana centre. For *rabi* season, treatments T_{10} (80, 40, 40) and T_{17} (120, 80, 0) came

out to be most stable over other treatments. For Bhubaneswar centre (1978–2003), the treatments T_4 (40, 40, 40), T_{16} (120, 40, 40) and T_{17} (120, 80, 0) were more stable over other treatments for *kharif* season of rice-rice cropping system. For *rabi* season, T_{10} (80, 40, 40), T_{11} (80, 80, 0), T_{14} (120, 0, 40) and T_{17} (120, 80, 0) were found to be most stable over other treatments.

Stable Treatments at Different Centres

Centres	Seasons/Crops	Stable Treatments
Rajendra Nagar	*Kharif* (Rice)	T_7, T_8, T_{10} and T_{11}
	Rabi (Rice)	T_7, T_8, T_9 and T_{10}
Bhubaneswar	*Kharif* (Rice)	T_4, T_{16} and T_{17}
	Rabi (Rice)	T_{10}, T_{11}, T_{14} and T_{17}
Karmana	*Kharif* (Rice)	T_8, T_{12} and T_{14}
	Rabi (Rice)	T_{10} and T_{17}
R.S. Pura	*Kharif* (Rice)	T_4, T_7, T_8 and T_{11}
	Rabi (Wheat)	T_{15}, T_3 and T_{11}
Pant Nagar	*Kharif* (Rice)	T_7, T_8 and T_{10}
	Rabi (Wheat)	T_8, T_9 and T_{10}
Rewa	*Kharif* (Rice)	T_7, T_9, T_{10} and T_{13}
	Rabi (Wheat)	T_8, T_9, T_{10} and T_{13}
Masodha	*Kharif* (Rice)	T_3, T_9, T_{16} and T_{18}
	Rabi (Wheat)	T_9, T_{11}, T_{16} and T_{18}
Ludhiana	*Kharif* (Maize)	T_7, T_{12} and T_{17}
	Rabi (Wheat)	T_4, T_8, T_{11} and T_{13}
Siruguppa	*Kharif* (Maize)	T_{14}, T_3 and T_9
	Rabi (Wheat)	T_9, T_{12} and T_{14}
Indore	*Kharif* (Sorghum)	T_6, T_9 and T_{10}
	Rabi (Wheat)	T_{12}, T_{14} and T_{16}
Bichpuri	*Kharif* (Pearlmillet)	T_5, T_7, T_8 and T_{15}
	Rabi (Wheat)	T_3, T_6, T_9 and T_{16}

The TFP index was calculated using Divisia-Tornqvist method which indicated that at most of the centres, treatments T_{12} (80:80:40) and T_{18} (120:80:40) were most sustainable that showed the role of balanced nutrition in long-term sustained productivity.

In **Statistical Analysis of Experiments on Determining Level and Frequency of Phosphorus Application in Different Cropping Systems,** analysis of variance (ANOVA) of each cycle as well as combined over the cycles for each centre were carried out on the net returns (cost of produce – cost of phosphorus applied) using PROC GLM in SAS. As the same treatments were applied in each cycle, to account for the correlation between the observations over the cycles, multivariate analysis of variance (MANOVA) for repeated measures was performed and for making all possible pair-wise comparisons, the multivariate treatment contrast analysis was done using PROC GLM in SAS. In order to assess the effect of change in prices of the commodity and fertilizer on the appropriateness of the optimal treatment, a sensitivity analysis was carried out. Price ratios (indices) for each commodity were calculated for the period 1980–81 to 2003–04 on the basis of their respective prices for the year 2003–04. Returns per Rupee of investment or the marginal profit was also calculated for each treatment. Further more, to study the behaviour of different nutrients in the soil after each cycle as well as over all the cycles, available nutrients in the soil before and after completion of each cycle were analyzed using Analysis of Covariance technique.

The study revealed that under rice-rice and rice-groundnut sequence none of the treatment effects was found to be significant. Thus, for judicious use of phosphorus, its application at the rate of 30 kg P_2O_5 per hectare applied in either season in alternate years might be economical. Under rice-wheat sequence application of 30 kg P_2O_5 per hectare at Banswara and 60 kg P_2O_5 per hectare at Palampur to both the crops in alternate years proved to be beneficial for higher returns and both these treatments were insensitive to the change in the selected price ratios. At Varanasi and R.S. Pura, the maximum returns were obtained from 90 kg of P_2O_5 per hectare applied during *kharif* and *rabi* both every year which was sensitive to different price ratios examined. Under rice-gram sequence at Rewa, maximum returns were obtained with 60 kg P_2O_5 per hectare applied during *kharif* or *rabi* every year or during both the seasons in alternate years. This treatment was sensitive to the different price ratios tried. From pigeonpea-wheat sequence at Rahuri the highest returns were obtained when 90 kg of P_2O_5 per hectare was applied to both the crops every year, whereas, at Bichpuri, its application at the rate of 30 kg P_2O_5 per hectare during *kharif* or *rabi* every year was observed to be the optimum. Application of P at the rate of 60 kg P_2O_5 per hectare to soybean crop followed by sorghum crop every year at Parbhani gave the maximum returns, whereas, when sorghum was replaced by sunflower and 30 kg P_2O_5 per hectare was given to either soybean or sunflower every year proved to be beneficial. Maize followed by soybean and pearlmillet followed by mustard gave the maximum returns when 60 kg of P_2O_5 per hectare was applied during *kharif* or *rabi* in alternate

years and to both the seasons every year at Coimbatore and S.K. Nagar centres, respectively. The analysis further revealed that available nitrogen in the soil got depleted in all the plots at Navsari, Palampur, Rewa, Bichpuri, Coimbatore and S.K. Nagar. The available P content in the soil in all the plots increased over the cycles at Bichpuri and Rahuri whereas at Navsari and S.K. Nagar built up was observed only upto the first cycle and thereafter the soil got depleted in P. At Rewa, application of P could not enhance the P content of the soil which remained at the same level between 11 and 13 kg P_2O_5 per hectare throughout the experiment. The available K content in the soil increased only at Palampur and Coimbatore, whereas there was a marginal depletion in the available organic carbon in the soil at Rewa and S.K. Nagar.

Under the **Agricultural Field Experiments Information System (AFEIS)**, which is a web-enable information system, information about agricultural field experiments conducted in the country are stored and maintained on-line. It aims at bringing at a central place, in compatible form, the results and ancillary information of Agricultural Field Experiments conducted in past, so as to serve as a reference material for scientists, research workers and those who are working in the field of agricultural sciences.

Some of the important characteristics of experiments stored include:

- Objectives
- Details about treatments
- Design
- Cultural and other practices followed
- General crop conditions
- Summary/Results and
- Plot-wise observations

Depending upon the nature of treatments tried, experiments were classified in various types such as Manurial (M), Cultural (C), Irrigational (I), Disease, Pest and Weed control measures (D) and their combinations with Variety (V), if any. The purely varietal trials were excluded from this database system.

Presently, the database was the information relating to 22,750 agricultural field experiments. Data were collected from the agencies engaged in Agricultural Research in India, viz. Agricultural Universities, ICAR Research Institutes, Project Directorates and All India Coordinated Research Projects, Directorates of Agriculture of State Governments, etc. Provision for on-line data analysis was also made for some of the commonly used designs, viz. Randomised Complete Block Design, Factorial Experiments (2 and 3 factors) and Split Plot Designs (Main-A and Sub-B). The database size was growing continuously as more and more experimental data were merged into the system on a regular basis. Users can access the site through the URL: http://www.iasri.res.in and clicking the subsequent link Field Experimnetal Information System.

Under **Some Investigations on Design and Analysis of Agro Forestry Experiments,** the joint analysis of data received on crop and tree components of the experiment was undertaken. The combined analysis of six years yield data (1999–2000 to 2004–05) obtained on barley was also performed. It was observed that tree, year and its interaction (tree × year) had significant impact on the yield of barley. The impact of siris, neem and shisham was more or less same but more than babul on the yield of crop. Similarly, the combined analysis of gram from 6 years data indicated significant effect of tree, distance, year, tree × year and distance × year on the yield.

To study the behaviour of grain yield of barley over years under different tree species and without tree, the trend analysis was performed and power model was found to be the best with a declining trend. The declining trend was maximum under neem and minimum under shisham. When grown alone, the barley yield had the least decreasing trend. Similarly, the trend analysis of gram over years revealed the polynomial model of order three to be the best.

In agroforestry experiment, since the trees are much taller than the crop, it is suspected that the species of trees of one plot may affect the response from neighbouring plots. Further, the competition effect of the crop species is assumed to be negligible. So, there are two factors (tree and crop) in a plot and only one of which exerts interference effects. For such situations, the concept of neighbour balanced designs has been described.

Some methods of constructing complete block designs for two factors in a plot neighbour balanced for one factor (tree) were obtained that were variance balanced for estimating the direct effects of contrasts in the combinations of levels of both the factors (tree and crop).

Further, a method of constructing neighbour balanced block designs balanced for the effects of trees in the adjacent neighbouring plots using the existing neighbour balanced design was obtained that was

partially variance balanced with two associate classes.

Data on economics of the 14 combinations of the experiment in terms of five years accumulated benefit, gram sole with trees gave better return. Shisham + Gram combination gave the best accumulated net benefit of Rs. 13182.16/ha.

The analysis of two years cowpea data was also performed for all the characters as RCBD with 14 treatments in 2 replications. The contrast analysis was also performed and it was seen that the contrasts pertaining to tree groups with crop (barley as well as gram in previous season) significant for all the characters in both the years except plant population in the year 2003–04. Within tree groups, the contrasts were non-significant. Thus, cowpea has performed differently under different tree species.

Under the study **Design and Analysis of Experiments for Spatially Correlated Observations,** efficiencies (minimum as well as maximum of 1000 randomizations) of 21 BIB, 26 GD designs for $v \leq 10$ and all 18 cyclic designs reported in Clatworthy (1973) were worked out for NN and AR(1) error structures for different values of correlation coefficient. A list of robust experimental designs for correlated observations was prepared. The number of designs robust under different ranges of ρ based on minimum efficiency are presented in the following table:

	BIB	GD	Cyclic
NN Structure			
–0.4 to 0.4	21	21	9
–0.4 to 0.3	–	–	8
–0.3 to 0.2	–	–	1
–0.3 to 0.3	–	1	–
–0.2 to 0.3	–	4	–
AR(1) Structure			
–0.4 to 0.4	4	2	2
–0.4 to 0.6	4	11	5
–0.4 to 0.8	7	5	1
–0.6 to 0.8	6	2	6
–0.2 to 0.4	–	1	2
–0.2 to 0.2	–	5	–
0 to 0.2	–	–	1
–0.2	–	–	1

Most of the designs were robust in the range –0.4 to 0.4 under NN correlation structure. Same was the trend in case of AR(1) structure with 41 designs out of 65 robust in the range –0.4 to 0.4. Thus, these designs could be used in the presence of correlation among observations. The efficiencies obtained here were the lower bounds. The actual efficiency might be higher than this. The randomization and efficiency of these block designs for a given correlated structure and the value of correlation coefficient ρ were worked out by developing a code using PROC IML (SAS software package).

In **Statistical and Algorithmic Approach for Improved Estimation of Treatments Effects in Repeated Measurements Designs,** an input data management module was developed in SPRMD (Statistical Package for Repeated Measurements Designs) which handles input files for the analysis of RMD data. Following facilities were developed for input data handling:

- A spreadsheet like input data handling
- Creating a new input data file
- Importing the data from text and excel files
- Editing facilities like copy, cut, paste and select all from grid cells
- Saving data in text/excel file format

Database containing a catalogue of Repeated Measurements Designs (RMDs) was developed and parameters (number of treatments (v), number of periods (p), number of experimental units (n), total number of observations (N) and source/type of the design) of RMDs catalogued from literature were entered into it. This catalogue contains 216 RMDs falling under different classes for $v \leq 20$, $p \leq 20$ and $n \leq 100$.

Catalogue had following facilities:

- Sorting catalogue in ascending and descending order on the basis of various parameters (v, p, n and N).
- Filtering catalogue on the basis of any of the parameters (v, p, n and N), source type and for a specific set of values of all the parameters. Filtering can be done using operators like $=$, $\neq$, $>$, $\geq$, $<$, $\leq$ and for a range.
- Saving catalogue in excel, text format and in MS Word file.
- Displaying page setup and printing the catalogue.

Further, the database was linked to corresponding user interface to view the particular design and its randomized layout.

Following facilities were incorporated in the software:

- Splash Screen for the software was designed.
- GUI was modified by adding new features in the toolbar like 'redo' and 'clear text' buttons.
- Displaying of windows was modified.
- Computer Modules were developed to generate Partially Balanced Incomplete Sequence Repeated Measurements Designs by developing Williams Square Designs using the block contents of Circular (2), Cyclic (2) and Latin Square (L2) Designs.
- A class of reference-balanced complete sequence RMDs balanced for residual effects for bioequivalence trials was obtained using treatment replacement method in Williams Square RMDs.
- A class of reference-balanced incomplete sequence RMDs for bioequivalence trials was obtained by juxtaposing the Williams Square Designs developed using the reference added blocks of BIB designs.
- SAS code was written to calculate the variances of contrasts between test vs test and test vs reference for direct effects and residual effects of formulations in a reference balanced/partially reference balanced repeated measurements designs for test vs reference formulations comparisons (RBRMDT-R). These variances were calculated for three classes of RBRMDT-R.
- A list of parameters (number of formulations v = v* test formulations + 1 control, number of periods p, number of experimental units n, number of replications of test formulations r_f, number of replications r_0 of reference formulation, number of times each test formulation is immediately preceded by every other test formulation ν_{ff}, number of times the reference formulation is immediately preceded by every other test formulation ν_{f0}, number of times reference formulation is immediately preceded by itself ν_{00}) of these designs alongwith variances of the estimates of the contrasts between test vs. test and test vs. reference for direct effects and residual effects of formulations was prepared for $v \leq 11$, $p \leq 11$ and $n \leq 100$.

Under the study on **Outliers in Designed Experiments,** Least Median of Squares (LMS) method gives parameter estimates based on clean observations only and thus outliers or distributional extreme observations cannot create any problem in parameter estimation. Though LMS estimator has some good properties, yet this method did not get much popularity in designed experiments. One of the possible reasons why LMS method is not being used in designed experiments might be its computational difficulties. There is no exact formula for computing this estimator explicitly in linear regression models. An algorithm is available in literature for applying this method. Application of this algorithm to designed experiments possesses some problems. Combating all these problems, LMS procedure had been modified for application to designed experiments.

The algebra for identifying robust designs for presence of more than one outlier becomes so complicated; study of robust designs was confined to the presence of two outliers. It was found that all binary variance balanced block designs are robust against the presence of two outlying observations. A robust testing procedure for testing the treatment contrasts was developed. This testing procedure was also applied to experimental data. Relevant program for carrying out this analysis is written in SAS/IML.

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

The study **Developing Remote Sensing Based Methodology for Collecting Agricultural Statistics in Meghalaya** was initiated in 2003 in collaboration with Space Application Centre (SAC), Ahmedabad and North East Space Application Centre (NE-SAC), Shillong. The main objective of the study was to develop a suitable methodology for generation of crop statistics i.e. crop area and crop production through integration of remote sensing digital data and field survey. For developing feasible methodology for generation of crop statistics in Meghalaya it was decided to carry out this study initially in one district i.e. Ri-bhoi for paddy crop. In order to validate the methodology, same was repeated in the next year in Ri-bhoi district and also to another district of Jantia Hills. It was observed that acreage/production estimation of paddy crop could be obtained through this methodology with relatively high reliability (less than 5% standard error). Methodology was also found to be flexible in order to take care of the problems of North Eastern region i.e. non-availability of land record

system, non-accessibility of vast area, undulating topography, hilly terrain, etc.

It was further decided that this approach is to be further modified to generate agricultural statistics of other important crops of the state. The six crops identified were potato, ginger, pineapple, banana, maize and paddy. Also, it was decided that study may be taken up in the representative districts of these crops. The major districts growing these crops are Ri-Bhoi, East Garo Hills, East Khasi Hills and West Garo Hills.

Suitable integrated sampling design were adopted to collect the data for above crops through field survey. The data related to production statistics, consumption pattern, disposal and seed rate from the selected farmers from the above districts were collected through scientifically designed survey schedules. Similarly, appropriate digital data from various Indian Remote Sensing (IRS) Satellites were taken from NRSA, Hyderabad. The integration of two sources of information was taken up for arriving at the final estimation.

The study on **Assessment of Survey Capabilities of Private Sector** was taken up to primarily gather information on private organizations/agencies engaged in undertaking statistical surveys and studies, assess the survey capabilities, to develop a classified database, to suggest structure and functions of a Consultancy Wing to be set up by Govt. of India with linkages to the private sector and to prepare a project document for setting up the Consultancy Wing.

The inception report was prepared which contained a questionnaire developed for assessment of survey capabilities of the public/private sector agencies. The primary purpose of the questionnaire was to examine whether or not surveys were properly designed by the agencies, how efficiently the surveys were conducted by the agencies to collect quality data by optimum utilization of resources, whether or not modern tools like computers, statistical packages were used for data processing, the quality of manpower and infrastructure available with the agencies and the experience and expertise of the agencies. An exhaustive list containing 289 agencies was compiled. Further, a report on yardsticks was submitted which contained criteria for assessment of survey capabilities. For the assessment of survey capabilities of the agencies five indicators were developed. These were projects handled in the past, manpower, infrastructure available with the agencies, experience and expertise of the agencies and annual turnover on survey activities. Depending upon the importance of these five indicators, weights were assigned accordingly. The total score of each of the agencies was the weighted sum of these five indicator scores. In addition, the agencies were required to satisfy the non-negotiable criteria which meant that a agency could only be identified as a potential agency if it is using probability sampling design, has both PAN and TAN, has a statistician employed on a regular basis and has connectivity by way of phone, fax and e-mail.

Subsequent to this, a status report was also submitted. The status report covered details of agencies which were contacted as also a list of agencies which responded in the prescribed questionnaires. On the basis of information received from the responding agencies in the prescribed questionnaires as well as by personnel visits, a database, entitled 'Surveycap', of such agencies was developed. A report on database containing detailed information about the database was prepared for ultimate constitution of Consultancy Wing of CSO.

The Pilot Study to **Develop an Alternative Methodology for Estimation of Area and Production of Horticultural Crops** was undertaken to develop an alternative sampling methodology for estimation of acreage under each major fruit and vegetable crops as well as yield rates and total production of major fruit and vegetable crops grown in the state. For this purpose, primary data were collected from 10 selected districts of Maharashtra and 4 selected districts of H.P. in two different phases, i.e. Complete Enumeration and Detailed Survey for ultimate development of desired methodology useful for horticulture crop.

A Study to **Investigate the Causes of Variation between Official and Trade Estimates of Cotton Production** was taken up to review the existing methods of estimation of production of cotton for official as well as trade estimates, to identify the various factors responsible for the differences between the estimates obtained by the official agency and trade organization and also to suggest ways and means for improving the reliability of estimates of cotton production from both the sources. A total of ten districts, five from Maharashtra and five from Andhra Pradesh were selected on the basis of previous year's area figures under cotton crop. The previous year data on Crop Cutting Experiment (CCE) for fresh analysis for estimation of production of cotton crop was acquired from Commisionerate of Agriculture, Pune. Sampling

design and estimation procedure adopted by the State Govt., Maharashtra for estimation of area and production of cotton (Official estimate) were reviewed and discussed in detail.

For having an idea about the extent and severity of agricultural accidents in quantitative terms so as to develop safer equipment and to pursue measures for minimizing these accidents in agriculture, realistic estimates on these are essential. Accordingly, **All India Coordinated Research Project (AICRP) on Ergonomics and Safety in Agriculture (ESA)** in association with IASRI initiated a sample survey of agricultural accidents in a large sample of villages on the basis of statistical considerations during 2004–05, in four states namely Madhya Pradesh, Orissa, Punjab and Tamil Nadu, where the centres of AICRP are located. Three more centres of the AICRP in the three states, viz. Arunachal Pradesh, Rajasthan and West Bengal were newly created and it was decided to extend this survey in these states also. After thorough analysis of collected data, a reliable estimates of agricultural accidents would be obtained.

Agricultural Research Data Book

Agricultural research is a vital input for planned growth and sustainable development of agriculture in the country. As an apex organization, Indian Council of Agricultural Research (ICAR) is responsible for the organization and management of agricultural research and education in the country, and ever since independence, it has been playing an important and effective role towards overall growth of agriculture in the country. 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 2006, which is tenth in the series, is an attempt to put together main components/ indicators of such information. The Data Book comprising of 260 Tables, is organized, for the purpose of convenience of the users into eleven sections namely, Natural Resources, Environment, Agricultural Inputs, Fisheries, Horticulture, Production and Productivity, 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. The Data Book has been compiled through the joint efforts of the Indian Agricultural Statistics Research Institute (IASRI) and Indian Council of Agricultural Research (ICAR). It is the tenth edition and contains the latest information/ data as available in the country at the end of April 2006.

The study on **Crop Forecasting using State Space Models** aims at developing models based on time series data using state space approach for obtaining crop forecasts. Time series models viz. exponential smoothing models, ARIMA and state space models were fitted using 30 years data (1970–71 to 1999–2000) upon acreage, production and yield of Cotton crop in Maharashtra and at all-India level. The aforesaid models were also fitted using seasonal data on paddy crop for the years 1987–2002 in Tamilnadu state. Considering the same data, state space models under Holt's/Winters set up and generalized exponential smoothing framework were also fitted. Using these models, forecasts were obtained for subsequent years and were evaluated using Mean Absolute Percent Error (MAPE) measure. State space models were found better than exponential and ARIMA models in most of the cases. The results obtained for Cotton yield at All-India level are given below.

Cotton yield forecasts (kg/ha) at All-India level based on 1971–2000 data

Year	Actual yield	Yield forecasts from model				
		A	B	C	D	E
2001	190	235.00	218.00	216.00	202.00	218.00
2002	186	237.00	212.00	209.00	188.00	212.00
2003	193	239.00	207.00	204.00	174.00	207.00
2004	307	241.00	203.00	200.00	160.00	203.00
MAPE		10.72	17.46	16.66	7.23	7.76

A: Holt's exponential smoothing, B: ARIMA, C: General Gaussian time-invariant state space, D: State space under Holt's exponential smoothing framework, E: State space under generalized exponential smoothing framework

In a study **Neural Network Based Forecast Modeling in Crops**, neural network models using multilayer perceptron (MLP) architecture for forecasting rice and wheat yields for Eastern Plain zone (Allahabad,

Varanasi, Faizabad and Ballia), Central Plain zone (Kanpur, Lucknow, Fatehpur and Hardoi) & Bundelkhand zone (Jhansi, Banda, and Jalaun) of Uttar Pradesh were developed taking crop yield as output variable and weather data on maximum & minimum temperatures, rainfall and morning relative humidity as input variables. For each agro-climatic zone, data for all districts were taken together. For development of forecast models, weekly weather data have been used. As weather during pre-sowing period is important for establishment of the crop, data starting from two weeks before sowing was included in model development. Further, as the objective was to forecast yield well in advance of harvest, weather data till about 2½ months before harvesting were considered. Accordingly, for rice crop weather data from 23rd standard meteorological week (smw) to 38th smw and for wheat crop data from 40th smw to 52nd smw for the period from 1971–72 to 1997–98 were considered. The data for the subsequent years 1998–99 to 2000–01 were considered for validation of models. The forecasts obtained for rice and wheat were in agreement with the observed ones for most of the districts considered. Comparison of forecasts with the observed ones for rice yield in various districts of Eastern Plain zone are presented in Fig.1.

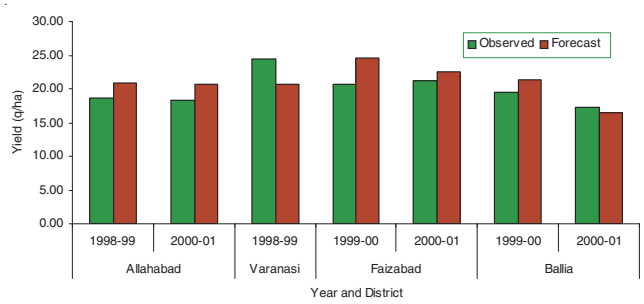


Fig. 1. Forecast of rice yield from ANN models for Eastern Plain Zone

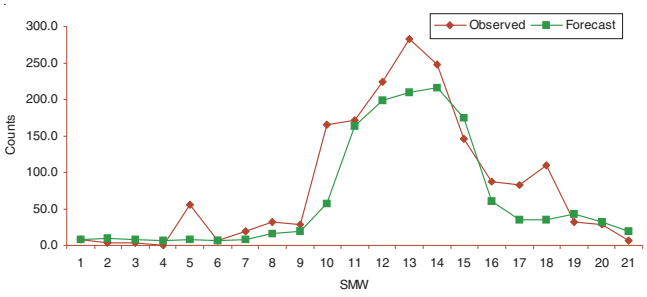


Fig. 2. Forecast of Helicoverpa armigera in Kanpur (Pigeon Pea) for 2003

For forewarning pests count viz. American bollworm (1985–2001) and pink bollworm (1985–1995) for Nagpur in Cotton and *Helicoverpa armigera* (1983–2002) for Kanpur in Pigeon pea, models were developed with weekly lagged weather variables (1–2 weeks for Cotton pests and 1–5 weeks for *H. armigera*) as input variables. Forecasts of *Helicoverpa armigera* counts in Pigeon pea along with the corresponding observed ones for Kanpur for the year 2003 are given in Fig. 2. Forecasts have been found close to the observed ones in most of the cases.

A study on **Editing and Imputation using Neural Networks** aims at evaluating performance of artificial neural networks (ANNs) for data editing and imputation. The accuracy of imputing missing values using neural network and regression imputation procedures was studied. For this, 1740 data points on land holding size, proportional area of holdings irrigated by well source (Y), proportional area of holdings irrigated by canal (X_1) and tank (X_2) sources, proportional net irrigated area of holdings (X_3) and number of wells (X_4) pertaining to 174 selected tehsils of Maharashtra state corresponding to ten size classes of individual operational land holdings were used from the 5th Agricultural Census (1995–96) of India. Imputation classes for the main variable Y were formed by two approaches viz. frequency distribution/percentile approach based on Y alone and by using CART (Classification and Regression Trees) approach based on associated variables X_1 through X_4. Imputation models within classes were developed upon 80% randomly selected data and the remaining 20% data were utilized for validation purpose. Using Mean Absolute Percent Error (MAPE) and Root Mean Square Error (RMSE) evaluation measures, performance of neural network imputation was found better than regression imputation under both types of imputation classes. The results obtained are given below:

Evaluation measures for class-wise imputation based on ANN and regression methods

Imputation method	Classes of main variable based on	MAPE	RMSE
ANN	A	51.46	0.034
	B	17.88	0.015
Regression	A	61.07	0.037
	B	27.67	0.018

A: CART (Classification and Regression Trees) based on associated variables; B: Distribution of main variable alone

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

The study on **an Econometric Approach for Measurement of Indemnity and Premium Rates under Crop Revenue Insurance** was undertaken. Instability indices were estimated for area, yield and revenue using *Cuddy Della Valle* index approach for Uttar Pradesh and Karnataka state. In Karnataka revenue and yield showed low instability compared to area. But, in case of Uttar Pradesh, instability is low for all the parameters. Under crop revenue approach, the proportion of almost all the crop strata was having high revenue premium rates than yield premiums in Karnataka state. However, in Uttar Pradesh, the revenue premiums rates were low in comparison to the yield premium rates. A comparison of estimated revenue premium rates for Karnataka and Uttar Pradesh state showed that the majority of crop strata were having low premium rates in Uttar Pradesh in comparison to Karnataka state.

An Econometric Study of Estimation of Elasticities of Demand and Supply of Major Fruits and Vegetables in India was undertaken**.** The analysis showed that there was an increasing trend in proportion of households consuming various vegetables over the years in the urban as well as rural India. A close look of the change in value of consumption of important vegetables over the years indicated that the expenditure on vegetables was increasing over the years in both rural as well as in urban households. This showed that the consumption pattern of rural households was changing faster than the urban households in fruits and vegetables. The vegetable expenditure elasticities of demand were positive and high for different vegetables indicating that if expenditure on vegetables increases the demand for theses vegetables would be much higher. It was observed that the total expenditure elasticity of demand for vegetables is positive in all regions for all vegetables. The fruits expenditure elasticities for all the regions and India as a whole were positive and very high. It was also observed that the total expenditure elasticity of demand for most of the fruits is positive in all regions except few fruits which indicated that an increase in the total expenditure would increase the demand for fruits.

The supply projections for the year 2010 indicate that the production of onion, potato, tomato and the total vegetables would be approximately 5.85, 29.16, 9.56 and 110.48 million tonnes respectively and for the year 2015 it would be approximately 6.49, 32.77, 11.03 and 124.91 million tonnes respectively at all India level. Fruits supply projections for the year 2010 showed that the production of apple, banana, mango and grapes would be estimated approximately as 1.64, 20.69, 12.85 and 1.37 million tonnes respectively and the total fruits production would be estimated 59.73 million tonnes. For the year 2015, the production estimates would approximately 1.78, 24.08, 13.98, 1.55 and 68.37 million tonnes for apple, banana, mango, grapes and total fruits, respectively.

