ABSTRACTS OF PAPERS

1. Construction of Three Symbol PB Arrays of Strength (2m + 1)

H.L. Sharma
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Using image method of Dey *et al.*, (1972) on a tactical configuration $(\alpha - \beta - k - v)$ converted into design parameters by standard relationship, a three symbol PB arrays of strength (2m + 1) has been constructed. An illustrative example is also included.

2. Experimental Factors Influencing Uncontrolled Variation (C.V.%)

J.K. Patel, N.M. Patel and J.S. Patel
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Coefficient of variation expressed in per cent (C.V.%) is a good index of reliability of the results of any kind of field experiment. Plot-wise yield data of 906 experiments conducted in Randomized Complete Block Design (RCBD) on six pulse crops, viz. Arhar, Cowpea, Urd, Mung, Guar and Gram at 25 research stations of Gujarat Agricultural University during the years 1988-89 to 1992-93 were collected and analyzed by analysis of variance technique. Usual t test showed that plot size and number of replication influenced the C.V.% of experiments. Block size (Number of treatments per replication) did not show any consistent trend in C.V.%.

3. Spatial Effects on Production of Tea: A Case Study in Dibrugarh District of Assam

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In this paper, an econometric study has been made to study the spatial effects on production of tea in Dibrugarh District of Assam using the tea production data of four tea estates of the district. The empirical study, made in

this paper, has revealed that the production functions for the four tea estates are indifferent and thus it has led us to conclude, in general, that there is no spatial effect on production of tea in Dibrugarh District of Assam.

4. Study on Growth Pattern in Crosses and Pure Indian Breeds of Goats

S.D. Wahi and Lal Chand
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The non-linear statistical models are tried to study the growth pattern of four Indian breeds of goats namely Jamuna Pari (A), Beetal (B), Barbari (C), Black Bengal (D) and their crosses. The corrected data for body weight from birth to twelve month of age was used to fit the different non-linear models such as monomolecular, Gompertz and logistic curves. The data was corrected for three nongenetic fixed effects i.e. type of birth, season and period. On comparing the values of R^2 and error mean square; it is found that monomolecular gave the best fit which is closely followed by Gompertz curve. Since, the monomolecular curve has the drawback that it does not provide the point of inflexion, the second best Gompertz curve is used to obtain the age, body weight and maximum growth rate at point of inflexion.

The optimum age at point of inflexion for male animals in Jamuna Pari, Beetal, Barbari and Black Bengal are 11.5, 3.9, 8.3 and 5.9 months respectively. The optimum age in crosses is around six months except for Jamuna Pari × Barbari and Beetal × Black Bengal for which these are 8.5 and 7.6 months respectively. The optimum age in case of female animals Jamuna Pari, Beetal, Barbari and Black Bengal is 8.6, 2.2, 5.0 and 3.9 months respectively. The optimum age of crosses is around 3.5 to 4 months except for Jamuna Pari × Beetal, Jamuna Pari × Black Bengal and Barbari × Black Bengal crosses for which these are 5.8, 5.1 and 4.9 months respectively. The growth rate is maximum at the optimum age and it starts declining thereafter at a slow pace. There is considerable improvement in body weight at the point of inflexion/ optimum age in crosses as compared to pure breed parent with lower body weight in both males and females. This improvement in males is more pronounced as compared to females.

5. Robustness of Bootstrap Estimates of Variance of Heritability to Master Samples in Half-sib Analysis

N. Okendro Singh, A.R. Rao, S.D. Wahi and V.P. Singh
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The bootstrap estimates of variance of heritability using half-sib analysis are obtained by drawing independent master samples of different size and family structure for low, moderate and high levels of population heritability. The optimum family size for getting the least standard error for low, moderate and high heritability are 40, 16-20 and 10-16 progenies per sire respectively. The bootstrap estimates of standard error of heritability are nearly independent of heritability itself. The bootstrap estimates of heritability approaches the population values irrespective of the master sample estimates and can be used with advantage for small sample situations where the estimates of heritability are generally outside the parametric space.

6. Techniques for Searching Information Over the Internet

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The Internet has been described as the information super highway, meaning that information on almost any topic could be accessed through a few clicks of the mouse. However, researchers and educationists often experience problems in finding the desired information through the Internet. Until recently, surfing was a typical approach for finding information on the Web. Surfing is unstructured and serendipitous browsing. Starting with a particular Web page, the approach is to follow links from page to page, make educated guesses along the way, hoping sooner or later to arrive at the desired piece of information.

A number of new tools have been developed that enable information published on the Web to be searched and discovered more effectively. This article focuses on various tools now available for finding information on the Web using the approaches such as browsing through keyword searching using search engines, subject trees and hierarchies and Peer-to-Peer (P2P) search engines. These tools enable information published on the Web to be searched and retrieved more effectively and expeditiously.

7. Handling Uncertainty in Databases

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Man has attempted development and maintenance of databases in various forms for centuries. However, the information collected have been far from perfect. Some of the imperfections are discontinuity, lack of precision, vagueness and uncertainty. Thus these database systems have always been subject to the challenge of how to manipulate the imperfect information to reduce the uncertainty.

