

ABSTRACTS OF PAPERS

1. Two Stage successive sampling when fsu's are of unequal sizes II

By

C.L. AGARWAL

Reserve Bank of India, Bombay

Agarwal (1978) has developed the theory of two stage successive sampling when first stage units (fsu's) are of unequal sizes and SRSWOR Scheme is used for selecting the units at both the stages and all the occasions. The Minimum Variance Linear Unbiased Estimator of the population mean on the $h (\geq 2)$ th occasion has been obtained in a specified T_{21} class of linear unbiased estimators when only second stage units (ssu's) are partially retained from one occasion to the other and it is pointed out that there is no gain due to partial replacement of fsu's if the estimator belongs to T_{21} class. A theory, when fsu's or fsu's as well as ssu's both are partially retained from occasion to occasion, is developed in this paper. A general replacement pattern is used and the estimator belongs to a more general class than referred above.

2. A general class of unequal probabilities without replacement sampling schemes for two units

By

PRANESH KUMAR AND A.K. SRIVASTAVA,

IASRI, New Delhi

A general class of unequal probabilities sampling schemes for selecting two units without replacement is given. It is shown that the Yates—Grundy form of the variance estimator is always non-negative for any scheme of the class. A necessary and sufficient condition for the π PS schemes of the class to be more efficient than the PPS with replacement scheme, is obtained. Further, the performance of the various sampling schemes is studied with the help of some natural populations.

3. Robustness of Hartley's estimator for Multiple frame surveys

BY

B.C. SAXENA, P. NARAIN AND A.K. SRIVASTAVA

IASRI, New Delhi

Hartley (1962, 74) considered the problem of estimating population total for multiple frame surveys. In two frame surveys with overlapping frames, samples are drawn from both the frames independently. Hartley suggested an optimum estimator for this situation and has shown that there is a definite gain due to the application of multiple frame as compared to a single frame situation. However, the optimum estimator consists of several population parameters which are not known. It is assumed that some knowledge about these parameters is available through pilot surveys or other alternative sources. When approximate values of these parameters are used instead of their correct values, the optimality of the suggested estimator is likely to be vitiated. In this paper, the gradual effect of departure in these approximations from the correct value on the efficiency of estimator is investigated.

4. Usefulness of Robust Estimators in Sample Survey

BY

M.L. TIKU

*Mcmaster University, Deptt. of Mathematical Sciences,
Ontario, Canada.*

It will be illustrated that the adaptation of recently developed robust estimators in sample survey can lead to considerable improvements in efficiencies in estimating the mean of a finite population (which may be considered as a random sample of independent observations from a superpopulation).

5. Estimation of Population mean after Preliminary test of Significance for Correlation Coefficient in Repeated Surveys.

BY

B.V.S. SISODIA

I.V.R.I., Izatnagar, Bareilly (U.P.)

The usual minimum variance linear unbiased estimator (MVLUE) of the population mean on the second occasion in sampling over successive occasions in repeated surveys requires the knowledge of true correlation coefficient between character values on first

and second occasion but its true value is, generally, not known. Its estimated value from the samples or a priori knowledge of it is often used to develop the estimator. Consequently, the optimum properties of the estimator are affected to that extent. If an experimenter has a priori knowledge of correlation coefficient through pilot survey, past data or experience gathered in due course of time, its use in the estimator may give better result provided it is very close to its true value. The estimator in such cases will naturally be very close to MVLUE. However, an experimenter may not, sometimes, be sure about the extent of closeness of priori and true values of correlation coefficient. A preliminary test for closeness of ρ_0 (a priori value of correlation coefficient) to its true value, may be helpful in formation of the estimator. Keeping above points in view, a preliminary test estimator, *i.e.*, an estimator subsequent to a preliminary test of significance for correlation coefficient is defined in this paper. It is found that the gains are appreciable due to use of preliminary test of significance.

6. A Sampling Scheme with Inclusion Probability Proportional to size using PPs Systematic Sampling

BY

RANJANA AGARAWAL,
I.A.S.R.I. New Delhi

AND

PADAM SINGH
Planning Commission, New Delhi

A π PS sampling has been proposed by modifying the usual PPS systematic sampling. On comparing the efficiency of proposed sampling scheme with some of the existing sampling schemes it has been observed that the performance of the proposed sampling scheme is satisfactory.

7. Reducing Sampling Variance after PPS Selection

BY

T. SRIVENKATARAMANA AND K. HARISHCHANDRA
Bangalore University

A simple transformation is proposed in the context of the usual unbiased estimation under varying probability sampling, which can be effected after the data are collected in a field survey. This requires assessment of the intercept and slope parameters of the population

regression line, which will be particularly feasible in repetitive studies as in crop surveys. The objective is to obtain improved estimates of the population total.

8. On Response Errors

BY

B.K. BHATTACHARYYA

Assam Agricultural University, Jorhat

Response error arises due to mainly evasive attitude on the part of the respondents when questions are sensitive. Warner (1965) devised the randomised response technique to control the evasive attitude of the respondents. In this paper a peculiar situation as reported by some workers, when response errors occur due to some causes other than the evasive attitude of the respondents has been discussed. This situation is reported to be faced in conducting surveys in the hill districts of Assam. Warner's randomised response technique seems not to be applicable under the situation. Some general steps only are being suggested for controlling response error under the situation. More work will have to be taken up to devise some generalised techniques for collecting reliable information and possible control of response errors.

9. Inverse Multi-Sample Estimation

By J.B. SINGH,

G.B. Pant University of Agriculture & Technology, Pantnagar

AND

F.S. CHAUDHARY,

Haryana Agril. University, Hissar.

Estimation of population size when finite but unknown is commonly made by capture-recapture method but the efficiency of this method invites serious questions when the size is very large. A new line of estimation is derived by taking multiple samples where the sample sizes are not fixed in advance. This would achieve a fixed degree of precision while minimising efforts. After fixing some of the parameters, the effects of modifications in the trials, such as a change in sample size or a change of the proportion of marked individuals in the population, are also evaluated by a comparison of power curves.

10. A Modified Method For Cluster Analysis

BY

F.S. CHAUDHARY,

Haryana Agricultural University, Hissar

A method for hidden similarities and relationships of points in multi-dimensional space is discussed by taking the minimized within cluster variance rather than the maximized between clusters variance. By using this technique of cluster analysis by sequential split, the points are grouped into two most compact clusters. Like Markov Chains, a tree diagram is formed to problems of classification. An application of the method to determine the natural clustering of objects from raw observations has been made and numerical examples are taken for illustration.

11. Estimation of the Finite Population Correlation Coefficient in Probability Proportional to Size Without Replacement Sampling

BY

JAI P. GUPTA

Punjab Agricultural University, Ludhiana

Let a sample of size n with PPSWOR sampling from the population Units U_1, U_2, \dots, U_N and the measurements on X and Y are recorded. In order to estimate the population correlation coefficient $\rho = \text{cov}(X, Y) / \sqrt{V(X)} \sqrt{V(Y)}$, the unbiased estimator of the covariance $\text{Cov}(X, Y)$, variances $V(X)$ and $V(Y)$ are given by

$$\text{Cov}(X, Y) \hat{=} \frac{1}{N} \sum_{i=1}^N \frac{X_i Y_i t_i}{\pi_i} - \frac{1}{N(N-1)} \sum_{i \neq j=1}^N \frac{X_i Y_j t_i t_j}{\pi_{ij}}$$

$$V(X) \hat{=} \frac{1}{N} \sum_{i=1}^N \frac{X_i^2 t_i}{\pi_i} - \frac{1}{N(N-1)} \sum_{i \neq j=1}^N \frac{X_i X_j t_i t_j}{\pi_{ij}}$$

and

$$V(Y) \hat{=} \frac{1}{N} \sum_{i=1}^N \frac{Y_i^2 t_i}{\pi_i} - \frac{1}{N(N-1)} \sum_{i \neq j=1}^N \frac{Y_i Y_j t_i t_j}{\pi_{ij}}$$

where $t_i = 1$ if a unit U_i is included in the sample
 $= 0$ otherwise

and $E(t_i) = \pi_i$ (the probability that the unit U_i is selected)

$E(t_i t_j) = \pi_{ij}$ (the probability that the units U_i, U_j both occur in the sample),

and the estimator of the correlation coefficient as

$$r_1 = \hat{\text{Cov}}(X, Y) / \sqrt{\hat{V}(X)} \sqrt{\hat{V}(Y)}$$

The expression for bias, variance and the estimate of the variance of the proposed estimator r_1 has been obtained.

12. On the Efficiency of an Unbiased Product Type Estimator in Double Sampling

BY

NARINDER KUMAR DATT AND SUKHMINDER SINGH
Punjab Agricultural University, Ludhiana

An unbiased product type estimator in double sampling by bias reduction method is constructed. Using simple random sampling without replacement scheme at both the phases of sampling, the suggested estimator is compared with the ordinary biased estimator in double sampling. An empirical investigation, by taking a wide variety of natural populations, has shown that the efficiency of the former does not differ much from the latter whereas the bias present in the latter is significant in some of the populations. Thus, the suggested estimator may be preferred to the biased one.

13. A note on an Unbiased Product Type Estimator Based on Interpenetrating Sub-Samples

BY

SUKHMINDER SINGH AND NARINDER KUMAR DATT
Punjab Agricultural University, Ludhiana

Usual biased product estimator is combined with the estimators based on interpenetrating sub-samples by assigning proper weights (sum of weights unity) in such a way that the linear combination becomes an unbiased product type estimator for population mean. Product estimator using Quenouille's technique becomes a particular case of it when the number of sub-samples is two. Interestingly, the suggested unbiased product type estimator is found to be equally efficient as that of usual biased product estimator when simple random sampling without replacement scheme is used for selecting the sample as well as interpenetrating sub-samples. Since the suggested estimator

is unbiased, while the usual estimator not, the former may be preferred to the latter. Results are also reported in case interpenetrating sub-samples are independent (using simple random sampling with replacements scheme).

