- Research Activities
- Awards and Recognition
- Human Resource Development
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- Publications
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From Director's desk……………

This Newsletter highlights salient research achievements, training programmers and workshops organized and other significant activities performed at the Institute during the period under report.

Approaches for modeling and construction of Transcription Regulatory Networks, after denoising the raw noisy gene expression data and approaches using vector autoregressive models and sparse autoregressive vector models using wavelet transformed gene expression data for time-series gene expression experiments, have been developed. The developed approaches were applied to salinity and aluminum stresses in rice and soybean respectively. Two R packages namely **dhga** (https://cran.r-project.org/web/packages/dhga) and **waveletGRN** have also been developed.

ICAR-Data Centre was inaugurated and KVK Mobile App was launched at ICAR-IASRI by Shri Radha Mohan Singh, Union Minister for Agriculture and Farmers Welfare. This digitization process in agriculture will help the farming community by encouraging technology, training and analysis of data by KVK portal and through its mobile app hosted at ICAR Data Centre of the Institute.

Seven training programmes were organized during this period. One Hindi workshop has also been organized. Scientists of the Institute received recognitions and have visited various countries viz. Rome-Italy, Addis Ababa-Ethiopia on different assignments. During the period, four new research projects were initiated. Scientists of the Institute have published 27 research papers, one popular article, 10 manual/pamphlets and developed one package. Scientists of the institute have participated in different conferences/symposia/workshops etc. in various capacities and invited lactures/lectures were also delivered. Scientists have also provided consultancy/Advisory services to students and scientists of different Institutes. It is hoped that the contents of the document would be informative and useful to scientists in NARES. Any suggestions for improving the contents of the newsletter further would be highly appreciated.

UC SUD

Research Achievements

Modelling and construction of Transcriptional Regulatory Networks using time-series gene expression data.
Samrendra Das, Bishal Gurung,Sanjeev Kumar and SD Wahi

Selection of informative genes, modelling and construction of Transcriptional Regulatory Networks is an important problem in gene expression genomics. The small sample size and the large number of genes in gene expression data make the selection and modelling process complex. Further, the selected informative genes from high dimensional gene expression data may act as a vital input for genetic network analysis. The identification of hub genes and module interactions in genetic networks is yet to be fully explored. Usually, the raw gene expression data is taken as input for genetic network analysis, which is inherently noisy due to different sources of variation present in gene expression experiments. Further, these noises may mislead the results obtained from the network modelling and inference algorithms and techniques. Therefore, attempts were made to develop approaches for modeling and construction of Transcriptional Regulatory Networks after denoising the raw noisy gene expression data. In this study, a statistically sound gene selection technique based on support vector machine algorithm for selecting informative genes from high dimensional gene expression data was proposed. The comparative performance of the proposed gene selection technique (Boot-SVM-RFE) was evaluated on three different crop microarray datasets. The proposed gene selection technique outperformed most of the existing techniques for selecting robust set of informative genes. Further, the bootstrap procedure incorporated in this technique was able to remove the spurious association among genes and their corresponding classes. Here, attempts were also made to develop an algorithm to estimate the true gene expression value from raw expression matrix based on Wavelet methodology. Further, statistical approaches for modelling and construction of gene regulatory networks using vector autoregressive models and sparse autoregressive vector models were also developed using wavelet transformed gene expression data for time-series gene expression experiments. Also, the effect of levels (scales), filter types and filter lengths of various wavelet filters on gene regulatory network modelling and inferences was studied. For this purpose, extensive simulations (artificial gene expression data) and synthetic gene expression data (DREAM4 data for *E. coli* and *S. cerviceae*) were used. Through this, better combinations of wavelet decomposition levels, filter types and lengths for better modelling and inference of gene regulatory networks was obtained. Further, the comparative performance analysis of the proposed approach was carried out on DREAM4 data with respect to WGCNA, CLR, ARACNE, NetworkBMA and MVAR. The results indicated that the proposed method performs better than these popular contemporary genetic network modelling and inference approaches. For identification of hub genes in genetic networks is a crucial task in system biology. Therefore, an attempt has been made to develop a statistical approach for identification of hub genes in the gene co-expression network. Besides, a differential hub gene analysis approach has also been developed to group the identified hub genes into various groups based on their gene connectivity in a case *vs.* control study. Based on the proposed hub gene identification approach, a few number of hub genes were identified as compared to the existing approach, which is in accordance with the principle of scale free property of real networks. In this

study, developed approaches were applied to salinity and Aluminum stresses in rice and soybean respectively. Through this, various key genes revealed the underlying molecular mechanisms of salinity and Aluminum toxic stress response in rice and soybean. Two R packages, namely, **dhga** (https://cran.r-project.org/web/packages/dhga) and **waveletGRN** for the users were also developed.

Inauguration of ICAR Data Centre and KVK Mobile App
AK Choubey, Sudeep Marwaha, Alka Arora, Soumen Pal, Mukesh Kumar and Anshu Bharadwaj

Shri Radha Mohan Singh, Union Minister for Agriculture and Farmers Welfare inaugurated the ICAR-

Data Centre and launched the KVK Mobile App at ICAR-Indian Agricultural Statistics Research Institute, New Delhi on December 21, 2016.

ICAR Data Centre provides the ICT infrastructure for hosting the web applications developed by ICAR institutes. It also provides the unified messaging solution which is based on Microsoft Exchange Server. The unified communication feature of the solution helps ICAR personnel to stay connected with each other via instant messaging, email, audio/video calls, persistent chat rooms, online meeting and presentations for scientific/research/technological/educational/ extension information exchange. It provides uniform email IDs (https://mail.icar.gov.in) of all ICAR personnel under single ICAR domain for effective communication.