The advent of computers in recent times have helped in solving many problems and attempts have been made to utilize them for handling uncertainties in databases. This paper is an attempt to describe the categories of imperfect information such as uncertainty, incompleteness, inaccuracy, imprecision, vagueness and inconsistency. Also the data models have been explored. These models can be independently applied with the different approaches to design specific database system. The main interest is to apply deductive approach to database systems with uncertainty. Hence, two different approaches and three models have been presented : fuzzy logic, lattices, and the theory of probability. When the expressive power of a database system increases, its complexity also increases. Thus the task becomes increasingly complex. The concluding part dwells on the possible future work for handling uncertainty in the database systems.

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8. Survey on Reproductive Status and Management of Marwari Goats Reared in Arid Climate of Rajasthan

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Goat is one of the useful farm animal for sustaining the rural economy of our country. Marwari is one of the best suited breed among the goat breeds of Rajasthan. This breed is reared mainly for milk and meat purpose. A survey was undertaken to collect information from 146 goat owners of 16 villages of Jodhpur, Jaisalmer, Pali and Barmer districts about the reproductive status and management of Marwari goats. The average birth weight of kids irrespective of sex was 2.0 to 3.5 kg while the body weight of adults bucks and does ranged

from 30 to 40 kg. and 25 to 30 kg. respectively. The age of first conception reported by maximum respondents ranged from 18 to 24 months. The estrus duration was 24 hours and oestrus cycle length ranged from 15 to 20 days. Marwari goat is not prolific breed and generally gives only one kid per year with less than 20% twinning. Although some farmers (40.4%) followed the practice of round the year breeding but the others adopted autumn (33.6%) or spring (26.0%) as the breeding season. The maximum frequency for conception and kidding rates was 60 to 70%. The majority of the farmers also took extra care of kids by providing them tree leaves and lopping. The major reproductive problems observed in their flocks were incidence of abortion (> 6%), dystocia (1 – 2%) and retention of placenta (3 – 4%).

9. Estimation of Contribution of Input Factors on the Milk Yield Using Principal Component Analysis Technique

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In this paper, an attempt has been made to study the effect of feed intake, housing conditions and other management practices on milk yield. The principal component analysis technique is used for identifying and estimating the contribution of the different factors on which milk yield is based. The secondary data of the survey conducted under the village conditions of Gurgaon district of Haryana State under the project "Development of a Suitable Methodology to Study the Effect of Housing Conditions and Other Related Factors on Milk Production under Village Conditions" is used. In the principal component technique, the linear combinations of all these variables are obtained in the form of components known as principal components, which are uncorrected and independent. All the variables are reduced to four such components, which accounts for 67.11% of the total variation using original feed. The variation explained by four components, individually are 27.3, 16.4, 12.5 and 10.9. The variation explained by four components in case of converted feed i.e. DCP and TDN is 30.5, 16.4, 12.2 and 11.7 per cent and overall it is 70.8 per cent.

10. Suitability of Statistical Tests for the Analysis of Data in Crossbred Cattle – A Case Study in Tarai Region of Uttaranchal

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Age at first calving is the most efficient measure of selection index in dairy cattle. Several studies have been carried out by Animal Scientists using parametric statistical test procedures for performance evaluation of pure and crossbred cows using this trait. In the present paper, an attempt has been made for finding the appropriate probability distribution of Age at First Calving in Crossbred (multiple crosses of Friesian and Jersey) cattle maintained in Tarai region of Uttaranchal so that appropriate statistical tests could be suggested for the statistical analysis data related to this trait. Normal distribution was found fit for the trait age at first calving in both the groups of crossbred cattle. It is concluded that parametric tests requiring the assumption of normal population can be used for the statistical analysis of data related to this trait.

11. A Comprehensive Database System on Livestock Resources of India

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A comprehensive electronic database system on livestock resources of India with specific focus on dairying has been developed by the Computer Centre, National Dairy Research Institute with the main goal to integrate the scattered data (available in different formats) on different aspects of livestock. Secondary data on several aspects of livestock and livestock products was collected from various government and research organizations. A uniform approach was followed to standardize the data using database normalization techniques and the same was then converted into database format using back-end tool viz. MS-Access 97 relational database management system (RDBMS). Also a user-friendly graphical user interface (GUI) has been developed for storage and retrieval of information from the database by using front-end programming tool viz. MS-Visual Basic 6.0. The whole database system has been recorded on the CD-ROM medium in auto-installable form. The minimum system requirements for its installation include P-II processor based personal computer system with 32 MB RAM, 4.0 GB Hard Drive, a CD-Drive, 15"SVGA color monitor, etc. The present database system provides information on different aspects of livestock at a single/uniform platform which can be

shared by the potential users including planners, administrators, policy makers, farmers, dairy industry and the scientific community at large.

12. Performance of Rice Yield Forecast Models Based on Several Statistical Techniques Using Rainfall Data

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The impact of weather and climate on food production is very high. In case of rice, rainfall and its distribution cause high fluctuation in the production. Considering the rainfall statistical methodology is developed for forecasting the rice in Raipur district using the yield data, area under crop, area under HYV and rainfall data from 1971 to 1994. Based on these data three different techniques are used to forecast the rice yield : Principal Component Analysis (PCA), Discriminant Analysis and ARMA (p, q). Using these techniques models are developed. In PCA, principal component of rainfall were obtained and used as independent variable in regression analysis. Similarly in Discriminant Analysis score are used as an independent variable in regression analysis. In ARMA time series analysis of yield data has been done. All three methods show a good forecast value.