14. An Unbiased Product Type Estimator Based on Independent Interpenetrating Sub-Samples

BY

SUKHMINDER SINGH

Punjab Agricultural University, Ludhiana

The product estimator based on independent interpenetrating sub-samples has been corrected for its bias to get a completely unbiased product type estimator for population total. This estimator is compared with the usual biased product estimator based on a single random sample and the biased estimator based on interpenetrating sub-samples when the population is large and follows a bivariate normal distribution. Simple random sampling scheme is used for selecting the sample as well as sub-samples. A simple condition has been found for the proposed estimator to be more efficient in comparison to the usual biased estimator. For a given value of correlation coefficient between the study variable and auxiliary variable in the population, the condition can be satisfied by choosing suitably the number of interpenetrating sub-samples. For the second comparison, the proposed estimator has been found to be more efficient than the biased estimator based on interpenetrating sub-samples. Thus, the proposed unbiased product type estimator may be preferred to the other two biased estimators.

15. Efficiency of Regression Estimator Under a Model

BY

L.N. SAHOO

OUAT, Bhubaneshwar

In this paper the efficiencies of the strategies involving classical regression estimator with respect to simple random sampling scheme and the scheme suggested by Singh and Srivastava (1980) have been compared under a super-population model. It is found that the scheme of Singh and Srivastava is superior to simple random sampling, when the auxiliary variable follows a symmetrical distribution. The results have been verified empirically using a variety of natural populations for a sample of size 2.

16. Combination of product and PPS. Estimators

BY

R.N. SINGH AND HAKIM SINGH

Rajendra Agricultural University, Patna.

An estimator combining product and PPS estimators has been proposed, which is found to be always more efficient than usual PPS estimator or product estimator under PPS sampling. Further, it is shown that the proposed estimator will be superior to the product estimator under PPS sampling and to the usual PPS estimator, if the difference between weights taken and optimum weight is less than

$$\left| 1 + \rho_{uv} \frac{C_u}{C_v} \right| \text{ and } \left| \rho_{uv} \frac{C_u}{C_v} \right| \text{ respectively.}$$

17. A Comparative Study of Population Size, Estimators and their Efficiencies

BY

R.S. KHATRI, *IASRI, New Delhi*

AND

F.S. CHAUDHAURY, *HAU, Hissar*

The estimation of the total size of mobile population is of great importance in a variety of social, economical, biological and agricultural problems, which may be related to adaptation, growth rate, natural selection and evolution etc. In various papers, several estimators of population size have been discussed by adopting classical or sequential sampling techniques and its efficiency has been obtained by deriving variance, mean square error etc. but the point of their acceptability has not been examined. This has been attempted in the present paper so as to arrive at a best linear unbiased estimator (blue). The efficiency of these methods has also been illustrated.

18. Cluster Sampling For the Study of Multiple characters

BY

SAVITA GARG AND B.B.P.S. GOEL

IASRI, New Delhi

The problem of simultaneous estimation of population parameters of several characters using cluster sampling has been considered in this paper. When all the elements in the population

do not possess information on all the characters or when the variability is too high in the case of certain characters and samples of much larger sizes are needed for estimation of those characters a suitable sample of elements or ultimate sampling units may not be appropriate. In such situations the method of cluster sampling can be used with advantage.

Suitable clusters of elements can be formed in such a way that at least some elements in each cluster possess information on each of the characters and further that the variability in the values of the characters from cluster to cluster is considerably reduced. Suitable procedures for estimation of several character from a random sample of clusters have been given and efficiency of cluster sampling relative to sampling of individual elements for a fixed sample size and also for a fixed cost has been considered. The cases of equal and unequal clusters have been considered separately.

19. Estimation from Incomplete Multiple-Observations

BY

RANDHIR SINGH

IASRI, New Delhi

In many situations a number of observations have to be made on the same sampling unit at some specified time stages for obtaining an estimate of population mean or total *e.g.* lactation yield of cows, vegetable yield *etc.* In such situations it is not uncommon that some of the observations are not recorded due to one reason or the other. In this case if all those units are to be discarded for which even one observation is missing then the data-mortality may be quite high. In the present investigation, an estimation procedure has been suggested which makes use of all the available information and is seen to be more efficient than the one based on only completely observed units.

20. A Study on Successive Sampling Procedure for Estimating the change in mean

BY

S.S. SHASTRI

IASRI, New Delhi

Successive sampling technique was used in integrated surveys conducted by IASRI. In this pattern m units (psu) were constant

over all the seasons and over all the years, the $n-m=l$ units in the second set were selected afresh at the beginning of each season in the first year and the same l units were taken for the corresponding seasons of the subsequent years. Lastly the remaining $n'-n=l'$ units in the third set were selected always afresh for all the three seasons of first year. The two different estimators for estimating the change in the mean value of the character are suggested in the present paper. The first estimator was based on the information of first two sets only, while the entire information of the first year was used in the second case. The comparison of the two estimators revealed that the efficiency of one estimator over the other depends on the value of ρ the correlation coefficient and the factor

$\frac{0.5}{1+m\left(\frac{1}{n}-\frac{1}{n'}\right)}$. The first estimator is more, less or equal in efficiency in the comparison to the second according as

$$\rho \text{ is } >, < \text{ or } = \frac{0.5}{1+\left(\frac{1}{n}-\frac{1}{n'}\right)m}$$

21. On the estimation of population mean utilising the knowledge on the population mean and variance of an auxiliary character

BY

H.P. SINGH AND L.N. UPADHYAYA
Indian School of Mines, Dhanbad

Two classes of estimators have been proposed for the population mean Y , of the study character using supplementary information on the mean (\bar{X}) and variance (σ_x^2) of an auxiliary character X . The expressions for the bias and mean squared error of the proposed class of estimator have been obtained under large sample expressions. It has been shown that it is more efficient than the conventional estimators — \bar{y} , linear regression estimator and the estimators considered by Srivastava and Jhaji (1981) and Das and Tripathi (1981*b*). The study has been confined to SRSWR. Two natural population have also been examined for the purpose of illustration.

22. A Class of Estimators of The Population Mean Using Multi-Auxiliary Information

BY

S.K. SRIVASTAVA AND H.S. JHAJJ
Punjabi University, Patiala.

For estimating the mean of a finite population, Srivastava and Jhaji (1981) defined a broad class of estimators which use infor-

mation of the sample mean as well as the sample variance of an auxiliary variable. In this paper, this class of estimators has been extended to the case when such information on $p(>1)$ auxiliary variables is available. The estimators of the class involve unknown constant whose optimum values depend on unknown population parameters. When these population parameters are replaced by their consistent estimates, the resulting estimators are shown to have the same asymptotic mean squared error. An expression by which the mean squared error of such estimators is smaller than those which use only the population means of the auxiliary variables, is obtained. Numerical illustrations for two population with two auxiliary variables are given. It is found that the gain in efficiency is very high as compared to the two-variable linear regression estimator and also as compared to when only one auxiliary variable is used.

23. A note on Necessary Best Estimator of Order Two

By

S.G. PRABHU-AJGAONKAR

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The paper presents another proof of the known result that the necessary best estimator of order two does not exist for the most general class of linear homogeneous unbiased estimators.

24. On the use of Designs in Sampling.

By

RAKESH KUMAR, *PAU, Ludhiana*

AND

RAJINDER SINGH, *GNDU, Amritsar.*

Experimental designs and sampling techniques are two important disciplines of Statistics and as such can be expected to be closely inter-related. Application of certain experimental designs could give direct and easier method of sample selection in some of the situations (Rajinder Singh, 1973). Rajinder Singh and Raghavarao (1975) discussed the use of linked block designs in successive sampling at two occasions. In this study results of above authors were generalised.

The dual of tectical configurations were used for successive sampling at 1-occasions, when pooled difference estimators were used on the matched portion of the sample. A method of sample selection has been given. An unbiased estimator of population mean, variance

of population mean, and an estimator of the variance has been worked out. Also an attempt has been made to compare the proposed scheme with the SRS. Due to complicated variance expression general comparison was not possible. However for successive sampling at two occasions, necessary conditions under which the proposed scheme will be more efficient has been derived. Finally, an empirical comparison for some hypothetical examples were also made and the proposed scheme was found to be more efficient in all the cases.

25. A Further Study for Estimating Changes in Dynamic Populations

By

H.P. SINGH, J.P. JAIN AND B.C. SAXENA

IASRI, New Delhi

Jain and Rajagopalan (1978) suggested earlier a simple heuristic approach for estimating the change in the total of a character in dynamic populations. However, when psu's change partially over time its use may mean sacrificing part of the data. To deal with this situation a suitable methodology has been delineated. The formulae developed have been illustrated with the data collected from the rural areas covered under the Madhavaram Milk Supply Scheme, Chingleput, (T.N.) during 1975-76 and 1979-80.

26. Optimum Points of Stratification for estimating Yield of cereal crops.

By

K.C. BHATNAGAR, *N.D.R.I., Karnal,*

AND

A.K. BANERJI

I.A.S.R.I., New Delhi.

The present study deals with the problem of determining the optimum points of stratification in sample surveys for estimating the total yield of cereal crops. It attempts to demarcate the boundary points of strata using different methods by making use of the information on the holding size of the cultivators selected under the "Sample surveys for Assessment of High Yielding Varieties Programme" in Chingleput district of Tamil Nadu during rabi 1972-73.

The different methods of demarcation of boundary points such as equalization of (a) strata totals, (b) $p_i r_i$ (Ekman's rule) (c)

cumulative of $\sqrt{f(Y)}$, (d) $\frac{1}{2} \{r(Y) + f(Y)\}$ (Durbin's rule) and (e) cumulative of $\sqrt[3]{f(Y)}$ (Ravindra Singh's approach), were examined and the efficiencies of estimating total yield of paddy in the district, were worked out. The results indicated that the optimum method of construction of strata was equalization of cumulative of $\sqrt{f(Y)}$ for four strata size class. An attempt was made to estimate the total yield of paddy in the district during rabi, 1972-73 with holding size of the cultivator as the auxiliary variable. From the available holdings a sample of 20 holdings was selected and allocated according to optimum method of allocation to the four strata size class. It is shown that equalization of cumulative of $\sqrt{f(Y)}$ method of construction of strata using linear regression method of estimation provides an estimate of the total yield of paddy with the smallest standard error and thus could be used with advantage.