KVK Mobile App (Android based) facilitates farmers with the vast amount of knowledge generated at Krishi Vigyan Kendra(s). The registered farmers can access package of practices for crops and animals using this App. They can send any farm related query to the experts available in the KVK and get solution of their problems. Farmers can get information about the facilities provided by KVK. They can access information about forthcoming as well as already organized events of the KVK in detail. There are provisions in the App to access Agro meteorological advisory and Market price of Agricultural Commodities.

In his inaugural address, the Union Minister appreciated the efforts being made towards digitization of agricultural information by ICAR. He said that ICAR Data Center can play pivotal role to take digital India campaign related to agriculture sector ahead by providing accurate agricultural information through single window. He opined that Data Centre will help to analyze data related to agriculture. This digitization process in agriculture will help the farming community by encouraging technology, training and analysis of data by KVK portal and through its mobile app hosted at ICAR Data Centre. On this occasion a brochure on 'ICAR Data Centre' was also released by the Hon'ble Minister.

Awards and Recognitions

- Dr. MA Iquebal received "SESR Computational Biologist 2016" award from Society for Educational and Scientific Research on December 16, 2016.
- Dr. AR Rao was awarded with Prof. PV Sukhatme Gold Medal in recognition of his significant contributions made in the field of Agricultural Statistics.
- Dr. Ranjit Kumar Paul received NAAS Young Scientist Award in Social Science.
- Dr. Prabin Kumar Meher received Dr. GR Seth Memorial Young Scientist Award
- Sh. Samarendra Das received Netaji Subhash ICAR, International Fellowship to undertake Ph.D. programme in U.S.A.
- Dr. Hukum Chandra, was awarded Fellowship of the National Academy of Agricultural Sciences from 2017 onward, by the National Academy of Agricultural Sciences, India.
- नगर राजभाषा कार्यान्वयन समिति (उत्तरी दिल्ली) की नवम्बर 30, 2016 को हुई सदस्य कार्यालयों की तीसरी बैठक में वर्ष 2015–16 मे राजभाषा कार्यान्वयन कार्य में उत्कृष्ट निष्पादन हेतु बड़े कार्यालय वर्ग में भारतीय कृषि सांख्यिकी अनुसंधान संस्थान को तृतीय पुरस्कार प्रदान किया गया । इसके लिए संस्थान को एक ट्रॉफी एवं प्रशस्ति पत्र प्रदान किया गया ।

Best Paper Award

- Dr. Arpan Bhowmik received the award for best paper in the ISEE National Seminar on "Information and Communication Management Concerning Climate Smart Agriculture for Sustainable Development and Poverty Alleviation" at Rajmata Vijaraje Scindia Krishi Viswavidyalaya (RVSKVV), Gwalior, Madhya Pradesh during November 28-30, 2016, for the paper "Impact of ICT Based Initiative of Connecting Dream Foundation in Empowerment of Rural Women", by Rabeesh K.Verma*, Monika Wason, R.N.Padaria, Premlata Singh, Sujit Sarkar and Arpan Bhowmik.
- Papers awarded with best poster award in International Conference on Statistics & Big Data Bioinformatics in Agricultural Research (70th Annual Conference of ISAS) at ICRISAT, Hyderabad during November 21-23, 2016.

- 1nd best poster awarded to Supriya, P, Sahu, S, Rai, A, Rao, AR and Bhat, KV on research paper "Genome wide mining mf Microsatellites in sesame".
- 2nd best poster award to Lall, S, Jaggi, S, Varghese, E, Varghese, C, and Bhowmik, A on research paper "Construction of D-optimal designs for logistic regression model".
- 3nd best poster awarded to Anjum, A, Jaggi, S, Varghese, E, Lall, S, Rai, A, Bhowmik, A, Mishra, DC and Sarika on research paper "Mixture distribution approach for identifying differentially expressed genes in microarray data of Arabidopsis thaliana".

Visits Abroad

- Dr. Tauqueer Ahmad participated in FAO of the United Nations organized Global Strategy Outreach Workshop on Agricultural Statistics held at FAO Headquarters, Rome, Italy during October 24-25, 2016.

- Dr. Tauqueer Ahmad participated in FAO of the United Nations organized Seventh International Conference on Agricultural Statistics (ICAS VII) held at FAO Headquarters, Rome, Italy during October 26-28, 2016.
- Dr. Hukum Chandra attended the Seventh International Conference on Agricultural Statistics (ICAS VII) at FAO, Rome, Italy during October 26-28, 2016.
- Dr. Hukum Chandra visited as Expert to attend the Experts Meeting on Ethiopia Statistics from Space project, organized by the FAO of the United Nations, in Addis Ababa, Ethiopia, December 04-08, 2016.

Human Resource Development

- **Training Programmes/Workshops organised**

S.N.	Title	Venue	Date	Sponsoring Agency	Number of participants
1.	Advances in Experimental Data Analysis Coordinator : Dr. Eldho Varghese Co-coordinator : Dr. Arpan Bhowmik	ICAR-IASRI New Delhi.	October 06-26, 2016	Education Division, ICAR	25
2.	Computational Approaches for NGS Data Analysis and Genomic Selection Coordinator : Dr. Sarika Co-coordinator : Dr. Asif Iquebal	Indian Institute of Wheat and Barley Research, Karnal	October 13-18, 2016	ICAR-IASRI	25
3.	Bioinformatics Tools and Techniques in Agriculture Coordinator : Dr. Dinesh Kumar	ICAR-NAARM, Hyderabad	November 01-10, 2016	ICAR-NAARM	18
4.	Statistical Techniques for Agricultural Data Analysis Coordinator : Dr. Seema Jaggi Co-coordinator : Dr. Arpan Bhomik	ICAR-IASRI New Delhi.	November 02-11, 2016	ICAR-IASRI	24
5.	Introduction to Bio-informatics Coordinator : Dr. M. Grover Co-coordinator : Dr. D. C. Mishra	ICAR-IASRI New Delhi.	November 08-21, 2016	Education Division, ICAR	14
6.	Advance Computational and Statistical Tools for Omics Data Analysis Coordinator : Dr. SB Lal Co-coordinator : Dr. KK Chaturvedi	ICAR-IASRI New Delhi.	December 01-21, 2016	Education Division, ICAR	19
7.	Basic Statistical Techniques using SAS(Hindi Workshop) Coordinator : Dr. Susheel Sarkar Co-coordinators : Dr. Anindita Datta Sh. Mohd. Harun	ICAR-IASRI New Delhi.	December 13-15, 2016	ICAR-IASRI	14