13. Application of Statistics in Pesticide Residue Analysis : Case Studies

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Pesticide residue analysis is required to save the population from the hazards of remnants of toxic pesticides in edible commodities. Statistics is required for generating reliable and quality information and deriving useful inferences from the data collected after pesticide residue analysis. The stages in a typical residue analysis involve designing a field trial, drawing representative samples for recording pest population before and after pesticide application, processing of sample and analysis for quantification of pesticide residues. The data is analyzed to determine regression equation, and slope of the time to find the rate of the dissipation of pesticides in order to determine half-life of the pesticide on the edible commodity. If Maximum Residue Limit (MRL) is available, then waiting period can be found to advise the growers for environmental safety and checking hazard due to pesticides. Simple methods of statistics are used for (a) design of the field experiment (b) determining

bio-efficacy e.g. application of a herbicide for weed control fungicides for disease control and (c) handling of residue data of insecticides. These will be presented as case studies. It is hoped that by posing these issues and need before August gathering of statisticians, pragmatic suggestions can be incorporated for improving science of pesticide residue analysis instead of routinely applying statistics.

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14. A Multivariate Approach for Studying the Rainfall Pattern

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A multivariate approach based on cluster analysis has been proposed to study the pattern of rainfall in the different periods of the season. The approach duly considers the dependence of rainfall (i.e. the lagged effect) among the periods of the season, which may not be accounted with the probabilities estimation of rainfall based on univariate rainfall variables. The rainfall patterns that can be identified through this approach are useful for determining the 'good' and 'bad' years of rainfall that may affect the crop yields. The approach was applied for studying the rainfall patterns of the four districts of Rayalseema region of Andhra Pradesh State. The rainfall analysis was based on 35 years of monthly rainfall data (1961 to 1995). The application of the approach was found to be effective in grouping the year-to-year variability in the rainfall.

15. Analysis of Economic Factors and Productivity in Oilseeds Production in India

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Growth analysis in production and economic factors based on secondary data was made to analyze the trends in increased cost of cultivation and profit which influence the cultivation of oilseeds. The analysis revealed that higher growth rate in production of groundnut (1.4% per annum) is due to increase in yield (1.06% per annum), in soyabean through the increase in area (18.0% per annum) as growth rate in yield has been marginal (1.36% per annum), and in rapeseed and mustard due to growth in yield (3.02% per annum) as well as due to area (3.42% per annum). Support price in mustard has been higher than the cost of cultivation and therefore, rapeseed and mustard are the most

remunerative crop. But support price in groundnut and soyabean has not been commensurate to cost of cultivation resulting in negative profit. Soyabean is one of the major crop grown in Madhya Pradesh, and the farmers having no other alternative continue to grow this crop get some remuneration for their labour and value of land (opportunity cost) that is included in the cost of cultivation.

16. Factors Affecting the Shape of Lactation Curve of Crossbred Cows

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Peak yield, peak period and persistency were considered as the most important factors responsible for the shape of lactation curve. The data on daily milk of 7/8 Holstein Friesian cows calved up to three lactations were utilized to study the effect of lactation order, season of calving and their interaction on these factors including lactation milk yield of 301 days. The effect of lactation order was highly significant $(P > 0.01)$ on peak yield and lactation yield. The season of calving significantly $(P > 0.01)$ affected all the three factors included in the study. Highest peak yield was observed in winter calvers $(18.088 \pm 0.588$ kg/day) followed by summer calvers $(16.606 \pm 0.632$ kg/day). The first lactating cows had lowest peak yield and it was significantly increased during second lactation. The summer and winter calvers took shortest $(18.85 \pm 4.24$ days) and longest time $(50.66 \pm 3.95$ days) respectively to attain their peak yields. There was no significant difference between rainy and summer calvers with respect to persistency and were more persistent than winter calvers. The persistency decreased with increase in lactation order showing that first lactating cows were more persistent than other calvers, although, the differences were non-significant. The average lactation yield of this breed increased significantly from first $(2726.007 \pm 127.404$ kg) to second lactation $(3509.496 \pm 135.003$ kg).

17. Use of Regression Type Estimator for Estimating Weight Loss in Potato Stored Under Heaps, Farmers' Storage Structure and Cold Store

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It is well recognized that the use of regression estimate results more reliable (precise) and efficient parameter estimate. This approach combines the available sample information with additional information. A pilot survey was carried out in Meerut district (1995-96) to develop suitable sampling methodology to estimate post harvest losses of potato. For estimating weight loss in potato stored under farmer's storage structure regression type estimator has been used and compared with simple average. These losses were obtained using actual observations recorded at different time intervals. Weight loss was also estimated in cold store. The results revealed that the moisture loss was very high (13%) in case of farmer's storage structures as compared to cold stores. Further, the rate of water evaporation in traditional stores was high in the month of May as compared to previous months. Rottage of potato was also noticed in May.