The demand projections for the total domestic consumption of fresh vegetables at average growth of per capita income based on the period 2000–05 (4.6%) would be 92.98 and 105.523 million tonnes and at hypothetical growth rate of 10.0 percent, it would be 106.13 and 128.89 million tonnes for the year 2010 and 2015, respectively. Further, the demand for the total domestic consumption of fresh fruits at average growth of per capita income (4.6%) would be 18.99 and 21.79 million tonnes at hypothetical growth rate 22.22 and 27.60 million tonnes in the year 2010 and 2015, respectively.

The study **Adoption and Impact of Resource Conservation Technologies on farm economy in Indo-gangetic Plains of India** was undertaken. Detailed analysis of primary survey data was undertaken on various aspects for studying the adoption pattern and also in examining the factors influencing the adoption of RCTs in Indo-Gangetic Plains for all the states.

The study on **Impact Assessment of Fisheries Research in India** was undertaken. A draft manual on "Methodologies for Assessing Impact of Fisheries Research" was developed in collaboration with NAARM, Hyderabad.

The study of **Lac Marketing in India** was completed. The study suggested that for increasing the financial status of poor tribal cultivators, they may be motivated for lac cultivation. In this direction there is need to establish brood lac farms especially in the potentially rich lac producing remote areas of Chhattisgarh, Madhya Pradesh and Maharashtra states. It further pointed that either brood lac or small funds may be provided to the lac cultivators at the proper time similar to Maharashtra state pattern of leasing out un-utilized host trees by forest department to the local cultivators

for lac production. Further, installation of lac processing units especially in remote lac cultivating zones would also attract cultivators to produce more for anticipation of better crop price.

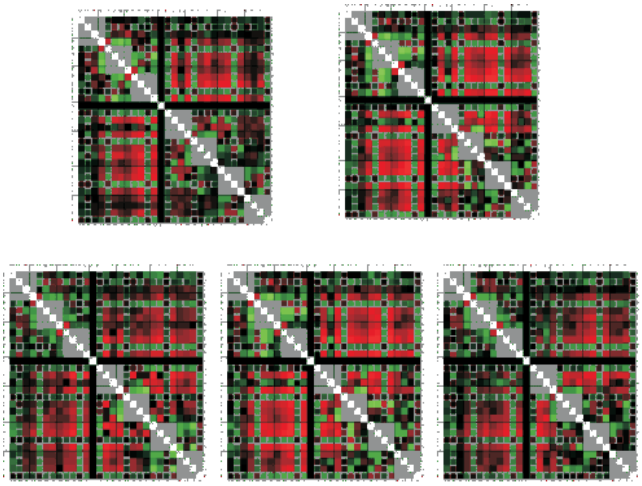
Programme 4: MODELING AND SIMULATION TECHNIQUES IN BIOLOGICAL SYSTEMS

The study on **Statistical Investigation on the Performance of Non-Parametric Stability Measures when the Genotype by Environment Data is Non-Normal** aims at developing a few simultaneous selection measures useful for selecting genotypes for yield and stability both. Computer programs for computation of Type 1 error and power for different nonparametric stability measures, in case of Normal, Beta and distributions were prepared. Type 1 error and power for different nonparametric stability measures were obtained for genotypes 8, 12, 16, 20, 24 and environments 5, 10, 15, 20 for different level of significance i.e. 0.01, 0.025, 0.05, 0.1. It was noticed that for increasing number of genotypes the power was increasing. It had no effect on changing environments. Some new nonparametric stability measures were developed.

In a study on **Some Investigations on Stable and Robust Clustering Procedures,** simulated samples of size 100 for tall, medium and dwarf rice varieties were mixed after providing codes for identification of case belongings. The frequency of misclassification against different combinations of clustering methods (Average Linkage, SLINK,CLINK and Ward's method) and distance measures (Euclidean, Squared Euclidean, Chebychev and City Block) were obtained and tabulated for nine variables under z-score and range method of standardization. On the basis of calculated total frequency of misclassification, the relative percentage misclassification under each clustering method as well as distance measures were calculated. Misclassification for all the considered hierarchical clustering methods (Average Linkage, Single Linkage, Complete Linkage and Ward's method) against different distance measures (Euclidean, Squared Euclidean, Chebychev and City Block) were obtained over different subset of variables along with the identified main variable through the application of proposed variable selection method over large simulated samples. The effect of outliers on the proposed variable selection method as well as on different clustering methods were also examined in terms of percentage misclassification. Performance of different clustering methods were also examined under proposed case descriptive scoring method under outlier as well as in absence of outliers.

For examining the **Effect of Selection and Incomplete Model Specification on Heritability Estimates** a study was initiated. The methodology was consolidated for obtaining estimates of genetic variance components under various situations of incomplete model specification as well as disturbances of underlying statistical assumptions. Simulation studies were carried out for half sib data for examining the effect of selection pressures on the estimates of variance components and consequently on the estimate of heritability co-efficient. It was observed that the estimates of heritability depend upon not only on the extent of selection pressures applied but also on various other attributes like family size and coefficient of inbreeding etc.

A study on **Identification and Validation of Functional SNPs in Complex Diseases, Genetic Networks and Evolution** was undertaken in collaboration with Cold Spring Harbor, New York. Life has a common origin. But during evolution, nature has carried out a wide range of experiments and the results of which are present today. Thus, study of cross species genomic data can expose patterns which reflect underlying biological phenomena. In the process of evolution, only successful features are (re)adapted in niches. Many a time biological experiments might mislead due to subtle changes. These subtle changes are difficult to address through conduct of experiments in the laboratory as they involve lot of time and money. However, with the advent



Dinucleotide correlation patterns across *H. sapiens, M.musculus, D.melanogaster, C.elegans and A.thaliana*

of bioinformatics tools one can predict the effects due to subtle changes that occur at functional elements on genome. Here, one can use Splice Sites (SS) and Single Nucleotide Polymorphisms (SNPs) to assess the effect of SNPs on splicing mechanism and thereby identify and validate functional SNPs in complex diseases, genetic networks and evolution.

Under this study, a new procedure was developed to identify SNPs at splice sites of Arabidopsis and Human species. Based on Position Weight Matrix (PWM) scores, effect of SNPs on splicing strength was assessed. Necessary Perl scripts/modules were written for identification of SNPs in splice sites. Databases of SNP on splice sites were populated separately for each species. These databases were maintained and managed effectively on web through PhpMyAdmin. A new method of classification based on splice site information and/or population diversity information was proposed. Correlations between positions on splice sites are important to study the extent of disruption caused by SNPs, particularly in weak splice sites. To study such correlations, we have considered splice site data of five genomes, viz., Homo sapiens, Mus musculus, Drosophila melanogaster, C. elegans and Arabidopsis thaliana. Heat maps were generated to study the similarity patterns across species and they were made available at http://katahdin.cshl.edu/splice/snp_in_splice/ cross_sps_ modi.cgi. It was observed that mutations have disrupted the correlations severely where as SNPs remain mostly neutral. However, there are few cases where SNPs cause more disruption than mutations. Such SNPs were identified and predicted to effect splicing and thereby associated with the diseases. A sorted list of SNPs were made available at http://katahdin.cshl.edu/splice/snp_in_splice/sorted_SNPs_illumina.html. Several *cgi* scripts were written to access data and get response on web. An user-friendly open source software http://katahdin.cshl.edu/splice/snp_in_splice/ was developed and all types of classifications of SNPs in splice sites were made available in it. Also, links were given to several public internet sites and databases, including NCBI.

Programme 5: DEVELOPMENT OF INFORMATICS IN AGRICULTURAL RESEARCH

A **Statistical Package for Animal Breeding 2 (SPAB2)** was completed. The customisation of the package was completed to make it more interactive.

Another study on **Development of Expert System on Wheat Crop Management** was also completed. The expert system was divided in four modules: Variety Selection module, Plant Protection module, Cultural Practices module and Harvest Technology module. The system provides the end users (farmers) with recommendations and advice concerning wheat production. This system was designed to cover agriculture operations, variety selection, fertilizer application, and insecticide/pesticide application. This system helps in diagnosing a pathological disorder in the plant and suggests its control measures. It also helps in identifying insect/pest and suggests defense mechanism. Some multimedia effects have been added to the system that guides the user with its voice for identification of disease, insects and weeds in the language of his choice. At present it has been made available on the intranet of the institute. Its URL is http://www.iasri.res.in/expert.

Brief on the functioning of the system for Variety Selection Module and Plant Protection Module is described below:

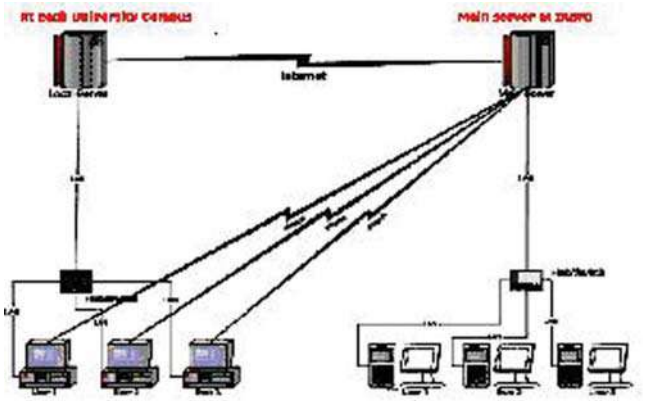
Variety selection module provides an interactive platform to select a variety on the basis of the characteristics given by the user. It gives variety for a state, zone or district and can be narrowed down with the combination of a single or group of criteria. The system suggests variety on the basis of yield and purpose as defined by the user in the form. It gives the information about the desired variety in the format given below:

- The Plant protection module of the system helps a farmer in identifying the pathological disorder in the crop, attack of insect/pest or the infection

of weed to the crop. It suggests treatment and control measures to farmers to protect the crop from all these threats.

- It helps in identifying wheat disease by the help of queries supported by images.
- After making queries on stage, major and minor symptoms the disease can finally be identified with the help of images.
- Insect Management Module of the expert system deals in identifying insects attacking the crop and also suggesting the defense measures.
- It gives the details about the insect identified.

In a study on **National Information System on Agricultural Education Network in India (NISAGENET)** two sets of Application Software were designed and developed; one for data management at Local Server of the each university campus and other one for data integration at the Central Server at IASRI, New Delhi. The Network Architecture is as presented in the following image:



Network Architecture of NISAGENET

NISAGENET at Local Server

The Software for data management of the universities and their affiliated/constituent colleges was installed at the Local Servers and made operational on the LAN of the universities. For installation and implementation, 2-days onsite trainings were organized during June–August 2006. The system has various facilities like Data Upload for sending updated data from the university/colleges to Central Server at IASRI, New Delhi; Query/Reports for University/Colleges level management and Database Administration at Local Server for allotment of User Id Passwords to university as well as college administrators.

Three documents namely Requirement Analysis Document, Reference Manual for Data Management and Reference Guide for Trouble Shooting were prepared and a copy of the same was provided to all the Nodal Officers. The work related to data collection, entry, updation and upload to Central Server was also initiated by almost all the participating organizations. To sensitize and advise the concerned officials for expediting the data collection/entry work and uploading of the data to the Central Server, two days Mid Term Appraisal Meeting on NISAGENET were organized at the following locations:

(i) Agricultural Engineering College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu during 11–12 December 2006
(ii) Indian Agricultural Research Institute, Pusa, New Delhi during 18–19 December 2006
(iii) Orissa University of Agriculture & Technology, Bhubneshwar, Orissa during 22–23 December 2006

NISAGENET at Central Server

The Application Software implemented at the Central Server at IASRI, New Delhi was designed and developed for the data management of all the participating organizations. It is equipped with download facility for updation with latest version of the Data Management Application Software for the Local Servers.

NISAGENET at Central Server has been broadly categorized into the following six modules. The user can access the home page of NISAGENET by using the address http://www.iasri.res.in/Nisagenet/

1. Database Administration
2. Data Management
3. Reports/Queries
4. Analysis
5. Discussion Form
6. AgriKhoj-Search Engine

The NISAGENET at Central Servers has the facilities for database administration; data management of all the participating organizations (42 Universities & 260 constituent/affiliated colleges); download facility for updated latest version of the Data Management Application Software for the Local Servers; facility for receiving updated data sent from the universities to Central Server; and data management of other colleges offering agricultural education, but affiliated to other Central Universities. In addition it has an exhaustive Query/Reports system to provide information at Country, State, University and College levels. The different kind of reports and a sample structure of the reports are depicted in the following images:

A study on **Development of Software for the Analysis of Survey Data** was undertaken to develop a windows-based software for the estimation of parameters for Stratified Multistage Sampling Design. The software utilized the object oriented programming language C^{++} with .NET technology. The software includes data management, imputation, class libraries for sampling methods, descriptive statistics and output modules. The data management module has the features of creating and saving a new data file in spreadsheet form and can also import data from MS Excel, text files, or MS-Access database. Imputation techniques for the filling up the missing data such as Zero Imputation, Mean Imputation and Mean of the neighboring units have been provided. Modules were developed for sampling schemes with and without replacement in the form of reusable class libraries. In case of Random and Stratified sampling, separate methods have been provided for equal probability with and without replacement and unequal probability with replacement in the library for estimation of parameters. For cluster sampling, in addition to the separate method

National Information System on Agricultural Education Network in India (NISAGENET)

Agricultural Universities - Affiliated/Constituent Colleges

Print

No.	University Names	No. of Colleges
	Acharya N.G. Ranga Agricultural University, Hyderabad (Andhra Pradesh)	20
	Aligarh Muslim University, Aligarh (Uttar Pradesh)	3
	Allahabad Agricultural Institute-Deemed University, Allahabad (Uttar Pradesh)	0
	Anand Agricultural University, Anand (Gujrat)	3
	Assam Agricultural University, Jorhat (Assam)	6
	Bidhan Chandra Krishi Viswavidyalaya, Kalyani (West Bengal)	0
	Birsa Agricultural University, Ranchi (Jharkhand)	3
	CCS Haryana Agricultural University, Hisar (Haryana)	7
	Central Agricultural University, Imphal (Manipur)	5
0	Central Institute of Fisheries Education, Mumbai (Maharashtra)	0
1	Ch. Sarwan Kumar Krishi Vishvavidyalaya, Palampur (Himachal Pradesh)	4
2	Chander Shekhar Azad University of Agriculture and Technology, Kanpur (Uttar Pradesh)	4
3	Dr Punjabrao Deshmukh Krishi Vidyapeeth, Akola (Maharashtra)	9
4	Dr. Bala Saheb Sawant Konkan Krishi Vidyapeeth, Dapoli (Maharashtra)	12
5	Dr. Y.S. Parmar University of Horticulture and Forestry, Nauni-Solan (Himachal Pradesh)	2
6	G.B. Pant University of Agriculture and Technology, Pantnagar (Uttaranchal)	9
7	Indian Agricultural Research Institute, NewDelhi (Delhi)	0
8	Indian Veterinary Research Institute, Bareilly (Uttar Pradesh)	0
9	Indira Gandhi Agricultural University, Raipur (Chhattisgarh)	24
0	Institute of Agricultural Sciences, Banaras Hindu University, Varanasi (Uttar Pradesh)	0
1	Jawaharlal Nehru Krishi Viswavidyalaya, Jabalpur (Madhya Pradesh)	11
2	Kerala Agricultural University, Thrissur (Kerala)	10
3	Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan)	6
4	Maharashtra Animal and Fishery Sciences University, Nagpur (Maharashtra)	7
5	Mahatma Phule Krishi Vidyapeeth, Rahuri (Maharashtra)	23
6	Marathwada Agricultural University, Parbhani (Maharashtra)	24
7	Narendra Deva University of Agriculture and Technology, Faizabad (Uttar Pradesh)	0
8	National Dairy Research Institute, Karnal (Haryana)	0
9	Orissa University of Agriculture and Technology, Bhubaneswar (Orissa)	7
0	Punjab Agricultural University, Ludhiana (Punjab)	4
1	Rajasthan Agricultural University, Bikaner (Rajasthan)	13
2	Rajendra Agricultural University, Samastipur (Bihar)	7
3	Sardar Vallabh Bhai Patel University of Agriculture and Technology, Meerut (Uttar Pradesh)	2
4	Sher-e-Kashmir University of Agricultural Sciences and Technology , Jammu (Jammu and Kashmir)	0
5	Sher-e-Kashmir University of Agricultural Sciences and Technology of Kashmir, Srinagar (Jammu and Kashmir)	2
6	Tamil Nadu Agricultural University, Coimbatore (Tamil Nadu)	12
7	Tamil Nadu Veterinary and Animal Sciences University, Chennai (Tamil Nadu)	4
8	U.P. Pt. Deen Dayal Upadhyaya Pashu Chikitsa Vigyan Vishwa Vidhyalaya Evem Go Anusandhan Sansthan, Mathura (Uttar Pradesh)	1
9	University of Agricultural Sciences, Dharwad (Karnataka)	9
0	University of Agricultural Sciences,Bangalore, Banglore (Karnataka)	7
1	Uttar Banga Krishi Viswavidyalaya, Cooch Behar (West Bengal)	0
2	West Bengal University of Animal and Fishery Sciences, Kolkata (West Bengal)	0
Total Colleges		260

in the class library, option has been provided for the estimation of parameters in case of known as well as unknown value of the total of all cluster sizes in population. In case of two stage method with unequal probability, at the first stage selection, if total number of second stage units in the population is not known, a popup screen for supplying probability values for first stage unit selections has been provided. Class library for stratified two-stage sampling with equal probability has also been developed. The descriptive statistics such as mean, variance, coefficient of variation, median, skewness, kurtosis etc. have also been calculated for all the variables under study along with the auxiliary variable if any. The output module of the software has

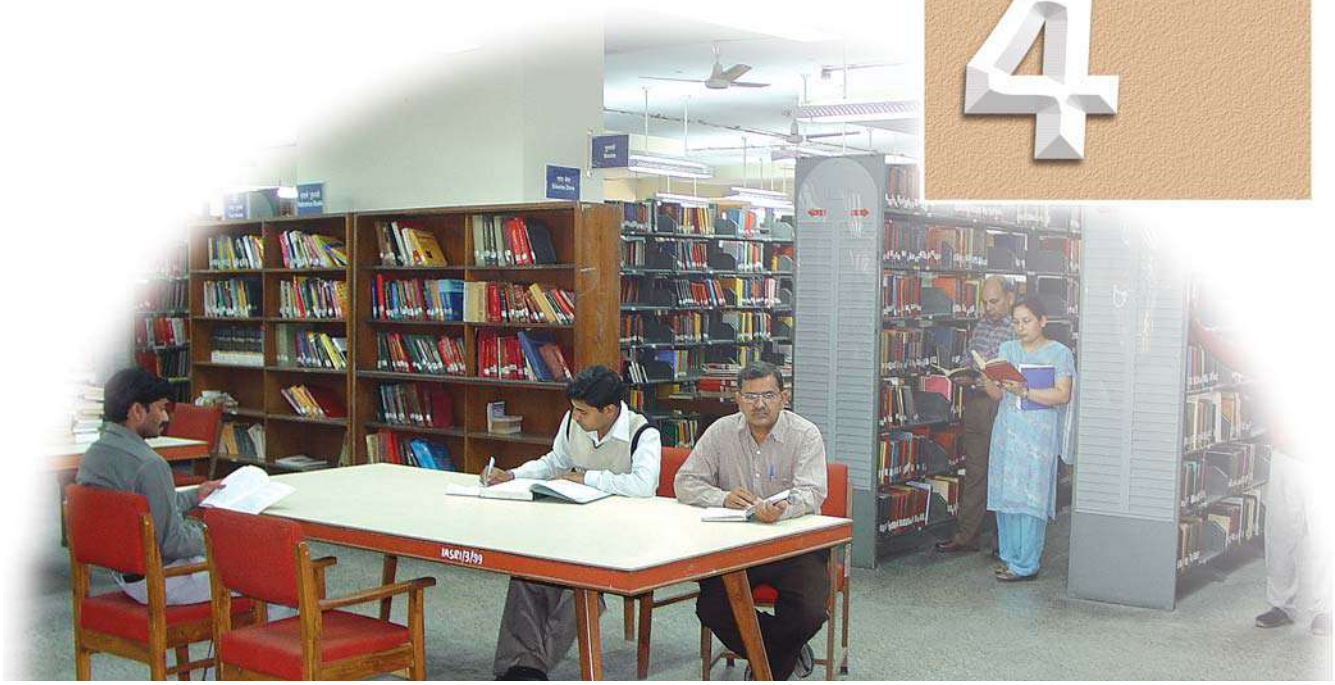
been designed in such a way that the results of the analysis, the input data supplied by the user and the selection made by the user at various stages is visible to the user. These reports can be saved as well as imported to some other data formats. The testing of the above stated sampling schemes is being done with the example data available including the real survey data.

The **Development of PERMISnet-II** system was initiated in .NET framework. Design and development of Data management module was completed. Design and development of the Reports at the Institute level, General Reports and Cadre strength reports were completed. Designing and development of selective reports at different levels of Institute and Council was also undertaken. Maintenance and backup of PERMISnet, coordination with the nodal officers and trainings to nodal officers is regular activity under this project PERMISNET-II. As a part of this activity regular backup of the system is maintained at the server. New reports and suggestions obtained from nodal officers are incorporated in to the system PERMISnet.

Programme 6: TEACHING AND TRAINING IN AGRICULTURAL STATISTICS AND COMPUTER APPLICATION

Another important activity of the Institute is to impart education and to conduct post graduate and in-service training courses in Agricultural Statistics and Computer Application. The achievements made under this programme are outlined separately under Education and Training.

4



Library and Documentation

The Library of the Institute is a Regional Library under National Agricultural Research System of the country. It plays a vital role in meeting the information needs of the In-house users as well as users from the NARS. It provides library, documentation and information services to the scientists, staff, students and researchers of the Institute as well as users from ICAR Institutes and State Agricultural Universities.

The Library Advisory Committee plays an important role in the Management of the Library and clears proposals relating to enrichment of resources of the Library such as books, journals, CD-ROMs as well as Infrastructural Development etc. The Library Advisory Committee for the year 2006–07 has been as under:

1.	Dr. S.D. Sharma	Chairman
2.	Dr. V.K. Gupta	Member
3.	Dr. H.V.L. Bathla	Member & BOS Member
4.	Dr. V.K. Sharma	Member
5.	Dr. P.K. Malhotra	Member
6.	Dr. Ranjana Agrawal	Member
7.	Dr. Prajneshu	Member
8.	Dr. Amit Kumar Vasisht	Member
9.	Dr. Rajender Parsad	Member
10.	Dr. Krishan Lal	BOS Member
11.	Sh. A.K. Chaturvedi	Member
12.	Capt. Mehar Singh	Member
13.	Sh. K.K. Hamza	Member
14.	Sh. D.C. Mishra	Student Rep.
15.	Dr. P. Visakhi	Member Secretary

The internal administration and organisation of the library and documentation is supervised by Dr. P. Visakhi, Librarian.

During the year the Library provided following services to its users through its website: http://lib.iasri. res.in

- Reprographic Service (Manual)
- Computerized Services
  1. Computerized Circulation
  2. Bibliographical Database
  3. Archival Database - 2
  4. On-line Journals - 46 (through Internet)
  5. On-line Database - 8 (through Internet)
  6. CD-ROM Database (both on-line and off-line) -15

Home page of library information system

7. Current Content Service (JCC) - 1
8. Internet Search
9. On-line Enquiry (OPAC)
10. Current Awareness Service (New Arrivals)
11. On-line Reservation of Documentation
12. On-line User Profile Service

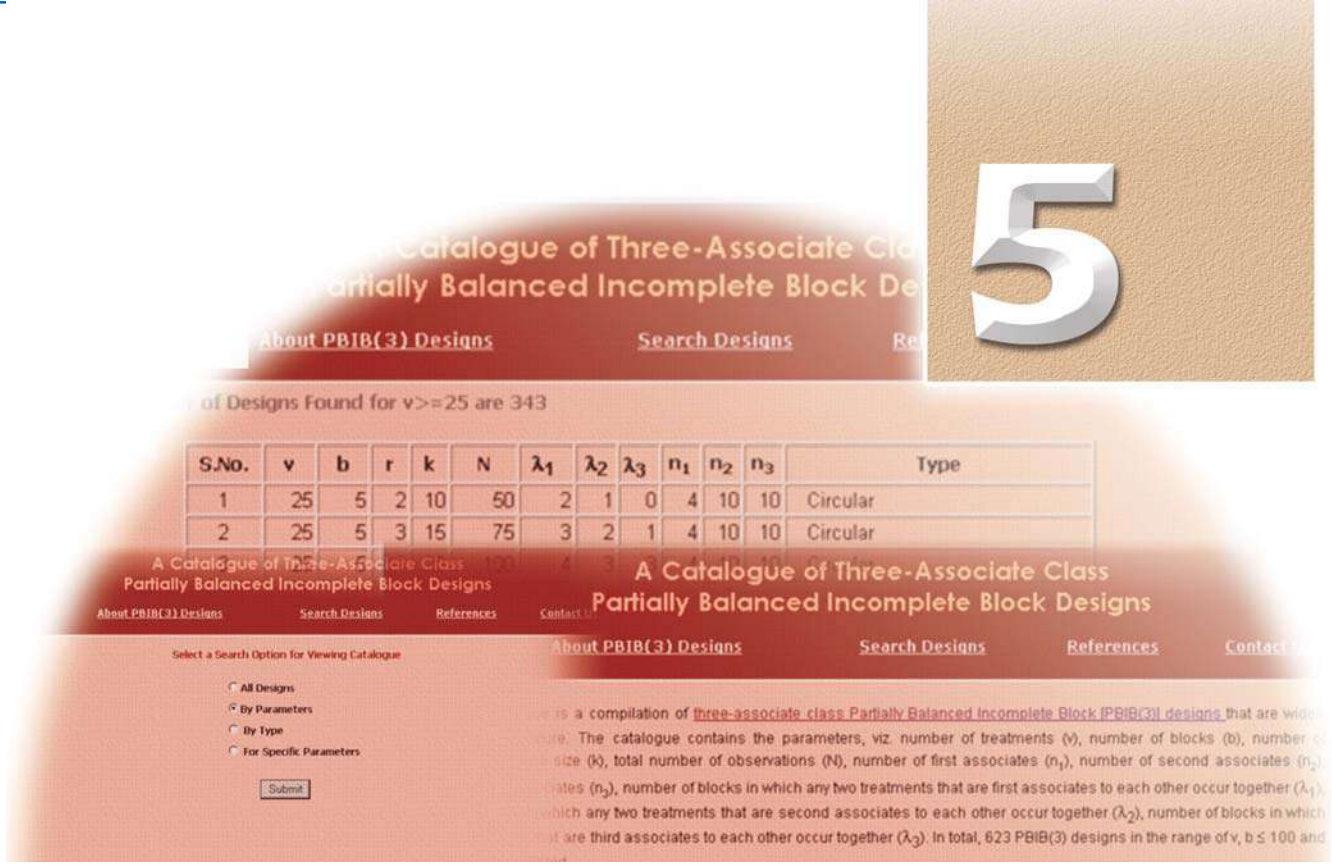
Library was renovated with new copper electrical wiring. All newly purchased racks and shelves were signaged with Subject Heading and Call Number for easy location of publications on a particular subject. Subjects of publications holding in each rack (shelf list) has been signaged in bilingual. Again each shelf has been highlighted with shelf number and call number. After searching a document through OPAC any user can have enough knowledge in locating document through above mapping.

The following Computer Activities were done:

- Server and two old computers were upgraded.
- All resources added in the library were barcoded and updated in the bibliographical database.
- All library users were given training on the use of library computerised services/resources.
- All bonafide members were issued electronic, bilingual and barcoded cards with photo.
- 46 e-journals were subscribed for on-line access in the institute.
- All trainees of the Institute were given lectures and Hands-on-Training on "On-line Library Information System".
- Library subscribed the following on-line Bibliographical, Statistical, Abstracting on-line and CD-ROM Databases:
  - MathSciNet (http://www.ams.orgmathscinet.com)
  - Ingenta (http://www.gateway.ingenta.com)
  - Indiastat.com (http://indiastat.com)
  - Current Index to the Statistics (http://www.statindex.org/CIS/query/)
  - Developing Library Network (http://delnet.nic.in/)
  - Indian Harvest(http://www.cmie.com)
  - Economic Intelligence Service (http://www.cmie.com)
  - Regional Monitoring Service (http://www.cmie.com)
  - J-gate Custom Content
- Library added/renewed the following CD-ROM databases during the period
  - AGRIS (1975 onwards)
  - Maths Science Disk (1940 Onwards)
  - AGRICOLA (1970 Onwards)
  - Annual Survey of Industries 1973–74 to 1997–98
  - Districtwise Agriculture Database of Maharashtra 1960–61 to 1997–98
  - Economic and Political Weekly 2003 to 2005

Statistics Relating to the Library

S.No.	Item	Number
1.	Number of books added (English)	247
2.	Number of books added (Hindi)	312
3.	Number of grey literature added	227
4.	Number of Indian journals subscribed	54
5.	Number of Foreign journals subscribed	57
6.	Number of On-line journals subscribed (Indian and Foreign)	46
7.	Number of electronic and printed thesis added	14
8.	Number of publication issued from the library	11,512
9.	Number of users visited library website	30,156
10.	Number of articles (E+P) received from DELNET	81
11.	Number of books received on Inter-library loan through DELNET	17
12.	Number of outside users accessed e-services in library premises (NARS)	1,389
13.	Number of publication lent out on inter-library loan	58
14.	Number of readers visited and consulted the library	11,516
15.	Number of scientific and technical papers reprographed (pages)	16,960
16.	Number of CD-ROM databases added	6
17.	Number of CD-ROM added	67
18.	Internet/databases access searches	50,873



Technology Assessed and Transferred

National Research Centre on Rapeseed and Mustard

α-designs have been suggested to be used in the experiments conducted by National Research Centre on Rapeseed and Mustard. These designs are resolvable incomplete block designs and a Monograph has been published for the benefit of the experimenters. The parameters for which alpha designs were recommended are: (i) $v = 12$, $b = 6$, $r = 3$; (ii) $v = 15$, $b = 9$, $r = 3$; (iii) $v = 18$, $b = 9$, $r = 3$; (iv) $v = 21$, $b = 9$, $r = 3$; (v) $v = 24$, $b = 12$, $r = 3$ and (vi) $v = 28$, $b = 12$, $r = 3$. These designs were developed during the preparation of Monograph on alpha designs.

