LATE ABSTRACTS OF PAPERS PRESENTED AT THE 34TH ANNUAL CONFERENCE OF ISAS, AT LUCKNOW

1. **Minimal Orthogonal Resolution IV Designs For Some Asymmetrical Factorials**

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A fractional factorial plan is said to be of resolution IV if it permits the estimation of the mean and all maineffects in the presence of 2-factor interactions when three factor and higher order interactions are assumed to be zero.

Resolution IV designs for asymmetrical factorials permitting the orthogonal estimates of the mean and all main effects are rarely available. Margolin (1969) obtained a lower bound for the number of runs required for a resolution IV design, orthogonal or not. Such plans, for which the number of runs equals the lower bound are called minimal. For $4^m \, 2^n$ designs, this lower bound is $4(n+3m-2)$. Margolin (1969) presented a scries of minimal plans for $4. \, 2^m$ factorials.

In this paper, a method of construction of resolution IV designs for $t^2, \, 2^m, \, (t=3, 4)$ factorials is reported. These plans permit the orthogonal estimation of the mean all the main-effects. For $t=4$, the plans are minimal as well.

2. **Multivariate Estimators for the Mean of Finite Population and Optimum Values of Sample Sizes for Different Auxiliary Characters in Multi-phase Sampling**

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In sample surveys, sometimes we have the information corresponding to more than one auxiliary character, highly correlated with the character under study. Some of the auxiliary characters may be positively correlated while some may be negatively correlated. Therefore, it is of interest to investigate the effect of using all or some of them in building up various estimators of the population mean (or total) for the character under study.

The cost of enumerating units for each auxiliary character may be different so in such type of situations it may not be worth-while to collect information on all the auxiliary characters from the same larger sample due to varying degrees of cost of enumerating different auxiliary characters. Moreover in some situations the population means corresponding to different auxiliary characters may not be available. In such type of situations, multi-phase sampling is resorted to. We take bigger samples corresponding to the auxiliary characters having cheaper cost of enumeration while smaller samples corrresponding to the auxiliary characters having costlier cost of enumeration.

Multivariate ratio, regession, product, two-variate ratio-product and multivariate ratio-product estimators for estimating the population mean of the characters under study, have been developed along with their biases and variances respectively. A comparison among the estimators has also been made. Empirical studies have also been made.

A suitable cost function for the proposed sampling scheme has also been developed and the optimum values of the sample sizes co rresponding to different auxiliary characters as well as for the study character have been determined.

3. Some Contributions to the Theory of Multi-Auxiliary Variate Double Sampling
BY ANAND SWAROOP GUPTA,
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Use of auxiliary information in probability sampling either at the designing stage or at the estimation stage is a commonly used device for improving the precision of the estimate of the population mean or total obtained from a sample. Double sampling regression method of estimation is one such device used at the estimation stage. When auxiliary information is available on more than one character, the theory of multi-auxiliary variate double sampling has been developed by various authors. However, the efficiency of such procedures is heavily dependent on the correlation coefficient between the character under study and the auxiliary characters on the one hand and the cost structure of the survey on the other. It has been seen that often the use of multi auxiliary variate double sampling procedure is suggested ignoring these two aspects. In this paper conditions have been studied under which multi-auxiliary variate double sampling procedure would be more efficient by assuming two types of cost structures. Optimum values

of size of preliminary large sample, 'n' and size of sub-sample, n have been obtained in terms of cost components considered and correlation coefficients.

4. On Unequal Probability Sampling of two Units Without Replacement.

BY PRANESH KUMAR, A. DEY
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A general class of unequal probablity sampling schemes for selecting two units without replacement is given. Many known sampling schemes are shown to be members of this class. It is shown that for any member of this class the Yates-Grundy estimator of variance of the Horvitz-Thompson estimator is always positive. A sampling scheme is suggested, which is also a member of the general class. The performance of the Horvitz-Thompson estimator under the suggested scheme is compared empirically with other unequal probability strategies, and it is observed that the suggested scheme performs quite satisfactorily.

5. A Study on Successive Sampling Procedure

BY S. S. SHASTRI AND M. RAJAGOPALAN
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The paper deals with successive sampling technique used in integrated surveys conducted by IASRI. The pattern used for selection of psu's in the said surveys was, m units were constant over all the seasons and over all the years, the $n-m=1$ units in the second set were selected afresh at the beginning of each season in the first year and the same 1 units were taken for the corresponding seasons of the subsequent years and lastly the remaining $n'-n=t$ units in the third set were selected always afresh for all the three seasons of first year. It is clear from this procedure that the pattern of successive sampling was strictly followed in the three seasons of each year whereas over the years this patttern was not adopted as no independent unmatched samples were selected except in the first year. Hence for obtaining an improved estimator of the mean value of a character per season for the first year successive sampling methodology was used and for similar estimators for second and third year double sampling procedure was used. Two different methods are suggested to arrive at alternate estimators of mean value per character per season in the year. The first estimator is based on the entire information while the second one is based on

an improved estimator for each successive season after utilising all the previous seasons' information. The comparison of efficiencies of those estimators revealed that in the case of first year the former estimators is always better than the second while in the case of second and third year the two estimators have the same precision.

