



Consultancy and Advisory Services

Advisory services for researchers in NARES and other organizations were pursued rigorously and various training programmes were conducted as consultancy (details given in Chapter 5).

International Consultancy

Study on improving methods for estimating crop area, yield and production under mixed, repeated and continuous cropping.

This consultancy was awarded to ICAR-IASRI by Food and Agriculture Organization of the United Nations (FAO) under the “Global Strategy to Improve Agricultural and Rural Statistics” of FAO with an approved budget of US Dollar 4,18,163 (Four lakh eighteen thousand one hundred sixty three). It was initiated on December 18, 2014 and is of one year and six months duration. This project is under Institutional Consultancy mode and ICAR-IASRI was selected for undertaking this study through competitive process of International bidding.

Under this project, sampling methodologies for estimation of crop area and yield under mixed and continuous cropping have been developed for different situations prevailing in different countries. Three different approaches namely, (i) Cadastral map based approach, (ii) Area Frame approach and (iii) Household approach have been proposed under this study. Technical Report-1 on “Synthesis of Literature and Framework” and Technical Report -2 on “Gap Analysis and Proposed Methodologies for Estimation of Crop Area and Crop Yield under Mixed and Continuous Cropping” were submitted

and both the Reports were accepted and published by the FAO. Field Test Protocol (FTP) document was also prepared and submitted to FAO, and is also accepted for publication. Presentations on Technical Report-1, Technical Report-2 and FTP were made in the Expert Group Meeting during April 15-16, 2015 and in Scientific Advisory Committee (SAC) meeting during June 26-28, 2015 at FAO Headquarter, Rome.

The developed methodology is being field tested in the three identified countries by the FAO, one each in Asia-Pacific, Africa and Latin America/Caribbean region, i.e. Indonesia, Rwanda and Jamaica respectively. Questionnaires were designed for primary data collection on crop area and crop yield for developed alternative methodologies proposed under three different approaches and Instruction Manuals for filling up the questionnaires were also prepared for all the three approaches. Classroom training as well as Field training for filling up schedules and different methods of conducting Crop Cutting Experiments was imparted by ICAR-IASRI officials to the Enumerators, Supervisors/Master trainers and nominated officials in all the three countries. Primary data collection is in progress in Indonesia, Rwanda and Jamaica using Computer Assisted Personal Interviewing (CAPI) and Paper Assisted Personal Interviewing (PAPI) methods.

The questionnaires developed for primary data collection in Indonesia have been designed using CAPI designer and are being designed for Rwanda and Jamaica. In-house server at ICAR-IASRI has been set up and configured for the CAPI software



Training imparted in Indonesia by ICAR-IASRI Officials



Training imparted in Rwanda by ICAR-IASRI Officials



Training imparted in Jamaica by ICAR-IASRI Officials

and the data from the field is being uploaded by the Enumerators/Field Investigators of Indonesia to the ICAR-IASRI server dedicated for this purpose and will be uploaded by the Enumerators of Rwanda and Jamaica shortly.

Advisory Services

Following advisory services were provided to the scientists/students of National Agricultural Research System and other organizations:

- Dr. Anita Malhotra, Associate Professor, University of Delhi was advised on suitable statistical techniques for analysis of data on April 25, 2015.
- Analysis of data (RBD design in SAS 9.2) of i) Mr. Sunder Pal Kantiya, Ph. D. scholar, GB Pant Agril. University for his Ph.D. thesis entitled "Mutation breeding through gamma radiation in dahlia crop" on April 18, 2015 and ii) Mr. Arjun Sutagatti, Institute of Agricultural Sciences, BHU for his M.Sc. thesis entitled "Bio-epicasy of insecticides against major insect pest of rice" on April 27, 2015.
- Dr. VK Mishra, Department of Genetics and Plant Breeding, BHU, Varanasi on SAS Code for