Rice-Wheat Consortium for Indo-Gangetic Plains

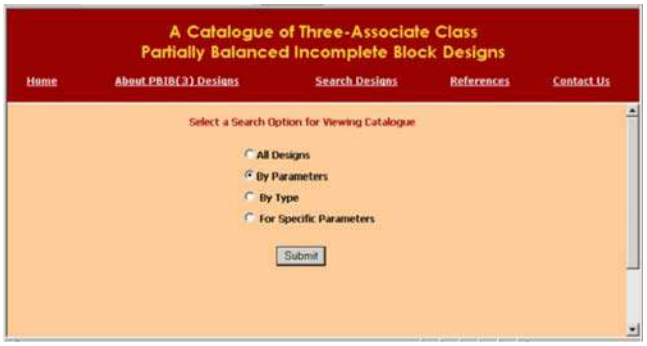
Farmers' Participatory Research Trials in Indo-Gangetic Plains for conservation agriculture are designed and managed by farmers, the researchers have only advisory role in the selection of the resource conservation technologies (RCT). Farmer has full control over the selection of treatments to be tested on his/her field(s). The main objective of these trials is to establish and demonstrate the benefits of resource conservation technologies such as zero tillage, furrow irrigated raised bed planting system, fresh beds, reduced tillage, etc. over the conventional tillage practices. In these trials, farmers are briefed about new practices. The participating farmers are given full control over the selection of subset of resource conservation technologies to be tested on their fields with a view to assess farmer innovation and acceptability. They are also given the freedom to modify the treatments such as number of ploughings in reduced tillage, number of ploughings in conventional tillage, number of irrigation, leaving residue in the field, complete burning of the residue, zero tillage with different machines such as double disc, happy seeder, etc. as per their choice and availability of equipments. Further, date of sowing vary widely over years from treatment to treatment. Often as many treatments will arise as there are farmers.

Further, Farmers Participatory Research Trials are conducted over different regions and over years. The RCT options may have an interaction with regions and/or years. It is desired to identify the RCT options that are suitable over regions/years. It is desired to identify the varieties that are most suitable for zero tillage, bed planting systems, etc. Therefore, different varieties are included in Farmers Participatory Research Trials. Generally, the variety to be used is the prerogative of the participatory farmer. Farmers Participatory Research Trials may have different soil types or land leveling. The aim is to study the interaction between treatments and varieties/soil types/land leveling. When varieties, soil types, years, regions, land leveling, etc. are considered as environments and RCT options as treatments then it amounts to studying the treatment × environment interactions. If there is no treatment × environment interaction then the best RCT option may be identified by averaging over the environments. If treatment × environment interaction is present then first one needs to identify whether the interaction is a cross-over (treatment ranks change from one environment to another) or non-cross-over type where treatment difference change in magnitude but not in direction among environments. In non-cross-over interaction the treatments with superior mean can be used in all the environments. If there is cross-over interaction, then the subsets of treatments are to be recommended only for certain environments. Therefore, it is important to test for cross-over interactions. In case of cross-over interactions, one-way to identify the sub-sets of treatments for certain environments is to use the technique of biplot. Analytical techniques using linear mixed effects models and biplots have been developed for the analysis of data from these trials. These techniques have been passed on to the research personnel involved in conduct of Farmers Participatory Research Trials in association with Rice-Wheat Consortium for Indo-Gangetic Plains.

A web-based catalogue of **"Three-associate Class Partially Balanced Incomplete Block [PBIB(3)] Designs"** has been developed for the benefit of the agricultural scientists and made available in the Institute's website (www.iasri.res.in).

A draft manual on **"Methodologies for Assessing Impact of Fisheries Research"** was developed in collaboration with NAARM, Hyderabad under the project, "Impact Assessment of Fisheries Research in India". This methodological manual will assist the researchers, academicians, policy makers and planners in assessing the impact of the technologies developed specially in fisheries sector for future planning.

Expert System on Wheat Crop Management is a tool that will transfer and extend technology to the farmers on wheat crop management.



Search options provided for viewing the list of design(s)

S.No.	v	b	r	k	N	λ_1	λ_2	λ_3	n_1	n_2	n_3	Type
1	25	5	2	10	50	2	1	0	4	10	10	Circular
2	25	5	3	15	75	3	2	1	4	10	10	Circular
3	25	5	4	20	100	4	3	3	4	10	10	Circular
4	25	100	12	3	300	2	1	0	8	8	8	NC3 Cyclic
5	25	50	16	8	400	12	4	3	4	4	16	Rectangular
6	25	50	18	9	450	7	10	4	8	4	12	Square
7	25	20	8	10	200	8	5	2	1	6	17	Diagonal
8	26	26	12	12	312	0	5	6	1	12	12	Rectangular
9	27	36	8	6	216	0	1	2	2	8	16	Rectangular
10	27	27	13	13	351	4	7	6	6	12	8	Cubic

Output displaying parameters of the sorted out designs

6

Education and Training

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 the 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)**
Two students were admitted and 4 students completed the Ph.D. (Agricultural Statistics) degree.

(b) **M.Sc. (Agricultural Statistics)**
Five students were admitted and five students completed the M.Sc. (Agricultural Statistics) degree.

(c) **M.Sc. (Computer Application)**
Five students were admitted and three students completed the M.Sc. (Computer Application) degree.

Details of students completed various courses during 2006-07 is as follows:

Ph.D. (Agricultural Statistics)

(i) Sandipan Bhattacharyya—Some investigations on repeated measurements designs

Repeated measurements designs form an important class of designs that has been advantageously used in dairy feeding trials, long-term experiments, clinical trials, etc. These designs are also known as change over designs and switch over designs. In these designs each experimental unit receives a sequence of treatments over a number of periods with observations recorded in each period. In this study, two new classes of partially balanced repeated measurements designs have been proposed. For the first class only the presence of first order residuals effects of treatments have been assumed whereas for the second class presence of first and second order residual effects have been considered. These designs are based on the circular association scheme. An outline of the method of analysis of these designs has been given along with an illustration. A modification of these designs, called repeated period partially balanced repeated measurements designs, has also been dealt with for the first class. Universal optimality of a class of balanced repeated measurements designs has been established for the estimation of direct, first and second order residual effects. Besides, the double-extra-period balanced repeated measurements designs, obtained by repeating the treatments of the last period in two succeeding periods for this class, are shown to be universally optimal for the estimation of second order residual effects. Moreover, one class of three-period balanced repeated measurements designs considering direct, first and second order residual effects has been proposed. Universal optimality of these three-period designs has been established after making them circular for the estimation of direct, first and second order residual effects. Lastly, efficient two-treatment repeated measurements designs are obtained using efficiency factors when the errors are auto-correlated, considering (i) first order residual effects of treatments, and (ii) first and second order residual effects of treatments.

Guide: Dr. V.K. Sharma

(ii) Subrata Kumar Satpati—Computer aided search of efficient designs for dependent observations

In many field experiments, the observations are mutually correlated through some systematic pattern of environmental variations. For example, plots occurring close together within a field area are well known to be more similar than plots occurring far away from each other. Whenever spatial contiguity is used as criteria for blocking, it is often the case that the experimental units occurring close together within spatial blocks created are correlated or that there may exist significant trends even within small blocks caused by things like fertility gradients within fields. In general three different types of correlation structures may exist among the observations within a block namely, (i) Nearest Neighbors correlation structure in which the same amount of correlation ($\tilde{n}$) exists between the observations in the nearest neighboring units i.e. the plot positions differ by 1 within a block, (ii) AR(1) correlation structure in which the same amount of correlation ($\tilde{n}$) exists between the observations in the nearest neighbors and the correlation decreases at a geometric progression rate among the observations as the difference in their positions increases and (iii) Equi-correlation structures in which the same amount of correlation ($\tilde{n}$) exists between the observations within a block. Further, in each type of correlation structure it is assumed that the observations from different blocks are independent. In the present investigation computer algorithms have been developed by making modifications in the existing algorithms for searching efficient designs for correlated observations for various experimental settings, like block designs, nested block designs and change-over designs.

Using this algorithm, a computer aided search of efficient block designs for making all possible pairwise treatment comparisons is made for v (number of treatments) ≤ 10, b (number of blocks) $\leq$ min(33, int[100/k]), k (block size) $< v$ such that n (total number of observations) = $bk \leq 100$. The bounds on ρ so that the correlation structure Ω is positive definite differs

according to the correlation structure assumed. NN and AR(1) correlation structures are considered for rectangular blocks and NN correlation structure for circular blocks. Efficient designs are obtained for $-0.50 \leq \tilde{n} \leq 0.50$ for NN correlation structure in rectangular blocks; $-0.95 \leq \tilde{n} \leq 0.95$ for AR(1) correlation structure in rectangular blocks and $-0.45 \leq \tilde{n} \leq 0.45$ for NN correlation structure in circular blocks. In practice, the value of the correlation coefficient between correlated observations may not be known exactly. Robust designs have been identified.

Designs efficient for correlated observations are position dependent and lack within block randomization. Therefore, robustness aspects of designs that are efficient for zero correlation structure has been studied by performing randomization 5000 times, and for all these randomized layouts, the lower bounds to A- and D-efficiencies have been obtained for a given correlation coefficient and correlation structure. The ranges of $\tilde{n}$ for different correlation structures when the loss in minimum efficiencies is less than 10% and 1% are obtained and the robust designs are catalogued.

Guide: Dr. V.K. Gupta

(iii) Ananta Sarkar—A study on design and analysis of microarray experiments

In microarray experiments, the four experimental factors are array (A), dye (D), variety (V) and gene (G). These four experimental factors give rise to $2^4-1=15$ possible experimental effects excluding the general mean. Out of these 15 possible experimental effects, seven effects, viz. array (A), dye (D), variety (V), gene (G), array-gene interaction (AG), dye-gene interaction (DG), variety-gene interaction (VG) effects are of main interest to the experimenter. In the present investigation, we have considered experimental situations where the same set of genes is spotted on each array. Therefore, gene/gene specific effects (G, AG, DG, VG) are orthogonal to global effects (A, D, V). Optimality aspects of designs for microarray experiments, can therefore, be studied leaving gene specific effects from the model, i.e., by taking only array, dye and variety effects in the model. Designs that are good under the model containing global effects are also good under the model containing both global and gene specific effects.

In 2-colour microarray experiments, only two varieties labelled with two different dyes can be accommodated on one array; therefore, arrays may be considered as blocks of size 2. Further, array effects may be taken as random. To deal with the problem of obtaining efficient designs when array effects are random, the lower bounds to the A- and D-efficiencies of the designs in a given class of designs have been obtained for block designs under mixed effects model. The existing algorithm based on exchange and interchange of treatments has been modified by incorporating the procedure of computing lower bounds to A- and D-efficiencies under mixed effects model. The algorithm developed is general in nature and can be used for generation of efficient block designs for any $2 \leq k < v$, where v is the number of treatments (varieties) and k is block size. Using this algorithm, efficient block designs for microarray experiments have been obtained in the parametric range $3 \leq v \leq 16$, $v \leq b \leq v(v-1)/2$ and $17 \leq v \leq 25$; $b = v$ and $k = 2$, where b is the number of arrays/blocks. A total of 569 designs including all the 14 unreduced balanced incomplete block designs in this parametric range have been obtained. Efficient block designs obtained under fixed effects model have been compared with the best available designs (designs with highest lower bound to A-efficiency) in literature and 2-associate partially balanced incomplete block designs. 30 designs are found to be more efficient than the best available block designs. The robustness aspects of designs obtained and best available block designs have been investigated under mixed effects model. Out of 30 more efficient designs, 7 designs are found to be strongly robust, 18 designs are found to be robust and the remaining 5 designs are non-robust.

Efficient block designs for 2-colour microarray experiments have been obtained under a restricted model involving array and variety effects. The dye effects have been ignored from the model, since in microarray experiments, the two varieties appearing on the array are to be labeled with two different dyes. If the variety at position 1 in a block is labeled with dye 1 and the variety at position 2 is labeled with dye 2, then the block contents should be so arranged that the varieties are most balanced with respect to dyes. Further, if dye effects are included in the model, then the structure of the design becomes that of a row-column design where arrays represent columns, dyes represent rows and varieties represent treatments. Efficient row-column designs have been obtained in the parametric range $3 \leq v \leq 10$, $v \leq b \leq v(v-1)/2$; $11 \leq v \leq 25$, $b \leq v$ and $(v, b) = (11, 13)$, $(12, 14)$, $(13, 14)$ and $(13, 15)$, where b is the number of arrays/columns by modifying the existing exchange and

interchange algorithm of row-column designs. A total of 139 designs have been obtained. Efficient row-column designs obtained under fixed effects model are then compared with the best available designs (block designs with highest A-efficiency under row-column set up after rearranging the block contents in such a fashion that the varieties are most balanced with respect to dyes) and even designs (designs in which replication of each variety is even). 45 designs are found to be more efficient than the best available designs and 90 designs obtained are more efficient than the best even designs. Robustness aspects of designs obtained and best available designs are then investigated under mixed effects model. Out of 45 more efficient designs, 9 designs are found to be strongly robust, 22 designs are found to be robust and the remaining 14 designs are non-robust.

The catalogues of all efficient block designs and row-column designs obtained and the best available designs have been prepared along with their lower bounds to A- and D-efficiencies under fixed/mixed effects models and their robustness status. Strength of the algorithm for obtaining block designs/row-column designs for 3-colour microarray experiments has also been demonstrated with the help of examples.

After the conduct of experiment using an appropriate design, the next step is analysis of data to identify differentially expressed genes from microarray experiments. We have developed analytical procedure based on single-step mixed effects model as well as two-stage linear mixed effects models considering array effects as random to identify differentially expressed genes from microarray experiments. The analytical techniques developed have been illustrated using real life data sets.

Guide: Dr. Rajender Parsad

(iv) Nilesh Kumar Gupta—On spatial prediction modelling

In regression models when parameter of interest is geographical in nature the regression coefficients do not remain fixed over space. When the regression model is applied to geographical data where each sample observations correspond to a geographical location, space plays no role in the modeling process. To overcome this problem geographically weighted regression was used and the regression model centered at each point p_i could be thought of as a weighted ordinary least square regression. If the concept of spatial dependence was introduced into the weight functions using the spatial variogram models approach then the technique obtained was considered as improved technique over the weights obtained by distance of neighbourhoods.

The yield data obtained from crop cutting experiments (CCE) and the corresponding locations of yield data in terms of latitude and longitude was identified. The spatial statistics was employed to the data of yields and locations to determine the spatial model of best fit along with its parameters. With the help of best fitted spatial model ordinary kriging method was used for spatial prediction at unsampled locations. Ordinary kriging gives both a prediction and standard error of prediction at sampled as well as unsampled locations. Also, production surface was obtained using ordinary kriging method in the form of grids of desired size. With the help of spatial model the yield values will be generated corresponding to each wheat pixel of the image. Now overlay the boundary map of district on the surface of grids the production of district was obtained. To get the production of individual village, the village map was overlayed over the district map and the estimate of production for villages was obtained, so that we get the population of villages. The average yield and its standard deviation was obtained for each village. The statistics generated in this way was attached to the centroid of each village. Large number of samples of different sample sizes of the villages was selected with the help of Simple Random Sampling for the analysis. The neighborhood criterion was decided for the villages and accordingly the spatial weights were assigned to the sampled villages for spatial regression analysis. The weights were based on the approach followed by Brunsdon *et al*. (1998). The weights will also be assigned with the help of best-fitted variogram model to the data. Same samples were used for the analysis following Bayesian approach of prediction. The prior distribution of the parameters was simulated by incorporating the properties of the empirical distribution from the yield data generated in by the above simulation for each village. Similarly, in case of fuzzy prediction analysis the centers and the width of the fuzzy parameters/variables under consideration were obtained with the help of data generated in the simulation process of each village. In all above procedures the accuracy of the prediction was compared on the basis of the expected residual errors/ width size.

Guide: Dr. Anil Rai

M.Sc. (Agricultural Statistics)

(i) Priya Kohli—Study on supersaturated designs

A supersaturated design (SSD) is a fraction of a factorial replication in which the number of factors (q) is greater than the number of experimental runs (N). These designs are very cost-effective and as such are useful when experimentation is expensive and the number of factors is large. Since the number of runs is less than the number of factors, non-orthogonality is introduced in such designs in the sense that the parameters are not estimated independently. Thus, the analysis and construction of efficient SSDs is very challenging. Motivated by the construction of SSDs, we have developed an exchange algorithm to construct two-level SSDs. It works on a selected column and modifies a pair of coordinates in this column. A catalogue of designs generated from the algorithm in the range $N \leq 50$, $N+1 \leq q \leq 75$, has been prepared. We have, however, in this thesis reported the designs in the range $N \leq 16$, $N+1 \leq q \leq 75$. Comparison of the designs obtained from above algorithm with SSDs available from other methods was also made. Further an algorithm for the construction of multi-level SSDs was developed. This algorithm generates multi-level SSDs through saturated orthogonal arrays. A catalogue of multi-level SSDs was also prepared in the range $N \leq 100$, $q \geq N+1$, $2 \leq s \leq 5$.

Guide: Dr. R. Srivastava

(ii) Nurnabi Meherul Alam—Some analytical techniques for long-term fertilizer experiments

Long-term fertilizer experiments are those experiments, which are conducted on same set of experimental units over a sequence of years with a pre-planned sequence of crops and graded level of fertilizer treatments. The fertilizer experiments are often used to establish a suitable functional relationship between the response and applied nutrients. The established relationship may change its form from year to year. Alternately, these long-term experiments are also analysed as per design adopted. Years are often statistically significant and inconsistency of treatment effects over years enters into significant Year x Treatment interaction, which are difficult to interpret. There seems to be need to complement the usual ANOVA analysis for interpretation of Year x Treatment interaction. Keeping this in view, the objectives of this study were:

(i) To establish the year-wise relationship between response and applied nutrient by including the initial soil test values of major nutrients (available N, P, K) and study the homogeneity of these functional relationship over years.

(ii) To evaluate long term fertility experiments by stability analysis and relative stability analysis and to observe possible benefits of these analyses to compliment the conventional analysis of variance procedure.

The response function studied were undertaken on 6 years data of Rice-Rice Cropping System experiments conducted at R.S. Pura centre under AICRP on Cropping System. Including the terms corresponding to soil parameters like available N, available P and available K modified the usual quadratic fertilizer response model. Year-wise models were obtained for *Kharif* Rice and *Rabi* Rice crops. The test of homogeneity of regression coefficient revealed that the given data set can be split into two groups of year (High and Low) on the basis of soil test values for obtaining the fertilizer recommendations. Stability analyses which consist of regression of the yearly treatment mean with the adjusted environment mean (adjusted for time trends) was undertaken on 20 years soybean and wheat data collected under the Ranchi centre of AICRP on LTFE. The analysis was undertaken for soybean, wheat crop individually and also for soybean – wheat cropping system (in term of monetary value) at constant prices.

Stability analysis results revealed that the treatments T_1 (50% NPK), T_3 (150% NPK), T_5 (100% NPK + lime), T_8 (100% NPK + FYM) and T_9 (optimal NPK + sulphur source) were found to stable for soybean and wheat yields in the sense that their performance is in consonance with the environment effect. Treatment T_7 (100% N alone) and T_{10} (no manure) were not found to be stable. Similar results were obtained for the analysis of monetary return of the wheat – soybean Cropping System.

Guide: Dr. P.K. Batra

(iii) Ranjit Kumar Paul—Robust analysis of designed experiments

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 or the observations are non-normal then the conclusion drawn from the experiments may be wrong. Outliers may arise in the experimental setup due to insect of pest attack in some

particular plot or mistakes may occur during recording of the data. Only one observation needs to move towards infinity to make a marked change in the parameter estimates. Therefore, robust method of estimation of parameters is advocated. The most important robust methods are M-estimation and Least Median of Squares (LMS) estimation. In M-estimation a function of errors in minimized whereas in least squared the error sum of squares in minimized. In the least squares estimation all the observations are given equal weight and that is unity. But if any observation is found to be outlier in the data set then it must get some lesser weight than that of the normal observations. This concept is utilized in the M-estimation. Different functions of robust estimation are available in the literature that is extensively used in the linear regression model. These functions are made used in the experimental setup also by slight modification. A new function for its application in the design of experiments is also proposed. It was observed that the newly proposed function performs very well in present of outliers in the sense that it will produce minimum average variance of a set of orthonormal contrasts in most of the cases. Least Median of Squares estimation utilizes a subset of the data. In the design of experiments experience says that only one or two outlying observations are generally present in the data set. Therefore, the LMS method is modified for its application in the design of experiments that utilizes the set of *n*-1 of *n*-2 observations. Of course it is more advantageous to apply M-estimation than that of LMS because it does not delete any observation.

Guide: Dr. L.M. Bhar

(iv) Prasenjit Pal—Model based estimation of finite population mean square using double sampling

The approach of estimation of parameter of interest in the traditional survey sampling theory is popularly called as "design based". Within the design based approach frame work Horvitz and Thompson (1952) drew attention to the existence of many different classes of estimators and that it may not be possible to find an estimator which is best in all the classes of estimators. These developments subsequently led to the result by Godambe (1955) about the non-existence of Uniformly Minimum Variance Unbiased Estimator (UMVUE). An offshoot of this development was that attempts were made to try alternative approaches to the problem of estimation of finite population mean/total etc. The underlying idea was to obtain "best estimators" within finite population frame work. An approach popularly called as model based approach was also tried. The main advantage of the approach is that it is possible to get the best estimators although the concept of best estimators is tried to a particular model. Thus, if the assumed model is different from the previous model than the model based approach may lead to seriously misleading inferences.

Till sometimes back the major emphasis in survey sampling theory was on estimation of linear parameters like population mean or total. Although model based estimation of quadratic parameters like finite population mean square was also tried, this was limited to the case when auxiliary information is assumed to be known for all the units of the population. In this dissertation an attempt was made to develop predictor for the finite population mean square under linear model set up when the auxiliary information was assumed unknown for all the units of the population. Accordingly a double sampling based predictor of finite population mean square ($\hat{T}_Q'$) was developed. It was shown to be design model unbiased. An expression for the variance was developed. The efficiency comparison of the proposed predictor was made vis-à-vis a predictor which utilizes auxiliary information for all the units of the population ($\hat{T}_Q$) assuming that cost is incurred to collect information on the auxiliary character under a suitable cost function. As a matter of fact cheaper the cost of collection of auxiliary variables vis-à-vis the character under study better is the performance.

Guide: Dr. U.C. Sud

(v) Nitiprasad Namdevrao Jambhulkar—Statistical investigations on QTL detection in maize

Quantitative traits are the traits controlled by many genes and each of the genes has a small effect on the trait. The loci controlling quantitative traits are referred to as QTLs (Quantitative Trait Loci) and the procedure of finding and locating the QTLs are called QTL mapping. The available literature on use of molecular markers for detecting loci influencing the performance of maize in drought stress is very scanty in India, so the data considered belongs to maize crop in drought stress, for the present investigation. Mapping population with 236 RILs (Recombinant Inbred Lines), using $Ac7643S_5$ (drought tolerant) and Ac7729 (drought susceptible) as male parent, at CIMMYT and evaluated in India under AMBIONET (Asian Maize Biotechnology

Network), Maize Genetic Unit, IARI was considered for the present investigation. Phenotypic data on different plant characters was utilized for the present study. Genotypic data on RILs obtained through 138 RFLP markers and a linkage map of a total length of 2250 cM with an average density of 17 cM were used for QTL detection. Genotypic data was obtained through molecular marker assay whereas phenotypic data was derived from evaluation of mapping population of the target traits of interest. The analysis was done using software QTLMapper (version 1) and it was found that marker MK28 was main-effect on four traits, marker MK28, MK101 and MK34 had main-effect on two traits. Interaction effect was also found in different marker pairs. The results were obtained considering the main and interaction effect of markers. For the study the data available on two environments Hyderabad and Karimnagar were considered, for examining QTL × environment interaction. The results on QTL detection were obtained considering the main-effect markers and interaction between markers. Further, the data are subjected to QTL × environment interaction and corresponding results were also obtained on QTL × environment interaction. The results were also obtained using Jackknife procedure and Bayesian methodology and from the results, it was seen that the results obtained by Jackknife and Bayesian methods were very much similar.

Guide: Dr. V.K. Bhatia

M.Sc. (Computer Application)

(i) Kaushik Bhagwati—GIS assisted farm management information

GFMIS is a web based user-friendly, integrated solution for the farm management activities, developed in Java Server Pages (JSP) and ArcView software. It is developed as comprehensive farm management software for Indian Agricultural Research Institute (IARI) research farm.

Geographic Information System (GIS) is the powerful tool that provides exact geographic information and visualization of any feature. Thus, GIS assisted Farm Management Information System helps the farm manager in better and precise decision making for scientific management of the farm. GFMIS provides map search facilities in which one can visualize the location of various features such as the distribution of Irrigation, road network, location of residential area and divisions, distribution of soil layers/series etc. Also provides search facility for plot, crop, variety, soil type, fertilizer, infestation, water source, and year wise information. The software also provides keyword wise searching facility. Users can also view customized reports on various aspects of farm. User can interact with subject specialists through e-mail.

On-line help is provided for both administrator and user. The feature of providing information to users through frequently asked questions has been included in this software. Information on various activities being undertaken in various divisions of IARI is also available in GFMIS which contain the General map and Plot map.

It has a three-layered architecture. Client Side Interface Layer is implemented in HTML and JavaScript. Server Side Application Layer is implemented in Java Server Pages, ArcView for generation of Thematic maps and Java Database Connectivity. Database Layer is implemented in Microsoft Access 2000. GFMIS can be implemented as a network-based system with a server at IASRI so that information is available on-line. GFMIS runs at any node of the Internet through a browser. Security features are provided in such a way that only concerned person can access the database.

Guide: Dr. P.K. Malhotra

(ii) Nisha Jha—Information system on post-harvest management of citrus fruit (*Kinnow mandarin*)

Information System on Post-harvest Management of Citrus Fruits (*Kinnow mandarin*) (InPhoCFK) is a Web-based Information System to provide information to farmers, students, research personnels on post-harvest management of citrus fruits. CIS (Computer based Information System) has great importance in horticulture as experts are not always available to answer farmers' query. InPhoCFK has modules to provide information on various aspects to farmers, etc. Information on citrus fruits varies from the general information, state wise statistics, harvesting methods, storage practices, packaging, transportation modes, processed products, and processing industry details etc. A simple query and report generation facility is provided with the software, so that it is easy to get the information 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 from the software. They can

also ask questions regarding the software to the concerned experts by sending an e-mail; this facility is included in the software itself. Users can also view some frequently asked questions (FAQs) regarding various queries.

InPhoCFK is developed using ASP.NET. It is a new web-based technology in the scenario. It is an easy and effective tool to develop web-based applications. Database part is developed using SQL Server 2000. It is the database widely used for its simplicity and ease in operation.

Guide: Dr. R.C. Goyal

(iii) Anesh Raj Y.—Information system on cropping sequence experiments

The information technology is changing at a very rapid rate and the information needs are growing day by day. The recent advances in computer and communication technology have made computer more affordable, user friendly and have resulted in faster processing of the information. The information technology also plays an important role in the field of agriculture. Agricultural Research in India is undertaken at various Agricultural Research Institutes of ICAR, State Agricultural Universities etc. Large number of agricultural field experiments is conducted in the country for the development of new agro-technologies. The results of experiments are of immense practical value and play crucial role in increasing the productivity of various crops. For increasing the cropping intensities the research is directed to crop sequence and intercropping experiments.

Cropping Sequence refers to an arrangement of crops in temporal and spatial dimension on a given piece of land and their interactions with farm resources and available technologies. Sequence cropping comprises the planting of two or more crops in the same plot one after other. Cropping Sequence Experiments Information System (CSEIS) site provides information related to cropping sequence experiments, conducted at various agricultural research stations in the country, their data and results. The information has been hyper-linked so that users can view the information in an easy manner. It aims to act as reference material for scientists, research workers and those who are working in the field of agricultural sciences. As improved systems on component technologies will become available, they will replace or be linked to the system.

It has a three-layered architecture. Client Side Interface Layer is implemented using HTML and JavaScript, Server Side Application Layer using Java Server Pages (JSP) and Java Database Connectivity. Database Layer is implemented using Microsoft Access 2000. CSEIS can be implemented as a network-based system with a server at a central location (IASRI) so that information is available on-line. Security features are provided in such a way that only authorised person can access the database. The authentication has two levels, viz. end user and administrator. End users can access the information system only whereas Administrators can access, update, insert and delete information in the database. The features of the information system include online addition, modification and deletion of the information, search facility, report generation, on-line help scheme etc.