Meetings/Conferences organized

- Meeting of Institute Research Committee (IRC) was organized during October 05-06, 2016.
- 70th Annual Conference of Indian Society of Agricultural Statistics was organized at ICRISAT, Hyderabad during 21-23 November, 2016.
- Special Meeting of Institute Research Committee (IRC) was organized under the chairmanship of Director of the Institute during November 02, 2016.
- 18th National Conference of Agricultural Research Statisticians was organized at ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut (UP) during December 16-17, 2016.
- A Brain Storming Session was organized on December 27, 2016 at ICAR-IASRI for the development of Portal and Mobile Applications for the Division of Agricultural Engineering. Directors of the Institutes and Co-ordinators of AICRP and Networks projects under Agricultural Engineering Division participated and deliberated in the session.

New Projects Initiated

- Assessment of post harvest losses in fruits and vegetables and strategies for their reduction in Andman and Nicobar Islands. (AGENIASRICIP201604600083) CIARI:SK Zamir Ahmad, LB Singh, Chandrika Ram, Manoj Kumar; IASRI: Prachi Mishra Sahoo, Tauqueer Ahmad: 03.10.2016-31.05.2017.
- A study on calibration estimators under adaptive cluster sampling. (AGENIASRISIL201604700084) Raju Kumar, Ankur Biswas and Deepak Singh: 25.10.2016-24.10.2018.
- Creating awareness for efficient use of ICT and MOOCs in Agriculture Education. Funded by Extramural project (AGENIASRISOL201604800085) Anil Kumar, Sukanta Dash:01.11.2016-31.03.2017.
- Future perspective of Bt technology in Indian Agriculture. (AGENIASRISIL201604900086) Mrinmoy Ray, Santosh Rathod, Bishal Gurung and KN Singh: 01.12.2016-30.11.2018

Research Papers Published

- Angadi, UB, Anandan, S, Gowda, NKS, Rajendran, D, Devi, L, Elangovan, AV and Jash, S (2016). Feed assist-an expert system on balanced feeding for dairy animals, *AGRIS on-line papers in Eco. Inform.* **8(3),** 3 - 12.
- Gupta, A, Sarangi, A, Singh, DK, Parihar, SS and Varghese, C (2016). Software for crop coefficient estimation and irrigation scheduling. *Green Farming*, **5**, 1186-1191.
- Jasna, VK, Roy Burman, R, Padaria, RN, Sharma, JP, Varghese, E, Chakrabarty, B, Loganandhan, N and Kumar, S (2016). Institutional role in climate resilience building process in rainfed agro-ecosystem. *J. Commu. Mobil.Sustain.* Dev.**11(2),**138-144.
- Kumar, N, Mukherjeea, I, Sarkar, B and Paul, RK (2017). Degradation of tricyclazole: effect of moisture, soil type, elevatedcarbon dioxide and blue green algae (BGA). *J. Hazard. Materials*, **321**, 517–527.
- Kumar, S, Ambreen, H, Variath, MT, Rao, AR, Agarwal, M, Kumar, A, Goel, S and Jagannath, A (2016). Utilization of molecular, phenotypic, and geographical diversity to develop compact

composite core collection in the oilseed crop, safflower (*Carthamustinctorius L.*) through maximization strategy. *Fron. Plant Sci.* **7,** 1554, DOI:10.3389/fpls. 2016.01554.

- Patil, S, Eldho, V, Shalini G Rudra and Kaur, Charanjit (2016). Effect of extrusion processing on phenolics, flavonoids and antioxidant activity of millets. *J. Food. Ferment. Technol.* **6(1),** 177-184.

- Shinde, MP, Upadhyay, A, Sarika, Iquebal, MA and Upadhyay, AK (2016). Identification, characterization and expression analysis of ERF transcription factor VviERF073 and standardization of stable reference genes under salt stress in grape. *J. Grape. Res.*, **55**,165-171.

- Harun, M, Varghese, C, Varghese, E and Jaggi, S (2016). Three-way cross designs for test lines vs. control line comparisons, Elect. *J.Plant Breed.*, DOI : 10.5958/0975-928X.2016.00006.5

- Khalili, A, Dhar, S, Rasrat, NA, Faiz, MA, Dass, A and Varghese, E (2016). Effect of nitrogen management on yield and economics of maize (*Zea mays L.*) in Kandahar region of Afghanistan. Ann. *Agric. Res. New Series.*,**37(3),** 236-242.

- Kour, S and Pradhan, UK (2016). Correlation, path coefficient analysis and construction of Indices for yield and yield components selection in forage sorghum [*Sorghum bicolor (L.) Moench*]. *J. Crop Weed.*,**12(2),**1-9.

- Kumar, P, Rudra SG, Varghese E, Kaur C (2016). Extrusion Conditions Effects Functional and Pasting Properties of Finger Millet. *VEGETOS* 29:2.

- Kumar, R, Parsad, R and Mandal, BN (2016). Smaller balanced sampling plans excluding adjacent units for one dimensional population. Inter. *J. Comput. Theo. Statist.*, **3(2),** 55-61.