27. Stratification as a Resort to Improve Efficiency—An Empirical Investigation

BY

A.S. SETHI

H.P. Agricultural University, Palampur

Geographical stratification is commonly practised for its convenience in large scale surveys. However, such stratification may not be invariably beneficial toward increasing precision of estimators. It therefore requires that before finally recommending a subjectively stratified sampling design, efficiency improvement, if any, resulting from the stratification be investigated. With this objective in view, the present paper aims at estimating variance reduction as a consequence of stratification for the proposed estimators of production and productivity of black pepper under a geographically stratified multistage random sampling design. The results of the investigation revealed that the efficiency gain achieved in the production estimator was of the order of 159% while that in the productivity estimator was 105%. Besides, there was a reduction of 50.8% and 38.1% in the percentage standard errors of the two estimators, respectively, as a result of stratification. Evidently, the findings justify the involvement of the type of stratification in the adopted design.

28. An empirical study on the performance of some sampling strategies using an auxiliary information

BY

ELLA AGARWAL, A.K. BANERJEE AND A. DEY

I.A.S.R.I., New Delhi

The use of auxiliary information for construction of improved estimators for estimating population characteristic is well known

and frequently applied in practice. The literature in this field include the work of several prominent research workers. However, theoretically it is not known as to how the auxiliary information should be made use of in a given situation. In order to obtain a solution to this problem, an empirical comparison of various strategies have been attempted by utilizing the data collected under the scheme "Sample surveys for methodological investigations into high yielding varieties programme" conducted by Indian Agricultural Statistics Research Institute during fifth plan period. For the purpose of the empirical study, two different groups of sampling strategies have been considered. In the first group the auxiliary information is used at the estimation stage, sample being drawn by SRSWOR while for the second group information on auxiliary character is used at the selection stage. The results indicate that (i) classical ratio estimator is superior to all other estimators and performance of regression estimator is poor in general, under strategies where auxiliary information is used at the estimation stage and (ii) among all the strategies that of Rao—Hartley and Cochran is the best.

29. A simple rule for stratification

By

R.K. BOSE, A.K. BANERJEE AND A. DEY

IASRI, New Delhi

The problem of optimum stratification for stratified random sampling estimate was first considered by Dalenius (1950) and subsequently studied by many research workers. The main drawback is that almost all authors have attempted to obtain optimum points of stratification on the basis of study variate. Optimum points of stratification on the basis of an auxiliary character have been studied by Dalenius (1957), Singh (1968), Singh and Sukhatme (1969, 72). In this paper an attempt has been made to obtain points of stratification on the basis of auxiliary variate by arranging the values of the auxiliary variate in ascending order and then dividing the set into as many groups as required. The performance of the proposed rule for stratification has been examined empirically on a variety of natural populations. The comparison has been made with respect to cum \sqrt{f} and Mahalanobis method using different methods of allocation. The results have shown that the proposed method is superior to the existing methods in situations where the distribution of the auxiliary variable is positively skewed. The method is recommended because of its simplicity in use.

30. Some sampling schemes for estimating fibre yield of jute

BY

V. KATYAL, AND B. C. SASMAL

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Green fibre weight of jute bears a strong relationship with its dry fibre weight. So green weight may be used as an auxiliary variable for estimating mean dry fibre weight from the plants of selected sampling units or plots. The information on auxiliary variable that brings about the reduction in the variance of the estimator (mean fibre yield) is true for estimation of dry fibre weight from the plants selected from different sampling units treated uniformly (Sasmal & Katyal, 1978 and 1981). An attempt has been made to study such problem of the variance reduction when the sampling units are subjected to different treatments.

Data for this study pertains to 30 sampling plots arranged in a field experiment with six treatment and five replications. These sampling units were numbered sequentially treatment-wise. From each sampling unit, observations on both green and dry fibre yield were collected. The variances of the mean dry fibre yield were computed for different sampling schemes and results discussed.

31. Responses of groundnut and rapeseed-mustard to irrigation and fertilizers and on prospects of achieving their Sixth Plan production targets

BY

O.P. KATHURIA, H.V.L. BATHLA AND JAGBIR SINGH

IASRI, New Delhi

The importance of groundnut and rapeseed-mustard in the oilseed economy of the country has been stressed. Responses of these two crops to irrigation and of the irrigated crop to application of fertilizers have been examined. Further, keeping in view the yields obtained from irrigated crops of groundnut and rapeseed-mustard and on the basis of their past performance and the scope for future increase in area, the feasibility of attaining targets of production of these two crops at the end of Sixth five year plan period has been examined.

32. A Study on the economics of vegetable cultivation in rural areas of Delhi

BY

D.C. MATHUR, A.K. SRIVASTAVA AND JAGMOHAN SINGH

IASRI, New Delhi

For investigating the economics of cultivation of a particular crop, it is necessary to study its cost of cultivation in relation to the monetary return from the crop. A survey was conducted to estimate the cost of cultivation of vegetable crops in rural areas of Delhi during 1978-81. Based on this survey the present study is an attempt to estimate the cost of cultivation of vegetable crops along with its monetary return. Attention is restricted in this paper to the study of only two vegetables viz. Tomato and Bottle gourd.

33. Yield performance of bajra hybrids under different levels of irrigation

BY

S.K. RAHEJA, V.S. RUSTOGI & P.C. MEHROTRA

IASRI, New Delhi

Bajra is an important kharif crop in large areas in the northern States and efforts have been made for increasing yield of bajra hybrids by adopting appropriate package of improved practices. A study was, therefore, undertaken to examine the effect of various rates of adoption of improved technology on the yield of bajra hybrids in Hissar during the Fifth Plan period. The data collected under the project "Sample surveys for methodological investigations into high yielding varieties programme" in respect of Hissar district of Haryana State have been utilized. Yield performance of bajra hybrids has been studied under irrigated and unirrigated conditions with or without the application of fertilizer as also its performance at different levels of irrigation under fertilized and unfertilized conditions. There was no evidence of improvement in yield beyond the second irrigation. Rather, a declining trend in yield was observed with more than two irrigations. Fitting of different regression models has also been tried to see whether there is any functional relationship between number of irrigations and yield.

34. Some Methodological issues in estimating Economic losses in livestock with special reference to diseases

BY

PARMATMA SINGH AND B.V.S. SISODIA

I.V.R.I., Izatnagar (U.P.)

The productivity of livestock production system is constrained by a series of factors such as nutrition, animal health, genetic potential, environmental condition and herd management. After nutrition, the animal health tends to be the most serious impediment to production. The information available on the extent of economic losses due to diseases in livestock are very scanty in this country. In the present paper some issues on methodological aspects like sources of data, survey planning, sample survey design, data requirement and its collection, analysis of the data, and presentation of the results and its interpretation, for estimating economic losses due to diseases in livestock are discussed.

35. On construction of adoption rate Index of improved agricultural practices

BY

S.K. RAHEJA, P.C. MEHROTRA AND K.K. TYAGI

I.A.S.R.I., New Delhi

The adoption rate of different components of new agricultural technology vary from one farmer to the other even in the same village. While one farmer may apply substantial doses of fertilizer, adopt improved management practices like timely sowing, seed treatment, weeding etc. and take all other measures necessary for achieving high yield level, another farmer might not go beyond adoption of high yielding variety seeds and application of low doses fertilizers. Obviously, the adoption rates of different components taken individually would not be much meaningful or even valid since, they are not independent of each other and their separate contribution to the overall yield is also not known. In other words, the impact of all the components of new agricultural technology would be reflected in the level of yield obtained.

It is therefore of interest to study procedure for developing suitable index which would reflect the aggregate effect of the adoption rates of different components of improved agricultural technology. The reliability of such an index would be indicated by the extent of its correlation with the yield. It is in this context that a study for

developing a suitable index of adoption rate of improved agricultural practices was undertaken. Five procedures for developing a suitable index were investigated (i) simple aggregation index (ii) Weighted index using cost per hectare on different components as weights based on all cultivators (iii) weighted index using cost per hectare on different components as weights based on cultivators using these components (iv) weighted index using area benefited by different components as weights based on all cultivators and (v) weighted index using area benefited by different components as weights based on cultivators using these components.

For studying the impact of the adoption of different components of technology as represented by one or the other index in terms of yield, the holdings were grouped according to different criteria like adoption rate, holding size etc., so as to average out soil and climate conditions. The results showed that weighted index with cost per hectare and based on all cultivators was better than the other procedures.

36. On estimation of straw to grain ratio for jowar crop

By

S.K. RAHEJA, P.C. MEHROTRA AND SATYA PAL

IASRI, New Delhi.

The amount of straw available in a region is generally worked out as the product of straw to grain ratio and grain production. The estimate of the latter is normally available with a good degree of precision from the state series of crop cutting experiments. The straw to grain ratio on the other hand which was quite stable for the local/indigenous varieties, is found to vary substantially for the high yielding varieties/hybrids. In the case of jowar which is an important crop for some of the central and southern states, the stalk to grain ratio varies substantially not only between hybrids and locals but also from one hybrid to the other. The main reason for this variability, apart from the genetic effect, is the variable soil fertility, climatic conditions and agronomic and management practices adopted. Accordingly, a study was undertaken to estimate the stalk to grain ratio for jowar crop using different procedures. The study showed that the ratio varied substantially from year to year as also over different varieties. In the absence of any specific trend or pattern of variation of this ratio, the only option for obtaining the estimate of the ratio on an objective and reliable basis appears to be to collect relevant data as part of the normal crop estimation surveys on a regular basis.

37. A study of variability in yield of groundnut in Aurangabad

By

S.K. RAHEJA, P.C. MEHROTRA AND G.S. BASSI

IASRI, New Delhi.