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18. Developing the Statistical Model for Nutritional Status of Adolescent Girls

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The term 'adolescence' comes from Latin word adolescere, meaning "to grow" or "to grow to maturity". It comprises of the period from 13-18 years for girls and 14-18 years for boys. They contribute to the human potential and impart strength to the national economy and development; hence the nutritional status is of great significance. Nutritional status of adolescent girls of residential and non-residential schools was assessed by nutritional anthropometry and diet survey. The anthropometric measurements were compared with Indian and International standards to know the nutritional status by using Z-test. Good nutritional status of the subjects can be seen only if good nutritious food reaches to every section of the people i.e., the benefits should be distributed evenly in the entire population. The intra and inter variations in calorie intake among different age groups and schools should be minimum. The distribution of calorie

intake per consumption unit is more important than the mean level comparisons. Therefore, appropriate distributions for the data of calorie intake per consumption unit for both the population were tried, the log normal and normal distributions were found appropriate.

19. Composite Regression Models for Forecasting Oil Yield of Lemongrass (Cymbophogon flexuous Nees ex Steud Wats)

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An attempt has been made to study the joint effects of weather variables on oil yield of lemongrass. Yield data pertaining to five harvests of the crop in a year, were obtained from the comparative yield trails conducted at the Aromatic and Medicinal Plants Research Station, Odakkali for the period 1966-1990. Data on weather variables viz., number of rainy days, total rainfall (mm), maximum temperature (°C), minimum temperature (°C) and relative humidity (%) were obtained for the same period from the records of the Meteorological Observatory of the station. Model proposed by Agrawal *et al.* (1980) has been used in this study. Beneficial effects of maximum temperature pertaining to the first fortnight on oil yield of first and second harvest, increased with an increase in minimum temperature of the same fortnight. However, minimum temperature was found to be detrimental for the oil yield of third harvest. Adverse effects of minimum temperature on yield of fourth harvest, increased with an increase in relative humidity. Further, beneficial effects of maximum temperature on yield of fourth harvest, increased with an increase in relative humidity. In the case of oil yield of fifth harvest too, it was found that beneficial effects of maximum temperature increased with an increase in relative humidity.

20. Statistical Methods for Ground Water Monitoring Network

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Ground water monitoring decisions historically have been rooted in statistical theory. Statistics has nevertheless played a critical role in environmental impact decisions. The problem is technically interesting. Given a new monitoring measurement for a ground water monitoring well, drilled at a particular aquifer and analysed for particular substance, be it water level or quality, what is the probability that measurement represents an effect of some

unnatural source. The effects may be due to excess withdrawal of ground water for irrigation or other purposes, or contamination through point or non-point sources.

Here, several parametric and non-parametric statistical procedures have been described for analyzing the ground water monitoring data. For ground water level evaluation, multivariate technique of principal component analysis (PCA) has been proposed. The PCA is a data reduction technique used to identify the important components or factors that explain most of the variance of a system. This technique is of immense help in identifying the monitoring wells taken here as variables that are important in predicting the dynamic variation in potentiometric head in a given aquifer. This will reduce the towering ground water monitoring cost and give precise results.

Then several non-parametric tests for trends in water quality have been proposed because such type of data does not usually admit the assumptions of classical parametric methods (i.e. normality, linearity and independence). Additional issues related to data such as missing values, censored data and seasonally compound the analysis and make one prefer non-parametric statistical test over the generally used parametric ones. It has been observed that Sen's test, Mann-Kendal test and Seasonal Kendal tests have been extremely helpful in analysis and interpretation of ground water quality monitoring data.

21. Bayesian Probability Approach for Crop Yield Forecast – A Case Study for Wheat Crop

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An attempt has been made to develop an alternative methodology for crop yield forecast based on farmers' appraisal which takes into account the totality of the effects of input variables, climatic effects, a view of biometrical characters and also the soil characteristics to arrive at the expected yield. Such information observed at different phases of crop are combined together using Bayesian approach to forecast the crop yield. The feasibility of adoption of the proposed methodology has been demonstrated for wheat crop in Muzaffarnagar district of Uttar Pradesh. A stratified multistage random sampling design was adopted for collection of data in a number of rounds about various aspects of wheat yield. The Bayesian forecasts for the year 1997-98 and 1998-99 are obtained about 2 months before crop harvest using the preceding year(s) likelihoods and indicated that no two consecutive years are alike with respect to crop conditions. To obtain better/close forecast for the current year likelihoods of a year before the preceding year should be used. The methodology ensures a continuous flow of data for revision/updation of the likelihoods to be used in obtaining the forecast for the current year.

22. The Weather Index Approach for Studying Crop Weather Relations

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The weather index, which is ratio of crop yield to the trend value during a year, indicates the aggregate effect of weather on the crop yield. In this study, it is demonstrated that the weather index approach can also be employed to isolate the responsive weather variables affecting the crop yield. The approach when applied to 29 years (1957-58 to 1985-86) sorghum yield-rainfall data of Parbhani district (Maharashtra State) identified the same rainfall months which otherwise could have been identified with the multiple regression analysis. The analysis also confirmed the contention that the new technology yields are more sensitive to weather than the old technology yields. Computational simplicity can be considered as the merit of this approach over the multiple regression approach.

