6

Education and Training

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

DEGREE COURSES

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

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

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

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

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

Number of students admitted/completed various courses are:

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

Admitted	:	7
Completed	:	3

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

Admitted	:	8
Completed	:	5

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

Admitted	:	8
Completed	:	8

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

Ph.D. (Agricultural Statistics)

i) Dharm Nath Jha

A study on spatial regression models under measurement errors framework

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

Guide: Dr. Anil Rai

ii) Nurnabi Meherul Alam

Some contributions to design and analysis of mixture experiments

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

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

For multifactor mixture experiments, situations may arise where restrictions are imposed on one or more than one components of different factors. Four methods of construction of designs for multifactor mixture experiments under restricted region using transformation/projection of response surface designs have been given. Methods of construction of designs for multifactor mixture experiments have been given for the cases where upper bound or lower bound restrictions are imposed on one component of each factor and both lower bound and upper bound restrictions are imposed on some of the components for each factor. SAS code for obtaining designs for multifactor mixture experiments has been developed and catalogue of designs has been prepared for $n \le 3$; $p_i \le 4$.

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

Guide: Dr. PK Batra

iii) Dwijesh Chandra Mishra

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

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

In addition to selection, estimates of genetic parameters are also influenced by not considering complete linear model. For a given set of experimental data, the estimates of variance components are affected by both statistical procedures and analytical linear models being used. Previous studies reported biases when using incorrect models. Therefore, model inadequacy also demands special statistical techniques to quantify this bias for different values of true genetic parameters. Further the underlying distribution of the observations may not be normal and as such traditional methods may not be suitable to tackle the problems arising from the non-normality. Inspite of the non normality of the data, there may be some abnormal or aberrant observations in the data or some data may be missing which also demands the search for robust methods of estimation of genetic components of variances and covariances.

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

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

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

Guide: Dr. VK Bhatia

M.Sc. (Agricultural Statistics)

i) Arpan Bhowmik

A study on logistic regression modeling for classification in agriculture

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

Guide: Dr. Ramasubramanian V

ii) Sankalpa Ojha

A study on outliers in multi-response experiment

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

Guide: Dr. Lalmohan Bhar

iii) N Mohondas Singh

Some empirical investigations on statistical properties of growth curves

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

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

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

Guide: Dr. AK Paul

iv) Ankur Biswas

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

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

Guide: Dr. Tauqueer Ahmad

v) Prabina Kumar Mehar

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

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

Guide: Dr. AR Rao

M.Sc. (Computer Application)

i) Rakesh Kumar Meshram

Information system for varietal experiments (ISVE)

The All India Coordinated Wheat Improvement Project

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

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

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

Guide: Dr. VK Mahajan

ii) Ramjilal Sharma

Online information system for intercropping experiments (OISIE)

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

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

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

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

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

Guide: Dr. IC Sethi

iii) Robin Singh

Software for online analysis of split-plot designs

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

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

Guide: Sh. HS Sikarwar

iv) Ashutosh Karna

Software for fitting of distributions

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

Guide: Dr. RC Goyal

v) Ragini Singh

Development of statistical package for analysis of cropping system experiments

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

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

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

Guide: Dr. IC Sethi

vi) Sarita Patle

Web based software for estimation of regression coefficient

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

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

Guide: Dr. VK Mahajan

vii) Amreshsing Ashoksing Rajput

Development of decision support system for surface runoff estimation

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

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

Guide: Dr. PK Malhotra

viii) Mali Snehal Sukhadev

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

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

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

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

Guide: Dr. RC Goyal

CERTIFICATE COURSE

Senior Certificate Course in Agricultural Statistics and Computing: 7 participants

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

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

During the period the course was organised during 06 July 2009 to 26 December 2009 (Module–I: 06 July 2009 to 26 September 2009 and Module–II: 12 October 2009 to 26 December 2009). Two officers participated in Module–I only, one officer participated in Module–II only and four officers participated in both the modules.