A critical study was undertaken for Aurangabad district of Maharashtra to know the reasons for low productivity of groundnut utilising the data collected under the project "Sample surveys for methodological investigations in high yielding varieties programme" during the 5th Plan. The area under high yielding/improved varieties of groundnut in the district during the five years of the survey varied between 50 to 70 per cent of the total area under the crop which is quite substantial considering that the crop is mostly grown under unirrigated conditions. The extent of fertiliser use on high yielding/improved varieties was reported to be 35-40 per cent on HYV and 10 per cent on local varieties. The corresponding levels of N, P & K application were 35, 30 and 20 on HYV and 15, 20 and 15 kg./ha. on local varieties. With this backdrop, one would expect substantial increase in the yield rates of the crop at the district level which, however, is not reflected in the production figures. The survey results showed that the average yield for HYV and local varieties was respectively of the order of 5.0 and 3.5 quintals per hectare. Compared with the national average of about 9 quintals per hectare, the yield of groundnut in the district remained poor though there was some improvement with the adoption of HYV. Examining the distribution of the yield of high yielding/improved varieties it was observed that yield level varied between 2 to 15 kg./ha. for the improved varieties over different holdings, showing thereby that the yield for these varieties was highly variable. The proportion of the cultivators below the average was 70 per cent as against 50 per cent for the local varieties. In other words, there was relatively a smaller number of farmers getting higher yields with the improved varieties. Taking the yield difference between high yielding and local varieties, its distribution was even more variable, the difference being sometime negative and sometime more than 10 quintals per hectare.

Thus, the low production over the past two decades is mainly on account of poor performance of improved varieties of the crop which did not improve much even with application of fertilisers. In addition, the high variability of the groundnut yield implies that substantial risk is involved in the cultivator of improved varieties of

this crop. There is, thus, a need to develop suitable varieties appropriate for the region which are stable in their yield level and are responsive to fertiliser application to minimise the risk factor.

38. Some Statistical Investigations Relating to causes of Idle Land in India

By

A.K. BANERJEE AND S K. RAHEJA.

IASRI, New Delhi.

The country has 12.4 million hectares of land lying idle according to 1970-71 agricultural census. It would, be of interest to investigate causes of such large area lying idle and to find out how much area can be brought under cultivation and put to productive use. This aspect was studied with the help of data collected under a research project "Study to find out causes of land lying idle in the operational holdings during agricultural years 1977-78". The survey was conducted in six typical districts of six states which accounted for most of the land lying idle in the country. To arrive at the estimate of land lying idle as well as the extent of the land that can be brought under cultivation, the first step is to choose an appropriate procedure of estimation. For this purpose, cultivated area in the holding was taken as a concomitant variable. It was observed that in some of the districts like Jhansi, the correlation between idle land and cultivated area was fairly high while in some others like Jabalpur the correlation was quite low. The ratio estimate will not be efficient in case of districts where this correlation was low.

The highest number of cultivators having some idle land as well as the total idle land were in Ratnagiri being nearly 348 thousand and 1030 thousand hectares respectively. The lowest area under waste land was in Anantapur. In Ratnagiri, the area under waste land was nearly three times the cultivated area while in Chittorgarh the two areas were more or less of the same order. In Ratnagiri almost the entire idle land belonged to private cultivators. The important causes for the land remaining idle were observed to be (i) unlevelled, rocky land (ii) lack of irrigation (iii) land with low fertility and (iv) grazing land. The major remedial measures suggested by the cultivators for reclaiming the land were (i) levelling and removal of rocks (ii) provision of irrigation facilities (iii) improving the soil fertility and provision of resources. If these measures were provided then nearly 60 to 80 per cent of the idle land in Anantapur, Belgaum, Jhansi and Ratnagiri could be reclaimed.

39. Utilization of Human Labour in Vegetable Cultivation in Rural areas of Delhi

BY

JAGMOHAN SINGH, A.K. SRIVASTAVA AND D.C. MATHUR
IASRI, New Delhi

Vegetable cultivation is known to be more labour intensive, due to its special nature of cultivation practices. It requires more careful handling in the form of protective measure and frequent cultural operations. Due to its short duration nature, vegetable cultivation is also used as an intermediate crop in between two main crops either as a main or mixed crop. Thus cultivation of vegetables provides a potential avenue for man-power utilisation in the villages. In this paper it is attempted to study the human labour utilisation in vegetable cultivation. The study is based on the data collected in a Pilot sample survey conducted for finding the cost of vegetable cultivation in Delhi during 1978. For illustration in the present study, the attention is restricted to Tomato crop.

40. A Statistical Study of Price Trends in Agricultural and non-Agricultural Sector (with Reference to Terms of Trade)

BY

S.K. MAHAJAN AND S.D. BOKIL
I.A.S.R.I., New Delhi

The 'terms of trade' of Agriculture imply the rates of exchange between Agricultural products and Non-Agricultural products. The terms are indicated by the relative prices of Agricultural and Non-Agricultural product. In order to provide incentive to increase production and productivity the 'terms of trade' in the early phase of development are made to move in favour of Agricultural sector by allowing Agricultural products prices and income from these to keep an upward trend both in absolute and relative terms.

In the present study the data, from 1955 to 1980, pertaining to Index of wholesale prices for the two sectors, have been analysed. The prices for both the sectors have increased considerably during the period under consideration, but the relative increase in the two have varied from time to time. These trends in prices have been studied both graphically as well as statistically. Apart for the period 1962 to 1964, when the two prices indices have moved very close to each other, they have been moving on parallel lines with some divergence at times, always keeping terms of trade in favour of Agricultural sector. In the later period the prices of the Agricultural products have gone up very high which is bad for our economy.

41. Intercropping : An Approach for maximizing Production in Rainfed Agriculture.

BY

S.V. MAHAJAN

Mahatma Phule Agricultural University, Rahuri

In Maharashtra nearly 80 per cent area is under rainfed cropping where rainfall is marginal with erratic distribution of rains. In such situation it is essential to utilize the available rainfall to maximize the yield. The intercropping provides insurance against risk and gives stable returns even under aberrant weather conditions. The intercropping can achieve greater stability by compensation of one component when the other fails or grows poorly because of drought. Moreover, in dryland conditions, rainfall variability from season to season is high and it might show a greater influence on yields. So stability of crops plays important role. Attempt has been made to focus light on different cropping methods and analysis procedure of intercropping system in rainfed agriculture.

42. Supply Response of Important Oilseed Crops of India

BY

B.D. BHOLE, M.R. ALSHI AND Y.P. MAHALLEY

Punjabrao Krishi Vidyapeeth, Akola

Current shortages in oilseeds and pulses are well known in India. Price and productivity are the factors which can play a vital role in diversion of area from one crop to another. The present study is an attempt to evaluate the impact of lag price, relative price index, relative yield index and lag area on current area of groundnut, mustard, linseed and sesamum. The long-run and short-run elasticities for lag and relative prices were also estimated. The Nerlovian adjustment lag model was used to get the values of the coefficients. Results indicated that the relative price index has more influence on acreage than the own price of the product. The impact of relative price index on area allocated to respective crops was positive in case of groundnut, mustard and sesamum whereas it was negative in linseed crop. Area under sesamum crop was inversely associated with its own lag price and relative yield index. Short-run as well as long-run elasticities for own price were positive but not significant for all the crops except sesamum, whereas elasticities with respect to relative price were positive for groundnut, mustard and sesamum. The period of adjustment with price changes was highest (4 to 7 years) in linseed followed by groundnut (2 to 3 years) and mustard (1 to 3 years) with lowest (1 to 2 years) in sesamum.

43. Variability of Area, Production and Productivity of Slow Growth Crops-Pulses Grown in Vidarbha

N.S. GANDHI PRASAD, S.S. MARAWAR & V.D. GALGALIKAR

Punjabrao Krishi Vidyapeeth, Akola

An attempt has been made to quantify rate of progress in respect of area, production and yields of Tur and gram in Vidarbha, to estimate the extent of their variabilities during the period 1950-51 to 1976-77 and for estimation of contributions of Area, yield and their interaction towards the total change in production with an intention to judge the performance of agriculture in respect of these pulses and to identify areas which are lagging behind in any crop production.

All the district of Vidarbha registered negative changes in productivity as well as in production of tur during 1968-69 to 1976-77. The average production has considerably declined in all the districts of Vidarbha. Compound growth rates for area, production and yields are found to be 1.51, 3.53 and 1.98 for the period 1976-77. Contribution of yield is found to be minimum 47.3% and maximum 148.7% towards total increase in production.

Area, productivity and production of gram increased by 40.33%, 11.41% and 56.34% during the period 1976-77 over 1968-69. Total production of gram though increasing from 1968-69 onwards at the rate of 7.16% it has not reached the level of 1964-65 per hectare. Productivity is increasing at a rate of 1.81%.

Contribution of area towards the increase of total production ranges from 50% to 65% amongst the districts.

In case of Tur, it is found that yield contributes to the total production ranging from 47.1% to 148.71% whereas the contribution of area to its production is from 49.62% to 174.10%.

44. Distribution of acreage, yield, Climatic factors and other Important Statistics of Pulses Cultivation in Chotanagpur.

BY

M.M. AHSAN

Ranchi Agricultural College, Kanke

Protein calorie malnutrition is posing a serious threat to the overgrowing population of Chotanagpur. Increased production and

consumption of pulses is one of the best ways to overcome widespread malnutrition among poor Adivasi farmers. In order to formulate sound strategy for increasing pulses production in this region, studies on acreage, yield, climatic factors and other important statistics of pulse cultivation have been presented in the paper. The plateau of Chotanagpur receives an average annual rainfall of 1400mm which is more than in the plains. But due to its peculiar topography rain water "runs off" leaving little for storage in the soils. The plateau itself constitutes 46% of the total geographical area of the state. The main pulses crops grown in this region are Arhar, Urid, Kulthi and Gram. The highest acreage and Production have been recorded for Palamau district for most of the pulses grown. The average production of Chotanagpur is lesser than the state average. Economics of some important pulses, as compared to Marua and Gora paddy, indicate that pulses are most profitable crops for this region. The uplands of Chotanagpur, at present growing Gora paddy or Marua, can therefore, be replaced by lime-responsive pulses.

45. Construction of a series of Symmetrical Group Divisible Designs

BY

A. DEY AND A.K. BANERJEE

I.A.S.R.I., New Delhi

A group divisible (GD) design is an arrangement of $v=mn$ treatments in b blocks such that

- (i) each block contains k distinct treatments, $k < v$,
- (ii) each treatment appears in r blocks,
- (iii) the treatments can be divided into m groups of n treatments each, any two treatments occurring together in λ_1 blocks if they belong to the same group, and in λ_2 blocks if they belong to different groups.