This information system will provide information's regarding following aspects of the cropping sequence experiments: location details, experimental site history, cultural and other practices followed, objectives of the experiments conducted, details about treatments, details about design used, general crop conditions, summary results and/or plot wise observations for each of the crops in the sequence and over all results obtained.

Guide: Dr. V.K. Mahajan

NATIONAL/INTERNATIONAL TRAINING PROGRAMME

Senior Certificate Course in Agricultural Statistics and Computing

Senior Certificate Course in Agricultural Statistics and Computing was organised for the benefit of research workers engaged in handling statistical data collection, processing, interpretation and employed in Research Institutes of the Council, State Agricultural Universities and State Government Departments, etc. and foreign countries including SAARC countries. The main objective of the course was to train the participants in the use of latest statistical techniques as well as use of computers and software packages.

The course was organised during the period 03 July 2006 to 23 December 2006. The course comprised of two independent modules of three months duration each. Six officials including one Departmental candidate participated in both the modules. Module-I was organized during 03 July 2006 to 30 September 2006. One official participated in Module-I only.

Module-II was organised during 09 Oct 2006 to

A participant receiving the certificate after completing "Senior Certificate Course in Agricultural Statistics and Computing"

23 December 2006. Two officials participated in Module-II only. The course covered under both the modules included Statistical Methods and Official Agricultural Statistics, Use of Computers in Agricultural Research, Sampling Techniques, Econometrics and Forecasting Techniques, Design of Experiments and Statistical Genetics.

The Valedictory Function for the course was held on 23 December 2006 in which Dr. SD Sharma, Director, IASRI distributed the certificates to successful participants.

Programme under Centre of Advanced Studies

- A 21 days training programme on "Statistical Methods for Agricultural Research with Use of Software" was organized during 01 to 21 November 2006 under aegis of Centre of Advanced Studies in Agricultural Statistics and Computer Applications. The training programme was attended by 20 participants from various ICAR Institutes and State Agricultural Universities. Dr. Seema Jaggi was the Course Director for the training programme. The training programme was aimed at providing the participants opportunity to study and learn some sophisticated techniques of data analysis using softwares which may help them in analysis and interpretation of their results more meaningfully, with better sense of reliability and confidence. In particular, this course was designed to acquaint researchers with the techniques of data collection, statistical analysis, interpretation and presentation of results. The course was oriented towards application and a combination of lectures, exercises, and hands-on exercises on SPSS/SAS/MS-EXCEL. A web page was designed regarding the details of the training and was attached in our Institute's website. This course was intended primarily for scientists undertaking agricultural research. In all 20 participants from various disciplines of Agriculture representing different ICAR Institutes (9) and State Agricultural Universities (11) attended this training.

  The topics were covered under following four modules (i) Statistical Softwares and Information Systems in Agricultural Research, (ii) Statistical Methods in Agricultural Research, (iii) Planning of Agricultural Experiments/Surveys and (iv) Modern Approaches to the Analysis of Agricultural Data. Concepts were explained largely without using much of mathematics using computer software and the course emphasized on understanding that which analysis is appropriate to use and correct interpretation of the results. 22 faculty members from the institute and 7 guest speakers (Prof. B.K. Sinha, Prof. T. Krishnan, Prof. R.L. Karandikar, Prof. Navneet Goyal, Dr. B.M. Prasanna, Dr. Rabi Narayan Sahoo and Dr. Girish Kumar Jha) delivered lectures during this training. Course material in the form of Reference Manual and Electronic Manual was provided to all the participants.

Inauguration of a training programme on "Statistical Methods for Agricultural Research with Use of Software"

- A 21 days training programme on "Design & Development of Web based Application using .NET Technology" was organized during 22 November to 12 December 2006 under aegis of Centre of Advanced Studies in Agricultural Statistics and Computer Applications. The training programme was attended by 20 participants from various ICAR Institutes and State Agricultural Universities. Mrs. Alka Arora was the Course Director for the training programme.

This training programme offered sufficient practical knowledge to develop and host a web application using Microsoft .NET technology on IIS Web Server. In brief the practicals were divided into four modules—Hypertext Mark-Up Language (HTML), Internet Information Server, SQL Server and ASP.NET. Major areas covered were Web Portals, An Overview, Role of Information

A participant receiving the certificate during Valedictory Function of CAS training programme on "Design & Development of Web based Application using .NET Technology"

Communication Technology in taking Scientific Knowledge/Technologies to the End Users, Data Warehouse and its Applications in Agriculture, On-line Library Information System, Web Application Architecture, Introduction to .NET Framework, Working with HTML (Structure, Formatting, Tables and Images), Demo of Training Site for HTML Controls, VB.NET Language Concepts, OOPS Concepts using VB.NET, Introduction to Web Server (IIS), Configuration & Development of Web Application, Concepts of RDBMS, Structured Query Language, Overview of SQL Server, Creation of Tables, Views using SQL Server Enterprise Manager, Introduction to Visual Studio.NET, Introduction to ASP.NET, ASP.NET Web Application, Web Controls, Accessing Database with ADO.NET, Manipulating data with ADO.NET, securing ASP.NET Web Application etc. Guest Lectures on Consuming and Creating Web Services, Report Generation, XML, State Management and Mobile Controls & Advances in Microsoft Technologies were also arranged.

- A 21 days training programme on "Advances in Data Analytical Techniques" was organized during 08–28 February 2007 under aegis of Centre of Advanced Studies in Agricultural Statistics and Computer Applications. Dr. Rajender Parsad, National Fellow was the Course Director for the training programme.

The training programme was aimed at familiarizing the participants with the advances in statistical data analysis for making inferences from agricultural research data and to acquaint the participants with the use of statistical software packages SAS/SPSS/MINITAB/SYSTAT. This course was intended for the scientific research personnel working in the National Agricultural Research System. The training programme was attended by 19 participants from various disciplines of Agricultural Sciences representing different ICAR institutes (13) and State Agricultural Universities (6). The entire course for this programme was structured in a series of six modules namely (i) Computer Usage and Statistical Software Packages, (ii) Basic Statistical

Inauguration of a CAS training programme on "Advances in Data Analytical Techniques"

Techniques consisting of Statistical Methods and Inference, Design of Experiments and Sample Surveys, (iii) Diagnostics and Remedial Measures, (iv) Applications of Multivariate Techniques, (v) Modelling and Forecasting Techniques in Agriculture and (vi) Other Useful Techniques such as Bio-informatics, Geoinformatics, Microarrays, Nanotechnology in agriculture, DNA fingerprinting, Biplots, etc.

The course material was distributed to the participants at the beginning of the programme in the form of Reference Manual in two volumes that consisted of 834 pages. The course contents were completed in 64 lectures. 8 practical exercise/ participants presentation sessions were also given. 21 faculty members from the Institute and 10 guest

speakers (Professor Bikas Sinha, Member, National Statistical Commission; Dr. Aloke Dey, Professor, ISI, Delhi Centre; Dr. T. Krishnan, Crane Softwares, Bangalore; Dr. A.K. Singh, Project Director, WTC, IARI; Dr. Navneet Goel , BITS, Pilani; Dr. B.M. Prasanna, Division of Genetics, IARI; Dr. T.R. Sharma, NRC on Plant Bio-Technology, IARI; Dr. R.N. Sahoo, Division of Agricultural Physics, IARI; Dr. Girish Kumar Jha, Division of Agricultural Economics, IARI and Dr. K.V. Bhat, NBPGR) delivered the lectures. Among the 31 faculty members 8 were IARI Best Teacher Awardees.

- One International training programme for a trainee from NARC, Nepal on "Biometrics in Agricultural Research" was organised during 04 October to 29 November 2006.

Inaugural session of International training programme on "Biometrics in Agricultural Research"

OTHER TRAINING PROGRAMMES

- Training programme on "Design and Analysis of Experiments for Rapeseed-Mustard Varietal Trials" for the plant breeders and statisticians of All India Co-ordinated Research Project on Rapeseed-Mustard, National Research Centre on Rapseed-Mustard, Bharatpur was organized during 10–11 May 2006.

  13 participants attended the training programme, 8 participants were from State Agricultural Universities and 5 from ICAR Institutes. Dr. Rajender Parsad was the Course Director. The topics covered in this training programme included Fundamentals of Design of Experiments, MS-Excel: Analysis of Experimental Data, SPSS: An Overview, Combined Analysis of Data and Stability Analysis. Participants have analyzed some of the data sets on their own. The preparation of data and important characters such as seed yield, oil content and plant stand were finalized on which replicated data should be collected. It was also decided that the randomized layout should also be provided along with data to the co-ordinating unit.

Inaugural session of training programme on "Design and Analysis of Experiments for Rapeseed-Mustard Varietal Trials"

- A Summer School on "Sample Survey Techniques in Agricultural Research" was organised at the Institute during 05–25 September 2006 for Assistant/Associate Professors from State Agricultural Universities (SAUs) and Scientists from ICAR Institutes. Dr. K.K. Tyagi was the Course Director. The broader objective of the Summer School was to provide exposure to the participants to the different sample survey techniques in agricultural research as well as to help to upgrade their capabilities in research, teaching and training. 23 participants participated in the Summer School. The main topics covered were overview of survey sampling in relation to agricultural research, various concepts in sample survey, different procedures of sample selection, simple random sampling, stratified sampling, cluster sampling, sampling on successive occasions, multi-stage sampling, multi-phase sampling, systematic sampling, use of auxiliary information in sample surveys, small area estimation techniques in relation to national agricultural insurance scheme, use of remotely sensed data and GIS in survey sampling, simulation techniques, survey data analysis packages, planning & organisational aspects

A session of a summer school on "Sample Survey Techniques in Agricultural Research"

related to conduct of sample surveys, some recent agricultural surveys related to crops, livestock, farm mechanization etc.

Training Programme for Visitors

Following one day training programme was organised.

- Training programme on "Sensitization of Database" for the ISS officers of CSO, Govt. of India on 06 July 2006.
- Twenty participants of the course on Large Sample Survey sponsored by Ministry of Statistics & Programme Implementation, New Delhi visited on 12 December 2006.
- Thirty participants of the B.Sc. Course sponsored by CSK, Himachal Pradesh Krishi Vishvavidyalaya, Palampur visited on 20 January 2007.
- A training course on "Small Area Estimation Techniques" was organized for the 8 senior and middle level ISS officers of CSO, Ministry of Statistics and Programme Implementation, New Delhi during 10–15 July 2006.

A view of Inaugural session of a training course on "Small Area Estimation Techniques"

A view of presentation for three member delegation from Department of Statistics, Malaysia

- A study visit for three member delegation from Department of Statistics, Malaysia was organized during 01–05 August 2006. They were taken to different offices such as DES & Agricultural Census at Krishi Bhavan, Registrar General Office, CSO, so as to apprise them about their functions and activities. They were also taken to Agra under the study excursion tour. They also visited National Science Museum, NASC Complex, New Delhi.

Research Fellowship

During 2006–07, 13 Ph.D. and 26 M.Sc. students received research fellowship. 11 Ph.D. students received IARI Scholarship at the rate of Rs. 7,000 p.m. in addition to Rs.10,000 per annum as the contingent grant. 2 Ph.D. students received CSIR Scholarship at the rate of Rs. 8,000 p.m. in addition to Rs.15,000 per annum as the contingent grant.14 M.Sc. students received ICAR Junior Research Fellowship at the rate of Rs. 5,760 p.m. besides Rs. 6,000 per annum as the contingent grant and 14 M.Sc. students received IARI Scholarship at the rate of Rs. 5,040 p.m. besides Rs. 6,000 per annum as the contingent grant.

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

S. No.	Name	Year of induction
1.	Dr. VK Gupta, National Professor	1984
2.	Dr. VK Sharma, Professor (Agricultural Statistics)	1984
3.	Dr. Prajneshu, Principal Scientist	1984
4.	Dr. VK Bhatia, Principal Scientist	1987
5.	Dr. VT Prabhakaran, Principal Scientist	1987
6.	Sh. SD Wahi, Principal Scientist	1987
7.	Dr. Ranjana Agrawal, Principal Scientist	1988

S. No.	Name	Year of induction
8.	Dr. HVL Bathla, Principal Scientist	1991
9.	Dr. R Srivastava, Principal Scientist	1993
10.	Dr. UC Sud, Principal Scientist	1995
11.	Dr. KK Tyagi, Principal Scientist	1995
12.	Dr. Rajender Parsad, National Fellow	1995
13.	Dr. Anil Rai, Senior Scientist	1995
14.	Dr. Seema Jaggi, Senior Scientist	1995
15.	Dr. Chandrahas, Principal Scientist	1996
16.	Dr. PK Batra, Principal Scientist	1996
17.	Dr. Jagbir Singh, Principal Scientist	1996
18.	Mrs. Asha Saksena, Principal Scientist	1998
19.	Dr. MS Narang, Senior Scientist	1998
20.	Dr. Aloke Lahiri, Senior Scientist	1998
21.	Dr. Amit Kumar Vasisht, Principal Scientist	1998
22.	Dr. Lal Mohan Bhar, Scientist (Sr. Scale)	1998
23.	Dr. Amrit Kumar Paul, Scientist (Sr. Scale)	1998
24.	Dr. Tauqueer Ahmad, Scientist (Sr. Scale)	1998
25.	Dr. AR Rao, Scientist (Sr. Scale)	1998
26.	Dr. Ramasubramanian V, Scientist (Sr. Scale)	1999
27.	Dr. Girish Kumar Jha, Scientist (Sr. Scale)	1999
28.	Dr. Cini Varghese, Scientist (Sr. Scale)	2000
29.	Dr. Prachi Misra Sahoo, Scientist	2002
30.	Dr. RL Sapra, Principal Scientist	2002
31.	Dr. Krishan Lal, Senior Scientist	2003
32.	Sh. Hukum Chandra, Scientist	2003
33.	Sh. Amrender Kumar, Scientist	2003
34.	Md. Wasi Alam, Scientist	2003
35.	Dr. Prawin Arya, Scientist (Sr. Scale)	2003
36.	Dr. Himadri Ghosh, Scientist	2004

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

S. No.	Name	Year of induction
1.	Dr. SD Sharma, Director	1996
2.	Dr. PK Malhotra, Professor (Computer Application)	1991
3.	Dr. RC Goyal, Principal Scientist	1995
4.	Dr. IC Sethi, Principal Scientist	1995
5.	Dr. VK Mahajan, Principal Scientist	1996
6.	Dr. DK Agarwal, Principal Scientist	1999
7.	Sh. Harnam Singh Sikarwar, Scientist (SG)	1997
8.	Md. Samir Farooqi, Scientist	2001
9.	Ms. Alka Arora, Scientist	2001
10.	Ms. Shashi Dahiya, Scientist	2001
11.	Ms. Sangeeta Ahuja, Scientist (Study Leave)	2002
12.	Sh. Sudeep, Scientist (Study Leave)	2002
13.	Sh. KK Chaturvedi, Scientist	2002
14.	Sh. Vipin Kumar Dubey, Scientist	2002
15.	Sh. SN Islam, Scientist	2004
16.	Sh. SB Lal, Scientist	2004
17.	Ms. Anshu Dixit, Scientist (Study Leave)	2004
18.	Ms. Anu Sharma, Scientist	2004
19.	Ms. Rajni Jain, Sr. Scientist (at NCAP)	2007

COURSES TAUGHT DURING ACADEMIC YEAR 2005–06

Code	Title	Course Instructors
	Trimester – III	
	Agricultural Statistics	
AS-103	Elementary Sampling & Non-parametric Methods (2+1)	Jagibir Singh & Prachi Misra
AS-163	Statistical Inference (4+1)	Rajender Parsad & L.M. Bhar
AS-164	Design of Experiments-I (3+1)	Seema Jaggi & V.K. Gupta
AS-166	Statistical Genetics-I (3+1)	V.T. Prabharkran & A.K. Paul
AS-208	Bioinformatics-II (2+1)	V.K. Bhatia, Rajender Parsad, & K.V. Bhatt (NBPGR)
AS-302	Advanced Design of Experiments-II (2+1)	R. Srivastava & P.K. Batra
AS-306	Advanced Statistical Genetics-II (2+1)	A.K. Paul
AS-307	Forecasting Techniques (1+1)	Chandrahas & Ramasubramanian V.
AS-299	Seminar (1+0)	Seema Jaggi
	Computer Application	
CA-131	Data Base Management System (2+2)	Vipin Dubey & Anu Sharma
CS-132/ CA-132	Data Structures and Structured Programming/ Data Structures and Algorithms (2+1)	Shashi Dahiya & S.B. Lal
CA-134	Modeling and Simulation (2+1)	P.K. Malhotra & Samir Farooqi
CS-135/ CA-135	Computer Communication Networks (2+0)/ Computer Networks (2+1)	Alka Arora & S.N. Islam
CA-299	Seminar (1+0)	S.N. Islam

COURSES TAUGHT DURING THE YEAR ACADEMIC YEAR 2006–07

Code	Title	Course Instructors
	Agricultural Statistics	
	Trimester – I	
AS-101	Elementary Statistical Method (2+1)	V.T.Prabhakaran & S.D. Wahi
AS-150	Mathematical Methods (4+0)	Cini Varghese & Himadri Ghosh
AS-160	Probability Theory (2+0)	L.M. Bhar
AS-161	Statistical Methods-I (2+1)	V.T. Prabhakaran & Seema Jaggi
AS-167	Applied Multivariate Analysis (2+1)	Ranjana Agrawal & Amrender Kumar
As-168	Econometrics (2+1)	V.K. Sharma & Prawin Arya
AS-169	Planning of Surveys/Experiments (2+1)	M.S. Narang, R.S. Khatri & M.R. Vats
AS-200	Design of Experiments-II (1+1)	Rajender Parsad & Cini Varghese
AS-201	Sampling Techniques-II (1+1)	K.K. Tyagi & Prachi Mishra
AS-202	Statistical Genetics-II (1+1)	A.K. Paul
AS-203	Regression Analysis (1+1)	L.M. Bhar & Ramasubramanian V.
AS-204	Linear Models (2+0)	V.K. Sharma & R. Srivastava
AS-206	Optimization Techniques (1+1)	U.C. Sud & Amrendra Kumar
AS-370	Recent Advances in the Field of Specialisation (1+0)	V.K. Bhatia
AS-299	Seminar (1+0)	Seema Jaggi
	Trimester – II	
AS-102	Elementary Design of Experiments (2+1)	Krishan Lal & P.K. Batra
AS-151	Mathematical Methods in Statistics-II (4+0)	N.K. Sharma & Cini Varghese
AS-162	Statistical Methods-II (2+1)	L.M. Bhar & Ramasubramanian V.
AS-165	Sampling Techniques-I (3+1)	Tauqueer Ahmed & Anil Rai
AS-170	Statistical Modeling (2+1)	Prajneshu & Amrender Kumar
AS-171	Bioinformatics-I (3+1)	V.K. Bhatia, Rajender Parsad & K.V. Bhatt (NBPGR)
AS-205	Advanced Statistical Inference (1+1)	Krishan Lal & U.C. Sud
AS-207	Stochastic Processes (3+0)	Himadri Ghosh
AS-301	Advanced Design of Experiments-I (2+1)	R. Srivastava & V.K. Gupta
AS-370	Recent Advances in the Field of Specialisation (1+0)	Anil Rai
AS-299	Seminar (1+0)	Seema Jaggi
	Computer Application	
	Trimester – I	
CA-100	Introduction to Computer Application (1+1)	V.H. Gupta
CA-111	Computer Organization and Architecture (3+0)	V.K. Dubey
CA-112	Fundamentals of Computer Programming in C (2+1)	K.K. Chaturvedi
CA-114	Mathematical Foundations in Computer Application (4+0)	P.K. Batra & N.K. Sharma
CA-211	Compiler Construction (2+1)	S.B. Lal
CA-212	Computer Graphics (2+1)	Pal Singh
CA-213	Artificial Intelligence (2+1)	S.N. Islam & Rajni Jain
CA-214	Internet Technologies & Applications (2+1)	Alka Arora & Shashi Dahiya
CA-215	Software Engineering (1+0)	Anu Sharma
CA-299	Seminar (1+0)	S.N. Islam
	Trimester – II	
CA-101	Computer Fundamentals & Programming (3+1)	Alka Arora & Anu Sharma
CA-121	Object Oriented Programming & Design (2+1)	V.K. Dubey & S.B. Lal
CA-122	Operating System (2+1)	H.O. Agarwal
CA-123	Numerical Analysis (2+1)	H.S. Sikarwar & Pal Singh
CA-124	System Analysis & Design (2+1)	I.C. Sethi & M.S. Farooqi
CA-221	Data Warehousing and Data Mining (2+1)	Anil Rai & K.K. Chaturvedi
CA-222	Multimedia and Applications (1+1)	Shashi Dahiya
CA-224	GIS and Remote Sensing Techniques (1+0)	Prachi Mishra & M.S. Farooqi
CA-225	Data Analysis in Agriculture (1+2)	V.K. Mahajan & Wasi Alam

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

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Awards and Recognitions

AWARDS

- भारतीय कृषि अनुसंधान परिषद् के महानिदेशक महोदय की अध्यक्षता में आयोजित वार्षिक हिन्दी पुरस्कार वितरण समारोह में भाग लिया। बड़े संस्थानों की श्रेणी में भारतीय कृषि सांख्यिकी अनुसंधान संस्थान को राजर्षि टंडन राजभाषा पुरस्कार योजना के अंतर्गत प्रथम पुरस्कार प्रदान किया गया जिसे संस्थान के निदेशक महोदय ने अन्य सहयोगियों सहित प्राप्त किया।
- संस्थान द्वारा प्रकाशित पत्रिका सांख्यिकी विमर्श (2006-07) को भा.कृ.अ.प. द्वारा उत्कृष्ट गृहपत्रिका के प्रकाशन हेतु गणेश शंकर विद्यार्थी (द्वितीय) पुरस्कार प्रदान किया गया।

- Dr. V.K. Sharma received the Best Teacher Award 2006 for his outstanding contribution to teaching in the discipline of Agricultural Statistics. The award was conferred on the occasion of the 45th Convocation of the PG School, IARI, New Delhi held on 09 February 2007.

- भारत सरकार, सूचना एवं प्रसारण मंत्रालय के प्रकाशन विभाग द्वारा आयोजित भारतेंदु हरिश्चन्द्र पुरस्कार योजना के अंतर्गत डॉ. रंजना अग्रवाल की हिन्दी पाण्डुलिपि 'मच्छर ने समझाया' को संयुक्त रूप से द्वितीय पुरस्कार प्रदान किया गया।
- Dr. Rajender Parsad, National Fellow elected as Associate Fellow of National Academy of Agricultural Sciences, New Delhi from 01 January 2007.
- Dr. A.R. Rao was awarded the Biotechnology Overseas Associateship - Long Term 2005–06 by the Department of Biotechnology, Ministry of Science and Technology, Government of India. He was deputed at Cold Spring Harbor Laboratory, New York, USA from 05 April 2006 for a period of 12 months to conduct advanced training/research in the field of Bioinformatics. He has conducted one year Post Doctoral Research work on the project "Identification and validation of functional SNPs in complex dieseases, genetic networks and evolution".
- Md. Wasi Alam selected for Commonwealth Scholarship and Fellowship Plan-2007, United Kingdom, (Award Number-INCS-2007-153).
- Dr. Sushila Kaul, Anil Kumar and Sanjeev Panwar were awarded certification of appreciation for rendering organizational support in the conduct of National Conference on Innovations in Indian Science, Engineering & Technology held at Indian Agricultural Research Institute during 24–26 November 2006.
- Dr. Ramasubramanian V., Dr. Himadri Ghosh and Sh. Amrender Kumar participated in the Quiz Competition held on 01 July 2006 as part of Institute's Annual Day celebrations and the team bagged second prize.
- Dr. D.R. Singh and Sh. Mahender Singh won second prize in the Quiz competition during Hindi Chetana Mas.
- हिन्दी चेतनामास के अन्तर्गत "शोध-पत्र पोस्टर-प्रदर्शन प्रतियोगिता" में संस्थान के वैज्ञानिकों तथा तकनीकी कर्मियों ने अपने-अपने शोध-पत्र पोस्टर प्रदर्शित किए जिसमें से सर्वश्रेष्ठ निम्न शोध-पत्रों को पुरस्कृत किया गया:
  - अशोक कुमार: भारत के विभिन्न राज्यों में किसानों की खान-पान पद्धति व पोषण स्तर का अध्ययन (प्रथम पुरस्कार)
  - ए.के. गुप्ता, एम.एस. नारंग एवं डी.सी. माथुर: सब्जियों की उपज पर उर्वरक, सिंचाई तथा कीटनाशकों का प्रभाव (द्वितीय पुरस्कार)
  - रजिन्द्र कौर, आर.एस. तोमर एवं प्रमोद कुमार: चावल की विभिन्न किस्मों पर आधारित फसल क्रमों के समूहों का सांख्यिकीय मूल्यांकन (तृतीय पुरस्कार)

(a) Affiliation with Professional Societies/ Institutions

Many scientists and technical personnel are members of the following Professional Societies/Institutions

- Indian Society of Agricultural Statistics
- Society of Statistics, Computer and Applications
- Indian Society of Agricultural Sciences
- Indian Science Congress Association
- Indian Dairy Association (IDA)
- Indian Society of Agricultural Economics
- Indian Society of Agricultural Marketing
- Computer Society of India
- Indian Statistical Association
- Indian Econometric Society
- Agricultural Economics Research Association
- Indian Society for Medical Statistics
- Farming System Research and Development Association
- Indian Society for Sheep and Goat Production and Utilization
- Indian Association of Statistics and Applied Research
- Indian Society of Genetics and Plant Breeding
- Andaman Science Association
- Indian Society of Remote Sensing

- Indian Society of Geometrics
- Indian Economics Association
- Bhoovigyan Vikas Foundation
- Indian National Science Association
- IARI Alumini
- Calcutta Mathematical Society
- Allahabad Mathematical Society
- Ramanujan Mathematical Society
- Indian Academy of Mathematics
- Indian National Science Academy for Indian Journal of Pure and Applied Mathematics
- Sankhya
- International Biometric Society (Indian Region)
- Statistical Publishing Society
- Association of Commonwealth Universities
- Indian Society of Extension Education
- Annals of Agricultural Research
- Bihar Journal of Agricultural Marketing
- Indian Society of Ornamental Horticulture
- Haryana Economic Association
- NAARM Alumini
- Forum for Interdisciplinary Mathematics
- Indian Society of Agricultural Engineering

(b) Offices in Professional Societies

Indian Society of Agricultural Statistics

Prof. SD Sharma	Honorary Secretary, Member, Executive Council, Member, Editorial Board
Dr. VK Bhatia	Honorary Joint Secretary, Member, Executive Council, Member, Editorial Board
Sh. RS Khatri	Honorary Joint Secretary, Member, Executive Council
Dr. Rajender Parsad	Honorary Joint Secretary, Member, Executive Council, Member, Editorial Board
Dr. HVL Bathla	Member, Executive Council
Dr. VK Gupta	Member, Executive Council, Member, Editorial Board
Dr. Prajneshu	Member, Editorial Board
Dr. PK Malhotra	Member, Executive Council, Member, Editorial Board
Dr. VK Sharma	Member, Executive Council, Member, Editorial Board

Society of Statistics, Computer and Applications

Prof. SD Sharma	Vice President, Member, Executive Council
Dr. VK Gupta	Secretary and Managing Editor
Dr. VK Bhatia	Member, Editorial Board
Dr. Aloke Lahiri	Joint Secretary, Member, Executive Council
Dr. Rajender Parsad	Joint Secretary, Member, Editorial Board, Member, Executive Council
Dr. LM Bhar	Joint Secretary, Member, Executive Council

International Statistical Institute, Netherlands

Dr. VK Gupta	Elected Member

Journal of Statistical Planning and Inference

Dr. VK Gupta	Associate Editor

Journal of Statistical Theory and Practice

Dr. VK Gupta	Member, Editorial Board
Dr. Prajneshu	Member, Editorial Board

Statistics and Applications

Dr. VK Gupta	Managing Editor

Bureau of Indian Standards, New Delhi

Dr. VK Gupta	Member, Management and Systems Division Council

National Centre of Agricultural Economics and Policy Research, New Delhi

Dr. VK Gupta	Member, Institute Management Committee

Ministry of Statistics & Programme Implementation Statistics

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

The Indian Journal of Agricultural Science

Prof. SD Sharma	Member, Editorial Board

Aligarh Journal of Statistics

Dr. Tauqueer Ahmad	Member, Editorial Board

Farming Systems Research and Development Association

Dr. Anil Kumar	Joint Secretary, Member, Executive Council
Dr. VK Sharma	Member, Editorial Board

Indian Society of Agricultural Sciences

Dr. Rajender Parsad	Member, Editorial Board (Basic Sciences) for Annals of Agricultural Research

Brassica News, Mustard Research and Promotion Consotium (MRPC)

Dr. Seema Jaggi	Member, Editorial Board

Institute of Applied Statistics and Development Studies

Prof. SD Sharma	Member, Governing Body
Dr. VK Gupta	Member, Governing Body
Dr. Prajneshu	Member, Governing Body
Dr. Rajender Parsad	Member, Governing Body