6. A Note on the marketing of Banana in Surat District of Gujarat State
BY M. S. BATRA AND S. D. BOKIL
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Fruits after their harvest are available for disposal to places of demand and the machinery involved in carrying out this transfer of fruit from the orchardist to the consmuer is either Agricultural Produce Market Committee (A.P.M.C.) or cooperative societies operating in the state of Gujarat. The aim of the A. P. M. C. is to inspire the farmer to use better means of tilling and mannures to increase Agricultural production. Besides, it is expected to provide confidence to the farmer that the transactions made through A.P.M.C. will fetch him fair and better price in an open market free of any local mal-practices to boost his share in the consumers rupee.

Under the second channel of marketing *viz*; cooperative societies, the fruit transanctions are carried out on the basis of demands received from different places of the country. The societies keep contact with the farmers who are their respective members to make arrangements for the arrival of fruits in the yard and their disposal to the places of demand.

Under the system, the orchardist is paid the average prevailing prices of tract to the extent of 85 to 95 percent of sale proceeds. The balance goes as societies Commission and maintenance of the yard and establishment etc. In this paper Arrival of Banana and its disposal to the different places of the country through the existing cooperative snd societies and the behaviour of whole sale prices for the year 1979 have been discussed.

7. A Study of the extent of and reasons for discontinuation of cultivation of hybrid jowar
BY SATYENDRA KUMAR, P.C. MEHROTRA, AND S.K. RAHEJA
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Concentrated efforts are being directed towards modernising Indian Agriculture with a view to increasing food production by adopting the new strategy based on improved agricultural technology.

One of the main components of the new technology is cultivation of high yield potential seeds. In order to achieve larger coverage under these seeds, the High Yielding Varieties Programme was launched in the mid-sixties. During the course of the assessment and evaluation of this programme, it was observed that certain farmers are giving up cultivation of these seeds. It would, therefore, be of interest to investigate the extent of discontinuation of these seeds as also the causal factors for the same. In the present paper, an attempt has been made to study the extent of discontinuation of cultivation of hybrid jowar and also the causal factors of the same. For this purpose the data collected under the project 'sample surveys for the methodological investigation into High Yielding Varieties Programme' during the years 1976-77 to 1978-79 in the districts of Akola (Maharashtra), Dharwal and Shimoga (Karnataka) were utilized.

The results of the study have shown that the proportion of farmers giving up cultivation of hybrid jowar seeds ranged from 11 to 33 per cent. Further, this proportion did not show any significant association with the size of holding.

The main factors for discontinuation of the seeds were : Lack of satisfaction with the yield actually obtained, low price of the produce in the market, susceptibility of hybrid seeds to attack of plant diseases and insect pests and lack of funds. There is, thus a need to develop suitable area-specific varieites of hybrid jowar which can stand the vagaries of weather, are less prone to attack of pests and diseases and yield acceptable quality grains so as to assure the cultivator of a certain minimum yield level at least to compensate for his investment. Other important aspect namely adequacy and timliness of credit facilities has also to be ensured for this purpose. Difficulties experienced by farmers and suggestions for streamlining the procedures for grant of loan also needs to be looked into.

8.   Causes of Land lying idle in the operational holding and their remedial measures—A case Study
By S.K. Raheja and A.K. Banerjee
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The extant of land which is cultivable but not cultivated in India, according to 1970 Agricultural Census, is of the order of 12.4 million hectares. The reasons for such large area having remained idle are not fully known. Obviously, if brought under cultivation, it can substantially increase the agricultural production in the country. The extent of land that can be brought under cultivation

can be determined only if a detailed survey to find out the causes of land lying idle in different districts, their remedial measures and the alternative uses to which this land can be put is carried out. Accordingly, a survey with these objectives was planned and undertaken by the Indian Agricultural Statistics Research Institute in six districts *viz*. Belgaun, Chittorgarh, Jabalpur, Jhansi, Anantapur and Ratnagiri. The reference period of the survey was 1977-78. The sampling design adopted was two stage random sampling with C.D. blocks in the districts as strata. The villages in the block having idle land constituted the primary sampling units and cultivators having idle land were the ultimate units of sampling. A total of 150 villages were randomnly selected in a district and in each of these villages 20 cultivators were selected at a random. The data were collected by enquiry. The results available from Ratnagiri district have been presented in this paper.