GD designs have been studied quite extensively in literature and a large number of such designs have been tabulated by Clatworthy (1973).

In this paper, a method of construction of GD designs is described. The designs constructed have parameters.

$$v=3p=b, \quad r=(p+3)/2=k, \quad m=3, \quad n=p, \\ \lambda_1=(p-3)/4, \quad \lambda_2=1,$$

where $p=4t+3$ = an integer. The designs have a cyclic structure.

46. Single Factor Switch Over Design Involving One Missing Sequence

BY

S.B. AGARWAL

NDRI, Karnal

In switch over designs available in literature the treatments are the levels of single factor. These designs are essentially non-orthogonal when the residual effects of the treatments are estimated alongwith the direct effects. In animal experiments which would run over long periods it is likely that some animals under the experiment die or otherwise are not available for experimentation. In this situation the analysis of the design mentioned above becomes much more complicated as the degree of non-orthogonality increases. In this paper a method of analysis of switch over designs in the presence of residual effects when one animal is missing thereby a sequence of the treatments get lost has been discussed.

47. Construction and Analysis of Some Experimental Designs for Two-Way Elimination of Heterogeneity

BY

G.M. SAHA

Indian Statistical Institute, Calcutta

AND

B.K. SAMANTA

Jute Agricultural Research Institute, Barrackpore

A method of construction of a wide variety of experimental designs for two-way elimination of heterogeneity is described in this paper. Unified and simple analysis for these designs is also evolved. Many designs of Agrawal, H.L. (1975, JISAS) turn out to be special cases of our designs. Some new designs are also obtained.

48. The Existence of Locally Resistant BIB Designs on Degree One

BY

SANPEI KAGEYAMA,

Hiroshima University,

(Presently at Indian Statistical Institute, Calcutta)

This paper characterizes locally resistant balanced incomplete block (BIB) designs of degree one, in terms of only the parameters of the designs. A new necessary condition for the existence of such a BIB design is presented. This condition yields a complete characterization of affine α -resolvable locally resistant BIB designs of degree one.

Furthermore, when the block size is at most eight, a necessary and sufficient condition is given for the BIB design to be locally resistant of degree one.

49. On the Construction of PBIB Designs II

BY

KISHORE SINHA

Birsa Agricultural University, Ranchi

Some series of m -associate triangular PBIB designs have been constructed. A table of new three associate PBIB designs in the range $b, v \leq 100, r, k \leq 10$ with their average efficiencies has been given. These designs with (v, b, r, k) are new in the sense that the existence of two associate PBIB designs (cf. Clatworthy, 1973), John & Turner (1977), Dey (1978) with these parameters are not known. The constructions presented herein also yield Partially balanced weighing designs, nested PBIB designs and PBIB designs for multi-response experiments.

50. A Group of Different Designs with Heterogeneous Error Variances

BY

K.C. BHUYAN

AND

T.K. GUPTA

Bidhan Chandra Krishi Viswavidyalaya, Kalyani

For a group of experiments conducted following different designs with the same set of treatments, it is assumed that the error variance is constant for a particular experiment but it varies from experiment to experiment. Assuming error variances to be unknown, combined estimators of treatment contrast and test on treatment parameters based on all the experiments are provided. The estimation and test are based on the work of James (1954, 1951). The suggested test provides an exact test when the error degrees of freedom of individual experiments are large.

51. Analysis of a B.I.B.D. Under the Non-response of a Treatment

BY

SUKHPAL SINGH AND MAHENDRA PRATAP

J.V. College, Barut (Meerut)

If a number of treatments are compared in an experiment, it sometimes happens that a treatment fails completely. In a varietal

trial, the seed of a particular variety may not germinate. For randomized blocks this presents no difficulty, since the failed treatment can be ignored and the remaining treatments are analysed as randomized block design. If, however, the design is a B.I.B.D., the remaining treatments can not be analysed as a B.I.B.D., as the rejection of the observations from one treatment destroys the balancy of the various comparisons. This situation demands some modification in the procedure of analysis. In the present investigation, a procedure is described which fulfils the above requirement. The estimates of the treatment effects and those of their variances-covariances are obtained by inverting a square matrix of order r only instead of inverting a $(v-1) \times (v-1)$ matrix. Very often r is much less than $(v-1)$ and thus there is a lot of saving in the computational work.

52. Size and Shape of Plots and Blocks for Field Experiments with *Prosopis Juliflora* in Agra Ravines

BY

RAM BABU, M.C. AGARWAL, S.K. SHARMA AND J.P. SINGH
*Central Soil & Water Conservation Research & Training
Institute, Dehra Dun and its Research Centre, Agra*

A uniformity trial on *Prosopis juliflora* trees in undulating ravine lands was conducted at Central Soil and Water Conservation Research and Training Institute, Research Centre, Agra, during the year 1978. The green weight (kg) and G.B.H. (cm) of all the trees in 12×12 and 12×8 trees compartments were recorded. The coefficient of variation decreased with the increase in the plot size upto 6 trees plots for both with and without blocking arrangement for both the compartment for both the observations. The equation $y = ax^{-b}$ gave a good fit to the relationship between coefficient of variation (y) and the plot sizes (x). For a fixed size of plot, plot shape did not show any consistent effect on coefficient of variation. However, plots elongated in slope direction showed less variability. The number of replications and the total number of trees also indicated that a plot of 6 trees having shape of 3 trees along the slope \times 2 trees across the slope would be most suitable. The block efficiency decreased with an increase in block size. The shape of the block had no consistent effect on block efficiency.

53. Size and shape of plots and blocks for field experiments with eucalyptus in Doon valley

BY

M.C. AGARWAL, RAM BABU, M.K. VISHWANATHAM AND
P. JOSHI

*Central Soil & Water Conservation Research & Training
Institute, Dehra Dun*

A uniformity trial was conducted on Eucalyptus spp. at the Research Farm, Selakui of the Central Soil and Water Conservation Research and Training Institute, Dehra Dun during 1978. The trees were raised at 2m × 2m at uniform treatments and were nine years in 1978. The data on weight and DBH of all the individual trees in three different compartments (each of 12 trees × 8 trees) were recorded and analysed to find out the optimum plot and block sizes for conducting field experiments. It indicated that the coefficient of variation decreased with the increase in the plot size for both with and without blocking arrangements for all the three compartments for both the observations. There was no effect of plot shape on variability. The equation $y = ax^{-b}$ gave a good fit to the relationship between coefficient of variation and plot size in all the three compartments for both the observations. The minimum number of replications and trees required to detect 15% difference in means to be significant at 10% level of significance also indicated that a plot of 6 trees appears to be most suitable. The percentage block efficiency also indicated that although in general blocks were efficient, bigger blocks were less efficient than small ones. The shape of the block had no consistent effect on block efficiency.

54. Application of PBIB designs (2) in analysing a diallel cross experiment with parents and F_1 's.

BY

S.K. PANDA AND H.P. SINGH

I.A.S.R.I. New Delhi.

In a diallel cross experiment on 'V' varieties when the parents and one set of F_1 's are included in the experiment, the total number of crosses $\frac{V(V+1)}{2}$ increases rapidly with slight increase in the number of parental lines. Thus it becomes necessary to lay the experiment in a suitable Incomplete Block Design to control the

within block variation. The analysis of such designs is a typical one as the model contains more than one treatment effects like general combining ability (*g.c.a.*) and specific combining ability (*s.c.a.*) effects etc.

Ponnuswamy (1971) suggested the construction aspects of PBIB Designs dealing with partial diallel crosses. But the theoretical expressions required for the analysis of these designs concerning Griffing's Model I were not attempted by him. In the present investigation, theoretical analysis has been carried out for the above mentioned case and the expressions for the estimates of various effects with their standard errors were derived. Further, the applicability of such design has been investigated in studying the resistance to blast disease of rice. It reveals that the PBIB Design with two associate classes is always efficient over the pre-existing randomised block design in estimating the *g.c.a.* and *s.c.a.* effects.

55. Comparative study of the contribution of biometric characters on yield in dessert varieties of Banana

BY

VIJAYA RAGHAVA KUMAR,
Rubber Board, Kottayam

K.C. GEORGE

AND

N. KRISHNAN NAIR

KAU, Trivandrum.

Investigations of twelve morphological characters of dessert varieties of banana were carried out on the crop raised at the KAU Banana Research Farm, Kannara. Fifty eight dessert varieties of plants were grown in randomised blocks with three replications. The analysis revealed that all the twelve characters showed high significant difference among the varieties. All the phenotypic and genotypic correlations of the characters with yield were positive. From the path coefficient analysis, it was found that the character weight of hands was having maximum contribution to yield. The 'weight of fingers' and 'number of fingers' also influence the yield indirectly. The genetic advance through discriminant function was found to be less than that through straight selection. The best two varieties selected were Chenkadali and Red Banana through the method of selection indices.

56. Statistical analysis of the influence of some biometric characters on yield in some culinary varieties of banana

BY

VIJAYARAGHAVA KUMAR,

Rubber Board, Kottayam

K.C. GEORGE

AND

N. KRISHNAN NAIR

KAU, Trivandrum.

Thirty culinary varieties of banana plants were grown in an RBD with three replication at the KAU banana Research Farm, Kannara. Measurements on thirteen morphological characters were taken for the study. These biometric characters had shown high significant difference among the varieties. All the significant phenotypic and genotypic correlations of the characters with yield, were positive. From the path coefficient analysis, it was seen that the yield was influenced by the 'number of fingers', and as the 'number of hands', increases, the number of fingers per hand decreases. No significant gain in genetic advance was observed, when the genetic advance through discriminant function was compared with that of straight selection. The analysis with restricted selection (to girth) indicated that the character number of fingers' had the maximum genetic advance. The varieties Peykunnan and Walha were noted for their highest values of selection indices.