- Ngaki, MN, Wang, B, Sahu, BB, Srivastava SK, Farooqi, MS, Kambakam, S, et. al. (2016). Tanscriptomic study of the soybean-fusarium virguliforme interaction revealed a novel ankyrin-repeat containing defense gene, expression of whose during infection led to enhanced resistance to the fungal pathogen in transgenic soybean plants. *PLoS ONE* **11(10),** e0163106. doi:10.1371/.

- Saha, S, Kalia, P, Sureja, AK, Srivastava, A and Sarkar, SK (2016). Genetic analysis of bioactive compounds and antioxidant properties in lettuce (*Lactuca sativa). Ind. J. Agril.Sci.*, **86 (11),** 1471–1476.

- Singh, A and Sharma, A (2016). An approach for personalized web information retrieval using modified page rank method, *Proceedings of the International Conference on Advances in Information Communication Technology & Computing,* Article No. 102, ACM.

- Singh, N, Dash, S and Khan, YJ (2016). Survival of chickpea, sesame, niger, castor and safflower seeds stored at low and ultra-low moisture contents for 16-18 years, *Seed Sci. and Tech.*, https://doi.org/10.15258/sst.2016.44.3.09.

- Tiwari, R, Kumar M, Singh BP, Ujjwal DE, Jha Sunil Kr and Dutt T, (2016). Enhancing the knowledge level of dog owners using an electronic self-learning module*, Ind. J.Anim. Sci.* **86 (11):**1328–1330

- Aditya, K, Sud, UC and Chandra, H. Calibration approach based estimation of finite population total under two stage sampling. *J. Ind. Soc. Agril. Statist.* 70(3):219-226.

- Alam, W, Chaturvedi, A, Kumar, A, Singh, KN and Sinha, Kanchan (2016). Sequential testing for decision making in the management of mustard aphid using size-biased negative binomial distribution. *J. Agricult. Stat. Sci.*, **12(2):**531-535.

- Bhowmik, A, Ramasubramanian V, Rai, A, Kumar, A and Kundu MG (2016). Improved estimation in logistic regression through quadratic bootstrap approach: An application in agricultural ergonomics. *J. Ind. Soc. Agrl. Statist.*, **70(3):**227–235.

- Das, S, Aditya, K and Singh, M. Evaluation of rhizobium efficency in chickpea through boron management. *Bharatiya Krishi Anusandhan Patrika*, **31(3):**181-186.

- Das, S, Meher, PK, Rai, A, Bhar, LM, Mandal, BN (2017). Statistical approaches for gene selectionh hub gene identification and module interaction in gene co-Expression network analysis: Aluminum stress in soybean (*Glycine max L.*). *PLoS ONE,* **12(1):** e0169605. doi:10.1371/*journal.pone*.0169605.
- Datta, A, Jaggi, S, Varghese, C and Varghese, E (2016). Series of incomplete row-column designs with two units per cell. *Adv. Method. Statist.*, **13(1):**17-25.
- Iquebal, MA, Prajneshu and Sarika (2016). Application of data reduction technique in agriculture: A functional approach. *Inter. J. Agril. Statist. Sci.*, **12(1):**209-213.
- Joshy, A, Rudra, Shalini G, Sagar, VR, Varghese, E and Singh, B (2016). A promising way for mineral fortification in potato porous matrix (Potato chips). *J. Food Sci.Tech.*, **53 (12):**4348–4353.
- Rajurkar, GB, Patel, N, Rajmohan, N, Rajput, TBS, Prathapar, SA and Varghese, C (2016). Irrigation application efficiency and uniformity of water distribution using multi-outlet pipe and resource conservation technologies. *J. App. Natural Sci.*, **8(4):**1868-1877.
- Ranganath, HK, Ghosh, H and Prajneshu (2016). Nonlinear exponential autoregressive time-series model with moving average errors. *J. Agri. Stat. Sci.* **(2):**409-414.
- Varghese, E, Bhowmik, A, Jaggi, S, Varghese, C and Kaur, C (2016). On the generation of cost effective response surface designs. *Comp. Elect. Agric.*, **133:**37–45.

♣ Popular Articles

- Sud, UC and Singh Pal. (2016) *KRISHI UDYANIKI PATRIKA* Lucknow, RNI. NO. UPHIN/2007/21869   ISSN 2455-1198

Reference Manual/ E-manual/Pamphlet

- Eldho, V and Bhowmik, Arpan (2016). Advances in experimental data analysis, E-Manual. ICAR-IASRI (http://cbp.icar.gov.in/EBook.aspx).
- Sarika, Iquebal, MA, Sheoran, Sonia, Tiwari, Ratan, Angadi, UB, Rai, Anil, Kumar, D (2016). Hands-on training on computational approaches for ngs data analysis and genomic selection. training reference manual, ICAR-IIWBR, Karnal and ICAR-IASRI, New Delhi.
- Jaggi, S and Bhowmik, A (2016). Statistical techniques for agricultural data analysis. Reference manual and E-Manual. ICAR-IASRI Publications.
- Mukherjee, A, Rakshit, S, Nag, A, Ray, M, Kharbikar, HL, Kumari, S, Sarkar, S, Paul, S, Roy, S, Maity, A, Meena, VS and Burman, RR (2016). Climate change risk perception, adaptation and mitigation strategy. An extension outlook in mountain himalaya. In: JK, Meena, VS, Mishra, PK and Edition PA. Conservation Agriculture pp. 257-292. Springer Singapore.
- Mruthyunjaya, PS, Birthal, BP, Sinha, C, Prasad, Narain, P, Gupta, VK, Parsad, R and Bamji Mahtab, S (2016). Social Sciences. pp. 470-508. In: Singh, RB. 100 Years of Agricultural Sciences in India. NAAS, New Delhi, India pp. xvi+522, ISBN: 978 81 93152423.
- Lal, SB, Chaturvedi, KK, Kumar, Sanjeev, Farooqi, MS and Kaur, MK (2016). Advance computational and statistical tools for omics data analysis, CAFT, Vol. I, ICAR-Indian Agricultural Statistics Research Institute, New Delhi.
- Lal, SB, Chaturvedi, KK, Kumar, Sanjeev, Farooqi, MS and Kaur, MK (2016). Advance computational and statistical tools for omics data analysis, CAFT, Vol. II, ICAR-Indian Agricultural Statistics Research Institute, New Delhi.