- performing Principal Component Analysis.
- Dr. Anita Malhotra, Associate Professor, University of Delhi, on suitable statistical techniques for analysis of data on May 02, 2015.
 - Provided the concept of different type of coefficient of determination to Dr. VK Mishra, Professor, Genetics and Plant Breeding, BHU, Varanasi.
 - Analyzed data in Matlab of Mr. Anand Kumar, M. Tech., student, UAS, Raichur for his M. Tech. Thesis on application of ANN in forecasting ground water recharge on May 08, 2015.
 - Analyzed colour index data of Dr. Madhubala Thakrey, Scientist, IARI.
 - Mr. Azizullah Khalili, a researcher from Kabul, Afghanistan on the procedure of analysis of experiments involving two factors (each at 3 levels) along with 2 control treatments. The analysis has also been done by developing appropriate contrasts as well as computer program using SAS and Dr. Parihar, Scientist from ICAR-IIMR on the use of Proc mixed of SAS for combined analysis of data obtained over years from split plot design.
 - Dr. Swaran Lata, Professor (Plant Breeding), Department of Crop Improvement, College of Agriculture, CSKHPKV, Palampur on estimating genotypic and phenotypic variance-covariance matrix, genotypic and phenotypic correlations, estimates of heritability and co-heritability and path analysis from the data on 13 characters generated from designed experiment on 45 cultivars of maize conducted using an alpha design in 2 replications and 15 blocks of size 3 per replication.
 - Dr. K Aivelu, Senior Scientist, ICAR-Indian Institute of Oilseeds Research, Hyderabad Advised on randomized layout of alpha designs in (i) $v=170, r=2, k=17, k=10$; (ii) $v=260, r=2, k=13, k=20, k=10$; (iii) $v=330, r=2, k=11, k=10, k=15$ for experiments to be conducted under National Crossing Programme on Sunflower.
 - Dr. Anju Kamra, Principal Scientist, Division of Nematology, ICAR-IARI, New Delhi on analysis of data pertaining to 5 experiments completely randomized design.
 - Dr CR Mehta, Project Coordinator (FIM), CIAE, Bhopal, M. P. on sampling design.
 - Dr Tushar Kumar Mohanty, NDRI, Karnal on performing repeated measurement analysis data sets on cattle.
 - Dr Ashim Kumar Biswas, Central Avian Research Institute, Izatnagar, UP on performing two way analysis of variance for two data sets.
 - Dr. Prameela Krishnan, Head, Division Agricultural Physics, IARI on the use of SAS for doing PCA to generate minimum data sets (MDS) for computation of Crop Status Index (CSI).
 - Ms. Sweta Amrita Lakra, Ph. D. Student, Division of Environmental Science, ICAR-IARI, New Delhi regarding analysis of data of Ph.D. research work entitled “Calibrating the info crop modeling for assessing impact of climate change”
 - Ms. Sukanya Som, M.Sc. (Agril. Extension), ICAR-IARI, New Delhi regarding analysis of social science data employing nonparametric test and Dr. Madhubala Thakrey, Scientist (ICAR-IARI), New Delhi regarding analysis of RBD design.
 - Dr. Suresh M. Nebapure, Scientist, Division of Agricultural Entomology, ICAR-IARI on the use of two way analysis of variance for data on Electroantennogram responses of Uzi fly against various compounds viz., terpenoides, green plant volatiles, aromatics, aliphatics and nitrogenous compounds.
 - Dr. Madhubala Thakrey, Scientist, IARI, New Delhi to use RBD design.
 - Mr. Anirban Mukhopadhyay, Scientist, VPKAS, Almora to apply fuzzy logic.
 - Dr. Heena Sharma, SRF in the project entitled “Regulatory role of gibberellic acid under high temperature stress in wheat (*Triticum aestivum* L.)” at IARI, New Delhi (funded by CSIR) on July 20, 2015.
 - Ms. Vanita Pandey, Ph.D. student of PG School, IARI in the analysis of data on soybean.
 - M.Sc. (Floriculture) student regarding the data analysis of her research work. The data pertained to study the effect of various bio-fertiliser doses on the growth of gladiolus genotypes. The data on various plant traits like plant height, corn length, corn weight etc. were generated by using RCBD and the analysis was performed in SAS (9.4).