57. Comparative Study of Different Breeding Broiler Strains—A Case Study

BY

R.K. KOLHE AND S.W. JAHAGIRDAR

Punjabrao Krishi Vidyapeeth, Akola

The object of the present study is to assess the performance of different broiler strains raised at 'All India Coordinated Research Project on Poultry Breeding for Meat; Punjabrao Krishi Vidyapeeth Akola'.

A sample of 40 birds each from three strains, namely IR₄, IH₁ and IC₁ have been selected for the study. The comparison of different generation of each strain (i.e. generation effects) and of different strains during each year were made using analysis of variance technique to the characters weight of day old and weight at eight weeks of each as well as relative growth rate during the period of eight weeks. The other parameters like Selection differentials, Realised Response to selection, Heritability etc. were also studied. The prediction equations for estimating body weight beyond six weeks on the basis of body weights at day old and 4/6 weeks have also been worked out with a view to find out appropriate time for sale of birds.

The study reveals the significant differences between different generations in each of the strains, in respect of percentage growth rate during eight weeks period. In IR₄ and IC₁ strains recorded the highest growth rates respectively in base population and first generation. The study also reveals the significant differences of growth rates between different strains under any generation. In second generation, IH₁ strain recorded highest growth rate whereas in base population and first generation, for IR₄ and IC₁ strains recorded the lowest growth rate.

58. On the Selection of Environmental Indices in Stability Analysis

BY

S.W. JAHAGIRDAR AND B.G. SAPATE

Punjabrao Krishi Vidyapeeth, Akola

The object of the study is to examine the consistency of average yields, stability measures and summary statistics when yields of different replications are selected as measures of environmental indices in Freeman and Perkins (1971) model. The data extracted from varieties on Groundnut conducted by 'All India Coordinated Research Project on Oilseeds (Groundnut)' at 9 different centres in India during 1979 to 1981, Kharif seasons has been adopted for the study.

The study reveals that estimate of average yields are consistent when different sets of environmental indices are used but the estimate of stability measures and other summary statistics are inconsistent.

59. Decomposition of Enhanced Milk Yield according to Sources of Increase

BY

K.C. RAUT

IASRI, New Delhi

Cross breeding of cattle has raised the milk yield potential substantially. The difference in the level of production of non-descript cows and the cross-bred ones (using local non-descript cows) in cross-breeding programme is due to not only new production technology, but also due to feeding and management. It is desirable to know quantitatively how much increase in milk yield is due to breeding and how much of it is due to increased quantity of feeds and fodders fed and other management. This has been studied through decomposition analysis utilizing available data from a large scale sample survey in Krishna Nagar area of West Bengal. The fitted Cobb-Douglas function explained 72.6 per cent of the total change in the level of milk yield due to three sources viz. breeding, enhanced feeding and labour utilised. The contribution of technological change (breed) into the total change in milk yield was estimated to be 38.7 per cent. With an increased use of feed input, cross-bred cow contributed about 32.5 per cent to the total change in milk yield. Increased level of labour input would marginally contribute to additional output. This shows that high yielding ability of cross-bred cows can be sustained only if proper feeding is resorted to.

60. Intra-Family Selection Against Recessives under Fullsib Mating-Genetic make-up of the Population using Generation Matrix Theory

BY

SUBHASH CHANDRA

G.B. Pant University of Agriculture & Technology, Pantnagar

A single locus with two alleles case is considered. The possible three genotypes AA, Aa, and aa give rise to six distinct mating types which in turn produce six fullsib families in the first generation. A constant proportion $m=(1-s)$, s being the selection coefficient, of recessives aa is retained within each fullsib-family in the first generation and in each of the successive generations. The genetic make-up of

the population has been studied, using Fisher's generation matrix theory, as a result of the above-referred intra-family selection against recessives.

61. Study on growth of crossbred and indigenous calves reared in a rural area

BY

SHIVTAR SINGH, K.C. RAUT AND H.O. AGGARWAL

I.A.S.R.I., New Delhi

Data on body measurements (length, heart-girth and height), taken at regular intervals, of calves from birth to three years of age, collected during 1977-80 in the large scale sample survey on economics of raising cattle in Nadia district, West Bengal were utilised to study in detail the growth rates in respect of the growth parameters. Growth curves which express the relationship between age and body measurements of calves were found to be linear. There was a marked difference in the growth rates of crossbred and indigenous calves. The former were found growing at a higher rate than the latter.

62. Employment Absorption in Poultry keeping Around Delhi

BY

T.B. JAIN AND D.K. BHATIA

IASRI, New Delhi

An attempt has been made to know the extent of human labour absorption in poultry keeping utilising data collected in a pilot survey from 101 commercial poultry farms in the Union Territory of Delhi during 1969-71.

The study has revealed that 58 layers can generate one hour of employment for one adult person per day in the farms where entirely family labour is utilised; 76 layers can generate one hour employment for one adult person per day in the farms where both family and paid labour is utilised and 86 layers can generate the same amount of employment for one adult person where exclusively paid labour is utilised.

63. Effect of Socio-Economic Parameters on Consumer Behaviour of Milk and Milk Products

By

BHUPAL SINGH AND R.K. PATEL

NDRI, Karnal

The present study was conducted to estimate the influence of some of the principal socio-economic variables, such as occupation, type of consumer (producer and non-producer of milk), seasons, socio-economic status and extent of urbanization etc. on consumption pattern of milk products in Muzaffar Nagar (U.P.). A cross-section of 220 households (160 from rural and 60 from urban sectors) were interviewed through a well defined question naire, specially structured for the purpose. Relevant information was gathered three times during the survey period (Once in each season, starting from July, 1976).

The regression analysis was employed to estimate the expenditure elasticities and to develop equivalent-adult scales. Dummy variables were used to examine and quantify the effect of seasons and socio-economic status. All the ten forms of Engel curve, namely (i) Linear, (ii) Parabolic, (iii) Hyperbolic, (iv) Semi-log, (v) semi-log-inverse, (vi) Double log, (vii) Log inverse, (viii) Log-log-inverse, (ix) Exponential and, (x) Log-parabolic, were fitted for each category and for each milk item. Engel elasticities were worked out by using one explaining maximum coefficient of determination (\bar{R}^2).

On an average the per unit monthly consumption of liquid milk was around 15.4 and 13.6 litres in the rural and urban areas respectively. The relatively lower quantum of milk use in urban sector might be attributed to higher prices and to the preponderance of pure consumer households. This reasoning holds good for 'ghee and butter' and other milk products also. Further details based on the findings have been discussed in the paper.

64. An Efficient Management of Fertilizer use—Inverse Quadratic Approach

By

F.S. CHAUDHARY AND RAJENDRA SINGH

Haryana Agricultural University, Hissar

An attempt has been made to obtain optimum doses, taking into consideration different combinations and to make a comparative

study of response models viz., quadratic, inverse quadratic, and linear-plateau.

It has been found that fitting of inverse quadratic model involves less labour than the quadratic model, when studied under certain assumptions. A comparative study of the two models has been made. The inverse quadratic model is found to be better fit and having an edge over the quadratic model. The general discussion of the value of fitted response surfaces to the experimental data is presented. An inverse quadratic response surface has been found useful, when the response after an initial rising, begins to come down as dose is further increased.

65. Effect of Calf Mortality on Milk Yield and other Production Traits of Cows under Village Conditions

BY

K.V. PRASAD AND K.C. RAUT

IASRI, New Delhi

Weaning is generally not practised in rural areas. If calf dies during the lactation period of a cow, the milk yield and other production traits are likely to be affected. A study was undertaken to assess the effect of calf mortality on milk yield, lactation length, calving interval and persistency, utilising data collected in a large scale sample survey in I.C.D. area, Bikaner (Rajasthan) during 1975-77. The study revealed that there was substantial difference in all the production traits between cows with calf and those which lost calves during lactation. Of all the lactation curves fitted quadratic-cum-log considered to be the best fit as it explained the maximum amount of variation. From the fitted linear regression, it was seen that for delay in death of a calf by one month there was significant increase in lactation yield as well as lactation length both for Rathi and Non-descript cows. If adequate steps can be taken to reduce calf mortality there would be substantial increase in milk yield even under the existing feeding and management practices.

66. Multivariate comparison of White Plymouth Rock and White Cornish breeds on selected characters under varying restricted feeding.

BY

S. RAMACHANDRA, GURUMURTHY, C.V. GOWDH AND B.S.

RAMAPPA

UAS, Hebbal, Bangalore

Effect of four levels of restricted feeding (0, 10, 20, and 30 per cent of the current ad libitum feeding of 127 gms) on the productive

performance of White Plymouth Rock (WPR) and White Cornish (WC) breeds was studied at UAS Poultry Farm. Observations recorded were body weights at 11th, 20th and 25th weeks of age at sexual maturity and 100-day egg production. The data when subjected to Multivariate Analysis of Variance revealed that both the breed and treatment effects were non-significant suggesting that 30% reduction (38.1gms/bird/day) in the current adlibitum feeding of 127gms during either growing or laying phases. Consequently, a 1000 broiler breeder farm could save about 1.15 tons of grower mash per month.

67. A Study on the age Specific Mortality of Bovines under Village Conditions

BY

P.M. RAMESAN AND K.C. RAUT

IASRI, NEW DELHI

An attempt has been made to compute age specific mortality rates of bovines by mid-value-method and the exposure method using the data collected in a pilot sample survey conducted in Gantur district, Andhra Pradesh. Animals existed at the start of the survey in a household were taken as 'beginners' and those animals existed at the end of the survey in the household (at the last visit) were taken as 'enders'. An average of these two populations was taken for each age group (mid-value-method). The total exposure (in years) falling in each age group was also computed after screening each animal for the period in which they were exposed to the risk of death in each age interval (Fractional exposure method). Agewise frequency distribution of both beginners and ender were smoothed separately by a polynomial from the above two. Age specific deaths were also fitted into another polynomial. The ratio of the value of the function from death polynomial to that of the mid-year population polynomial for each age group was taken as mortality rate. Similarly mortality rates were computed, as the ratio of the polynomial of deaths to polynomial fitted for exposures. It was seen that the mortality rates estimated by these two methods mentioned above followed Pearsonian type I Curves.