The population of the district according to 1970 census is 19.9 lakhs of which 92 per cent is rural and 8 per cent is urban. The proporation of cultivators having idle land is 72 per cent. The net area sown was 351 thousand hectares while the idle land was 1004 thousand hactares. The cause-wise land worked out to (*i*) low fertility 342, (*ii*) grazing land (including land for rab material and under miscellaneous tree crops) 288, (*iii*) unleveled land 153, (*iv*) rocky land 62, (*v*) lack of irrigation 52 and (*vi*) miscellaneous causes like lack of resources, unremurative nature of farming, saline land, weed infested land etc. 107 thousand hectares. Of the 1004 thousand hectares idle land, nearly 852 thousand hectares land can be brought under cultivation if remedial measures are provided.

The main remedial measures and the extent of land that can be cultivated if these are adopted were (*i*) Augmentation of resources like credit at low interest and technical guidance—400 thousand hectares (*ii*) Improvement of soil fertility by supply of critical input 213 thousand hectares (*iii*) Land improvement measures—128 thousand hectares (*iv*) Other measures like lift irrigation, soil reclamation etc.—111 thousand hectares.

Of the 852 thousand hectare land that can be brought under cultivation, 204 thousand hectares can be sown with Kharif crops like nagli, wari, Harik, til etc., 97 thousand hectares land can be sown with perennial crops like mango and cashewnut while 551 thousand hectares of land can be sown with Kharif as well as rabi crops.

9. A Study on Food Grain Losses in Aligarh Distt. (U.P.)
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The I.A.S.R.I. (ICAR) New Delhi-12 conducted a Sample Survey in Aiigarh District of U.P. (India) to estimate the losses of food-grains in storage at cultivator's level and studied different modes of storage systems used in practice alongwith different causes of damage during the years 1972-73 and 1973-74. Some salient results of the Survey are presented in this paper. This study covered some important food-grains like wheat, gram, barley, paddy, bajra and maize.

The study indicated that the most common practice of storage of food-grains are in Kuthala, bags, matka any Khatti. It is observed that 50 per cent of the grains among larger holdings are stored in Kuthala while medium and small holdings used bags. This is true in the sense that the produce which is to be sold is kept in bags while the produce for home consumption is kept in Kuthala. The extent and cause of damage to food-grains have also been studied in storage. It is observed that the extent of loss in case of wheat was of the order of 1.3 per cent of the produce out of which 0.2 per cent and 0.3 per cent were due to rats and dampness. Similar figures have been worked out for gram, barley, maize and bajra. It is also observed that cultivators with smaller holdings do not use any protection measure while medium and larger cultivator holdings used straw and pesticides like gamaxin, D.D.T. and B.H.C.

10. Some Estimators for Multiple Characteristics
BY PRANESH KUMAR AND A.K. SRIVASTAVA
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For Studying multiple characters, Rao (1966) and Pathak (1966) considered various alternative estimators and investigated their performance with respect to super—population model.

In this paper, some estimators belonging to T_3 class have been considered for three sampling schemes. One of the sampling schemes is an IPPS scheme while the other two are those considered by Singh and Srivatava (1980) for making unbiased regression estimators. For dealing with situations when several characters are to be estimated with one auxiliary character is poorly correlated or unrelated with some of the study characters, alternative estimators have been suggested. Their performance has been studied under super-population model.

11. A Study of Effect of Certain Meteorological Factors on Calf Mortality

By V.K. DWIVEDI, B.V.S. SISODIA and SATISH KUMAR

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In certain studies, it has been observed that calf mortality rate (CMR) on dairy farms was seasonal with peak CMR occuring in some particular seasons. This variation pattern in CMR motivated us to establish a possible relationship between certain meteorological factors and CMR. For this purpose, we have considered the data on calf mortality pertaining to Holastein-Friesion at I.V.R.I, dairy farm for the period of six years, *i.e.* from 1974 to 1979. The data on meteorological factors were obtained from Division of Physiology and Climatology, I.V.R.I.. Izatnagar. A suitable multiple linear model was developed to study the effect of meteorological factor on CMR. Step-wise regression analysis technique was applied to fit the data. A principal component analysis was also proposed to carry out.

12. Use of Blus Residuals in Empirical Research in Finance, Agriculture and Business

By ARUN JAI PRAKAS

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In this treatise, the problems which might arise due to the presence of specification and non-specification errors have been discussed. The tests to detect their specification errors through BLUS residuals have been presented. The BLUS residual procedure insures the independence of estimators of disturbances if the population disturbances conform to ideal conditions as required in ordinary least squares regression. Also, the tests based on BLUS residuals are asymptotically more powerful than their corresponding specification error tests based on OLS residuals except possibly for the tests for autocorrelation. However, this claim has been disputed by Theil. A brief description of non-specification errors have also been provided. Three examples are provided.