23. Testing the Stationarity of Tea Productions in Dibrugarh District, Assam : A Study with Correlogram and Dickey-Fuller (D.F.) Test

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In this paper, correlogram and Dickey-Fuller (1979) test have been applied for testing the stationarity of tea production in Kenduguri and Joonktolee tea estates of Dibrugarh district, Assam, over the period 1982 to 2001. The extended version of Dickey-Fuller tables extended by Mackinnon (1991) have been used for comparing with computed values of (tau) statistic. The study reveals that the tea production data for both the tea estates are non-stationary. In regression analysis, the classical t-test, F-test etc. are based on the assumption that the time series is stationary. So, these type of data should be modified before going to use it for further statistical analysis like model estimation, forecasting etc.

24. Crop Yield Forecasting Model Based on Weather Variables at an Organized Farm

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An investigation was carried out to study the distribution pattern of weather variables for rice and wheat crop and to develop pre-harvest forecasting model for both rice and wheat crop at an organized farm on the basis of weather data recorded for a period of 33 years (1966-67 to 1998-99).

Pearson's type I distribution was fitted in all the seasons for most of the weather variables in rice and wheat crop and Pearson's type II distribution was fitted in one crop season for the variable relative humidity at 1400 hrs. in rice crop while for maximum temperature and relative humidity at 0700 and 1400 hrs. for wheat crop. Pearson's type IV distribution was fitted for maximum temperature in case of rice crop while Pearson's type VI distribution was fitted for pan evaporation for wheat crops.

The forecast model was developed by using correlation coefficient as weight. The computer programmes in C++ were developed for generating the variables and for stepwise regression analysis. The rice crop yield can be forecasted in 3rd week of September and wheat crop yield can be forecasted in last week of February. The rice and wheat crop yield were simulated for next 3 years which were not considered in developing the forecasting model. About 84 per cent variation in rice yield and 82 per cent variation in wheat yield was explained by the variables included in the forecast model.

25. Statistical Modeling for Forewarning Epidemic Outbreak of Powdery Mildew Disease in Mango

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Powdery mildew is a fungal disease in mango which when takes epidemic form causes severe loss in crop yield. Thus there is a need for development of timely and reliable statistical and epidemiological models for forewarning disease outbreak. These disease monitoring and forecasting systems enable us to apply timely cost effective disease management control measures to reduce the losses. In this paper, logistic regression models have been developed by taking moving averages at different periods of weather parameters viz. maximum temperature and relative humidity and using them separately as regressors to establish a non-linear relationship with the single dichotomous response variable

i.e. epidemic status of powdery mildew in mango. Weather data during 1987-2000 in Lucknow mango belt of U.P. have been used to develop these models upon historical years. On validation, the forewarning system thus obtained by using partial data proved effective with the results obtained comparing well with the corresponding actual year-wise responses of subsequent years not included in model development. Thus the study substantiates statistically the findings carried out earlier by pathologists and also suggest forewarning models for taking timely remedial measures and effective control of powdery mildew in mango.

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26. Cost Estimation in Intercropping System

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In a predominantly agricultural economy like that in India, the attainment of the objective of economic development with stability depends largely on a proper agricultural price policy. It would, therefore, be helpful in devising ways and means of formulating our price policy on the basis of cost of production data and adjusting the same from time to time. The agricultural produce and its cost varies in different areas according to the farming, agro-climatic factors such as soil types, distribution of rainfall, crop pattern and size of holding. Such variations must be closely observed over a period of time and possibly from the same people. In this paper, the estimation of crop production cost in the situation of intercropping system has been considered by following the cost accounting method under usual approach, return based approach, area based approach and density based approach. Also the cost estimators for the two periods, average thereof and change therein have been developed.

27. Mechanism of Monitoring and Concurrent Evaluation for National Agricultural Technology Project

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One of the main objectives of National Agricultural Technology Project (NATP) is to initiate management reforms to improve efficiency and relevance of the National Agricultural Research System (NARS). Monitoring and Concurrent Evaluation (M and CE) is an integral and essential component to

achieve this objective. Implementation of research programs needs to be effectively monitored for better control on quality of research and utilization of resources. An effort has been made to develop a M & CE system, as part of the sub-project on "Institutionalization of Research Priority Setting, Monitoring & Evaluation and Networking of Social Scientists" under the Organization and Management (O & M) component of NATP. The suggested mechanism of Monitoring and Concurrent Evaluation of the NATP projects is a three level ongoing process, following a bottom up and decentralized approach. The three levels of monitoring are (i) Half yearly and annual self-assessment of projects at PI/ZC level (ii) Review by Peer Review Team (PRT) on the basis of PI/ZC observations and site committee/state level committee recommendations and (iii) overall performance of the project on the basis of four point score quantification method. A set of monitoring indicators have also been suggested to access the overall scientific/technical, physical and financial performance of the projects. The implementation of this monitoring mechanism would effectively assess research efforts against well-defined targets, avoid duplication of research efforts and provide feedback to research planning process. It would also help to establish link between performance evaluation and incentive mechanism.