Journal of IARI, PG School

Dr. Rajender Parsad	Member, Editorial Board

Journal of Econometric Application and Theory

Dr. Rajender Parsad	Member, Managing Editor

Forum for Interdisciplinary Mathematics

Dr. Rajender Parsad	Joint Secretary

IARI Alumni Association

Dr. Rajender Parsad	Member, Executive Council

Indian Society of Agricultural Marketing

Dr. SP Bhardwaj	Member, Executive Council

Board of Studies of Department of Statistics at NEHU, Shillong

Dr. Prajneshu	Member

International Journal of Agricultural and Statistical Science

Sh. Anil Kumar	Member, Editorial Board

Computer Society of India

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

(c) Offices of Recognition in Professional Societies/Institution

Dr. VK Gupta	Organising Secretary, International Conference on Statistics and Informatics in Agricultural Research to mark the Diamond Jubilee Celebrations of the foundation of the Indian Society of Agricultural Statistics

Linkages and Collaboration in India and Abroad including Outside Funded Projects

S. No.	Title	Collaborative/ Funding Agency	Date of Start	Date of Completion
1.	Developing remote sensing based methodology for collecting agricultural statistics in Meghalaya	SAC, Ahmedabad and NESAC, Shillong	01 April 2003	31 March 2007
2.	Planning, designing and analysis of experiments planned ON-STATION under PDCSR	Project Directorate of Cropping System Research, Modipuram	01 April 2002	31 March 2007
3.	Planning, designing and analysis of ON-FARM experiments under PDCSR	Project Directorate of Cropping System Research, Modipuram	01 April 2002	31 March 2007
4.	Planning, designing and analysis of data relating to experiments conducted under AICRP on LTFE	Project Coordinator (LTFE) IISS, Bhopal	01 April 2002	31 March 2007
5.	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 (ICAR), Bhopal	March 2000	Continuing
6.	Design and analysis of experiments for spatially correlated observations	Department of Science and Technology (DST)	27 September 2004	26 September 2007
7.	Statistical and algorithmic approach for improved estimation of treatments effects in repeated measurements designs	Department of Science and Technology (DST)	18 May 2004	17 April 2007

S. No.	Title	Collaborative/ Funding Agency	Date of Start	Date of Completion
8.	Combined analysis of experiments on long-range effect of continuous cropping and manuring on soil fertility and yields stability	ICAR AP Cess Fund	01 May 2004	30 April 2007
9.	Outliers in designed experiments	ICAR AP Cess Fund	01 August 2004	31 July 2007
10.	Some investigations on design and analysis of agro-forestry experiments	Indian Grassland and Fodder Research Institute (IGFRI), Jhansi	01 September 2004	31 August 2006
11.	Precision farming for sustainable rice-wheat cropping system	IARI, New Delhi	01 June 2001	31 May 2006
12.	Development of expert system on wheat crop management	DWR, Karnal/IARI, New Delhi	01 March 2003	28 February 2007
13.	To assess the survey capabilities of private sector	CSO, MOS & PI, New Delhi	22 August 2005	22 June 2006
14.	A pilot study to develop an alternate methodology for estimation of area and production of horticultural crops	CSO, MOS & PI, New Delhi	01 May 2005	30 April 2007
15.	Statistical investigation on the performance of non-parametric stability measures when the genotype × environment data is non-normal	ICAR AP Cess Fund	01 August 2004	31 July 2007
16.	Study to investigate the causes of variation between official and trade estimates of cotton production	Ministry of Agriculture, Department of Agriculture & Cooperation, DES, New Delhi	01 October 2006	30 September 2008
17.	Adoption and impact of resource conserving technologies on farm economy in Indo-Gangetic plains, India	IARI, ICAR AP Cess Fund	01 August 2004	31 July 2007
18.	Impact assessment of fisheries research in India	IARI, ICAR AP Cess Fund	01 April 2006	31 March 2009
19.	Long term manurial and fertilizer experiment on potato based cropping systems	CPRS, Modipuram	01 April 2004	31 March 2009
20.	National Information System on Agricultural Education Network in India (NISAGENET)	ICAR AP Cess Fund	01 January 2005	31 December 2007
21.	Some investigations on stable and robust clustering procedures	ICAR AP Cess Fund	01 September 2004	31 August 2007

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Research Coordination and Management Unit

Research Coordination and Management Unit (RCMU) is responsible for documentation and dissemination of scientific output of the Institute through IASRI News and Annual Report etc. It also organises 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 Council (RAC) and Quinquennial Review Team (QRT) and is responsible for correspondence with ICAR, ICAR Institutes, SAUs and other organisations in India and abroad. The other functions of the Unit are: to examine the new research project proposals before these are considered by the IRC in respect of importance of problems, 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, Zero Based Budgeting etc.; to maintain the Research Project Files (RPF), revision of 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 following activities were undertaken by the Unit during the year under report:

Publications

- Annual Report of the Institute for the year 2005–06
- Proceedings of XIV National Conference of Agricultural Research Statisticians held at JNKVV, Jabalpur (Madhya Pradesh) during 17–19 November 2004
- IASRI Newsletters
- Monitoring Progress Reports: Half-yearly summary of progress of on-going research projects ending 31 March 2006 and 30 September 2006

Releasing the Annual Report of the Institute during the Annual Day Function

- Background material of the Institute for QRT 2001–05

Communication of Research Material to

(i) Indian Council of Agricultural Research

- Material for preparation of DARE/ICAR Annual Report for the year 2006–07
- Copies of Annual Report of the Institute, for review of Annual Report 2005–06 for getting the Trophy to the Best Annual Report
- Half yearly information regarding programme of Conferences, Seminars, Symposia, Workshops, Meetings, etc. in Agricultural and Allied Sciences proposed
- Information for organization of Summer School/ Winter School/Short Course – regarding proposal etc. during 2007–08
- Correspondence regarding IV Regional Committees of the ICAR
- Information in respect of organisation of II International Rice Research Congress 2006 organised in Delhi during 09–13 October 2006
- Other miscellaneous correspondence with respect to Institute
- Material for quarterly publication, 'ICAR Newsletter' and 'ICAR Reporter'
- Material for 'Monthly Progress Report' for the Cabinet Secretariat
- Monitorable targets Annual/Five yearly in respect of various programmes being implemented at the Institute
- Information of different Research Project Files (RPF I, II, III) of various Divisions of the Institute Quarterly/Half-yearly Performance Review (QPR/ HPR) of Central Schemes by Planning Commission
- Monthly targets and progress of the Institute
- Half-yearly scientific targets and achievement
- Quarterly/Half-yearly Progress Report (QPR/ HPR)
- Monthly progress of identified thrust areas required by Planning Commission
- Various drafts for revised Perspective Plan: Vision 2025 of the Institute

(ii) Indian Veterinary Research Institute, Izatnagar, Bareilly (U.P.)

- Brief report on achievements of the Institutes and Action Taken Report on the recommendation made at the XVII Meeting for presentation at the XVIII Meeting of the ICAR Regional Committee No. IV held at ICAR Research Complex for NE Region, WALMI Complex, Patna (Bihar) during 01–02 September 2006.

(iii) Information Supplied to CSO

- Quarterly information for CSO Newsletter
- Miscellaneous correspondence with respect to the Institute

(iv) National Research Development Corporation (A Govt. of India Enterprise)

- Miscellaneous correspondence for supply of IPRCD Version 2.0

Organisation of Meetings

The Unit organised

- Two meetings of Institute Research Committee (IRC) earlier known as Staff Research Council (SRC) on 22–23 August 2006 and 23 February 2007 under the Chairmanship of Director of the Institute.
- One meeting of Dr. PV Shenoy, Chairman, Common Research Advisory Committee (RAC) with Director and all Heads of Divisions on 22 February 2006.
- Six meetings of QRT on IASRI for the period 2001–05 on 12 April, 11 December 2006, 12 January, 14 February, 06 March, 12 March 2007.

- Two meetings of Consultancy Processing Cell (CPC) on 26 May and 05 September 2006 for finalizing the consultancy training proposals as per ICAR Guidelines.
- Thirteen Senior Officers Meetings (SOM) of the Institute to discuss the monthly achievements, shortfalls, if any, and obstacles in achievements in terms of various activities of the Institute including research, teaching, training, projects, publications, library, administrative, financial and others were organized on 10 April, 05 May, 12 June, 04 July, 05 August, 06 September, 04 October, 07 November, 04 December, 2006; 01 and 06 January, 03 February and 03 March 2007. The meetings were chaired by the Director.

Art, Photography and Reprography

RCM Unit assisted the scientists in preparing and updating diagrams, charts, histograms and maps, photographs for research publications and also visual display of research findings in the exhibition room. It also caters the need of reprography of the Institute. It assisted in transcribing the lectures write-ups on transparencies. A Sony Handy Cam DCR PC 350E and a Digital Still Camera of Sony Model No. MVC-CD 500 are available for covering important events organised at the Institute. More than 1000 photographs and video films of important occasions of research and extension activities of the Institute were undertaken and also some slides were prepared. The photocopy need of the Institute was fulfilled by 7 photocopy machines installed at the Reprographic Lab working under the Unit. Unit has Gestetner Copy Printer 5327, Rex Rotary Copy Printer 1560, Toshiba Estudio 352, Panasonic DP 4510 and two Godrej G 2238 photocopy machines and a colour photocopier Canon iRC 3170i and about 4.9 lakhs black and white and 4357 coloured copies were multi-copied and supplied to various users of the Institute. A HP Scanjet 4070 Photosmart Scanner is also available. A lab of Senior Artist for Graphic Designing with Macintosh Computer system is also maintained.

Miscellaneous Activities

In addition to the above, the Unit is involved in the following work:

- Miscellaneous correspondence for the International Conference on Statistics and Informatics in Agricultural Research on the occasion of 60th Conference of Indian Society of Agricultural Statistics held during 27–30 December 2006
- Supplying the information about training programmes/research activities received from ICAR and various organisations from time to time among the HDs and Scientists of the Institute
- Proposals for deputation of scientists of the Institute for various conferences/symposia/ workshops etc.
- Correspondence/Initiation for procuring various useful softwares and other equipments at the Institute
- Making availability of Annual Report, Newsletters, Perspective Plan Vision and other important material on the website of the Institute
- Arrangement of demonstration of procured and other software packages
- Installation of video projector in the Committee Room of the Institute
- Reply of various Audit para raised by External Audit Party
- Reply of various Parliament Questions raised from time to time
- Captured important moments of various functions organized at the Institute/NASC/NCAP in the Digital Still Camera/ Video Camera and also make arrangements for inclusion of these moments at the website of the Institute


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List of Publications

Research Papers

1. Arora, Alka, Singh, Balbir, Dahiya, Shashi and Farooqi, Mohd. Samir (2005). Planning and distribution of manpower of ICAR using PERMISnet. *J. Ind. Soc. Agril. Statist.*, **59**, 141–145.
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6. Choudhary, Gunanand, Kumar, Jitendra, Walia, Suresh, Parsad, Rajender and Parmar, Balraj S (2006). Development of controlled release formulations of carbofuran and evaluation of their efficacy against *Meloidogyne incognita*. *J. Agric. Food Chem.,* **54**, 4727–4733.
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12. Ghosh, H, Iquebal, MA and Prajneshu (2006). On mixture nonlinear time-series modelling and forecasting for ARCH effects. *Sankhya,* **68**, 111–129.
13. Iquebal, MA and Paul, Amrit Kumar (2006). Effect of more than one related auxiliary trait on estimation of heritability of herd life. *Ind. J. Anim. Sci.,* **76(8)**, 625–632.
14. Iquebal, MA and Paul, Amrit Kumar (2006). Empirical comparison of different estimates of heritability of herd life using related auxiliary traits in case of non-normal situations. *Ind. J. Anim. Sci.*, **76(9)**, 750–754.
15. Iquebal, MA, Paul, Amrit Kumar and Bhatia, VK (2004). Empirical comparison of different estimates of heritability of herd life using unrelated auxiliary traits under non-normal situations. *Ind. J. Appl. Statist.,* **8**, 59–72.
16. Jaggi, Seema, Gupta, VK and Ashraf, Jawaid (2006). On block designs partially balanced for neighbouring competition effects. *J. Ind. Statist. Assoc.*, **44**, 27–41.
17. Kadam, DM, Samuek, DVK and Parsad, Rajender (2006). Optimisation of pre-treatments of solar dehydrated cauliflower. *J. Food Engg.,* **77**, 659–664.
18. Kaul, Sushila and Singh, RK (2006). An economic analysis of wages of agricultural labour in Uttar Pradesh. *Manpower J.*, **31(1)**, 77–86.
19. Kaur, Rajinder, Kumar, Anil and Farooqi, Samir (2005). Statistical assessment of different rice (*Orya sativa*) varieties based sequences. *Ind. J. Agri. Sci.*, **75(8)**, 501–503.
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26. Parsad, Rajender, Gupta, VK and Srivastava, R (2007). Designs for cropping systems research. *J. Statist. Plann. Inf.*, **137**, 1687–1703.
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Popular Articles

- Bhardwaj, SP and Sharma, SD (2007). Cultivation of NTFPs as the best measure of poverty eradication of poor tribal cultivators - A case study of lac cultivation. *Non-Wood News*, **14**, 28–29.
- Prajneshu and Chandran, KP (2006). Computation of compound growth rates using nonlinear growth models - An illustration with SPSS. *The SPSS Anal.*, 24–28.
- अग्रवाल, रंजना एवं भाटिया, विजय कुमार (2007). संस्थान के कीर्ति स्तम्भ-डॉ विनायक गोविन्द पान्से। *सांख्यिकी-विमर्श (2006-07)*, भा.कृ.सां.अ.सं., नई दिल्ली, 1-5
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- खत्री, आर एस एवं कुमार, अनिल (2006). भारतीय अर्थव्यवस्था में पशुधन का महत्व। *स्मारिका*, किसान मेला आवाम पशु विज्ञान प्रदर्शनी। अक्टूबर 28-30, 2006, 127-131
- प्रज्ञेषु, घोष, हिमाद्री एवं अग्रवाल, रंजना (2007). कृषि अनुसंधान में अरैखिक काल-श्रृंखला मॉडलिंग। *सांख्यिकी-विमर्श (2006-07)*, भा.कृ.सां.अ.स., नई दिल्ली, 35-42
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- शर्मा, एस डी, खत्री, आर एस एवं जैन, आर पी (2007). राष्ट्रीय कृषि विज्ञान संग्रहालय। *सांख्यिकी-विमर्श (2006-07)*, भा.कृ.सां.अ.स., नई दिल्ली, 56-66

The following popular articles were appeared in the Proceedings of XIV National Conference of Agricultural Research Statisticians held at JNKVV, Jabalpur from 17 to 19 November, 2004.

- Application of Data Mining Techniques in Cluster Analysis, V.K. Bhatia, 83–89
- Application of Information Technology (IT) in Agricultural Research and Development-Research Needs, P.K. Malhotra, 157–164
- Forecasting Agricultural Systems-Status and Challenges, Ranjana Agrawal and Chandrahas, 69–75
- Imputation for Handling Non-Response, Girish Kumar Jha and Randhir Singh, 188–193
- Issues of Design and Development of Agricultural Data Warehouse, Anil Rai, Vipin Kumar Dubey, K.K. Chaturvedi, P.K. Malhotra, 100–107
- Key Note Address of Dr. S.D. Sharma, Director, IASRI, New Delhi, *4–7*
- Spatial Data Quality: Issues and Problems, Prachi Misra Sahoo, Randhir Singh, Anil Rai and Tauqueer Ahmed, 180–187
- Statistical Issues for Experimentation in National Agricultural Research System, Rajender Parsad and V.K. Gupta, 144–151
- Statistical Modelling in Agriculture: Current Status and Future Challenges, Prajneshu, 53–57
- Status of Agricultural Experimentation in the National Agricultural Research System, V.K. Gupta, Rajender Parsad and P.K. Batra, 58–68
- Teaching and Research Linkages between ICAR Institutes and Agricultural Universities: Current Scenario and Emerging Challenges, V.K. Sharma and Seema Jaggi, 117–120
- Teaching and Training in Computer Application in the NARS- Emerging Needs, P.K. Malhotra, 131–135

Research Project Reports

1. Design and analysis of on-station and on-farm agricultural research experiments: A revisit. (Joint Publication of IASDS, Lucknow and IASRI, New Delhi) by AK Nigam, Rajender Parsad and VK Gupta
2. Study relating to formulating long term mechanisation strategy for each agro-climatic zone/state in India
3. Crop yield estimation at small area level using farmer's estimates by UC Sud, DC Mathur, GK Jha, SC Sethi and RM Bhasin
4. National Information System on Animal Experiments (AP Cess fund, ICAR) by PK Batra, RC Goyal, DK Sehgal and VK Sharma
5. National Information System on Long-term Fertilizer Experiments (AP Cess fund, ICAR) by MR Vats, DK Sehgal, Krishan Lal, Anshu Dixit and Shashi Dahiya
6. Some investigations on design and analysis of agroforestry experiments by Seema Jaggi, VK Sharma, AS Gill and Cini Varghese

Agricultural Research Data Book 2006

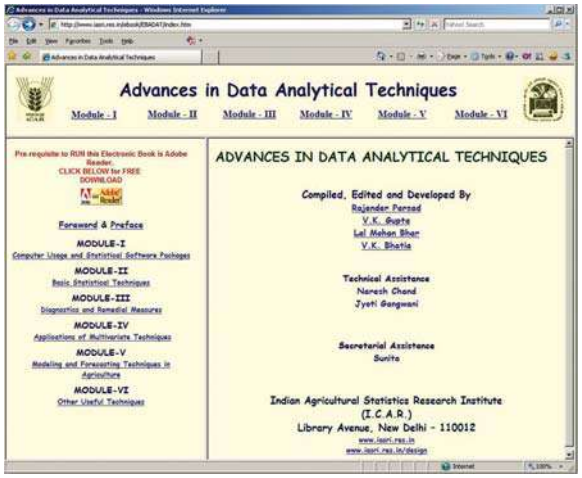
1. Agricultural Research Data Book 2006 (2006) by HVL Bathla, KK Tyagi, RS Khatri, Jagbir Singh, JP Goyal, SC Agarwal and RM Sood

Book Chapters

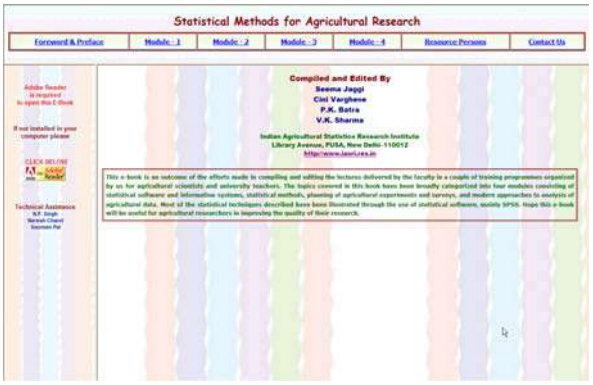
1. Gupta, VK and Parsad, Rajender (2006). Statistical designing of experiments with emphasis on hill agriculture. In: *Sustainable Production from Agricultural Watersheds in North West Himalaya*. Eds. HS Gupta, AK Srivastava and JC Bhatt published by Vivekananda Parvatiya Krishi Anusandhan Sansthan, Almora, 457-474.
2. Parsad, Rajender, Dixit, Anshu, Malhotra, PK and Gupta, VK (2007). Geoinformatics in precision farming: An overview. In: *Geoinformatics Applications for Sustainable Development*. Eds. AK Singh and UK Chopra published by New India Publishing Agency, New Delhi, 39-78.
3. Prajneshu (2007). Statistical modelling in aquaculture. In: *Bioinformatics and Statistics in Fisheries Research*, 3. Eds. AK Roy and N Sarangi, CIFA, Bhubaneswar, 326-340.
4. Rao, AR (2007). Applications of hidden Markov models in computational biology. In: *Bioinformatics and Statistics in Fisheries Research*, 3. Eds. AK Roy and Sarangi, CIFA, Bhubaneswar, 50-62.

Electronic Book

1. An electronic book on Advances in Data Analytical Techniques has been compiled, edited and developed by Rajender Parsad, VK Gupta, Lal Mohan Bhar and VK Bhatia. The e-book consists of chapters on 66 topics described in more than 920 pages. The topics covered in this electronic book have been categorized into six modules namely Computer Usage and Statistical Software Packages, Basic Statistical Techniques consisting of Statistical Methods and Inference, Design of Experiments and Sample Surveys, Diagnostics and Remedial Measures, Applications of Multivariate Techniques, Modelling and Forecasting Techniques in Agriculture and Other Useful Techniques such as Bio-informatics, Geoinformatics, Microarrays, DNA Fingerprinting, Nanotechnology in Agriculture etc. This book is available at IASRI website (www.iasri.res.in).



2. An electronic book on Statistical Methods for Agricultural Research has been compiled, edited and developed by Seema Jaggi, Cini Varghese, PK Batra and VK Sharma. This e-book is an outcome of the efforts made in compiling and editing the lectures delivered by the faculty in a couple of training programmes organized by the Institute for agricultural scientists and university teachers. The topics covered in this book have been broadly categorized into four modules consisting of Statistical Software and Information Systems, Statistical Methods, Planning of Agricultural Experiments and Surveys and Modern Approaches to Analysis of Agricultural Data. Most of the statistical techniques described have been illustrated through the use of statistical softwares mainly SPSS. This book is available at IASRI website (www.iasri.res.in).



Lesson Series

Following lessons have been prepared for an application course on Basic Statistics for BA programme of University of Delhi which will be put at the University's website:

Seema Jaggi and Prajneshu: Sampling Distributions

Seema Jaggi and Prajneshu: Testing of Hypothesis


ANNUAL DAY FUNCTION-3 JULY 2006


वार्षिक दिवस समारोह-3 जुलाई 2006


वार्षिक दिवस समारोह-3 जुलाई 2006
ANNUAL DAY FUNCTION-3 JULY 2006


वार्षिक दिवस समारोह-3 जुलाई 2006
ANNUAL DAY FUNCTION-3 JULY 2006

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Consultancy and Advisory Services

Consultancy/Advisory Services Provided

A Senior Scientist, Division of Agronomy, Indian Agricultural Research Institute (IARI), New Delhi was advised on the analysis of experimental data conducted for standardization of nitrification inhibiting property of neem oil coated urea for kharif rice, 2005. In one experiment, 16 treatments tried were all possible combinations of 5 sources of nitrogen viz. prilled urea, 500 ppm oil coated urea, 1000 ppm oil coated urea, 2000 ppm oil coated urea, 5000 ppm oil coated urea and three doses, viz. 50, 100, 150 kg/ha and one absolute control. In another experiment, 16 treatments tried were all possible combinations of 5 sources of oil viz. FFA, pure oil, meliacins, saturated and unsaturated and three doses of oil viz. 500 ppm, 1000 ppm and 5000 ppm and one absolute control. The experiments were conducted using a randomized complete block design. The analysis was carried out using the concepts of contrast analysis.

A Ph.D. student of Molecular Biology and Biotechnology, IARI, New Delhi was advised on the analysis of data pertaining to an experiment related to study of wheat transformation for tolerance to dehydration stress. 30 wheat genotypes were grown in the field in a randomized complete block design with 3 replications. Samples for each plot were taken and studied for callus formation in the laboratory. Samples from these 90 plots were also investigated in 2 regeneration media and the characters observed were G-spot, shoots per callus and number of shoots. The analysis was performed using PROC GLM of SAS.

Another Ph.D. student from Department of Plant Breeding and Genetics, Punjab Agricultural University, Ludhiana was advised on the analysis of data pertaining to 37 inbred lines (maize), all at advanced stage of development, selected for estimating the genetic diversity using molecular markers (SSR).

Professor, Department of Genetics and Plant Breeding, Institute of Agricultural Sciences, Banaras Hindu University, Varanasi and Visiting Scientist at CIMMYT, Mexico was advised on (i) analysis of data

pertaining to experiments conducted with resource conservation technology viz. zero tillage and conventional tillage in combination with different varieties of wheat to identify varieties that are good for zero tillage/conventional tillage and (ii) analysis of data pertaining to the experiment conducted for detecting the variation in 963 diverse lines of wheat for stay green trait. The experiment was conducted using randomized complete block design with three replications for three years. He was also advised on the analysis of data pertaining to an experiment on 100 diverse lines for stay green, canopy temperature difference and yield traits. The 100 lines comprised of 25 lines from each of the four groups, stay green, moderately stay green, moderately non-stay green and non-stay green. The experiment was conducted using a randomized complete block design with three replications for three years. There were three dates of sowing in each of the year.

Senior Scientist from Division of Agronomy, IARI, New Delhi was advised on the contrast analysis for comparison between durum, timely sown aestivum and late sown aestivum cultivars of wheat for the characters grain yield, thousand grain weight, harvest index, water use efficiency, etc. The technique of combined analysis was suggested for the data on different parameters such as vine length, shoot weight of sweet potato having three sites with two seasons, four varieties and four replications. While analyzing the data, the sites were taken as random and seasons as fixed effects.

Provided consultancy services to one foreign M.Sc. student of IVRI and one Ph.D. student of NDRI. Helped them for their research work as well as analysis work.

Guidance and help were provided to the MCA student trainees of various Universities/colleges for their project work.

Consultancy services were provided to 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.

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QRT, RAC, Management Committee and IRC

Quinquennial Review Team (QRT)

A Quinquennial Review Team (QRT) to review the work done by Indian Agricultural Statistics Research Institute (IASRI), Pusa, New Delhi for the period 2001–05 was constituted by the Director General, Indian Council of Agricultural Research (ICAR), New Delhi. The composition of the QRT is as given below:

1. Prof. A.K. Nigam, — Chairman
   Director,
   Institute of Applied Statistics & Development Studies (IASDS),
   B-16/1, First Floor, Rajajipuram,
   Lucknow-226 017 (U.P.)
2. Dr. P.K. Joshi, — Member
   Coordinator (IFPRI), NASC,
   Pusa, New Delhi-110 012
   Presently
   Director,
   National Centre for Agricultural Economics and Policy Research (NCAP),
   Library Avenue, Pusa Campus, New Delhi-110 012
3. Dr. A.P. Gore, — Member
   Professor,
   Department of Statistics,
   University of Pune, Ganeshkhind,
   Pune-411 007
4. Dr. Rahul Mukerjee, — Member
   Professor,
   Indian Institute of Management,
   Kolkata, PO:Joka D.H. Road,
   Kolkota-700 104
5. Dr. K.K. Bhardwaj, — Member
   Professor,
   School of Computer Systems Sciences,
   Jawaharlal Nehru University,
   New Delhi-110 067
6. Dr. A.K. Srivastava, — Member-Secretary
   Ex-Joint Director of IASRI,
   B-25/G-1, Dilshad Garden,
   Delhi-110 095

The first and preliminary Planning Meeting of QRT was held on 11 December 2006 at IASRI, New Delhi. The meeting was attended by the following:

1. Dr. Nawab Ali, DDG (Engg.), Chairman
2. Dr. A.K. Nigam, Chairman, QRT
3. Dr. S.D. Sharma, Director, IASRI
4. Dr. K.K. Bhardwaj, Member
5. Dr. A.P. Gore, Member
6. Dr. A.K. Srivastava, Member Secretary
7. Dr. V.K. Bhatia (Invited)

QRT Meeting is in progress

Chairman, Dr. Nawab Ali, apprised the members about the expectations of ICAR. A work plan to review, consultations, meetings, visits, writing and finalisation of the report was discussed. As a preliminary requirement, a document prepared by the Institute consisting of background information regarding the Institute was provided to each member of the QRT. Chairman, QRT, in consultation with the other members decided that they would like to review the functioning of the following committees:

- Research Advisory Committee (RAC)
- Institute Management Committee (IMC)
- Institute Research Committee (IRC) formerly known as Staff Research Council (SRC)
- Divisional Research Committee (DRC)

Chairman desired that besides the regular meetings QRT members may interact individually with scientists, students and other mandatory bodies within the Institute like Institute Joint Staff Council (IJSC), Grievance Cell etc.

QRT members also decided that the review work of the Institute will be shared between themselves.

Second QRT Meeting was held on 12 January 2007 in which Dr. A.K. Nigam, Chairman, QRT and Dr. K.K. Bhardwaj, Member, QRT met with Heads of Divisions of the Institute to discuss the research achievements in respective Divisions. After the meeting with the Heads of Divisions, members of QRT had held another meeting with the following:

- Sh. A.K. Chaturvedi, OSD as official side Member Secretary of the Institute Joint Staff Council (IJSC)
- Sh. A.K. Bhalla, Staff side Member Secretary of the Institute Joint Staff Council (IJSC)
- Sh. D.N. Bhatia, Member Secretary of the Institute Grievance Cell (IGC)

Third QRT Meeting was held on 14 February 2007. Dr. A.P. Gore, Member, QRT visited Institute on 14 February 2007 and had meeting with the scientists of the three Divisions namely Biometrics, Forecasting Techniques and Econometrics.

Fourth QRT Meeting was held on 06 March 2007. Dr. P.K. Joshi and Dr. A.K. Srivastava, Member and Member Secretary respectively visited Institute on 06 March 2007 and had meetings with the scientists of the two Divisions namely Econometrics and Sample Survey.

Fifth QRT Meeting was held on 12 March 2007. Dr. A.K. Nigam, Dr. A.K. Srivastava and Dr. K.K. Bhardwaj had meetings with the scientists of the four Divisions namely Sample Survey, Computer Applications, Design of Experiments and Econometrics.