- Mr. Harish Makhija, Ph.D. Student, PG School, ICAR-IARI, New Delhi analysis of data on stability analysis and GGE plot generated for the given data to genotype x environment interaction of variety development.
- Ph.D. student Mr. Ravishankar M Pardhi in Agricultural Economics for Institute of Agricultural Sciences, BHU regarding price forecast of potato using ARIMA, SARIMA cointegration and wavelets technique.
- Ms. Snigdharani Sahoo, M.Sc. student, OUAT, Bhubaneswar to forecast production of different cereal and pulses using ARIMA model.
- Dr. Namita Saha, Scientist, Centre for Environment Science and Climate Resilient Agriculture (CESCRA), ICAR-IARI, New Delhi, on the use of cluster analysis for studying microbial diversity analysis under organic farming system. The data was analysed using SAS 9.3 and on the use of factorial experiments to study the effect of climate change variables (six different combinations of elevated CO₂ and elevated temperature as different treatment combinations) on Quorum sensing mediated bacterial pathogenesis of soft rot in tomato. The experiment was conducted in National Phytotron Facility lab, ICAR- IARI, New Delhi.
- Mr. Amrit Lamichaney, Scientist IIPR, on the procedure of analysis using D² and Principal Component Analysis for his research. The analysis was carried out using SAS software
- Dr. Bipasa Sarkar from Agricultural Chemicals, IARI in analyzing the Effect of moisture, soil type and Blue Green Algae (BGA) on Degradation of tricyclazole.
- Dr. D Ramajayam, Senior Scientist (Fruit Science), ICAR-Indian Institute of Oil Palm Research, Pedavegi on the use of confounded factorial in a single replication for a 3⁴ factorial experiment {with factors as varieties(V), Nitrogen(N), Phosphorus(P) and Potassium(K) each at three levels} in 33 plots per block. The design was obtained after confounding VNPk. This design allows estimation of all main effects, two factor interactions and three factor interactions. Two degrees of freedom of 4-factor interaction are confounded with blocks and remaining 14 df are treated as error degrees of freedom assuming the absence of 4-factor interaction. He was also suggested the SAS steps for analyzing the data generated from this design.
- Sh. A Maity, Scientist, ICAR-IGFRI, Jhansi to analyze the data for 24 varieties with 9 traits and calculate the character to character interaction, D-square, MANOVA, genotypic and phenotypic correlation, heritability, genetic advance and path analysis.
- Dr. Hemant Kumar, Scientist, ICAR-IIPR, Kanpur for analysis of multivariate data using cluster analysis and Ms. Archana Sanyal, Ph.D. Scholar, Division of Seed Science and Technology, ICAR-IARI, New Delhi, for multivariate analysis of ordinal data.
- Dr. Shailendra Jha, Scientist, Division of Genetics, ICAR-IARI, New Delhi to use α -design for comparing 270 genotypes in two replications with 27 blocks each of size 10. The layout of the design was also given. He also suggested Alpha designs with parameters $v = 100$, $b = 20$, $r = 2$, $k = 10$, $AE = 0.9308$, $DE = 0.9698$ to phenotype reference set of wheat germplasm for phosphorus use efficiency in low P soil and hydroponics to Ms. Soumya, M.Sc. student, Division of Genetics, ICAR-IARI, New Delhi. The layout was generated from Design Resources Server deployed at ICAR-IASRI web site (<http://iasri.res.in/design/>).
- Dr. Rahul Kumar, Assitant Professor, Eternal University, Himachal Pradesh for analyzing the data using R-software. RBD analysis was done for iron and zinc content by 20 varieties of wheat with three replications. Also, the linear logistic regression analysis was performed by taking zinc (iron) content at grain stage as dependent variable and zinc (iron) content at nine different stages of plants as independent variables. Further, trend of zinc (iron) content at different stages of plants was studied.
- Vijay Parjapati, Ph. D. student ICAR-IARI, New Delhi to analyze data using PCA.