- Sarkar, SK, Datta, A and Harun, M (2016). Basic statistical techniques using SAS. Manual and E-Manual. ICAR-IASRI Publications.

Packages Developed

Eldho Varghese, Arpan Bhowmik, Seema Jaggi, Cini Varghese and Shwetank Lall

- A R package named minimal RSD has been developed and deployed at (https://cran.r-project.org/web/packages/minimalRSD/index.html) for the generation of minimally changed run sequence for Response Surface Designs (RSDs).

(RK. Paul).
- R package WaveLet Long Memory and successfully uploaded in CRAN.

Invited Lecture Delivered

1. Training programme on "Computational Approaches for NGS Data Analysis and Genomic Selection" jointly organized by ICAR-IIWBR, Karnal and ICAR-IASRI, New Delhi at ICAR-IIWBR, Karnal October 13-18, 2016.
   a. Iquebal, MA (i) Genome Assembly, (|ii) Transcriptome Analysis, (iii) Allele mining and its application in agriculture and (iv) Metagenome Analysis
   b. Kumar, D. Genome Annotation.
   c. Sarika, (i) LINUX Operating system, (ii) Basic Bioinformatics, (iii) Data cleaning and prep processing, (iv) miRNA identification and its target prediction, v) Genome wide association studies and genomic selection and |(vi) Protein modelling and molecular simulation dynamics

2. Parsad, R. (2016) (i) SPSS: An overview; (ii) Practical exercise on central tendency using SPSS; (iii) Practical exercise on correlation and regression using SPSS and (iv) Practical exercise on analysis of qualitative data using SPSS on October 14, 2016 at Institute for Border Management and Strategic Studies Building, Hq 25 Bn BSF, Chhawla, New Delhi.

3. Winter school programme on "Concepts and Advances in Statistical and Molecular Approaches in Genetic Evaluation of Breeding Bulls for Sustainable Milk Production" held at ICAR-CIRC, Meerut during November 4-24, 2016.
   a. Iquebal, MA (i) Genome assembly, (ii) Data cleaning and pre-processing and (iii) Allele mining and its application in agriculture.
   b. Sarika (i) Genome annotation (ii) Phylogenetic analysis and (iii) Transcriptome analysis.
   c. Kumar, D (i) miRNA identification and its target prediction (ii) Genome wide association studies and genomic selection and (iii) Meta genome analysis

4. M. A. Iquebal. Application of computational tools to understand the language of genomic data. International Conference on Green Technology for Health and Environment: Implementations and Policies at Bengaluru during December 15-16, 2016 at Ramanashree Resort, Bangalore.

5. Hukum Chandra. Statistical analysis using R software. Workshop on "Research Methodology and Data Analysis" organized by University School of Management Studies, Guru Gobind Singh Indraprastha University, New Delhi, December 28, 2016.

Papers Presented

❖ Conferences and Workshops

- Ahmad, T, Sud, UC, Rai, A and Sahoo, PM; Jha, SN and Vishwarma, RK (2016). Sampling methodology for estimation of harvest and post harvest losses of major crops and commodities, in Global Strategy Outreach Workshop on Agricultural Statistics held at FAO Headquarters, Rome, Italy during October 24-25, 2016.
- Sud, UC, Ahmad, T, Rai, A and Sahoo, PM (2016). An alternative methodology for estimation of cotton yield using double sampling approach, in Seventh International Conference on Agricultural Statistics (ICAS VII) held at FAO Headquarters, Rome, Italy during 26-28 October 2016.
- Chandra, H, Salvati, N, Chambers, R and Sud, UC (2016). A spatially nonstationary Fay-Herriot model for small area estimation – An application to crop yield estimation. The Seventh International Conference on Agricultural Statistics (ICAS VII) at FAO, Rome, Italy during October 26-28, 2016.
- Parsad, R, Dhandapani, A and Sehgal, VK (2016). Guidelines for data management in ICAR institutes: Implementation and challenges and KRISHI portal in a conference "Integrated Land Use Planning for Smart Agriculture- An Agenda for Sustainable Land Management" organized at ICAR-National Bureau of Soil Survey and Land Use planning, Nagpur during November 10-13, 2016.

❖ International Conference on Statistics & Big Data Bioinformatics in Agricultural Research (70th Annual Conference of ISAS) at ICRISAT, Hyderabad during November 21-23, 2016.

- Alam, W. Transfer Function model for crop yield forecast using weather variables.
- Anjum, A, Jaggi, S, Varghese, E, Lall, S, Rai, Anil, Bhowmik, A, Mishra, DC and Sarika. Mixture distribution approach for identifying differentially expressed genes in microarray data of Arabidopsis thalianaArya, P.
- Basak, P, Sud, UC and Chandra, H. Estimation of finite population regression coefficient involving two-stage sampling design.
- Bhowmik, A, Varghese, E, Jaggi, S and Varghese, C. Web generation of factorial experiments with minimum level changes in run sequences (webFMC).
- Chandra, H, Kumar, S, Sud, UC and Aditya, K . Small area estimation of proportions by combining survey data with different levels of auxiliary data.
- Chatterjee, K, Datta, A and Mohd, H. Super saturated designs for mixed factorial experiments.
- Dash, S and Kumar P. Role of big data in agriculture. A statistical perspective.