Research Advisory Committee (RAC)

The common Research Advisory Committee (RAC) of the Indian Agricultural Statistics Research Institute (IASRI) and National Centre for Agricultural Economics and Policy Research (NCAP) was constituted for a period of three years w.e.f. 29 January 2007 except the membership of non-official members at S.No. given below, 11 and 12, and 13 and 14, whose term will be upto 08 September 2007 and 07 December 2007 respectively. The composition of RAC is as follows:

1. Dr. P.V. Shenoy, Chairman
   Former Special Secretary,
   Ministry of Agriculture,
   Govt. of India and Director, ISEC,
   20-C, First Main Road,
   RMV Extension, Stage-II, Block-I,
   Bangalore-560 094

2. Dr. S.S. Acharya, Member
Former Director,
IDS, Jaipur

3. Dr. Rahul Mukerjee, Member
Professor,
Indian Institute of Management,
Joka Diamond Harbour Road,
P.O. Alipur, Kolkata-700 104

4. Dr. A.K. Nigam, Member
Director,
Institute of Applied Statistics and
Development Studies (IASDS),
B-16/1, First Floor, Rajaji Puram,
Lucknow-226 017 (UP)

5. Dr. A.P. Gore, Member
Professor,
Statistics Department,
University of Pune,
Ganeshkhind, Pune-411 007

6. Dr. S.M. Jharwal, Member
Principal Advisor,
DAC, Ministry of Agriculture,
Krishi Bhawan, New Delhi-110 001

7. Dr. Rajeev Karindikar, Member
Software Expert,
Cranes Software India Limited,
Bangalore

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

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

10. Assistant Director General (ESM), Member
Indian Council of Agricultural Research,
Krishi Bhawan, New Delhi-110 001

11. Sh. Vijay Sardana, Member
Executive Director,
Centre for International Trade in
Agriculture and Agriculture based Industries,
82 & 83, Third Floor, Baikunth House,
Nehru Place, New Delhi
(up to 08 September 2007)

12. Dr. S.K. Dorge, Member
81, Shivaji Housing Society,
Senapati Bapat Road,
Pune-411 016
(up to 08 September 2007)

13. Dr. R.S. Deshpande, Member
Professor and Head,
ADRT Unit,
Institute for Social and Economic Change,
Nagarabhavi Post,
Bangalore
(up to 07 December 2007)

14. Dr. Mahesh Pathak, Member
Hony. Director,
Agro Economics Research Centre,
Sardar Patel University,
Ballabh Vidhya Nagar-388 120
(up to 07 December 2007)

15. Dr. V.K. Bhatia, Member-Secretary
Principal Scientist,
IASRI, New Delhi-110 012

A introductory meeting with Dr. P.V. Shenoy, Chairman, Common RAC of IASRI and NCAP was held on 22 February 2007 with Director and all Heads of Divisions of IASRI.

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 Management Committee of the Institute (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 Management Committee of the Institute comprises of:

1. Prof. S.D. Sharma, Chairman
Director,
IASRI (ICAR),
New Delhi-110 012

2. Director (Agriculture), Member
Government of Delhi, ITO,
New Delhi-110 001

3. Sh. V.K. Singh, Member
Director (Agriculture),
Government of Uttar Pradesh,
Lucknow, Uttar Pradesh

4. Dr. B.S. Parmar, Member
Joint Director (Research),
IARI, Pusa,
New Delhi-110 012

5. Sh. Vijay Sardana, Non-Official Member
Executive Director,
International Business Centre in Agriculture and Agriculture Related Industries,
82-83, Third Floor, Baikunth House,
Nehru Place,
New Delhi-110 019

6. Dr. S.K. Dorge, Non-Official Member
81, Shivaji Housing Society,
Senapati, Bapat Road, Pune-411 016

7. Sh. Radhey Shayam, Member
Senior Finance and Accounts Officer,
ICAR, Krishi Bhawan,
New Delhi-110 001

8. Dr. P.K. Agarwal, Member
Head,
Division of Environmental Sciences,
IARI, Pusa, New Delhi-110 012

9. Dr. Madhuban Gopal, Member
National Fellow,
Division of Agricultural Chemistry,
IARI, Pusa, New Delhi-110 012

10. Dr. R.K. Mahajan, Member
Principal Scientist (Agril. Stat.),
Division of Germplasm Evaluation,
NBPGR, Pusa, New Delhi-110 012

11. Dr. R.L. Sapra, Member
Principal Scientist (Agril. Stat.),
Division of Genetics,
IARI, Pusa, New Delhi-110 012

12. Dr. S.K. Tandon, Member
Assistant Director General (Engg.),
KAB-II, ICAR, Pusa,
New Delhi-110 012

13. Chief Administrative Officer Member-Secretary
IASRI (ICAR),
Pusa, New Delhi-110 012

The 53rd Meeting of the Management Committee was held on 23 June 2006 under the Chairmanship of Prof. S.D. Sharma, Director, IASRI. The following agenda items were discussed:

- Confirmation of proceedings of the 52nd meeting of the Management Committee held on 01 March 2006
- Approval of construction of International Training Hostel with estimated cost of Rs. 1,40,73,000/-
- Expenditure statement of IASRI for the year 2003–04 and 2004–05 and budget estimate for the year 2006–07
- Approval of a new member of Grievance committee in the Management Committee
- Under the Medical Attendance Rules 1944 employees (both in service and retired) who are not covered in CGHS area they can take medical treatment from authorised medical attendant-Approval for
- Five yearly assessment of technical personnel

53rd Management Committee meeting is in progress

54th meeting of the Management Committee was held on 15 December 2006 under the Chairmanship of Prof. S.D. Sharma, Director, IASRI. The following agenda items were discussed:

- Confirmation of proceedings of the 53rd meeting of the Management Committee held on 23 June 2006
- Review of action taken on the recommendations of the 53rd meeting of the Management Committee held on 23 June 2006
- Approval of the proceedings of the meeting of SRC of the Institute held on 22–23 August 2006
- Perspective Plan 2025

54th Management Committee meeting is in progress

- Approval of Renovation of Panse Guest House
- The expenditure statement of IASRI for the years from 2002–03 to 2006–07
- Extension of credit medical facilities to pensioners/ employees of the Institute

Member Secretary, Director and Chairman, National Professor in IRC (early called as SRC) meeting

A view of Institute Research Committee (IRC) meeting

Institute Research Committee

The Institute Research Committee (IRC) formerly known as Staff Research Council (SRC) of the Institute (renamed as per Council's O.O. No. 5 (1) / 2004- Gov. Cell dated 25 August 2006) 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. S.D. Sharma, Director is the Chairman and Dr. V.K. Bhatia, Principal Scientist and In-charge (RCMU) is the Member Secretary of the IRC. As per the guidelines of IRC, the new research project proposals were sent to outside experts.

Two meetings of the Institute Research Committee (IRC) were held during 22–23 August 2006 and 23 February 2007. In the first meeting one Institute's funded new research project was approved and progress of 28 ongoing research projects were discussed. In the second meeting four Institute funded new research projects were approved and review of progress of 26 ongoing research projects were discussed.


International Conference on
Statistics and Informatics in Agricultural Research
Diamond Jubilee Celebrations
INDIAN SOCIETY OF AGRICULTURAL STATISTICS
INTERNATIONAL CONFERENCE ON STATISTICS AND INFORMATICS IN AGRICULTURAL RESEARCH


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

PAPERS PRESENTED

Workshop on Human Intelligence, Forecasts and Planning for the Fertilizer Sector organised by Fertilizer Association of India at New Delhi during 17–19 April 2006

- Ranjana Agrawal and Ramasubramanian V. Forecasts of agricultural production

Western Regional Workshop of STCR at JNKVV, Jabalpur during 27–28 April 2006

- Aloke Lahiri. New design involving organic manures/bio-fertilizers for STCR experiments

Workshop on Improvement of Agricultural Statistics organized by the Directorate of Economics and Statistics, Govt. of India, New Delhi during 07–08 July 2006

- Tauqueer Ahmad. Cotton estimates - Need for improvement
- UC Sud. Certain issues with regard to method for cost of cultivation studies

4th Annual Conference Asia Pacific Research Conference of International Cooperative Alliance Organized at Colombo, Sri Lanka during 15–16 August 2006

- Sushila Kaul. Assessment of role of leadership in dairy cooperatives of India

Sensitization Workshop for Nodal Officers for ICT Project under NAIP at NAARM, Hyderabad on 03 September 2006

- Anil Rai, PK Malhotra and SD Sharma. Knowledge management of agricultural resources

Hindi Poster Pratiyogita held at the Institute on 22 September 2006

- परवीन आर्य, एन. शिवरमाने एवं डी.आर. सिंह। उत्तर प्रदेश में विभिन्न सिंचाई स्तरों पर फसल उत्पादन स्थिरता का विश्लेषण
- रजिन्द्र कौर, आर.एस. तोमर एवं प्रमोद कुमार। चावल की विभिन्न किस्मों पर आधारित फसल क्रमों के समूहों का सांख्यिकीय मूल्यांकन

- अमरेन्द्र कुमार, रंजना अग्रवाल, सुभाष चन्द मैहता, सी. चट्टोपाध्याय एवं वाई.एस. रामकृष्ण। सरसों के कीट व रोग के लिये न्यूरल नेटवर्क पद्धति पर आधारित पूर्वानुमान मॉडल
- ए.के. गुप्ता, एम.एस. नारंग एवं डी.सी. माथुर। सब्जियों की उपज पर उर्वरक, सिंचाई तथा कीटनाशकों का प्रभाव
- विजय बिन्दल। अपगमन परीक्षण के द्वारा विकास में क्षेत्रीय विषमताओं की पहचान
- सुभाष चन्द मैहता, अमरेन्द्र कुमार, आर.पी. शुक्ला एवं शशी शर्मा। आम में फल-मक्खी के पूर्वानुमान हेतु मौसम चरों पर आधारित मॉडल
- सत्यपाल एवं त्रिभुवन राय। दूध की मात्रा में विभिन्न कारकों के अंशदान का आकलन
- मीना नंदा। खरीफ की फसल-उत्पादन एवं न्यूनतम समर्थन मूल्य

National Seminar on Surveys on Land & Livestock Holdings, Debt & Investment and Morbidity & Health Care of NSS 59th & 60th Rounds organized by the NSSO at Arumbakkam, Chennai-600 106 during 27–28 September 2006

- Jagbir Singh, UC Sud and HVL Bathla. Some observations on debt and investment and land and livestock surveys

14th Annual Conference of Agricultural Economics Research Association organized at GBPUAT, Pantnagar during 27–28 September 2006

- Sushila Kaul. Economic analysis of productivity of rice production: State-wise analysis

2nd International Rice Research Conference 2006 during 09–13 October 2006

- W Alam, AR Rao, SD Wahi and VT Prabhakaran. Improved unsupervised classification of genotypes of rice crop based on multidimensional biometrical traits: An application of a proposed variable selection method
- Anupama, ML Jat, A Kumar, RK Gupta and BS Parmar. Performance evaluation of a novel pendimethaln impregnated hydrogel for weed and water management in direct seeded rice

National Conference on Innovations in Indian Science, Engineering and Technology at IARI, New Delhi during 26–28 November 2006

- Anil Kumar and Sanat Kumar. Yield prediction based on best fitted models under rice-wheat system
- Anupama, B Singh, JP Yadav, A Kumar and BS Parmar. Soilless media amendment with novel superabsorbent hydrogels: Effect on nursery seedling growth, post-transplantation behaviour and water and nutrient use pattern of high value tomato grown under protected conditions

National Symposium on Ornamental Bulbous Crops held at SVBPUA & T, Modipuram, Meerut during 05–06 December 2006

- AK Gupta, HVL Bathla, UC Sud and KK Tyagi. Methodology for estimation of production of flowers

International Conference on Statistics and Informatics in Agricultural Research and Diamond Jubilee of Indian Society of Agricultural Statistics held at IASRI, New Delhi during 27–30 December 2006

Theme 1: Statistical Applications in Agricultural Research

Theme 2: Emerging Issues in Areas of Basic Statistical Research (Invited Talks)

- **Ranjana Agrawal.** Weather based crop forecasting methodology – IASRI models
- **UC Sud** and Anil Rai. Ranked set sampling in the context of finite population
- **AK Srivastava** and UC Sud. Small area estimation – Some applications
- **VK Gupta**, Rajender Parsad and LM Bhar. Supersaturated designs for asymmetrical factorial experiments
- **Prajneshu**. Current status and future research problems and rainfall modelling and forecasting in India

Theme 3: Agricultural Informatics (Invited Talks)

- **A Dhandapani**, VK Gupta and Rajender Parsad. Computer aided generation of Hadamard matrices and orthogonal arrays
- **Anil Rai**, PK Malhotra, SD Sharma and KK Chaturvedi. An agricultural data warehouse – An integrated approach for decision making

Theme 4: Statistical and Computational Biology in Agriculture (Invited Talk)

- Ananta Sarkar, **Rajender Parsad**, VK Gupta and Abhishek Rathore. Efficient designs for 2-colour microarray experiments

Theme 5: Statistical and Economic Issues for Prosperity of Rural Community (Invited Talk)

- Prem Narain, SD Sharma, SC Rai and **VK Bhatia**. Statistical evaluation of social development at district level

Theme 6: Human Resource Development for Agricultural Statistics and Informatics

Poster Presentations

- AK Paul and MG Kundu. Heritability of growth curve parameters of pigs
- AK Gupta, MS Narang, VK Jain, UC Sud and KK Tyagi. Estimation of area, production and productivity of flowers in Delhi
- Aditi Sharan and Shashi Dahiya. An insight into the similarity aspects used on web
- Alka Arora, Balbir Singh, Shashi Dahiya, Samir Farooqi. Gender distribution of ICAR personnel using PERMISnet
- Amrender Kumar, Ranjana Agrawal, KS Behere, CS Reddy and YS Ramakrishna. Weather based forewarning models for pest and diseases in rice
- Ananta Sarkar, Rajender Parsad, KV Bhat and VK Bhatia. Analysis of microarray data
- Anil Kumar, Rajinder Kaur, Sanjeev Panwar and Sanjeev Pawar. Yield estimation under maize-wheat cropping system
- Anu Sharma, Rajni Jain and Krishna Asawa. Ontology based knowledge management in agriculture.
- Anu Sharma, SB Lal and VK Mahajan. Software for imputation of non-response in survey data
- Ashok Kumar. Dietary pattern and nutritional status of rural households: State-wise analysis
- BMK Raju, VK Bhatia and Lalmohan Bhar. Assessing stability of crop varieties with incomplete data
- BN Mandal, Rajender Parsad and VK Gupta. Construction of doubly nested balanced incomplete block design
- Cini Varghese, MN Sonawane, Seema Jaggi and VK Sharma. Repeated measurements designs for bioequivalence trials
- DN Jha, PK Batra and Rajender Parsad. Analysis of On-Farm experiments over farming situations
- DR Singh, Sushila Kaul and Naresh Kumar. Impact assessment of technology interventions in migratory sheep and goat production system in Himachal Pradesh
- Himadri Ghosh and Prajneshu. Nonlinear time series modeling through self exciting threshold autoregressive approach
- Jitendra Singh Tomar and Seema Jaggi. Efficient neighbour balanced block designs for correlated observations
- K Chakraborty, AK Paul, W Alam. Application of clustering techniques in mango and litchi germplasm of West Bengal
- Krishan Lal and Susheel Kumar. An algorithm for linear trend-free designs with two level factorial experiments
- Md. Samir Farooqi, Balbir Singh, Shashi Dahiya and Alka Arora. A perspective on the distribution of personnel visited abroad from the ICAR
- N Okendro, W Alam and AK Paul. Length-weight relationship and growth pattern of Tor putitora (Hamilton) under monoculture and polyculture systems
- NR Abeynayake, Seema Jaggi and Cini Varghese. Neighbour balanced block designs for test treatments-control comparisons
- P Singh, W Alam and AK Paul. Application of hierarchical clustering methods for study of time series wool production of India
- Prawin Arya, N Sivaramane and DR Singh. Crop revenue insurance: A new risk management tool
- R Srivastava, R Parsad, Manisha Jain and PK Batra. Robustness aspects of response surface designs against loss of data
- Rajendra Kumar, NP Singh and Gyan Singh. Long range effect of application of macro and micro nutrients with NPK in rice-wheat cropping system under Semi-Arid Eco System
- Ranjit Kumar Paul and Lalmohan Bhar. M-estimation in block designs
- SB Lal, VK Dubey, RC Goyal, VH Gupta and Alka Arora. Academic information system for agricultural education in India
- SN Islam and Hari Om Agarwal. Need of IT based agricultural professionals in India
- SN Islam, Hari Om Agarwal, Md. S Farooqi, Vipin K Dubey, KK Chaturvedi, HS Sikarwar, Randhir Singh, AK Sharma, RK Sharma, KD Srivastava, JP Sharma and Kirti Sharma. Knowledge management in agriculture through expert system.
- SB Lal, Anu Sharma and VK Mahajan. An object-oriented based application software for analysis of survey data

- SC Mehta, Amrendra Kumar, RP Shukla and Shashi Sharma. Weather based forewarning models for mango fruit-fly
- SC Sethi, RM Sud and Bhagwan Das. Small area estimation of wheat crop yield for district of Haryana state
- Sarika, Seema Jaggi and VK Sharma. Response surface analysis incorporating neighbour effects from adjacent units
- Satya Pal, Ramasubramanian V and SC Mehta. Statistical models for forecasting milk production in India
- Seema Jaggi, Rajender Parsad, VK Gupta and Suman Kumar. Robustness of BIB and GD designs for correlated observations
- Shashi Dahiya, Balbir Singh, Alka Arora and Md. Samir Farooqi. An age based platform for manpower management in ICAR
- Shuchita Upadhaya, Alka Arora and Rajni Jain. Rough set based cluster analysis for soybean disease diagnosis
- Jagbir Singh, UC Sud and HVL Bathla. Debt and investment and land and livestock holding surveys
- Sushila Kaul. An analytical study of status of food security in India
- T Rai and Chandrahas. A comparative study of rice yield forecast model
- UC Sud and Dwijesh Mishra. Double ranked set sampling in the context of finite population sampling
- UC Sud, Prasenjit Pal and IC Sethi. Estimating population mean square through predictive approach when auxiliary character is estimated
- VK Dubey, SB Lal, Ramasubramanian V, GK Jha and Ranjana Agrawal. Development of software for imputation using back propagation neural networks

Eastern Zonal Conference organized by Indian Soc. Mycol. Pl. Pathol., AAU, Jorhat, during 01–02 November 2006

- C Chattopadhyay, Ranjana Agrawal, Amrender Kumar, BK Bhattacharya, SA Khan, Vinod Kumar, LM Bhar, RP Awasthi, Ashok Kumar, AG Desai, AK Chattopadhyay, SN Singh, NVK Chakravarthy, RB Singh, RL Meena, PD Meena and Chander Shekhar. Epidemiology development of forecasting models and yield loss assessment for major diseases of oilseed Brassicas in India for eco-friendly crop management

Group Meeting of AICRP on STCR held at IASRI, New Delhi during 02–03 November 2006

- VK Gupta and Rajender Parsad. Design and analysis of experiments under AICRP on STCR

National Conference of Indian Society of Agricultural Economics organized at ICAR Research Complex, Meghalaya during 08–10 November 2006

- Ranjit Kumar, NP Singh, RP Singh and AK Vasisht. Rural infrastructure and agricultural growth: Interdependence and variability in Indo-Gangetic Plains of India

9th Annual Conference of Society of Statistics, Computer and Applications held at Department of Statistics, Saurashtra University, Rajkot during 11–13 November 2006

- Ranjit Kumar Paul and Lalmohan Bhar. Robust analysis of experimental data
- Rajender Parsad, Jose Crossa and VK Gupta. Statistical analytical techniques for farmers' participatory research trials for conservation agriculture. Invited Talk in Symposium on Information Extraction from Data Investigation.
- VK Gupta, Rajender Parsad and Lal Mohan Bhar. Super saturated designs: Some thoughts (Special Invited Talk)
- VK Gupta, Rajender Parsad and Lal Mohan Bhar. Supersaturated design for asymmetrical factorial experiment

Fifth Asia-Pacific Remote Sensing Symposium held by International Society of Optical Engineering (SPIE) in Goa during 13–17 November 2006

- Prachi Misra Sahoo, Anil Rai, Sudhakar Krishnamoorty, BK Handique, PPN Rao and JS Prihar. Sampling approach for estimation of crop acreage under cloud cover satellite data in hilly regions

National Conference on Innovations in Indian Science, Engineering and Technology organized at IARI, New Delhi during 24–26 November 2006

- Prawin Arya, DR Singh, N Sivaramane, Sanjeev Pawar and Sanat Kumar. Analysis of crop production stability under different irrigation levels in Uttar Pradesh
- Rajendra Kumar, NP Singh and Gyan Singh. Statistical investigation on use of application of micro nutrients in rice-wheat cropping system

- Sanjeev Panwar, Anil Kumar and Sushila Kaul. Trend analysis of flower production in India
- Sushila Kaul and BB Beohar. An empirical study of role of indigenous minor forest products in tribal economy of Madhya Pradesh
- सुशीला कौल। भूमण्डलीकरण का भारतीय कृषि अर्थ व्यवस्था पर प्रभाव

14th International Conference on Computational, Mathematical and Statistical Methods held at Chennai during 06–08 January 2007

- UC Sud. Estimation of finite population mean using double ranked set sampling

National Seminar on Enhancing Skills for Research and Development in Marine Fisheries organized at CMRI, Cochin during 05–07 February 2007

- Anil Rai and PK Malhotra. Knowledge management in marine fisheries

14th Regional Technical Coordination Committee Meeting of the Rice-Wheat Consortium for Indo-Gangetic Plains held at Katmandu, Nepal during 14–15 February 2007

- Rajender Parsad, Jose Crossa, VK Gupta and Raj K Gupta. Statistical tools for farmers' participatory research trials for conservation agriculture.

National Conference on Computing for Nations Development held at Bharati Vidyapeeth's Institute of Computer Applications and Management, New Delhi during 23–24 February 2007

- Alka Arora, Shuchita Upadhaya and Rajni Jain. Characterizing mushroom clusters using rough set
- Aditi Sharan and Shashi Dahiya. Web similarity aspects
- Anu Sharma, Rajni Jain and Krishna Asawa. Ontology for knowledge discovery in agriculture

International Conference on Information Systems, Technology and Management (ICISTM-2007) held at India Habitat Centre, New Delhi during 12–13 March 2007

- Alka Arora, Shuchita Upadhaya and Rajni Jain. Rough set approach for generating cluster description

Eastern Regional Workshop of STCR OUAT, Bhubaneswar during 15–16 March 2007

- Aloke Lahiri. On application of statistics in field experimentation and soil testing

International Conference on Environmental and Ecological Statistics with Application organized at ISI, Kolkatta during 21–23 March 2007

- Himadri Ghosh and Prajneshu. Rainfall modeling and forecasting in India – An overview

National Seminar on Forest and Forestry Techniques organized at Guru Ghasidas University, Bilaspur during 23–24 March 2007

- SP Bhardwaj, VK Bhatia and AK Vasisht. Economic study of exploitation of non-timber forest produce in India

PARTICIPATION

- National Seminar on Emerging Issues in Food Management organised by Commission for Agricultural Costs and Prices on 2 June 2006
- Workshops/Meetings of Book Development Team for Science & Technology for Upper Primary Classes (Class VII) during 15–17 April; 29 May to 2 June; 3–7 July 2006; 7–14 August 2006 held at NCERT, New Delhi
- National Workshop on Data Warehouse and Data Mining at Department of Computer Science, Saurashtra University and Society of Statistics, Computer and Applications on 23 April 2006
- Western Regional Workshop of STCR, held at JNKVV, Jabalpur during 27–28 April 2006
- National Workshop on Site Specific Nutrient Management for Sustainable High Yield Agriculture held during 18–19 May 2006 at PDCSR, Modipuram
- National Symposium on Buffalo for Rural Upliftment and Annual Convention of Indian Society for Buffalo Development during 27–30 May 2006 organized by Maharashtra Animal and Fisheries Sciences University, Bombay Veterinary College and Indian Society for Buffalo Development at Mumbai
- 26th Workshop of AICRP on Farm Implements & Machinery at MPKV, Rahuri during 08–09 June 2006
- Hindi Workshop held at IASRI New Delhi during 16–17 June 2006
- Workshop on Improvement of Agricultural Statistics organized by the Directorate of Economics and Statistics, Govt. of India, New Delhi at Vigyan Bhavan during 07–08 July 2006
- Brain Storming Session on Expectations of Different Divisions of ICAR from IASRI under the Chairmanship of Director General, ICAR and Secretary, DARE on 11 July 2006

- Workshop to guide the University Teachers regarding Teaching of Basic Statistics as One of Application Courses in BA Programme of University of Delhi held at South Campus, University of Delhi on 28 July 2006
- 4th ICA Asia Pacific Regional Research Conference at Colombo, Sri Lanka during 15–16 August 2006
- 14th Annual Conference of AERA held at GBPUAT Pantnagar during 27–28 September 2006
- NAIP Satellite Workshop organized at NBPGR, New Delhi on 12 September 2006
- 6th Biennial National Conference of Animal Nutrition during the period from 15–17 September 2006 organized by Faculty of Veterinary Science & Animal Husbandry at SKUAST Jammu
- National Seminar on Surveys on Land & Livestock Holdings, Debt & Investment and Morbidity & Health Care of NSS 59th & 60th Rounds organized by the NSSO at Arumbakkam, Chennai during 27–28 September 2006
- International Rice Congress sponsored by International Rice Research Institute, Philippines organized by ICAR at NASC Complex, New Delhi during 06–13 October 2006
- Agricultural Summit 2006: DOAC & FICCI at Vigyan Bhawan on 18 October 2006
- Agriculture Summit 2006: Reforms for Empowering the Farmer organized jointly by DOAC, MOA, GOI and FICCI at Vigyan Bhawan, New Delhi during 18–19 October 2006
- Two day Workshop on Soil Test Crop Response Correlation Studies held at IASRI, New Delhi during 02–03 November 2006
- International Conference on India and the Global Economy held at ICRIER, New Delhi during 06–07 November 2006
- 9th Annual Conference of Society of Statistics, Computer and Applications held at Department of Statistics, Saurashtra University, Rajkot during 11–13 November 2006
- Fifth Asia-Pacific Remote Sensing Symposium held by International Society of Optical Engineering (SPIE) in Goa during 13–17 November 2006
- Dairy Industry Conference at National Dairy Development Board, Kolkata during 23–25 November 2006
- National Conference on Innovations in Indian Science, Engineering and Technology held at National Physical Laboratory, IARI, New Delhi during 26–28 November 2006
- National Symposium on Ornamental Bulbous Crops held at SVBPUA & T, Modipuram, Meerut during 05–06 December 2006
- Pre-conference Workshops on Hotspot Geoinformatics and Regression Diagnostics oragnised on 26 December 2006 at IASRI, New Delhi
- International Conference on Statistics and Informatics in Agricultural Research organized by IASRI, New Delhi during 27–30 December 2006 to celebrate the Diamond Jubilee of Indian Society of Agricultural Statistics at NASC Complex, New Delhi
- International Conference on Computational, Mathematical and Statistical Methods held at Chennai during 06–08 January 2007
- National Seminar on Serving Farmer and Saving Farming Indian Imperatives and Global Perspectives at Pant Nagar during 10–12 January 2007
- 20th National Convention of Agricultural Engineers and National Seminar on Farm Mechanization for Diversification of Agriculture organized by the Ludhiana Local Centre of the Institution of Engineers (India) in collaboration with the Department of Farm Power & Machinery, Punjab Agricultural University, Ludhiana during 19–20 January 2007
- An India-US Agriculture Knowledge Initiative (AKI) Joint Workshop on Curriculum Development in Emerging Areas of Agriculture and Rural Development organized by ICAR and GBPUAT, Pant Nagar at NASC Complex, New Delhi during 22–23 January 2007
- हिन्दी ग्रहन कार्यशाला का आयोजन एन.ए.ए.आर.एम., हैदराबाद में दिनांक 01-06 फरवरी 2007 को हुआ।
- Workshop on Data Analysis and Data Mining held at NAARM, Hyderabad on 26 February 2007
- Eastern Regional Workshop of STCR OUAT held at Bhubaneswar during 15–16 March 2007
- National Seminar on Forest and Forestry Techniques held at Guru Ghasidas University, Bilaspur during 23–24 March 2007
- Zonal Research & Extension Programme Workshop of Eastern Dry Zone (Zone-5) held at GKVK, Bangalore on 28 March 2007
- Workshop of All India Coordinated Research Project on Post-Harvest Technology

MEETINGS

- Meeting with Dr. BS Pathak, Director, SPRERI, Vallabh Vidyanagar (Gujarat) for discussion relating to the final report of the farm mechanization project on 03 April 2006.
- Meetings with officials of Mahindra & Mahindra at Mumbai on 04 April and 05 May 2006.
- Technical Committee Meeting on 18th Livestock Census under the Chairmanship of Animal Husbandry Commissioner at Krishi Bhavan, New Delhi on 05 April 2006.
- Meeting with scientists in the Division of Agricultural Engineering, ICAR Research Complex for NEH Region, Umiam, Barapani (Meghalaya) during 07–08 April 2006.
- Meetings of Technical Committee of FASAL on 27 June 2006 and 13 January 2007 at Krishi Bhavan, New Delhi.
- Meeting of the Working Group constituted for the land use statistics at Krishi Bhavan, New Delhi on 28 June 2006.
- Meeting with Adviser regarding Horticulture Statistics at Shastri Bhavan, New Delhi and Sub-committee meeting pertaining to 18th livestock census under the Chairmanship of Animal Husbandry Commissioner on 29 June 2006.
- Meeting at Krishi Bhawan, New Delhi to discuss and finalise the methodology and procedural issues with a view to start collection of cost data in Tamil Nadu, Karnataka and Andhra Pradesh under the Chairmanship of Principal Adviser, Ministry of Agriculture on 05 July 2006.
- Meetings of the Standing Committee on Faculty and Discipline of the PG School, IARI held on 13 July and 04 November 2006.
- Meeting of the Committee constituted for examining the requisite qualification etc. for the post of Principal Scientists and Sr. Scientists on 05 August 2006.
- Meetings of the Sub-Group on Animal Husbandry and Dairying for XI Five Year Plan at New Delhi on 25 July, 03, 10, 17 August and 18 September 2006.
- Meeting of the Sub-Group on Agricultural Statistics in connection with the XI Five Year Plan under the Chairmanship of Principal Adviser, Ministry of Agriculture, Govt. of India at Krishi Bhawan, New Delhi on 19 August 2006.
- Meeting at DOAC regarding National Agricultural Insurance Scheme under the Chairmanship of Special Secretary, Sh. AK Singh at Krishi Bhavan, New Delhi on 21 August 2006.
- Screening Committee meeting for updating the rates and ratios used for compilation of the estimates of domestic products capital formation and other aggregates on 25 August 2006 at CSO, Sardar Patel Bhavan, New Delhi.
- Meeting under the Chairmanship of DG, CSO at Sardar Patel Bhavan, New Delhi regarding the proposed training programme to be organized for the participants from Somalia on 25 August 2006.
- High Level Coordination Committee Meeting at Department of Agriculture, Lucknow on 29 August 2006.
- High Level Coordination Committee Meeting at Department of Agriculture, Karnataka at Bangalore on 31 August 2006.
- Second meeting of the Working Group on Crop Husbandry, Agricultural Inputs, Demand and Supply Projections and Agricultural Statistics for the XI Five Year Plan under the Chairmanship of Dr. VS Vyas, in Yojna Bhavan, New Delhi on 07 September 2006.
- Coordination Committee Meeting for studies in Agricultural Economics under the Chairmanship of Secretary (Agriculture), Ministry of Agriculture in Krishi Bhawan, New Delhi on 07 September 2006.
- Meeting of SAARC Technical Committee on Agriculture and Rural Development (TCARD) on 18th September 2006 at NCAP, New Delhi jointly organized by Department of Agricultural Research and Education, Ministry of Agriculture, Govt. of India, ICAR and NCAP.
- 3rd Meeting of the Technical Committee on Agriculture and Rural Development (TCARD) of SAARC at NASC Complex, New Delhi on 18 September 2006.
- Board of Post-graduate Studies Meeting held at NEH University, Shillong on 9 October 2006.
- 8th Meeting of the Task Force on Assessment of Survey Capabilities of Private Sector at CSO, Sardar Patel Bhawan on 30 November 2006.
- Meeting of Technical Monitoring Committee on 07 and 08 December 2006 at CIFRI, Barrackpore, West Bengal.
- Group Meeting of AICRP-LTFE held at IISS, Bhopal during 17–18 January 2007.
- Meeting related to Crop Insurance under the

Chairmanship of Secretary, Ministry of Agriculture at Krishi Bhavan, New Delhi on 14 February 2007.