28. Utilization Pattern of Farm Power and Machinery in Karnal District of Haryana

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To ascertain the utilization pattern of tractors on the farms, a study was conducted in Karnal district of Haryana State. The sampling design adopted was stratified two-stage random sampling. The blocks were the strata, villages within the block as PSUs and farmers within a village, the SSUs. There were 6 blocks in Karnal district. Two villages from each block and 9 tractor-owning farmers from each of the villages were selected randomly. As such, a total of 108 farmers were contacted for the collection of data by personal interview method, during the agricultural year 1999-2000. Information was collected from each farmer on the existing inventory of farm power and machinery, use pattern of machinery and power sources, cultural practices followed, and yield of paddy and wheat crops. It was found that tractors upto 35 HP were more popular among farmers. Marginal farmers were not having tractor while a few small farmers were having tractors. Most of the farmers were having electric motors, mainly for irrigation purpose. Gross power availability, which included mobile and stationary power sources, was highest on large farms and lowest on small farms. On the contrary, unit gross power availability was highest on small farms (12.29 kw) and lowest on large farms (3.34 kw). Unit mobile and stationary

power also followed the same pattern. On the average, the available unit gross power, including mobile and stationary sources, was of the order of 4.27 kw/ha. Unit mobile and gross power availability was found to be higher than national average of 1.15 kw/ha. Tractor operated disc harrow was most popular implement followed by cultivator, trailer, thresher, bund former, puddler, leveler and winnower.

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29. Jackknife Estimation of Reliability in Exponential Failure Model with Censored Samples

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For a situation where the failure rate appears to be more or less constant, the exponential distribution would be an adequate choice but not all the times satisfy the condition that "it does not age". There are several situations where the failure rate may be increasing or decreasing and Weibull, Gamma or Log Normal distributions would be a realistic choice (Sinha and Kale, 1979). Given the data, perhaps the best one can do is to apply some transformation which will support the assumption that transformed observations are exponentially distributed. In life testing research, the simplest of the most widely used model is the one parameter exponential distribution.

In this paper, we consider the problem of estimation of reliability, which is the probability of survival of the system for at least time t, by using the jackknife technique under the censored sample situations.

30. Estimation of Dry Spells by Using Markov Chain at Hisar

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The success or failure of crops particularly under rainfed conditions is clearly linked with the rainfall patterns. Simple criteria related to sequential phenomenon like dry and wet spells could be used for analyzing daily rainfall data to obtain specific information needed for crop planning and for carrying out the agricultural operations. Dry spells have been found to persist for a few days over a region. It is useful to ascertain the probability of such sequential events

during a crop-growing season. Analysis of daily rainfall time series data always tend to reveal existence of stochastic dependence. Markov Chain probability model has been found suitable to describe the long-term frequency behaviour of wet and dry spells.

The data of daily rainfall of 75 years (1926-2000) at Hisar station have been analyzed by fitting a Markov Chain Model. The transition probabilities were estimated by M.L.E. and the dry spells of n days have been estimated by the definition of the first order Markov Chain. Testing of goodness of fit of the observed and expected frequencies of dry spells revealed that the model fits well at 5% level of significance for explaining the dry spells.

Expected lengths of dry spells have been calculated for each month and for the whole south-west monsoon season. It has been found that June and September months are more prone to drought (10-13 days dry spells) in comparison to July and August where the expected length of dry spells comes out to be around 7 days.

31. A Software for Agricultural Discussion Forum

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A number of search engines having facility for chatting and discussions are available on the Internet. The search results through these engines are sometime so voluminous that it becomes difficult to select the relevant information. In India, there is a strong need to develop software for discipline based informal discussion forum where people discuss issues of their interest with no fixed agenda except trying to provide/get solutions for some specific problems. In the present study, an effort has been initiated to develop an Agricultural Discussion Forum (ADF) for the users community of agricultural research and development. This Forum is an Internet based platform, where anyone can post queries related to any field of agricultural sciences, can obtain responses to the queries, or obtain information as per requirements. ADF is a web-based application based on Java technology; and is platform independent and can be accessed from any computer connected to the Internet.

32. Online Monitoring and Concurrent Evaluation System for National Agricultural Technology Project

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Indian Agricultural Statistics Research Institute, New Delhi

National Agricultural Technology Project (NATP) is a mega project funded by the World Bank. The project consists of over 800 sub-projects distributed across the country in the diversified fields of knowledge. Each project has its unique input, output and processing entities. Manual management and monitoring of such a large number of projects is very cumbersome and time taking process. An effort has been made at IASRI, New Delhi to develop a online monitoring system based on a mechanism for Monitoring and Concurrent Evaluation of NATP sub-projects as part of the sub-project on "Institutionalization of Research Priority Setting, Monitoring & Evaluation and Networking of Social Scientists" under the Organization and Management (O & M) component of NATP. The online monitoring system, act as an integrated module under the Project Information and Management System (PIMS). The system performs monitoring in two phases viz. half yearly and annually. The underlying mechanism defines various indicators for each phase and a calculation procedure to reach to a final score. It has various forms that take the required information for each indicator and provide the same to the calculation procedure. The calculation procedure aggregates the indicator scores over the time scale and produces the progress of the research project. The monitoring system follows the universally accepted three their architecture. The database tier is developed using the MS SQL Server 2000. The database design consists of highly normalized set of tables while the middle tier is developed using MS Active Server Pages (ASP). The presentation tier is a browser that displays forms and reports in HTML format.