- Datta, A, Jaggi, S, Varghese, C and Varghese, E. Balanced Bipartite Generalized row-column designs.
- Gurung, B. An insight into technology diffusion of tractor through Weibull growth model.
- Kumar, H, Sahu, S and Rao, AR. Prediction of lncRNAs from Capra hircus Transcriptome.
- Kumar, P. Rank based simultaneous index for assessing stable crop varieties with high yield.
- Lall, S, Jaggi, S, Varghese, E, Varghese, C, and Bhowmik, A. On construction of D-optimal designs for logistic regression model.
- Mandal, BN. Algorithmic construction of A-optimal balanced treatment incomplete block designs.
- Meher, PK. Rank based simultaneous index for assessing stable crop varieties with high yield.
- Pal, S, KVK Knowledge Network: Data management of Krishi Vigyan Kendra's in India on statistics & big data bioinformatics in agricultural research.
- Paul, RK and Anjoy, P. Wavelet methodology for capturing volatility in agricultural commodity prices.
- Ranjan, R. Energy-growth linkage in Indian agriculture: A comprehensive analysis using panel co-integration.
- Rathod, S. Space time autoregressive moving average (STARMA) model for modeling and forecasting spatio-temporal time series data.
- Ray, M. Nonparametric bootstrap approach for constructing prediction intervals of VAR model.
- Sahu, S, Singh, I, Dalal, M, Gaikwad, K., Ghosal, S. and Rao, AR. In Silico identification and functional annotation of bread wheat lncRNAs.
- Saurav, S, Varghese, C, Varghese, E and Jaggi, S. Near resolvable multi-session sensory designs balanced for carryover effects.
- Shekhawat, RS. Decomposition analysis of agricultural production in Rajasthan.
- Singh, KN. Use of Statistical models in forecasting of food grain production of the country
- Tyagi, KK, Rao, GM, Aditya, K, Chandra, H and Sud, UC. Pilot study for developing state level estimates of crop area and production on the basis of sample size recommended by Prof. Vaidyanathan Committee - Observations on field data collection work.
- Varghese, E, Bhowmik, A, Jaggi, S and Varghese, C. On the generation of cost-effective response surface designs.
- Yadav, SK. 2K factorial experiments with logistic error distribution.
- Yadav, SP, Kannaki, TR, Reddy, MR, Bhattacharya, TK, Mahapatra, RK, Sarkar, SK and Chatterjee, RN. Comparative analysis of cytotoxic T lymphocytes (CD8+) in different breeds of chicken.
- Paul, RK and Anjoy, P. Wavelet Methodology for Capturing Volatility in Agricultural Commodity Prices.
- Himadri Ghosh. Nonparametric time-series regression modeling and forecasting under correlated errors using simple data-driven bandwidth.
- Pal, Soumen. KVK Knowledge Network : Data management of KVKs in India.

❖ **18th National Conference of Agricultural Research Statisticians organized at ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut (UP) during December 16-17, 2016.**

- Aditya, K, Chandra, H, and Sud, UC. MAPI software for data collection using smart phones – A way forward for fast, cost effective and quality data.
- Biswas, A, Sahoo, RN and Krishna, G. Discrimination of wheat varieties using hyperspectral data.
- Jaggi, S. Current status and future challenges in post graduate teaching and HRD in agricultural statistics.
- Kumar, RR. Co-integration approach for examining the co-movement between energy and agricultural commodity prices in India.
- Shekhawat, RS. Study of rapeseed and mustard and gram production in rajasthan through decomposition.
- Varghese, C, Dash, S, and Bhowmik, A. Statistical tools employed in on-farm farming system data analysis.

❖ **25th International Conference of the forum for Interdisciplinary Mathematics Statistics and Computational Techniques, Jaipur, December 22-24, 2016.**

- Chandra, H, Kumar, S, Sud, UC and Aditya, K. Small area estimation of proportions by combining survey data with different levels of auxiliary data.

❖ **Symposium on Managing Agriculture in a Changing Environment at NRL Auditorium, CESCRA, ICAR-IARI. New Delhi during December 1-2, 2016.**

- Saha, ND, Bhatia, A, Chakrabarty, B, Bhattacharya, R, Singh, SD, Preeti, B, Pant, Bhowmik, A, Gurung, B and Pathak, H. Long term fumigation with elevated CO_2 alters the soil microbial community structure and catabolic responses in C4 agro-ecosystem of north-western India.

❖ **4th International Agronomy Congress, November 22-26, 2016 at IARI, New Delhi**

- Kumar, A, Choudhary, VK, Singh, DR, Arya, Prawin and Kumar, S. Sustainability through diversification and intensification of crops.

❖ **International Conference on Innovative Research in Biomedical Engineering, Cancer Biology, Stem Cells, Bioinformatics and Applied Biotechnology (BECBAB-2016) at Jawaharlal Nehru University, New Delhi.**

- Sarika. Candidate genes discovery of coconut root wilt disease and development of its transcriptomic database (CnTDB).

❖ **30ᵗʰ National conference on Agricultural Marketing at IAS, BHU, Varanasi.**

- Ravindra Singh Shekhawat. Potentials of Agro-Processing and Agri-business in Uttar Pradesh.