- 14th Regional Technical Coordination Committee Meeting of the Rice-Wheat Consortium for Indo-Gangetic Plains held at Kathmandu, Nepal during 14–15 February 2007.
- Meeting of the Screening Committee to discuss the project proposal for updating rates and ratios under the Chairmanship of Additional Director General (NAD) at Sardar Patel Bhawan, New Delhi on 19 March 2007.
- Meeting of the Empowerment Committee under the Chairmanship of the Secretary, Statistics and Programme Implementation at CSO, Sardar Patel Bhavan, New Delhi.
- Meeting with Director, Fisheries Statistics regarding ensuing TMC Meeting at Barrackpore.
- Meeting on Programme Implementation under FASAL Project at Space Application Center, Ahmedabad.
- ICAR-ICRISAT Partnership Project Meeting in NAAS, New Delhi on 25 May 2006.
- Meeting of Secretary ICAR with ERNET India to apprise and discuss the scope of Intranet and Internet and proposed network of KVKs in DG's Committee room on 28 June 2006.
- Brainstorming Session on Projectised Mode of Research in ICAR at NCAP on 19 July 2006.
- PERMISNET and Intelligent Reporting System Workshop at NASC Complex on 21–22 July 2006.
- NAIP Component I: Information, Communication and Dissemination System (ICDS) Meeting at NAIP Office, KAB II on 01 August 2006.
- Meeting of the Sub Committee on Higher Education (HRD Ministry). NIEPA, NCERT Campus, Chaired by Shri Satyam, former Secretary Statistics on 29 August 2006.
- Meeting of ICAR Regional Committee No. IV at Patna, Bihar on 1–2 September 2006.
- Presentation of Vision 2025 Perspective Plan before SMD, Engg. Division, ICAR on 7–8 September 2006.
- Policy & Gender Analysis and Visioning (PGAV) Programme Meeting of the experts on 08 September 2006.
- MHRD meeting for Higher Education Statistics at NIEPA, NCERT on 18 September 2006.
- Combined Meeting of all committees of IRC-2006 under the Chairmanship of Dr. MS Swaminathan & Co-Chairmanship of Dr. Mangala Rai, DG, ICAR on 22 September 2006.
- Meeting with Dr. Gautam Bose, DDG NIC and Dr. ABL Srivastava at NIC for finalizing parameters for Higher Educational Statistics for MHRD on 16 October 2006.
- O&M Program Committee Meeting for Component I at NAIP on 17 October 2006.
- Meeting with SMD to discuss Agenda of Directors' Conference slated for 3–4 November 2006.
- Directors' Conference at NASC Complex during 3–4 November 2006.
- APAARI: Expert consultation on agricultural innovations: Linking farmers to Market at NASC on 6 November 2006.
- Planning Meeting of QRT (2001–05) at IASRI. DDG (Engg), Dr. AK Nigam and members on 11 December 2006.
- Discussion of Vision 2025: Perspective Plan with DDG (Engg) along with Foreword, etc. on 14 December 2006.
- Indo US Knowledge initiative discussion with Dr. SP Tiwari, Dr. PL Gautam and others on 08 January 2007.
- Indo-US Agricultural Knowledge Initiative Joint Workshop at NAAS for Curriculum Development on 22–23 January 2007.
- Meeting with Dr. S Ayyappan, DDG (Animal Sciences) with Directors of IASRI and NCAP in connection with constitution of RAC on 24 January 2007.
- Meeting with Chairman, Research Advisory Committee, Dr. PV Shenoi and all HDs on 22 February 2007.
- Meeting with Dr. Simon Holland regarding agri-extension programme through the use of ICT and the INARIS project on 26 April 2006.
- Meeting for planning baseline survey for horticultural mission under the Chairmanship of Prof. Abhijit Sen, Member, Planning Commission on 3 May 2006.
- Meeting to discuss ASTIN project with collaborating scientists from IASRI Chaired by Director, IASRI and with collaborating institutions with Dr. P Das, DDG (Extn) in chair on 5 and 19 May 2006.
- Meeting with Dr. KD Singh and Chief Conservator of Forest, Punjab for model building on tree growth dynamics on 6 May 2006.

- Meeting of the Expert Group on Informal Sector (Delhi Group) for discussing: (i) Data quality of surveys on informal sector and informal employment (ii) Measuring the links between poverty and informal employment (iii) Identification of informal jobs in agriculture, and (iv) Measuring contribution of informal sector/informal employment at New Delhi during 10–12 May 2006.
- Meeting of the Empowered Committee for implementation of Awards and Fellowships for outstanding and meritorious research work in statistics under the Chairmanship of Dr. RC Panda, Special Secretary (S&PI), MOS&PI, GOI on 15 May 2006.
- Meeting with Dr. SM Jharwal, Principal Advisor and Sh. Vijay Kumar, Advisor, DES, DOAC along with Dr. Tauqueer Ahmad for project proposal on divergence in cotton production statistics among CAB and DES estimates on 17 May 2006.
- 6th Meeting of Task Force on assessment of survey capability at MOS&PI, Sardar Patel Bhavan, under Chairmanship of Dr. RC Panda, Special Secretary on 7 June 2006.
- Discussions with Prof. Shashi Gadia, Iowa State University and Dr. Navneet Goel, BITS Pilani for data mining collaboration on 12 June 2006.
- Director Inaugurated the Awareness training on SURVEYCAP database for 10 officers of CSO on 6 July 2006.
- Meeting of Empowered Committee for fellowship/ grants of MOS&PI on 24 July 2006.
- Release of results of census on marine fisheries conducted by CMFRI at Krishi Bhawan on 25 July 2006.
- XI Plan Working Group Meeting for Agricultural Statistics in Planning Commission on 27 July 2006 and on Crop husbandry, inputs and agricultural statistics at Yojana Bhavan on 16 November 2006.
- Meeting of Core Group in Horticulture Statistics at IASRI with Dr. AK Bhatia, Advisor (Horticulture) on 31 July 2006.
- Meeting with Dr. Simon Holland for finalizing NAIP project proposal on 31 July 2006.
- Meeting of Standing Committee of the Conference of Central and State Statistical Organisation (COCSSO) for finalizing agenda with Secretary, Dr. RC Panda in Chair on 9 August 2006.
- Director Chaired the Horticulture Core Group Meeting at IASRI for discussing weakness in present horticultural database on 21 August 2006.
- Executive Council Meeting for Society of Statistics, Computer and Applications at ISI Delhi on 24 August 2006.
- UP State High Level Coordination Committee Meeting for improvement of agricultural statistics at Lucknow on 21 September 2006.
- Coordination Committee Meeting for ISAS International Conference on Statistics and Informatics (ICSI-2006) on 27 September 2006.
- Technical Advisory Committee Meeting for 18th Livestock Census at Krishi Bhawan on 12 October 2006.
- Meeting with Mrs. Shobha Marwah, Director Fishery Statistics and DK Sinha, DAHD on 17 November 2006.
- Eighth Meeting of the Task Force for Study on Assessment of Survey Capabilities of Private Sector: World Bank assisted India Statistical Strengthening Project on 30 November 2006.
- Director Chaired the Technical Monitoring Committee Meeting for Fishery Statistics at CIFRI, Barrackpore on 07–08 December 2006.
- Director Chaired the 2nd Steering Committee for Pilot study for estimation of area and production of horticulture crops at IASRI on 12 December 2006.
- Meeting of the Coordinating Committee for Organisation of Studies in the Field of Agril. Economics under Chairmanship of Secy (A&C), Krishi Bhawan on 24 January 2007.
- Meeting of the Empowered Committee for implementation of Awards and Fellowships for outstanding and meritorious research work in statistics with Dr. RC Panda, Secretary (S&PI) in Chair on 25 January 2007.
- Orissa State High Level Coordination Committee Meeting for improvement of agricultural statistics at Bhubaneswar on 31 January 2007.
- Second Meeting of UN OSLO City Group on Energy Statistics inaugurated by Hon'ble Minister of State (Ind. Charge) on 5 February 2007.
- Meeting for Assessment of inputs and investment requirements for 4% growth in ag sector in XI plan with Dr. Abhijit Sen in Chair at Yojana Bhawan on 9 February 2007.

- Meeting under Chairmanship of Secretary Ag. & Coop. for National Agricultural Insurance Scheme – Maintaining single series of Crop Cutting Experiments on 14 February 2007.
- Meeting with Dr. DP Singh, VC, JNKVV regarding their staff selection for computers on 13 March 2007.
- Discussions with Sh. SC Sheddy, ADG (Trng) CSO for planning various world class facilities at Statistical Training Institute at NOIDA on 15 March 2007.

Training/Study visit

- Dr. Rajender Parsad, National fellow was deputed for a study visit on Hands-on Experience on Analysis of Farmer Participatory Research Trials conducted by Rice-Wheat Consortium for Indo-Gangetic Plains to CIMMYT, Mexico from 24 May to 28 June 2006. During this study visit, he worked on ASREML (a statistical package that fits linear mixed effects models using Residual Maximum Likelihood) for spatial data analysis. Also worked on SAS to obtain biplots from Additive Main Effects and Multiplicative Interactions and Site Regression (SREG) models. Analyzed 5 data sets of Rice Wheat Consortium for Indo-Gangetic Plains. In this analysis, farmers or villages are taken as blocks and resource conservation technology options as treatments. Farmers/ villages effects were taken as random. Efforts were also made to find year × treatment interactions and variety × treatment interactions. The efforts were also made to identify technology for a given variety or soil type. The results obtained were communicated to Dr. RK Gupta and other scientists involved for their comments. The data file preparation for the analysis is very important. Some suggestions were also made on how to prepare the EXCEL files to maintain uniformity overall locations and years.
- Dr. Rajender Parsad, National fellow was deputed for participating in 14th Regional Technical Coordination Committee Meeting of the Rice-Wheat Consortium for Indo-Gangetic Plains held at Kathmandu, Nepal during 13–16 February 2007. During this meeting, a paper on Statistical Tools for Farmers' Participatory Research Trials for Conservation Agriculture was presented.
- Ms. Alka Arora participated in one day training program for the CSO officials on SurveyCap Database on 06 July 2006 held at IASRI, New Delhi.
- Scientists of the Institute attended a training programme on "On-line library information system" for CMIE, DELNET, Ingenta and other Library Utility organized by IASRI Library during 27–29 July 2006.
- Dr. Anil Rai and Mohd. Samir Farooqi attended a training on Spatial Analyst of ARC-GIS organized by ESRI, India at NIIT, New Delhi during 5–7 March 2007.

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Workshops, Conferences, Meetings, Seminars and Annual Day Organized

Conferences/Workshops

Workshop-cum-training programme on "Design and Analysis of Farmers Participatory Research Trials" for the research personnel involved in the conduct of farmers participatory research trials under the aegis of Rice Wheat Consortium for Indo-Gangetic Plains was organized during 10–12 August 2006. This workshop-cum-training programme aimed at the theme of statistical principles involved in the conduct of farmers participatory research trials. It was attended by 20 participants. Out of 20 participants, 7 were from RWC-CIMMYT, 2 from IRRI, 2 from Banaras Hindu University, 4 from different ICAR Institutes, 4 from SAUs and 1 from State Department of Agriculture. Dr. Rajender Parsad was the Course Director. The topics discussed were fundamentals of design of experiments, contrast analysis, analysis of covariance, biplot graphic display, SAS and ASREML. The main emphasis was laid on case studies. Several real data sets were analyzed by the participants using SAS. The workshop-cum-training programme was conducted in participatory mode. A lot of discussions took place. It was decided that some

Inaugural session of workshop-cum-training programme on "Design and Analysis of Farmers Participatory Research Trials"

treatments such as conventional tillage may be kept common for all the farmers. The data may be analyzed on grain yield, straw yield, thousand grain weight and returns over variable cost. To investigate the effect of resource conversation technologies on the soil physical and biological properties, long term experiments with reference to resource conservation technologies may be conducted at some of the ICAR institutes. The clear cut definition and identification of treatments was done and all the centres were asked to present their data as per the terminology finalized. The variables on which the data is to be supplied were also finalized along with EXCEL sheets.

Organised one day study programme for a batch of Statistical Personnel of Central/State/UT Governments/ PSUs on 31 August 2006. Four lectures were delivered.

Inauguration of one day study programme for a batch of statistical personnel

An International Conference on Statistics and Informatics in Agricultural Research (ICSI2006) was organized by IASRI, New Delhi during 27–30 December 2006 to mark the Diamond Jubilee Celebration of the foundation of Indian Society of Agricultural Statistics.

To meet the goal of the Conference, the following six major sessions were convened and 54 invited lectures were delivered by eminent scientists of International repute.

Theme 1 : Statistical Applications in Agricultural Research
Theme 2 : Emerging Issues in Areas of Basic Statistical Research
Theme 3 : Agricultural Informatics
Theme 4 : Statistical and Computational Biology in Agriculture
Theme 5 : Statistical and Economic Issues for Prosperity of Rural Community
Theme 6 : Human Resource Development for Agricultural Statistics and Informatics

The Hon'ble Minister of Statistics and Programme Implementation, Shri GK Vasan inaugurated the conference. The Minister emphasized the need for conducting basic research in Statistics and Informatics

The Hon'ble Minister of Statistics and Programme Implementation, GOI, inaugurating the Conference

in newer emerging areas of micro array experiments; computational biology; genomics of plant, livestock, fishery, flora and fauna; biodiversity, evaluation and valuation; statistical modeling; precision agriculture, etc. so as to meet the challenges of agricultural research. For micro-level policy planning research, small area techniques should be continued more rigorously. Efforts should be made to improve the quality of data and while providing the estimates timeliness and accuracy of estimates of parameters of interest should be maintained for proper and effective policy planning. Further, the definitions of various parameters used by different agencies should be uniform. Dr. Mangala Rai, Secretary, DARE and DG, ICAR and President, ISAS delivered the Presidential Address. Dr. Rai echoed the feeling that in view of the applicational nature of the discipline of Statistics to other sciences, it is important that the scientists of this discipline should work in close collaboration with the subject matter specialists so as to enable the information generated through research in Statistics and Informatics get converted into knowledge.

During the conference, three Plenary Talks were delivered by Dr. GP Patil, Dr. James H Matis and Dr. Padam Singh. Besides, there were two Memorial Lectures, viz., Dr. Rajendra Prasad Memorial Lecture,

delivered by Dr. GS Bhalla and Dr. VG Panse Memorial Lecture, delivered by Dr. AK Nigam.

155 posters were presented during the conference. Many important recommendations have emerged from the conference.

During this International Conference two Pre-Conference Workshops on HOTSPOT GEOINFORMATICS and REGRESSION DIAGNOSTICS were organised on 26 December 2006.

HOTSPOT GEOINFORMATICS by GP Patil

Geoinformatics for spatial and temporal hotspot detection and prioritization is a critical need for the 21st Century. A declared need is around for statistical geoinformatics and software infrastructure for spatial and spatiotemporal hotspot detection, prioritization, early warning, and sustainable management. A hotspot can mean an unusual phenomenon, anomaly, aberration, outbreak, elevated cluster, critical area. The declared need may be for monitoring, etiology, early warning, or management. The responsible factors may be natural, accidental, or intentional. The five year NSF DGP project has been instrumental to conceptualize hotspot geoinformatics partnership among several interested cross-disciplinary scientists in academia, agencies, and private sector around the world. Our efforts are driven by a wide variety of case studies of interest to agencies, academia, and private sector involving critical societal issues, such as public health, ecosystem health, ecohealth, biodiversity and threats to biodiversity, emerging infectious disease, water management and conservation, carbon sources and sinks, persistent poverty, environmental justice, crop pathogens, invasive species management, biosurveillance, biosecurity, disease biogeoinformatics, social networks, sensor networks, hospital networks and syndromic surveillance, video mining, early warning, tsunami inundation, remote sensing, and disaster management. Also space-time disease, poverty, pollution, object identification and tracking, early detection, early warning, hotspot trajectories and trends with examples of West Nile Virus, urban poverty patch dynamics, etc. The project emphasis is on development of geoinformatic hotspot system. The system has two methodological components: hotspot detection and prioritization.

Dr. GP Patil addressing participants of the workshop

The emphasis during this workshop was on geoinformatics of hotspot detection and prioritization motivated by a wide variety of subject areas and critical issues confronting agencies, academia, and industry involved with agriculture, natural resources, environment and ecology, and ecohealth. It has provided up-to-date exposition with live examples and illustrations. The participants were emensely benefitted from this workshop through the case studies. In all 127 scientists and technical personnel attended this workshop.

REGRESSION DIAGNOSTICS by T Krishnan

The main aim of regression modelling and analysis is to develop a good predictive relationship between the dependent (response) and independent (predictor) variables. Regression Diagnostics plays a vital role in finding and validating such a relationship. In this workshop, issues that arise in the development of a multiple linear regression under model were discussed.

The workshop consisted mainly of descriptions of the rationale and techniqes of various diagnostic procedures used in Multiple Regression Analysis, and demonsrations of their use in suitable agricultural data sets, using SYSTAT statistical software. Exercises of the same type were given, some of the which the participants were asked to carry out during the workshop and the rest in their own time.

Data sets used in the demonstrations and for the exercises were also described. A folder of these data sets in the SYSTAT format were provided on the computer system used for the workshop. Moreover, information on the source of the data was available in the data file itself in the comments box of the first variable.

This workshop discussed only diagnostics for regression. In the end, participants were advised that they should follow it up with a study of remedies for the problems encountered. Since this is a vast subject, it was also familiarized to participants that these are only some show pointers whereas in practice many more problems in regression diagnostics may arise.

Director, National Professor & participants during the workshop

101 scientists and technical personnel attended this workshop.

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 proposed. 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 85 seminar talks were delivered. Out of these, 63 were student seminars, 20 by scientists of the Institute and 02 by guest speakers.

- Guest Seminar by Dr. Mousumi Bose, ISI, Kolkata on Application of Design to Visual Cryptography on 7 June 2006
- Foreign Visit Seminar by Dr. Rajender Parsad, National Fellow, IASRI on Hands on Experience of Analysis of Farmers Participatory Research Trials conducted by Rice-Wheat Consortium for Indo-Gangetic Plains on 28 July 2006
- Guest Seminar by Dr. AP Gore on Measurement of Poverty on 14 February 2007

Annual Day Celebrations

The Annual Day of the Institute was celebrated on 03 July 2006. As part of these celebrations a Quiz Contest for students, scientific staff was held on 01 July 2006. Prizes were given to the following teams:

Prize	Name	Designation
I	Sh. Ajay Kankure	Student, Ph.D (Ag. Stat.)
	Sh. Dharm Nath Jha	Student, Ph.D (Ag. Stat.)
	Sh. Susheel Kumar Sarker	Student, Ph.D (Ag. Stat.)
II	Dr. Ramasubramanian V	Scientist (SS)
	Dr. Himadri Ghosh	Scientist (SS)
	Sh. Amrender Kumar	Scientist
III	Sh. S.N. Islam	Scientist
	Ms. Shashi Dahiya	Scientist (SS)
	Sh. S.B. Lal	Scientist (SS)

On 03 July 2006, the main Annual Day Function was celebrated in which Dr. M. Mahadevappa, Ex-Chairman, ASRB was the Chief Guest. Dr. Nawab Ali, DDG (Engg.), ICAR delivered the Nehru Memorial Lecture entitled, 'Production and Utilization Pattern of the major Agricultural Commodities in India - Role of Statistics in its Rationalization'.

Nehru Memorial Gold Medal for the year 2003–05 was awarded to Km. Chhawi Saurabh, M.Sc. (CA), student.

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Distinguished Visitors

INDIAN

Dr. Mangala Rai,
Secretary, DARE and DG,
Indian Council of Agricultural Research (ICAR), New Delhi

Dr. Nawab Ali,
Deputy Director General (Engg.),
Krishi Anusandhan Bhavan-II, Pusa, New Delhi

Prof. RB Singh,
Member,
National Commission on Farmers, New Delhi

Dr. Kirti Singh,
Former Chairman,
ASRB, New Delhi

Dr. M Mahadevappa,
Former Chairman,
ASRB, New Delhi

Dr. Aloke Dey,
Professor,
Indian Statistical Institute, New Delhi

Dr. AK Nigam,
Director, IASDS,
B-16/1, First Floor, Rajajipuram,
Lucknow, Uttar Pradesh

Prof. Mousami Bose,
Indian Statistical Institute, Kolkata

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

Prof. MN Das,
Ex-Director,
IASRI, New Delhi

Sh. Prem Singh,
Deputy Director,
Regional Official Laguage Implementation,
Delhi

Dr. SK Nath,
Director General,
Central Statistical Organisation, New Delhi

Dr. RC Panda,
Secretary,
Ministry of Statistics and Programme Implementation,
Govt. of India, New Delhi

Dr. Padam Singh,
Member, National Statistical Commission,
New Delhi

Dr. MC Agarwal,
Professor (Statistics),
Delhi University, Delhi

Sh. BK Tyagi,
Director (Ag. Census),
Ministry of Agriculture, GOI, New Delhi

Sh. Vijay Kumar,
Advisor,
DES, New Delhi

Prof. Rajeev Karandikar,
Cranes Software International Limited,
Bangalore

Dr. T Krishnan,
Cranes Software International Limited,
Bangalore

Dr. Navneet Goyal,
Department of Computer Science & Information Systems,
BITS, Pilani-333 031

Dr. PK Joshi,
Director,
National Centre for Agricultural Economics and
Policy Research (NCAP),
New Delhi

Dr. AP Gore,
Professor,
Department of Statistics,
University of Pune, Ganeshkhind,
Pune

Dr. Rahul Mukerjee,
Professor,
Indian Institute of Management,
Kolkata

Dr. KK Bhardwaj,
Professor,
School of Computer Systems Sciences,
Jawaharlal Nehru University,
New Delhi

Dr. PV Shenoy,
Former Special Secretary, Ministry of Agriculture,
Govt. of India and Director, ISEC,
Bangalore

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

FOREIGN

Dr. Sat Gupta,
Professor of Statistics and Director, Statistics Division,
University of North Carolina at Greensboro,
327, Bryans Building, Greensboro, NC 27402

Dr. GP Patil,
Center for Statistical Ecology and Environmental Statistics,
Department of Statistics,
The Pennsylvania State University,
University Park, PA, 16802, USA

Dr. RA Bailey,
Professor of Statistics,
Rothamset Experimental Station, UK

Dr. Shashikala Sukhatme,
Iowa State University,
AMES, Iowa, USA

Dr. James H Matis,
Professor, Department of Statistics,
Texas A&M University, College Station,
TX77843-3143, USA

Ms. Wan Ramlah Bt. Wan Abd. Ra'of,
Deputy Chief Statistician,
Socio-economic and Trade Programme,
Department of Statistics,
Malaysia

Ms. Yatimah Bt. Sarjiman,
Deputy Director,
Industrial Production and Construction Division,
Department of Statistics, Malaysia

Ms. Zaitun Bt. Mohd. Taha Abd .Rahman,
Assistant Director,
Industrial Production and Construction Division,
Department of Statistics,
Malaysia

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IASRI Personnel

DIRECTOR
Dr. S.D. Sharma

NATIONAL PROFESSOR
Dr. V.K. Gupta

NATIONAL FELLOW
Dr. Rajender Parsad

DIVISION OF SAMPLE SURVEY
Dr. H.V.L. Bathla,
Principal Scientist and Head

Principal Scientists
Dr. K.K. Tyagi
Dr. U.C. Sud
Sh. R.S. Khatri
Dr. Jagbir Singh

Senior Scientists
Dr. M.S. Narang
Dr. Ashok Kumar Gupta

Scientists (Selection Grade)
Sh. D.C. Mathur
Sh. S.C. Agarwal
Sh. V.K. Jain
Sh. K.K. Kher
Sh. R.M. Sood

Scientists (Senior Scale)
Sh. Bhagwan Dass
Dr. Tauqueer Ahmad
Dr. (Smt.) Prachi Mishra Sahoo
Sh. Hukum Chandra (on leave)

DIVISION OF DESIGN OF EXPERIMENTS
Dr. V.K. Sharma,
Principal Scientist and Head

Principal Scientists
Dr. R. Srivastava
Dr. P.K. Batra

Senior Scientists
Dr. Aloke Lahiri
Dr. Krishan Lal
Dr. (Smt.) Seema Jaggi
Dr. L.M. Bhar

Scientists (Selection Grade)
Smt. Rajinder Kaur
Sh. M.R. Vats
Sh. N.K. Sharma
Sh. D.K. Sehgal
Sh. O.P. Khanduri

Scientists (Senior Scale)
Sh. Anil Kumar
Dr. (Smt.) Cini Varghese

Experimental Scientist
Dr. S.M.G. Saran

DIVISION OF BIOMETRICS
Dr. Prajneshu,
Principal Scientist and Head

Principal Scientists
Dr. V.T. Prabhakaran
Sh. S.D. Wahi
Smt. Asha Saksena

Scientists (Selection Grade)
Sh. S.C. Sethi

Scientists (Senior Scale)
Sh. Inder Singh
Dr. Amrit Kumar Paul
Dr. A. Ramakrishna Rao
Sh. R.M. Bhasin
Md. Wasi Alam
Sh. Pal Singh

DIVISION OF FORECASTING TECHNIQUES
Dr. (Smt.) Ranjana Agrawal,
Principal Scientist and Head

Principal Scientists
Dr. Chandrahas

Scientists (Selection Grade)
Sh. S.S. Walia
Sh. S.C. Mehta
Sh. Tribhuwan Rai
Sh. Satya Pal

Scientists (Senior Scale)
Sh. Madan Mohan
Dr. Ramasubramanian V.
Dr. Himadri Ghosh
Sh. Amrender Kumar

DIVISION OF ECONOMETRICS
Dr. A.K. Vasisht,
Principal Scientist and Head

Principal Scientist
Dr. S.P. Bhardwaj

Senior Scientists
Dr. Ashok Kumar
Dr. (Smt.) Sushila Kaul

Scientist (Selection Grade)
Sh. Mahender Singh
Sh. Rajender Kumar

Scientist (Senior Scale)
Dr. Prawin Arya
Dr. Dharam Raj Singh
Sh. Sanjeev Panwar

Scientists
Sh. Shivramane N. (on leave)

DIVISION OF COMPUTER APPLICATIONS
Dr. P.K. Malhotra,
Principal Scientist and Head

Principal Scientists
Dr. R.C. Goyal
Dr. I.C. Sethi
Dr. V.K. Mahajan

Senior Scientist
Dr. Anil Rai

Scientists (Selection Grade)
Sh. H.S. Sikarwar
Sh. Hari Om Agarwal
Sh. Balbir Singh
Sh. V.H. Gupta

Scientist (Senior Scale)
Smt. Alka Arora
Smt. Shashi Dahiya
Ms. Anshu Dixit (on leave)
Sh. Sudeep (on leave)
Md. S.N. Islam
Md. Samir Farooqi
Sh. Krishan Kumar Chaturvedi
Sh. Vipin Kumar Dubey
Sh. Shashi Bhushan Lal
Smt. Anu Sharma
Ms. Sangeeta Ahuja (on leave)

Scientists
Ms. Sonali Das (on leave)

RESEARCH COORDINATION AND MANAGEMENT UNIT
Dr. V.K. Bhatia,
Principal Scientist and In-charge

TRAINING ADMINISTRATION CELL
Dr. V.K. Sharma, Professor (Agricultural Statistics)
Dr. P.K. Malhotra, Professor (Computer Application)

NATIONAL AGRICULTURE SCIENCE MUSEUM (NASM)
Sh. R.S. Khatri, Principal Scientist and Nodal Officer
Sh. R.P. Jain, Scientist (SG) & Incharge

LIBRARY
Dr. P. Visakhi, Head

ADMINISTRATION
Capt. Mehar Singh, Chief Administrative Officer
Sh. A.K. Chaturvedi, Officer on Special Duty
Sh. K.K. Hamja, Finance and Accounts Officer

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Any Other Relevant Information

National Agricultural Science Museum

National Agricultural Science Museum (NASM) is situated at NASC Complex, Dev Prakash Shastri Marg, Opposite Dasghara Village, Pusa Campus, New Delhi-110 012. A Central Management Committee comprised of

Dr. Nawab Ali	DDG (Engg)	Chairman
Dr. P. Chandra	ADG (PE)	Member
Sh. V.P. Kothiyal	Director (Works)	Member
Sh. H.C. Pathak	Director (Finance)	Member
Sh. P.K. Jain	Under Secretary (GAC)	Member
Dr. S.D. Sharma	Director, IASRI	Member Secretary

has been constituted to oversee the National Agricultural Science Museum at the ICAR level.