68. Maximum likelihood estimation of frechet distribution Parameters

BY

N.P. SINGH,

Haryana Agricultural University, Hissar

For some distributions whose certain moments do not exist for some values of shape parameter, the estimation of parameter is done by the method of maximum likelihood. These results have been generalized by considering the m -th maximum of n samples. Models are developed and comparative studies are made by calculating covariance-matrices for different values of m and shape parameter (k). The estimates of the joint distribution of m maxima are also obtained and all these results for different values of m and k are presented in tabular forms so as to make their applications simple and much easier.

69. A Test for judging internal spread of disease among plants

BY

N. SUNDARARAJ AND GURUMURTHY

University of Agricultural Sciences, Bangalore

Plant diseases have been measured through the quantitative data on the occurrence and development of diseases. These data have been mainly used to determine the relationship between the disease intensity and the corresponding crop loss. The study of the disease spread itself is of considerable interest primarily in knowing the nature of the spread and secondarily in deciding to take the corrective measures. An attempt is made here to provide a conditional test criterion to judge whether the disease spread is random or systematic from 'within'. This test criterion makes use of the concept of 'doublet' developed by Van der plank and based on a few basic assumptions.

If d_i is the observed number of diseased plants in the plot i ($i=1, 2, \dots, M$), the conditional joint distribution of (d_1, d_2, \dots, d_M) is a multivariate hypergeometric distribution conditional on $\sum d_i = t$ from which the factorial moments are obtained.

If X is the number of doublets, the conditional mean and the conditional variance of the number of doublets are obtained. For large number of plants, the asymptotic distribution of \bar{X} may under Central Limit theory be expected to be normal with mean $E(\bar{X})$ and variance $V(\bar{X})$.

From these results an asymptotic conditional test is proposed to test the null hypothesis that the incidence of disease is random.

70. A Note on Estimation of λ^2 in Poisson Distribution

BY

R.N. SINGH AND HAKIM SINGH

Rajendra Agricultural University, Patna

Let, x_1, x_2, x_n be a random sample of size n drawn from a Poisson distribution with parameter λ . An estimator T^* of λ^2 has been developed which is biased and has smaller Mean-Squared Error (MSE) than the usual unbiased estimator $T = \bar{x}^2 - \frac{\bar{x}}{n}$

71. The non-reversibility approach : An alternative approach to Estimating crop weather relationships

BY

B.S. KULKARNI, P.R. WAGHMARE AND J.H. GARULE

Marathwada Agricultural University, Parbhani

Estimating crop weather relations involve identification of responsive weather factors affecting crop yields. Identification is a problem, especially in the time series data, which is affected by countless number of factors. As a result, many a times, non sense (false) or even non-significant correlations are depicted by the factors. The approach of estimation under non-reversibility phenomenon presented here, would be a humble effort in this direction. The approach, which is essentially a dummy variable like transformation, enables one to identify the nature of the component (fluctuations) in the variable affecting crop yields. An illustration of the method in comparison to the existing models on wheat yield recorded at Parbhani district (Maharashtra) is also presented.

72. Optimum number of Comparisons in Paired and Triad Experiments

BY

S.C. RAI

IASRI, New Delhi

In paired comparisons, two objects are compared for obtaining the best one. This objective is achieved by comparing three objects at a time in triad comparisons. The outcome of the comparisons depends partly on chance factors and chance may some time operate against the better object. In such cases the decision regarding the best item should be made on the basis of sufficient number of comparisons. In many instances of paired comparisons, the better of the two objects is one which is preferred K times earlier than the other where K is fixed in advance and actual number of comparisons in the experiment is a random variable with possible values $K, K+1, \dots, 2K-1$. There is still a chance that the better item may not be selected but the probability of this event decreases with increasing K .

The problem of optimising K has been attempted in this paper. It is assumed that a comparison must result in the choice of one of the two objects in paired experiment and ranking of 1, 2 and 3 in triad experiment i.e. ties are not permitted. Loss functions have been constructed for various situations and by minimising the loss functions, we get the optimum number of comparisons. The problem has also been considered for incomplete pairs and triplets in fractional paired and triad experiments.

73. Statistical test for testing the Sensory Quality of bread

BY

N.Y. PALIMKAR AND A.G. SHAKKARWAR

Marathwada Agricultural University, Parbhani

Bread is a "ready to eat" type of cereal food, easy to digest and having better nutritional quality. Sensory quality of bread plays a major role in selection of the bread. Four types of breads sold in Parbhani market have been compared. The breads were tested by six judges, three males and three females. The scores given by them are analysed and presented. It was observed that female judges had unbiased sensory sense compared to male judges. It is concluded that the bread "Atul" is best in sensory quality and hence most acceptable in Parbhani town.

74. Use of Principal Component Technique in Yield Forecast

BY

R.C. JAIN, RANJANA AGRAWAL AND H. SRIDHARAN

IASRI, New Delhi

Principal component technique has been used to obtain yield forecast. The forecast model has been obtained for hybrid jowar using principal components of biometrical characters. The results indicate that the forecast of hybrid jowar yield is possible one month before harvest for a crop of three and half months duration.

75. Discriminant Function—an Application to Agricultural Development in Maharashtra State

BY

P.R. WAGHMARE

Marathwada Agril, University, Parbhani

In the present paper the technique of Fisher's discriminant function is applied to the problem of agricultural development in Maharashtra state. The per unit area yield of ten important crops viz. rice, wheat, kharif jowar, rabi jowar, bajra, tur, gram, cotton, sugarcane and groundnut are utilized as some indicators of agricultural development.

The average yield per hectare for the period 1960-61 to 1975-76, of the above said crops for all the districts in the state and in aggregate of the state were worked out and ranked cropwise. By utilizing the per hectare yield, a set was constructed such that all the crops in the set secured the lowest yield. Similarly the aggregate yield of crops formed the another set for classification. Variance covariance matrix were formed by taking the observations for the period of 1960-61 to 1975-76 for both the sets. Discriminant scores were worked out for the sets of an aggregate yield, the lowest yield and for all the districts. On the basis of discriminant score and critical value, the districts which fell below the level of critical value were defined as under developed and the districts which fell above the level of critical value were formed as developed districts, greater than or equal to average development of the state. Tur, sugarcane and rice were found to be the important crops in discriminating between the two groups. Thane, Raigad, Solapur, Aurangabad, Parbhani,

Bhir, Nanded, Osmanabad, Akola, Nagpur, and Bhandara districts were found to be classified as under developed and the other districts in the state were observed to be as developed as the aggregate state or greater than the state.

76. On Forecasting Cotton Production using Partial Harvest Data

BY

MRS. N.A. CHAUBE AND D.V. RATNALIKAR

Punjabrao Krishi Vidyapeeth, Akola

The final estimates of productions of crops are available after a lapse of even more than a year from the harvest time. For some of the crops, where multiple pickings are made, the data on the yields of the individual pickings can be used for forecasting the total yield of the crop with sufficient accuracy. In the present study, the data on the pickingwise yields of cotton, upto the first five pickings, has been used for the forecasting of the total yield of cotton. Data is obtained from a purposive sample of 25 farms spread over the cotton intensive tract of the Vidarbha region. The study revealed that the yield data of the third picking precisely forecasts the total yield. However, the inclusion of the data of forth and fifth pickings as explanatory variables in addition to the third picking yield increases the precision of the estimates. The conclusions of the present study are of indicative nature and study is needed to be taken on wide based data on different varieties.

77. Statistical Evaluation of Pulses In Madhya Pradesh- Production Trends In Recent Years.

BY

SHANTI SARUP, R.K. PANDEY AND GEETAM VERMA

IASRI, New Delhi

Madhya Pradesh is one of the important pulse producing state of India accounting for one fifth of the total pulse crops grown in the country. Gram, Tur, Urad and Moong are the important pulse crops grown extensively in the state and these crops contribute about 75 percent to the total pulse production in the state. This paper attempts to study the performance of pulse production during the period of 1966-67 to 1978-79 and to examine the acreage response to prices of these crops.

Compound growth rates of area, production and productivity of the important pulses of the states have been computed by fitting the exponential function of the form $Y = ab^t$. Analysis of variance technique have been utilized to study the performance of pulses during fourth and fifth plan periods. Regression equations have been fitted to study the acreage response to prices for different pulse crops. The study utilizes the secondary data available in the published reports of the Directorate of Agriculture, Government of Madhya Pradesh, Bhopal and other Government agencies.

The study reveals a significant annual growth rate of about 4 percent in production of gram, tur, urad and total pulses while for moong it is observed to be 2.4 per cent which is not significant. The significant growth rates of the crops are mostly due to expansion in area of these crops during this period while for tur crop it is largely due to the improvement in productivity. The coefficient of variation, is observed to be highest (27%) in respect of tur production. While for other crops it is about 18%. The fluctuations in the production levels are mostly attributed to the Zig-zag productivity levels in different years during this period. The analysis revealed that the developmental efforts during the fourth plan had succeeded in raising the total output of pulse crops but during the fifth plan these had little impact in further boosting up the production level achieved during the previous plan. The analysis of acreage response to prices revealed that the response of area to changes in gram as well as urad prices were positive and significant while in respect of tur and moong, the response was negative though not statistically significant. It implied that these pulse crops were grown not because of their economic superiority but perhaps because of their need both in the diet as well to utilize the marginal lands.

78. Linear Growth Models of Area, Production and Yield of important Cereal and Noncereal Crops—A case study of Fifteen Districts of Eastern Uttar Pradesh

BY

M.N. SINGH AND ASHOK KUMAR

K.A. Degree College, Allahabad

The linear growth models of important cereal (wheat, rice) and non-cereal (sugarcane) crops for the eastern Uttar Pradesh as a whole and separately for 15 districts, during the period 1961-62 to 1979-80

have been attempted. The various findings with regard to growth rates of area, production and yield for these crops reveal that (i) the average per annum rates of increase of area, production and yield in the whole of east U.P. have been 8.55%, 16.54% and 3.85% for wheat ; 0.62%, 1.70% and 0.92% for rice ; and -0.15%, -0.25% and -0.12% for sugarcane (ii) the aggregate production of wheat and rice in east U.P. as a whole and each of 15 districts (except for 3 districts in case of rice) increased relatively at a faster rate as compared to area and yield (iii) in east U.P. as a whole and each of 15 districts, the growth rates of area and production for wheat are relatively much higher than those for rice (iv) with regard to yield as well, the growth rates of wheat are higher than those of rice in east U.P. as a whole and most of the districts, and (v) the average per annum growth rates of area, production and yield in different districts, are found to vary between ; 37.73% to 1.73%, 64.18% to 7.24% and 5.75% to 0.81% for wheat ; 1.76% to -0.49%, 5.98%, to 0.33 and 3.64% to 0.27% for rice ; and 1.97% to -2.99%, 1.90% to -2.90% and 0.86% to -0.94%, for sugarcane.