Participation

❖ **International Conference on Statistics & Big Data Bioinformatics in Agricultural Research' during November 21-23, 2016 at ICRISAT, Hyderabad.**

- A.K. Choubey, (Co-Convener of Data Science Teaching & Communication session),
- Amrit Kumar Paul, (Chaired the session "Recent advances in Statistics").
- Anindita Data, (Participated)
- AR Rao, (Co-Convener of Genomic Selection & Genome-Wide Association Mapping and Delivered a talk on Development of Algorithms, Databases and Analysis Techniques & Tools),
- Arpan Bhowmik, (Participated)
- B.N. Mandal, (Participated)
- Dinesh Kumar, (talk on Computational genomics approach for development of breed and variety signature system for agricultural germplasm management).
- Eldho Varghese, (Participated)
- Hukum Chandra, (Co-Convener of Open Sources Statistical Computing and invited speaker on Advances in Statistical Sampling)
- KN Singh, (convener and invited speaker of the symposium "Statistical Modelling and Forecasting)
- LM Bhar, (Co-convener of Statistical Genetics and Genomics),
- Mohd Harun, (Participated)
- Neeraj Budhlakoti, (talk on Microarray data expression study for better identification of differentially expressed genes).
- Rajender Parsad, (Co-Chair of Special session on Big Data and Evidence-based Agronomy)
- Sanjeev Kumar, (Participated)
- Sudeep, (Co-Convener of Data Management Session),
- Sukanta Dash, (Participated)
- Sunil Kumar Yadav, (Participated)
- Susheel Kumar Sarkar, (Chaired in Recent Advances in Statistics (Session-I), Joint Secretary of ISAS and member Conference Advisory Committee).
- Tauqueer Ahmad, (Co-Convener of Geostatistics & Remote Sensing)
- International Conference CAF 16 in New Delhi organized by Ag. Engineering Division of ICAR (Dr Sudeep).

❖ **4th International Agronomy Congress at IARI, New Delhi-110012 during November 2016.**

- Dr. Anil Kumar, (Participated)

❖ **International Conference on Green Technology for Health and Environment: Implementations and Policies at Bengaluru during December 15-16, 2016 at Ramanashree Resort, Bangalore.**

- Dr. M.A. Iquebal, (Participated)

❖ 18th National Conference of Agricultural Research Statisticians organized at ICAR-Indian Institute of Farming Systems Research, Modipuram, Meerut (UP) during December 16-17, 2016.

- Dr Anil Rai (Convener in session on Current Status and future challenges in research in bioinformatics).
- Dr Ankur Biswas (Participated).
- Dr Hukum Chandra (Convener and invited speaker, in session on Current Status and Future Challenges in Space Technology based tools in Agriculture research (Applications of Remote Sensing and Geographic Information System).
- Dr Kaustav Aditya (Participated).
- Dr KK Chaturvedi (Participated).
- Dr LM Bhar (Convener and invited talk on "Some Challenges on Statistical Genetics and Genomics)
- Dr RK Paul (Rapporteur and invited talk on "Statistical Models for Forecasting Rainfall in Different Agro-Climatic Zones of INDIA).
- Dr. AK Choubey (Convener in session on 'Access to Technology Information for End Users with Specific Reference to Development of Expert/ Decision Support/ Knowledge Management Systems and Mobile Applications in Agricultural Research and Extension).
- Dr. Anil Kumar (Rapporteur in Session on Current Status and Future Challenges in Research in Agricultural Statistics).
- Dr. Anu Sharma (an invited talk on GPU Based Applications in Bioinformatics).
- Dr. Bishal Gurung (a Rapporteur and presented a paper on Modelling the diffusion of tractor technology through growth models).
- Dr. Cini Varghese and Dr. Eldho Varghese(Rapporteurs in special session on "Statistical tools for farming system data analysis).
- Dr. DC Misra (an invited talk on Protein Structure Comparison: Past to Current Scenario).
- Dr. Dinesh Kumar (an invited lecture on "Need of agri-computational genomics with respect to global hunger index of India).
- Dr. KN Singh (Convener in session "Statistical Application and Modelling with specific reference to Natural Resources Management and Agricultural Engineering).
- Dr. Mukesh Kumar (an invited talk on KRISHI Portal).
- Dr. Rajeev Ranjan Kumar (participated).
- Dr. Rajender Parsad (Convener in Session on Current Status and Future Challenges in Research in Agricultural Statistics).

- Dr. Seema Jaggi (Convener in session on Current Status and Future Challenges in Teaching and Human Resource Development in Agricultural Statistics and Informatics).
- Dr. Soumen Pal (an invited talk on "Krishi Vigyan Kendra Knowledge Network: A Management System for Agriculture Extension Services in Indian NARES" and a talk on "MS Office POWERPOINT" in a training programme for Technical, Administration and Skill Support Staff).
- Mohammad Samir Farooqi (participated).
- Sh Raju Kumar (Participated).
- Sh. Pal Singh (participated).
- Sh. Subhash Chand (delivered a lecture in a Training Program).

❖ Participation in Workshop/ Seminar/ Symposia /Training/ Foundation Course/ Annual Day/ Lectures etc.

- Workshop organized by Population Research Centre (PRC), Kerala under the Ministry of Health & Family Welfare, Govt. of India at Trivandrum, Kerala during October 06-07, 2016 (Dr. Hukum Chandra).
- Training programme under the aegis of Centre of Advanced Faculty Training in Frontier and Specialized Areas of Agriculture and allied sciences on Advances in Experimental Data Analysis organized during October 06-26, 2016 at ICAR-IASRI (Mr. Mohd. Harun)
- Workshop on Linear Mixed Model in Practice: An AS REML-Oriented Approach at CIFE, Mumbai organized by Indian Fisheries Association and CIFE, Mumbai during October 13-15, 2016 (Dr. Susheel Kumar Sarkar and Dr. Sukanta Dash).
- Workshop on RTIMIS for RTI Nodal Officer on 21st October, 2016 at NASC Complex was organized by ICAR HQ with DoPT Personnel. (Dr. Mukesh Kumar).
- Training course on Digitalization of Breeding Database through Breeding Management System software of Integrated Breeding Platform during November 14-18, 2016 at ICRISAT, Hyderabad (Dr. Susheel Kumar Sarkar)
- Training programme on "Transforming Governments Through ICT: Government Process Reengineering" held at Indian Institute of Public Administration (IIPA), New Delhi during November 16-18, 2016 (Dr. Mukesh Kumar).
- Consultation Workshop on Mobile Seva organised by DeitY (MeitY) during November 21, 2016 at CGO Complex, New Delhi (Mukesh Kumar).
- Workshop on Breeding Data Management & Analysis during November 24, 2016 at ICRISAT Hyderabad (Dr. A.K.Choubey)
- 8th International Symposium on Statistics and Optimization in conjuction with XXXVI Annual Convention of Indian Society of Probability and Statistics organized at Department of Statistics and Operations Research, Aligarh Muslim University, Aligarh during December 17-19, 2016. (Dr. Rajender Parsad).
- In third formal Meeting of the Agricultural Technological Foresight Center, a technical aspects of future perspective of Bt technology in India was presented during December 07, 2016 in ATFC, KAB-II, PUSA, New Delhi-110012. (Mrinmoy Ray).
- Seventh Annual Review Meeting of FASAL a lecture was delivered on Crop yield forecast using integrated statistical models & LASSO technique during December 16, 2016 at QUAT, Bhubaneshwar (Dr. K.N. Singh).