The management and maintenance of the Museum is looked after by the Indian Agricultural Statistics Research Institute (IASRI) through a Management Committee under the Chairmanship of Director, IASRI consisting of the following officers:

Dr. S.D. Sharma	Director, IASRI	Chairman
Dr. P.K. Malhotra	Head (CA)	Member
Dr. H.V.L. Bathla	Head (SS)	Member
Capt. Mehar Singh	CAO	Member
Sh. K.K. Hamza	F&AO	Member
Sh. R.S. Khatri	PS & Nodal Officer	Convener
Sh. R.P. Jain	Scientist (SG)	In-charge, Museum

Under the able guidance of this Committee the day-to-day activity of the Museum is looked after by a team of Officers/Staff of IASRI deployed in the Museum.

During the period under report, many persons visited the Museum. The visitors included VVIPs, VIPs, farmers, students from various universities/colleges and schools in India and abroad. All the visitors, especially high dignitaries and foreign visitors appreciated this centrally air-conditioned unique Museum on Agriculture with an aesthetic ambience. Some of the distinguished visitors were Mr. Robin H. Chery (USA); Mr. Geamd O Doaoghue (IPGRI, Rome); Mr. Atif Nurberoy (Uzbekistan); Mr. Wair Rauelih, Deputy Chief Statistician, Mr. Jatiman Sarjiman, Department of Statistics from Malaysia, Mr. Zaitun Mohd. Taha, Department of Statistics from Malaysia, Mr. Gavan Wall

and Mr. Geoffry Memo, FAO from Rome, Mr. Besnact Charpentlcr and Mr. Michel Dodet, Vice President from INRA, France and Dr. Jacque Ajenstat and Dr. Mastialy Quebec from Canada.

All farmers and groups of students from Schools, Universities and other Educational Institutions were allowed free of charge and for others a nominal entry fee of Rs. 5 per head was charged. There is ample free parking space available for the public in the campus. The Museum is OPEN on all days (Except Monday) during 10.30 AM to 4.30 PM.

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) was constituted at the Institute with the following composition:

Dr. H.V.L. Bathla, HD(SS)	Chairman
Dr. P.K. Malhotra, HD(CA)	Member
Dr. V.K. Bhatia, Principal Scientist and Incharge (RCMU)	Member
Officer on Special Duty and Head of Office	Member
Finance and Accounts Officer	Member
Sh. P.P. Singh, Technical Officer	Member-Secretary

The functions of the Cell are as follows:

- Give broad guidelines for consultancy work
- Bring out consultancy information system, catalogues periodically
- Identify and prepare list of consultants in different fields; the consultants could be retired Scientist/ Officer of proven experience
- Prepare a roster of available human resources on the basis of time schedule
- Identify team for specific consultancy assignments and periodic reviews of progress
- Prepare consultancy proposals as per prescribed flow chart

Two meetings on 26 May 2006 and 05 September 2006 were held for finalizing the consultancy training proposals received at Consultancy Processing Cell as per ICAR Guidelines and getting approval of the Director.

Planning, Monitoring and Evaluation (PME) Cell

To facilitate all activities related to priority setting, monitoring and evaluation a Planning, Monitoring and Evaluation (PME) Cell within the RCMU in the capacity as against their names is working at the Institute. The composition of the PME Cell is as given below:

1. Dr. P.K. Malhotra, HD(CA)	Nodal Officer
2. Dr. V.K. Bhatia, Principal Scientist and Incharge (RCMU)	Member
3. Dr. Rajender Parsad, National Fellow	Member
4. Dr. Ashok Kumar, Senior Scientist	Member
5. Dr. Tauqueer Ahmad, Scientist (SS)	Member
6. Dr. Ramasubramanian V., Scientist (SS)	Member
7. Sh. P.P. Singh, Technical Officer	Member

The Terms of Reference of the Cell are as follows:

- 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 of monitoring and evaluation (site-level) activities of NATP/NAIP
- Impact analysis, especially that of research and tension 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, i.e. 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 as given below:

Prof. S.D. Sharma, Director, IASRI (ICAR), Pusa, New Delhi-110 012	Chairman
Dr. Amit Kumar Vasisht, Head of the Division (Econometrics), IASRI (ICAR), Pusa, New Delhi-110 012	Member

Dr. Anil Rai, Senior Scientist, IASRI (ICAR), Pusa, New Delhi-110 012 (Technical Expert – A Scientist of the Institute)	Member
Dr. Seema Jaggi, Senior Scientist, IASRI (ICAR), Pusa, New Delhi-110 012 (Technical Expert – A Scientist of the Institute)	Member
Dr. Madhuban Gopal, Principal Scientist and National Fellow, Division of Agricultural Chemistry. IARI, Pusa, New Delhi-110012 (IPR Expert – A Scientist from ICAR Institute in the Zone)	Member
Dr. V.K. Bhatia, Principal Scientist and Incharge (RCMU), IASRI (ICAR), Pusa, New Delhi-110 012 (Member Secretary, IRC and Incharge, ITMU)	Member Secretary

Institute Technology Management Unit (ITMU)

As per the 'ICAR Guidelines for Intellectual Property Management and Technology Transfer/ Commercialisation' a Institute Technology Management Unit (ITMU; Short title for Intellectual Property Management and Technology Transfer Commercialization Unit at institute level, i.e. IPM&TTU) for management of its IP/ deemed IP and transfer/commercialization of technologies has been constituted for pursueing 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 or the Agro-Technology Management Centre (ATMC) at the ICAR headquarters. The composition of the ITMC is as given below:

Dr. V.K. Bhatia, Principal Scientist and Incharge (RCMU), Dr. Tauqueer Ahmad, Scientist (SS) Sh. P.P. Singh, Technical Officer	Officer Incharge

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 Joint Staff Council of the Institute was as under:

Prof. S.D. Sharma	Director	Chairman
Official-side Representatives		
Dr. H.V.L. Bathla	HD (SS)	Member
Dr. P.K. Malhotra	HD (CA)	Member
Sh. R.S. Khatri	Principal Scientist and Welfare Officer	Member
Sh. K.K. Hamza	F&AO (Ex-Officio)	Member
Sh. A.K. Chaturvedi	OSD	Member-Secretary
Staff-side Representatives		
Sh. Anil Kumar Bhalla	Assistant	Secretary
Sh. D.P.S. Mann	Assistant	Member
Sh. M.M. Morya	AECO (T-4)	Member
Sh. Satya Pal Singh	Technical Officer (T-5)	Member
Sh. Gabar Singh Rana	SS Gr. II	Member
Sh. Raj Nath	SS Gr. II	Member

Two meetings of the Institute Joint Staff Council were held on 09 June 2006 and 06 December 2006 under the Chairmanship of Prof. S.D. Sharma, Director, IASRI.

IASRI Employees Co-operative Thrift and Credit Society Limited

The Society which is registered with the Registrar, Co-operative Societies, Delhi Administration continue its activities during 2006–07 in the similar manner as during the past years by advancing regular and emergent loan to its members and looking after their welfare. The sources of funds of the society are share money (value of each share is Rs. 50 only) and compulsory deposits (Rs.100 only per month from each member). The present strength of the members of the society is 386.

The Management Committee of the Society for the year 2006–09 is as follows:

Sh. U.C. Bandooni	President
Ms. Vijay Bindal	Vice-President
Sh. Pratap Singh	Secretary
Sh. Pradeep Kumar	Treasurer
Sh. V.K. Mishra	Internal Auditor
Smt. Meena Nanda	Member
Smt. Satinder Pal	Member
Sh. Arbind Kumar	Member
Sh. G.M. Pathak	Member
Sh. Sudershan Sharma	Member
Sh. Parbhu Dayal	Member
Sh. Gabar Singh Rana	Member

Main Achievements

- The society advanced Rs. 69,93,700 (Rupees sixty nine lakh ninty three thousand and seven 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. 5000 (Rupees five thousand only) to each was extended from member welfare fund of the society to the families of (Late) Sh. S.D. Sharma and Sh. S.K. Bhatnagar after their death.

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 was reconstituted with the approval of the Management Committee of the Institute for a period of two years w.e.f. October 2005 as follows:

Official-side Representative	
Prof. S.D. Sharma	Chairman
Dr. V.K. Sharma	Member
Sh. A.K. Chaturvedi	Member
Sh. K.K. Hamza	Member
Sh. D.N. Bhatia	Member Secretary
Staff-side Representative	
Sh. Mahendar Singh	Member
Sh. Vijay Pal Singh	Member
Sh. Prem Narain	Member
Sh. Purushottam Sharma	Member

Nine meetings of the Grievance Committee of the Institute were held on 24 June, 28 July, 26 August, 26 September, 28 October, 29 November, 23 December 2006, 26 February and 24 March 2007 under the Chairmanship of Prof. S.D. Sharma, Director.

Benevolent Fund

The employees of the Institute have constituted a 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 and a gift of Rs. 600 is being given to the retiring employees of the Institute. During the year, a sum of Rs. 8060 was collected from members. This year, gifts of Rs. 7800 were distributed to thirteen retiring personnel of the Institute. A relief of Rs. 1500 each to the grieved families of (Late) Sh. Sunil Dutt Sharma, AECO(T-4), Dr. S.K. Bhatnagar, T-6 and Sh. Balwant Singh, SS Gr. III were provided on their untimely death.

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. Women cell, reconstituted on 5 February 2004, comprises of the following members:

Dr. Ranjana Agrawal	Principal Scientist and HD (FT)	Chairperson
Dr. Seema Jaggi	Sr. Scientist	Member
Ms. Vijay Bindal	Tech. Officer	Member
Smt. Sushma Banati	Sr. PA	Member
Smt. Satyavati Tripathi	Asstt. Fin. & Account 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 committee comprises of the following members:

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

Hostel Activities

There are two well furnished hostels, viz. Panse Hostel and Sukhatme 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 other 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. Hostel mess is run by the students on co-operative basis. The

general management of the hostels is vested with the Warden, who is assisted by the Prefect and other students. The main activities included are as follows:

A General Body meeting of IASRI hostel inmates was held under the Chairmanship of Shri R.S. Khatri, Warden. For smooth functioning of the hostel activities, the Executive Committee members elected for the session 2006-07 were:

Prefect	Dwijesh Chandra Mishra
Mess Secretary/Asstt. Prefect	Ranjit Kumar Paul
Sports Secretary	Vinayanand Kandala
Maintenance Secretary	Sanjay Prasad
Cultural Secretary	Uttam Singh
Health Secretary	Baidyanath Mandal
Computer Lab Secretary	Sandip Shil
Common Room Secretary	Sanmit Ramdasi and Rakesh Meshram
Auditor	Subrat Kishori Behra
Cashier	Robin Singh
Warden's Nominee	Susheel Kumar Sarkar

On the eve of the Annual Day, a sports week was organised by IASRI in Sukhatme Hostel where students at IASRI participated in various sports like table-tennis, badminton and musical chair, etc.

Recreation and Welfare Club

The Institute has a Recreation and Welfare Club, which provides facilities for indoor and outdoor games, promotes 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 e.g. table tennis, carrom, volleyball, cards, etc.

The functioning of the Recreation and Welfare Club is monitored by the following Executive Committee:

Prof. S.D. Sharma	President
Dr. K.K. Tyagi	Vice-President
Sh. K.B. Sharma	Secretary
Sh. Sunil Bhatia	Sports Secretary
Sh. Girish	Treasurer
Sh. Sanjay Jain	Member
Smt. Vijay Laxmi Murthy	Member
Smt. Satinder Pal	Member
Sh. Diwan Singh	Member

Sports Activities

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

Prof. S.D. Sharma	Patron
Dr. V.K. Gupta	President
Dr. K.K. Tyagi	Vice President
Sh. R.S. Khatri	Member
Capt. Mehar Singh	Member
Sh. K.K. Hamza	Member
Dr. (Smt.) Seema Jaggi	Member
Sh. G.M. Pathak	Member
Sh. R.S. Tomar	Member
Smt. Vijaya Laxmi	Member
Sh. D.P.S. Mann	Member
Sh. Krishan Kumar	Member
Sh. Amar Singh	Member
Sh. Rambhool	Member
Sh. K.B. Sharma	Member
Sh. Ashok Kumar	Member
Sh. K.K. Hans	Member
Sh. A.K. Bhalla	Member
Sh. M.S. Verma	Convenor


शिक्षक दिवस समारोह
5 सितम्बर,2006
भारतीय कृषि सांख्यिकी अनुसंधान संस्थान
नई दिल्ली- 110012
डॉ. एम.एन. दास

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। संस्थान का समस्त प्रशासनिक कार्य शत-प्रतिशत हिन्दी में और यथा आवश्यक द्विभाषी रूप में ही हो रहा है।

राजभाषा हिन्दी के प्रयोग को बढ़ावा देने के लिए परिषद् मुख्यालय द्वारा चलायी जा रही 'राजर्षि टंडन राजभाषा पुरस्कार योजना' के अन्तर्गत वर्ष 2005-06 के दौरान सरकारी कामकाज में हिन्दी के प्रयोग में उल्लेखनीय योगदान के लिए परिषद् के बड़े संस्थानों के वर्ग में संस्थान को प्रथम तथा उत्कृष्ट गृह पत्रिका के प्रकाशन के लिए 'गणेश शंकर विद्यार्थी हिन्दी कृषि पत्रिका पुरस्कार योजना' के अन्तर्गत संस्थान की पत्रिका 'सांख्यिकी-विमर्श' को द्वितीय पुरस्कार प्रदान किये गये। ये पुरस्कार परिषद् के वार्षिक पुरस्कार वितरण समारोह के अवसर पर दिनांक 28 नवम्बर 2006 को परिषद् के महानिदेशक महोदय द्वारा प्रदान किये गये जिन्हें संस्थान के निदेशक महोदय ने ग्रहण किया।

संस्थान में हिन्दी की प्रगति का जायज़ा लेने के लिए भारत सरकार, गृह मंत्रालय, राजभाषा विभाग के क्षेत्रीय कार्यान्वयन कार्यालय, दिल्ली

निदेशक हिन्दी अनुभाग को संस्थान द्वारा प्राप्त राजर्षि टंडन राजभाषा प्रथम पुरस्कार प्रदान करते हुए

द्वारा दिनांक 22 मई 2006 को संस्थान का निरीक्षण किया गया तथा संस्थान में हो रहे हिन्दी कार्यों की सराहना की गयी।

संस्थान के पूर्वानुमान तकनीक प्रभाग की प्रधान एवं राजभाषा

प्रभारी, डॉ. (श्रीमती) रंजना अग्रवाल को भारत सरकार, सूचना एवं प्रसारण मंत्रालय के प्रकाशन विभाग द्वारा आयोजित 'भारतेन्दु हरिश्चन्द्र पुरस्कार योजना' (2003) के अन्तर्गत उनकी पाण्डुलिपि 'मच्छर ने समझाया' के लिए 12 मई 2006 को माननीय सूचना एवं प्रसारण मंत्री, श्री प्रियरंजन दासमुंशी के कर-कमलों द्वारा (संयुक्त रूप से दो व्यक्तियों को) द्वितीय पुरस्कार प्रदान किया गया।

प्रतिवेदनाधीन अवधि में संस्थान में राजभाषा कार्यान्वयन समिति की तिमाही बैठकें नियमित रूप से आयोजित की गयीं। उनमें लिये गये निर्णयों पर कार्यान्वयन सुनिश्चित करने के लिए संस्थान में गठित राजभाषा निरीक्षण समिति द्वारा निरीक्षण किया गया। इस समिति द्वारा राजभाषा कार्यान्वयन समिति की बैठकों में लिये गये निर्णयों के कार्यान्वयन पर निगरानी रखी जाती है। स्थिति के अनुसार समिति द्वारा अपने सुझाव एवं संस्तुतियाँ निदेशक महोदय के समक्ष प्रस्तुत की गयीं तथा निदेशक द्वारा दिये गये आदेशों को विभिन्न प्रभागों/अनुभागों में परिचालित किया गया।

इस वर्ष में संस्थान के कर्मियों के लिए चार कार्यशालाएँ आयोजित की गयीं। दिनांक 16-17 जून 2006 के दौरान संस्थान के वैज्ञानिक एवं तकनीकी वर्ग के लिए "वैज्ञानिक/तकनीकी सामग्री का हिन्दी अनुवाद" विषय पर एक कार्यशाला आयोजित की गयी। इस कार्यशाला में वैज्ञानिक एवं तकनीकी शब्दावली आयोग के पूर्व अध्यक्ष, प्रो. सूरज भान सिंह ने "वैज्ञानिक अनुवाद एवं लेखन" विषय पर तथा केन्द्रीय अनुवाद ब्यूरो के निदेशक, डॉ. विचार दास ने "वैज्ञानिक अनुवाद की समस्याएँ" विषय पर व्याख्यान दिये। द्वितीय कार्यशाला 16 तथा 18 सितम्बर 2006 को "हिन्दी वर्तनी एवं व्याकरण" विषय पर आयोजित की गयी। इस कार्यशाला में भारतीय कृषि अनुसंधान परिषद् के सहायक

कार्यशाला में प्रतिभागी भाग लेते हुए

निदेशक (राजभाषा), श्री सुरेन्द्र उनियाल ने "हिन्दी वर्तनी" विषय पर तथा प्रख्यात साहित्यकार एवं पूर्व वरिष्ठ अध्यापक (हिन्दी), पं. मधुर शास्त्री ने 'हिन्दी व्याकरण' विषय पर व्याख्यान दिये। तृतीय कार्यशाला 17 तथा 18 नवम्बर 2006 को 'राजभाषा नीति एवं कार्यान्वयन' विषय पर आयोजित की गयी जिसमें क्षेत्रीय कार्यान्वयन कार्यालय (दिल्ली) के उप-निदेशक, श्री प्रेम सिंह ने 'राजभाषा नीति एवं कार्यान्वयन' विषय पर तथा गृह मंत्रालय, राजभाषा विभाग के उपनिदेशक (कार्यान्यवन), श्री नेत्र सिंह रावत ने 'आँकड़ों का रखरखाव' विषय पर व्याख्यान दिये। चतुर्थ कार्यशाला 15 से 17 मार्च 2007 के दौरान 'हिन्दी टंकण' विषय पर आयोजित की गयी। इस कार्यशाला में संस्थान के उन कर्मियों ने सहभागिता की जो हिन्दी टंकण नहीं जानते थे परन्तु हिन्दी टंकण जानने के इच्छुक थे। इस कार्यशाला में राजभाषा

एक वैज्ञानिक कार्यशाला प्रतिभागिता का प्रमाण-पत्र प्राप्त करते हुए

विशेष कार्य अधिकारी एवं कार्यालय प्रधान कार्यशाला के प्रतिभागी को सम्बोधित करते हुए

हिन्दी टंकण के लिए एक प्रतिभागी प्रमाण पत्र प्राप्त करते हुए

विभाग, हिन्दी शिक्षण योजना, नई दिल्ली की सहायक निदेशिका (टंकण एवं आशुलिपि), श्रीमती ऊषा शर्मा ने 15 मार्च 2007 को तथा राजभाषा विभाग, हिन्दी शिक्षण योजना, नई दिल्ली की ही सहायक निदेशिका (टंकण एवं आशुलिपि), सुश्री आशा ने 16 तथा 17 मार्च 2007 को कम्प्यूटर पर हिन्दी टंकण का प्रशिक्षण दिया।

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 हाल ही में नियुक्त दो कनिष्ठ लिपिकों को ही हिन्दी टंकण का प्रशिक्षण दिया जाना शेष 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 अंग्रेज़ी 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 सात अनुभागों को विनिर्दिष्ट करने का लक्ष्य संस्थान द्वारा पहले ही प्राप्त कर लिया गया है। हमारे 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 सारांश प्रस्तुत किये गये। वैज्ञानिकों एवं तकनीकी कर्मियों द्वारा हिन्दी में शोध-पत्र प्रकाशित किये गये तथा अनेक शोध-पत्र प्रकाशन हेतु भेजे गये। इसके अतिरिक्त, संस्थान से बाहर आयोजित सम्मेलनों में भी संस्थान के वैज्ञानिकों द्वारा हिन्दी में शोध-पत्र/पोस्टर प्रस्तुत किये गये। 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 सितम्बर, 2006 के दौरान हिन्दी चेतनामास का आयोजन किया गया। इस दौरान अनेक कार्यक्रम/प्रतियोगिताएँ जैसे - अन्ताक्षरी, हिन्दी निबन्ध, टिप्पण एवं प्रारूप लेखन, काव्य-पाठ, वर्तनी, आशुलिपि, टंकण, वाद-विवाद, शोध-पत्र-पोस्टर-प्रदर्शन, प्रश्न-मंच इत्यादि आयोजित किये गये। इस वर्ष से वर्तनी प्रतियोगिता को हिन्दी चेतनामास के कार्यक्रमों में एक नयी कड़ी के रूप में सम्मिलित किया गया। संस्थान में 05 सितम्बर 2006 को 'शिक्षक दिवस' का आयोजन किया गया। इस अवसर पर मुख्य अतिथि एवं संस्थान के पूर्व निदेशक, प्रो. मनेन्द्र नाथ दास को सम्मानित किया गया। संस्थान में हर वर्ष हिन्दी दिवस के अवसर पर डॉ. दरोगा सिंह स्मृति व्याख्यान का आयोजन किया जाता है। दिनांक 14 सितम्बर 2006 को हिन्दी दिवस के अवसर पर डॉ. दरोगा सिंह स्मृति व्याख्यानमाला का 15वाँ व्याख्यान राष्ट्रीय कृषक आयोग के सदस्य एवं कृषि वैज्ञानिक चयन मंडल के पूर्व अध्यक्ष, प्रो. राम बदन सिंह द्वारा "लघु कृषक अनुकूल कृषि अनुसंधान एवं किसान नीति" विषय पर दिया गया। इस कार्यक्रम की अध्यक्षता कृषि वैज्ञानिक चयन मंडल के पूर्व अध्यक्ष, प्रो. कीर्ति सिंह ने की। दिनांक 22 सितम्बर 2006 को संस्थान के वैज्ञानिकों/तकनीकी कर्मियों/छात्रों के लिए शोध-पत्र-पोस्टर-प्रदर्शन प्रतियोगिता का आयोजन हुआ। इस प्रतियोगिता में 15 शोध-पत्र प्रस्तुत किये गये जिसमें से तीन श्रेष्ठ शोध-पत्रों का चयन आमंत्रित निर्णायकों द्वारा किया गया। हिन्दी चेतनामास के समापन के अवसर पर संस्थान में हो रहे हिन्दी कार्यों तथा चेतनामास के दौरान आयोजित समस्त कार्यक्रमों/ प्रतियोगिताओं की एक झलकी प्रस्तुत की गयी तथा विभिन्न कार्यक्रमों/प्रतियोगिताओं

शोध-पत्र-पोस्टर-प्रदर्शन प्रतियोगिता का एक दृश्य

शिक्षक दिवस समारोह का एक दृश्य

के सफल प्रतियोगियों को निदेशक महोदय द्वारा पुरस्कृत किया गया।

संस्थान की हिन्दी पत्रिका, 'सांख्यिकी-विमर्श' के दूसरे अंक का प्रकाशन किया गया। इस अंक में संस्थान के कीर्तिस्तम्भ, सांख्यिकी के विषय में रोचक लेख, सांख्यिकी के ऐतिहासिक विकास और देश में उपलब्ध राष्ट्रीय सांख्यिकी तंत्र से सम्बन्धित लेख, कृषि सांख्यिकी से सम्बन्धित आधुनिकतम पद्धतियों का विवरण, सूक्ष्म वित्त प्रणाली एवं संस्थान द्वारा विकसित सॉफ्टवेयरों में से एक की विस्तृत जानकारी तथा पूर्वानुमान एवं पूर्व-चेतावनी जैसे महत्वपूर्ण विषयों पर सामग्री का समावेश है। देश में कृषि पर एकमात्र संग्रहालय का रोचक व सजीव वर्णन है। डॉ. दरोगा सिंह स्मृति व्याख्यानमाला के अन्तर्गत राष्ट्रीय कृषक आयोग के सदस्य एवं कृषि वैज्ञानिक चयन मंडल के पूर्व अध्यक्ष, प्रो. राम बदन सिंह द्वारा दिया गया व्याख्यान आमंत्रित ज्ञानवर्धक लेख के रूप में पत्रिका में सम्मिलित किया गया है। कृषि सांख्यिकी के क्षेत्र में प्रयोग होने वाले सौ तकनीकी शब्दों का शब्द-शतक हिन्दी व अंग्रेज़ी में दिया गया है ताकि लेखकों को हिन्दी में लेख लिखने में आसानी हो सके।

Annexure

List of Approved On-going Research Projects

Remote Sensing and Geographic Information System

1. Developing remote sensing based methodology for collecting agricultural statistics in Meghalaya.
   Prachi Misra Sahoo, Anil Rai, Randhir Singh

Assessment and Evaluation Studies

2. Assessment of survey capabilities of private sector.
   UC Sud, SD Sharma, HVL Bathla, RC Goyal, MS Narang, DC Mathur, AK Gupta, Satya Pal, VK Jain, Bhagwan Dass, Alka Arora

Production and Area Estimation

3. Pilot study to develop an alternative methodology for estimation of area and production of horticultural crops.
   Tauqueer Ahmad, HVL Bathla, Anil Rai, DC Mathur, RM Sood
4. Study to investigate the causes of variation between official and trade estimates of cotton production
   Tauqueer Ahmad, HVL Bathla, Anil Rai, Prachi Misra Sahoo, AK Gupta, VK Jain DV Mhadgut (CIRCOT, Mumbai)

Cropping Systems Research

5. Planning, designing and analysis of experiments planned ON STATION under the Project Directorate of Cropping Systems Research.
   Rajinder Kaur, Ajit Kaur Bhatia, Anil Kumar
6. Planning, designing and analysis of ON FARM research experiments planned under Project Directorate of Cropping Systems Research.
   NK Sharma, PK Batra
7. Planning, designing and analysis of data relating to experiments conducted under AICRP on long-term fertilizer experiments.
   MR Vats, DK Sehgal, DK Mehta
8. Some investigations on design and analysis of agro-forestry experiments.
   Seema Jaggi, VK Sharma, AS Gill (IGFRI, Jhansi), Cini Varghese
9. A statistical investigation on production, economic and energy potential of crop sequences in different agro-ecosystems.
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Published by Research Co-ordination and Management Unit on behalf of Director, Indian Agricultural Statistics Research Institute, New Delhi 110 012; Laser typeset by Xpedite Computer Systems, B-587, 2nd Floor, (Opp. Naraina Bus Depot), Pandav Nagar, New Delhi 110 008 and printed at Royal Offset Printers, A-89/1, Naraina Industrial Area, Phase-I, New Delhi 110 028.