33. Survey on Migratory Sheep of Bikaner District of Rajasthan

V. Geethalakshmi, J. Jayasankar, R.S. Khatri[*] and J.P. Goyal[*]
Central Sheep & Wool Research Institute, Avikanagar

Rajasthan's economy is mainly from the livestock sector. Livestock rearing is an important occupation of the farmers of the State as the scarcity of rainfall makes agriculture too risky to profess. Among the livestock reared, sheep and goat are reared in good numbers. The sheep rearers of the State migrate to other places during the summer season to overcome the shortage of water and fodder for the animals. The aspect of migration has many important facets. This article

presents the migration pattern prevailing in Bikaner district of the State based on a survey carried out in the district.

34. Ranked Set Sampling in the Context of Finite Population

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Extensive literature on the technique of ranked set sampling is available. The technique is useful when difficulties are encountered in measuring large number of units but visual ranking for some of the units is possible. The theory developed for ranked set sampling can be extended to the case of finite populations. In this context, some interesting observations are presented.

35. A Survey Based Socio-economic Profile of Sheep Rearing Population of Bikaner District of Rajasthan

J. Jayasankar, V. Geethalakshmi, R.S. Khatri* and J.P. Goyal*
Central Sheep & Wool Research Institute, Avikanagar

Sheep rearing is one of the major means of subsistence amidst the rural population of Rajasthan. This study is aimed at throwing some light on the socio-economic parameters prevalent in the sheep rearing populace of Bikaner district of Rajasthan. The interrelationship among different parameters is also studied. It was noticed that sheep rearing contributed to about 20-50 per cent of total income of sheep rearing families either as main or secondary occupation. The time spent in sheep rearing activities is also compared among different strata and categories of flock size. It is also noted that income per family was directly proportional to the flock size which clearly underlines the fact that only large flocks can be profitable.

36. SVI : Spatial Variability and Interpolation–A Computer Software

Basant Kumar, V.K. Bhatia, Ajay M. Pawar and P.K. Malhotra
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SVI : Spatial Variability & Interpolation is a computer software tool designed to support the requirements of spatial variability and interpolation in 2-Dimension and 3-Dimensions. It enables the user to visualize the spatial variability in graphical form both in 2D and 3D. It includes 'File editor', 'Variogram Specification Wizard' & 'Graphical Visualization tool'. File editor helps in creating, modifying, saving, opening and printing of data files. Variogram specification wizard guides the user through the steps necessary for specifying a variogram type viz. Isotropic or Anisotropic. Under isotropic head 'One Dimension', 'All Dimension', 'Cross Variogram' can be specified, whereas under Anisotropic head 'Classical Approach', 'Robust I Approach' and 'Robust II Approach' with required data transformation (original scale, logarithmic scale, square root scale) can be specified. Graphical tool visualizes the calculated results in 2D (for isotropic) and 3D (for Anisotropic) graphical form. For the development of the software Object Oriented Programming (OOPs) approach through Java has been applied. The advantages and disadvantages of using Java are compared with its counterpart. From the results, it has been observed that Java provides a high level programming language, more importantly it provides a way of sharing applications across the Internet.

37. Estimation of Willingness to Pay Using Double Bound Approach

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The present work is based on the field survey data collected through a questionnaire administered with 500 households, to quantify the non-market economic benefits from the coastal biodiversity in Dakshina Kannada district. In the study, information was collected on the willingness of the respondents across different occupational, region and age groups to pay by the option of double-bounded approach. A logit regression (single stage) as well as double bounded logistic regression proposed by Barbara J. Kanninen and M. Sami Khawaja (American Journal of Agricultural Economics, 77 – November 1995: 885-890) was fitted. Using the parameters obtained from these models, the average

amount willing to pay has also been estimated assuming logistic distribution. These estimators, which are parametric in nature, are compared with the non-parametric estimator.

Carrying out conventional as well as the sequential classification procedure suggested in the above paper was checked for the goodness of fit of the models. The sequential classification procedure suffers from the fact that the estimates of the probabilities can either be less than zero or greater than one.

38. A Note on the Study of Region of Influence Through Variography

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In order to examine the influence of the neighbouring units for prediction of unknown data point in the spatial process, the concept of variography and kriging has been exploited. For illustration purposes, the data on the designed experiment conducted on the wheat crop have been utilized. Forty-four observations are taken from a wheat field with 11 blocks of 4 plots each. The dimension of the block is 2 × 8 units, with dimension of each plot being 2 × 2 units. For examining the optimum zone of influence for kriging (prediction), it has been assumed that the yield of each plot is observed at its center with the assumption that the co-ordinates at the center of first plot is (1, 1).

The jackknife technique has been used for prediction through Ordinary Kriging (OK). The model considered is Gaussian with a range of 2 units, a sill value equal to 0.6 and a nugget effect of 0.1. Kriging is done, for different regions of influence ranging from 5 units apart through 12 units, at the center of each plot to obtain the estimate along with the kriging variance.