- Workshop of AICRP on IFS at SKUAST, Jammu during December 20-21, 2016 and made a presentation on "Progress and methodology for statistical analysis of on-farm farming system experiments (Dr. Cini Varghese).
- Workshop of AICRP on IFS held at SKUAS&T, Jammu during 20-23, December, 2016. Presentation is also made on "Progress on statistical analysis techniques for On-station experiments of cropping and farming systems" in Technical session-I. (Dr. Anil Kumar)
- Dr. Eldho Varghese completed a Massive Open Online Course (MOOC) on Competency Enhancement for Effective Teaching during November 18–December 15, 2016 organized by NAARM Hyderabad.

Technology Assessed/Transferred

- Reviewed RPP-I of Institute Research Project, ICAER- IASRI, New Delhi (Dr. Hukum Chandra).
- Updated the MAPI software with new features.

Consultancy/Advisory Services Provided

- Updated version of the data entry software was provided to the state headquarters for the state of Odisha and Karnataka under the project "Pilot study for developing State level estimates of crop area and production on the basis of sample sizes recommended by Professor Vaidyanathan Committee report".
- Prakash Kumar provided consultancy work to analyze the data on study of Gene expression and resistance of a plant to disease provided by Dr. Arvind Konda, Scientist ICAR-IIPR, Kanpur.
- PK Meher provided data advisory service to Divya Sharma, a Ph.D. Student of GBPUAT, Pantnagar. MLMM and MTMM analysis were carried out for genome wide association studies in finger millet using R-software.
- Dr. Rajender Parsad and Dr. Eldho Varghese advised Ms. Lakshmi, Ph.D. student, IARI, New Delhi for analysis of data generated from an experiment done using Semi-Latin square design with 8 units (These eight units are some factorial combinations of 3 factors + 1 control) in the row-column intersection. Further, she was also advised to use RSM to study the significance of these factorial effects on the response variables.
- Dr. Seema Jaggi and Dr. Eldho Varghese advised Ms. Laneesha from IARI, New Delhi for PROC NLIN of SAS for fitting nonlinear models to the data on rate of development and Ambient temperature pertaining to an experiment to study the toxicity of two Insecticides on egg parasitoids. She was suggested to use the case study available at SSCNARS portal (http://www.iasri.res.in/sscnars/cs_animal.htm) for getting the syntax for the same.
- Mr. Santosha Rathod carried out data analysis (Polynomial model fitting) of Mr. Mahadevswamy, Scientist, SBI Coimbatore.
- Mr. Santosha Rathod analyzed data (Split plot design) of Mr. Tayeeb, Ph.D Scholor (Hort), UHS Bagalkot.
- Dr. Ravindra Singh Shekhawat Carried out correspondence analysis to Dr. Madhusudan Bhattarai, Consultant, IFPRI, New Delhi.

- Dr. Bishal Gurung advised Dr. Ibandaling Mawlong, Scientist, Bharatpur on the use of regression and tukey grouping using SAS software.
- Dr. Prakash Kumar provided consultancy work to analyze the data on Triple Test Cross and develop excel program to analyze triple test cross data provided by Ph. D. student Geeta Devi, CCSHAU Hissar.
- Dr. Bishal Gurung advised Ms. Omem Tamut, a Ph.D. student, to use Cluster analysis and Principal Component analysis for her research work.
- Mr. Rajeev Ranjan Kumar Carried out data analysis (trend analysis) of Mr. Pawanjeet Kumar, Ph.D. Student, Division of Ag. Engineering, IARI, New Delhi.
- Rajeev Ranjan Kumar carried out data analysis (trend analysis) of Mr. Pawan Jeet, Ph.D. Student, Division of Ag. Engineering, IARI, New Delhi.
- Dr. Prakash Kumar provided consultancy work to analyze PCA and correlation study of data provided by Ph. D. student Samadhan Bagul, Microbiology, IARI, New Delhi.
- Dr. Kaustav Aditya provided Consultancy service to Dr. Shrila Das, Scientist, Division of Soil Science, IARI about analysis of data.
- Dr. Rajender Parsad and Dr. B. N. Mandal advised Dr. Amrit Kaur Mahal, PAU, Ludhiana on generation of alpha design with v=200, b=60, r=3, k=10, Efficiency factor (E) 0.8747253.

Personnel

❖ Wish you happy retired life

- Shri Punjab Chand Thakur, Assistant Administrative Officer, retired on October 31, 2016.
- Shri PP Singh, Chief Technical Officer and Shri Bhagat Singh, Assistant both retired on November 30, 2016
- Shri S.P.S. Hans, Assistant Chief Technical Officer retired on December 31, 2016.

❖ Congratulation on your promotion

- Smt. Sunita was promoted as personal assistant (Pay Band-2) from Steno Grade III.

स्वच्छ भारत

एक कदम स्वच्छता की ओर

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किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

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