NATIONAL/INTERNATIONAL TRAINING PROGRAMMES

Programme under Centre of Advanced Faculty Training

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

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

Summer/Winter School Organized

21 days Winter School on Bioinformatics and Statistical Genomics was organised during 17 November–07 December 2009. The main objective was to train individuals at the interface of genomic, computational and statistical sciences. The course was structured in a series of modules on preliminaries, introduction to LAMP technology, bioinformatics and statistical genomics, covering important topics on biological databases, sequence alignments, genome browsers, SNPs, comparative genomics, machine learning approaches, HMMs, proteomics, QTLs, marker assisted selection, analysis of molecular variance (AMOVA), whole genome association (WGA) and bioinformatics software and tools. A total of 25 participants from ICAR institutes / SAUs representing 13 states, cutting across different disciplines like Molecular Biology & Biotechnology, Biochemistry, Breeding & Genetics, Computer Application, Statistics and Microbiology, participated in the Winter School. Dr. B.C. Barah, Director, NCAP was the Chief Guest for the inaugural session and Dr. Arvind Kumar, Deputy Director General (Education), ICAR was the Chief Guest for the valedictory session. Dr. A.R. Rao was the Course Director for the Winter School.

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

International Training Programmes

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

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

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

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

Other Training Programmes

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

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

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

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

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

- A refresher training programme on Small Area Estimation for the Indian Statistical Services and other senior officers of States/Union Territories, was organized during 18-22 January 2010. The course was sponsored by Central Statistical Organization, Ministry of Statistics & Programme Implementation, Govt of India. Dr. UC Sud was the Course Director and Dr. Hukum Chandra was the Course Co- Director of the programme. The topics covered in the training programme were Importance and problem of small area estimation, different approaches used in small area estimation, small area estimation under mixed model, small area estimation using NSSO data and use of R package. 25 participants attended the training programme.

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

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

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

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

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

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

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


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

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

Research Fellowship

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

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

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

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

COURSES TAUGHT DURING THE ACADEMIC YEAR 2008–09

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

COURSES TAUGHT DURING THE ACADEMIC YEAR 2009–10

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

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

EENADU, 06-10-2009

సదస్సును ప్రారంభిస్తున్న ఎన్‌జీ రంగా వ్యవసాయ విశ్వవిద్యాలయం డైరెక్టరు యల్లమందారెడ్డి

ప్రయోగ ఫలితాల్లో కచ్చితత్వం ముఖ్యం

ఎన్.జి.రంగా విశ్వవిద్యాలయం డైరెక్టర్

తిరుపతి (వెటర్నరీ యూనివర్సిటీ), న్యూస్‌టుడే: తిరుపతి ప్రాంతీయ వ్యవసా పరిశోధన స్థానంలో 'పరిశోధన, ప్రయోగ రచనా విశ్లేషణ పద్ధతులు' అంశ రెండు రోజుల సదస్సు సోమవారం ప్రారంభమైంది. ఈ సదస్సును ఆచార్య ఎ జి.రంగా వ్యవసాయ విశ్వవిద్యాలయం డైరెక్టర్ టి.యల్లమందారెడ్డి ప్రారంభించా ప్రయోగాల్లో ఆధునిక విశ్లేషణ పద్ధతులను అవలంబించి మెరుగైన, కచ్చితమైన తాలు అందివ్వాలని ఆయన శాస్త్రవేత్తలకు సూచించారు. ఈ కార్యక్రమానికి హా యిన ఇండియన్ అగ్రికల్చర్ స్టాటిస్టికల్ రీసెర్చ్ ఇన్‌స్టిట్యూట్ నేషనల్ ప్రొఫె వి.కె.గుప్తా మాట్లాడుతూ పరిశోధన గణాంకాలు ఎన్నో అంశాలను ప్రభావిత చేస్తాయని వివరించారు. స్వల్ప వర్షపాతం నమోదయ్యే ప్రాంతాల శాస్త్రవేత్తలకు పలు సూచనలు ఇచ్చారు. సదస్సులో తిరుపతి ఏడీఆర్ రాజారెడ్డి, ఎఎస్ఆర్ ప్రొఫెసర్ రాజేంద్రప్రసాద్, ఎస్వీవీయూ అసోసియేట్ డీన్ సుధాకరరావు, సదస్సు స న్వయకర్త రవీంద్రరెడ్డి

స్థానికం

సాక్షి
విశాఖపట్నం

పరిస్థితులను బట్టి పరి

ప్రారంభిస్తున్న ప్రొఫెసర్ గుప్తా

వ్యవసాయ ప్రయో

మంగళవారం | అక్టోబర్ | 6 | 2009

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కచ్చితమైన ఫలితాలకు
సాంఖ్యిక రచనా పద్ధతులు అవలంబించా

తిరుపతి టౌన్, న్యూస్‌లైన్:

CHEN

HE HINDU • TUESDAY, OCTOBER 6, 2009

Stress on use of statistical tools

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

- Special Corresponde