From the results obtained, it has been observed that initially estimate of the unknown data point gets improved as we take more number of observations in the zone of influence. The improvement is in terms of the bias as well as kriging variance. Further as expected the number of observations influences the kriging variance involved in kriging (irrespective of the zone of influence). The prediction error reduces with increasing distance from 5 through 10 units, beyond which it becomes constant. The minimum prediction error is obtained at distance equals to 10 units, which implies that the observations within the region of 10 units are spatially correlated and beyond 10 units the observations behave independently. For examining this zone of influence, the assumption of isotropy of the variograms has been made.

39. Crop Weather Model for Kharif Sorghum Yield at Dharwad

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A multiple regression model between the kharif sorghum (DSV-2) yield and five weather parameters at Dharwad (15 26'N, 75 07'E, 678 m), located in the northern transition zone of Karnataka, was developed. 94% of the variation in the kharif sorghum yield was due to these parameters. They were June heat units, August relative humidity, July wind speed, 25 week rainfall and 28 week rainfall. 25 week rainfall was significant.

40. An Application of Jackknife Technique in Regression Analysis

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Clusters used in sampling design exhibit some degree of homogeneity with respect to variables leading to positive intracluster correlation for two stage sampling design. It is well known that the effect of this positive intracluster correlation is to increase the variance of the estimator of population mean. Perhaps much is not known about the effect of this intracluster correlation on regression coefficient obtained through jackknifing for survey data. Thus the main aim of this paper is to study the effect of intracluster correlation on regression coefficient when it is obtained through jackknifing. It has thus been concluded that general weighting scheme for independent situations such as regression, variance estimator is unbiased for homoscedastic error as well as also for hetroscedatic error case when generalized linear model is used. This technique may be useful in some problems of life sciences to draw valid inferences through small samples taken from survey data.

41. Imputation Methods Under Conditional Framework

Girish Kumar Jha, A.K. Srivastava and Anil Rai
Indian Agricultural Statistics Research Institute, New Delhi

Most of the large-scale surveys especially modern complex surveys are subject to non-sampling errors out of which the major source of error is non-response from units selected in the sample. Imputation i.e., filling in for missing

values is a very common technique for handing non-response. In this paper, with the help of a simulation study an attempt has been made to investigate the performance of various imputation methods under conditional framework where groups have been formed on the basis of ancillary statistics. Through conditional framework, it has been observed that the performance of the comparable methods vary only in different groups, however, overall there do not emerge any clear cut trend among themselves.

42. Correlation Study in Potato Variety Kufri Chandramukhi Under Different Crop Geometry, Date of Planting and Nitrogen Levels Under Rainfed Condition

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Field experiment was conducted to study the effect of crop geometry, date of planting and nitrogen levels on growth and yield of potato at Main Research Station, UAS, Dharwad. The experiment was conducted during kharif season of 1999-2000 under rainfed condition. The results revealed positive and significant correlation between tuber yield and growth attributes viz., plant height $(r = 0.977)$, total dry matter production per plant $(r = 0.797)$ but negative and significant correlation between dry matter production in tubers per plant $(r = -0.782)$. Number of tubers per plant $(r = 0.818)$ and weight of tubers per plant $(r = 0.782)$ were also positively and significantly correlated with tuber yield.

43. Imputation Methods Under Conditional Framework

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Most of the large-scale surveys especially modern complex surveys are subject to non-sampling errors out of which the major source of error is non-response from units selected in the sample. Imputation i.e., filling in for missing values is a very common technique for handling non response. In this paper, with the help of a simulation study an attempt has been made to investigate the performance of various imputation methods under conditional framework where groups have been formed on the basis of ancillary statistics. Through conditional framework. it has been observed that the performance of the comparable methods vary only in different groups, however, overall there do not emerge any cut trend among themselves.

44. Use of Empirical Models to Measure the Yield Loss in Groundnut

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Plant disease is the major crop Limiting factors causing economic loss up to 50 percent, if uncontrolled. Ten groundnut genotypes were studied in response to late leaf spot and rust. Disease (disease severity at different growth stages) and physiological (reproductive efficiency measure, leaf area index, harvest index, leaf area duration, growth rates and partitioning coefficient) parameters were considered as independent variables and yield loss as dependent variable in regression models. Single point models based on disease did not explain the variation in loss completely, but revealed the pod filling (85-95 DAS) as the critical stage in determining yield loss. Non-linear, polynomial and logarithm models were also tried but could not explain the yield loss phenomenon with considerable precision. Multiplicative models, with disease severity at more than one stage were tried and these models showed a slight improvement in explanatory variables thus indicating that disease measurements alone cannot explain the total variation in yield loss over the genotypes. It is attributed to the inherent properties of the different genotypes to resist yield loss in the disease conditions. So, physiological variables were also considered in developing the models. Inclusion of physiological traits in stepwise regression models improved the R^2 considerably, which indicated that the inherent property of the genotype to partition the nutrients to pod in disease conditions has a significant role in yield loss than the disease severity. From the results it could be concluded that the varieties, which have higher translocation and partitioning characters, should be considered in breeding programmes, to incorporate the property of tolerance to pod loss in presence of disease, along with the resistance to disease. Among the genotypes, D39d combined resistance and high yielding potential with minimum yield reduction due to high pod growth rate. Highly susceptible genotype TAG-24 showed tolerance to reduction in yield by early cessation of vegetative growth and efficient translocation to pods leading to high harvest index.