79. Review of Trend of Production of Oilseeds

BY

DINESH SINGH AND S.D. BOKIL

Indian Society of Agricultural Statistics, New Delhi

It is frequently noted that the production of edible oils and their raw material, oilseeds, is not keeping pace with the demand leading frequently to situation of scarcity. However, oilseeds constitute a group of crops and it is of interest to study their trend of production separately to be able to judge future prospects. This exercise has been undertaken in the present paper on the basis of data on area, production and yield of different oilseeds for the period 1967-68 to 1980-81.

80. Trends In Area And Production of Oilseeds in Vidarbha

BY

D.K. WANKHADE

Punjabrao Krishi Vidyapeeth, Akola

An attempt has been made in this study to assess changes in area and production of major Oilseed crops grown in Vidarbha

Region of Maharashtra State over the period of 16 years (1960-61 to 1975-76). The agreement between cropping patterns of any two years was examined with the help of Kendall's ranks correlation coefficients where as agreement amongst the cropping pattern of all the years was studied with the help of concordance coefficient. The trends in area and production have been studied with the help of compound growth rates.

It is noted that acreage under major Oilseeds of every district is constantly decreasing. The production of groundnut is found to be increasing in every district of the region. Negative growth rate of area under sesamum could be overcome and its production is slowly increasing in Chandrapur District. Negative growth of area under linseed could be overcome in Buldana and Chandrapur District and positive growth rates of production have been observed. Amravati and Yeotmal districts recorded negative growth rates of production, inspite of negative growth rate of production under this crop.

81. Seasonal Adjustment of Economic Time Series

BY

GURUMURTHY, *University of Agricultural Science, Bangalore*

S. SATISH AND S.K. MISHRA, *IIT, Kharagpur,*

Seasonal component of the economic time series gains significance as it accomplishes the objective of comparison of a variable at different time points of the year and facilitates short-term forecasting and policy analysis. Deseasonalizing an economic time series has been attempted by various investigators employing several approaches. The present study presents a simple, accurate and refined official seasonal adjustment procedure in the back-ground of the several limitations underlying the usage of the least squares procedure. Several properties satisfied by the procedure, sum preserving, product preserving, orthogonality and idempotency, are in line with the consistency requirements that seasonal adjustment procedures should satisfy. Tests for detecting the presence and type of seasonality are also enlisted. An application of the same to the price and arrival series of Jowar in Karnataka is also attempted.

82. Study of Marketable Surplus of Groundnut in Operational Research Project area, Chittorgarh (Rajasthan).

BY

H.B. CHOUDHARY AND R.K. PANDEY

IASRI, New Delhi.

The main objective of this paper is to study factors affecting marketed surplus of groundnut on the different holding size in the operational research project area Chittorgarh (Rajasthan). The data collected for studying the constraints in O.R.P. area Chittorgarh have been used for this purpose. The study reveals that the variables affecting marketable surplus are total output, area under the crop and family size. Different econometric models have been fitted to study factors affecting the marketable surplus.

83. An Econometric Analysis in Estimation of Short Run and Long Run price Elasticities for Wheat and Rice-A case study of Allahabad District

BY

ASHOK KUMAR AND I.L. SRIVASTAVA

K.A. Degree College, Allahabad

The estimates of short run and long run price elasticities in hectareage allocation under a crop for major staple food (wheat and rice) in Allahabad district, during the period 1961-62 to 1977-78, have been attempted. The traditional and the Nerlovian adjustment models have been used, each subject to four different price specifications; by taking current planted area under the crop as the dependent variable; and one year lagged hectareage, price, yield; presowing/sowing period rainfall, competing crop's price (lagged one year) and price variability as the independent variables, in different supply response equations. The variables which affected significantly the supply variations were presowing rainfall and lagged per hectare yield in case of wheat and sowing period rainfall in case of rice. The long run elasticities were relatively higher than short run elasticities for crop wheat; while almost similar in magnitudes for crop rice. The Nerlovian and the traditional models were both found to be almost equally efficient with regard to explanatory power (R^2) of the supply response equations. The results obtained have been discussed in detail in the paper.

84. Shift in Household Expenditure Pattern-A Rural-urban Comparison for Punjab,

BY

RAKESH KUMAR, NIRMAL SINGH, AND S.K. SINGLA

Punjab Agricultural University, Ludhiana

An attempt has been made to measure the welfare of the people over time (1966-67 to 1973-74) for both rural and urban Punjab using household expenditure pattern. Various summary statistics employed for this purpose are average expenditure, percentage expenditure both real and actual, growth rate and variances of the log values as a measure of inequality. The study utilizes per capita household expenditure for a period of 30 days, published by National Sample Survey Organisation of India for various commodity groups.

The analysis has shown that food items accounted for more than 60 per cent of the total expenditure. Percentage expenditure on foodgrains, milk and milk products and pan, tobacco and intoxicants was higher in rural areas, while for others it was higher in urban Punjab.

In both the regions growth rates for clothing and footwears, pan, tobacco and intoxicants, vegetables, fruits and nuts and edible oils were positive while for food grains the growth rate was negative. Further, inequality in consumption was quite high for clothing and footwear before 1970 in the rural Punjab as compared to urban Punjab. The position was reverse after 1970. Shift in expenditure was towards luxuries from necessities with the rise in income over time in both the regions.

85. Growth in Area, Production & Yield of Rapeseed-Mustard Regional Analysis of Uttar Pradesh.

BY

D.R. CHANDRA AND C.B. TIWARI

C.S.A. University of Agriculture & Technology, Kanpur

The time series data regarding area, production and average yield of rapeseed and mustard crop for the period 1960-61 to 1979-80 in different regions (Western, Central, Bundelkhand, Eastern and Hill) of Uttar Pradesh have been studied using the log-linear models

The study revealed that the growth in area was significant in all the regions except Bundelkhand region during 1960-61 to 1969-70 period. 1970-71 to 1979-80 period showed a decline in growth over 1960-61 to 1969-70 period in all the regions of the state except Bundelkhand region. Hill region registered a significant fall in acreage during this period.

All the regions except Bundelkhand registered a positive growth in production during 1960-61 to 1969-70 period. This growth was negative (-2.81 per cent) in Bundelkhand region. Eastern region gave highest growth rates (7.02 per cent). Production in the state increased at a much slower rate (0.72 per cent) during 1970-71 to 1979-80 period as compared to 1960-61 to 1969-70 period. Eastern region showed a negative growth (-0.16 per cent) in production. This growth was very slow in Eastern and Bundelkhand regions during 1960-61 to 1979-80 period as compared to western and central regions.

Eastern region showed a highest growth rate (4.11 per cent) of increase in average yield during 1960-61 to 1969-70 period. This increase was negative in almost all the regions of the state except Bundelkhand region (1.62 per cent) during 1970-71 to 1979-80 period. This decrease in average yield was very high in western region (-2.60 per cent) followed by Eastern region (-2.07).

86. Impact of Kharif Season Rainfall on Acreage Allocation to Wheat-an Exploratory Study

By

B.G. SAPATE AND R.K. KOLHE

Punjabrao Krishi Vidyapeeth, Akola

The object of this study is to find whether rainfall during kharif season influences the acreage allocation to wheat which is mainly rainfed crop and to establish mathematical relationship, if any. The period of kharif season was split up into four sub-periods according to critical stages during which rainfall is expected to affect the allocation of area. It was hypothesised that the cultivator may not respond to small deviations in rainfall during any sub-period and his response, if any, is likely to differ during dry spell and wet

spell of monsoon. As such the rainfall of each sub-period was classified into two different explanatory variables, *i.e.* "Below normal" and "Above normal" rainfall. The acreage under wheat, adjusted for trend was regressed on different sets of unclassified as well as classified rainfall variables and area under irrigated wheat in the lag year to identify the influential variables. Finally, linear and log-linear regressions were fitted on the significantly contributing variables.

It is observed that only in the event of rainfall below normal (*i.e.* dry spell) during kharif sowing time (*i.e.* 18th June to 29th July) area under wheat is affected and the area decreases with the increase in deficiency in the rainfall. However, dry spells during any other period or wet spells during any of the periods considered in the study has no influence on area allocation to wheat in rabi season.

87. A study on cropping pattern changes in eight districts of Vidarbha region of Maharashtra State

B.G. SAPATE AND S.W. JAHAGIRDAR

Punjabrao Krishi Vidyapeeth, Akola

The changes in cropping pattern, at micro level from 1959-60 to 1974-75 in eight districts of Vidarbha region comprising of heterogeneous soil and climatic zones have been studied with a view to observe different stages of diffusion of new technology. Based on the proportions of gross cropped area under different crops, ranks were assigned to each crop. Kendall's rank correlation coefficients were used to examine the agreement or otherwise between cropping patterns of any two years while the agreement amongst cropping patterns of all the years was examined with the help of coefficient of concordance. The study reveals that the four distinct and almost rigid cropping patterns are existing in the region during the period under study. However, the deviations in cropping pattern are observed and the nature of the same has been classified into five different types. This may be due to lack of competent substitute crops suitable for the soil and climatic conditions of the region. The adoption of improved and hybrid varieties, improved package of practices and other physical factors are mainly responsible for the deviations.

88. Acreage Response to price for Tobacco in Gujarat

BY

J.H. PATHAK

Directorate of Agriculture, Gujarat, Ahmedabad

AND

S.B. SINGH

Gujarat Agricultural University, Anand.

An attempt has been made to examine the effect of harvest price of tobacco and its competing crop (cotton) in allocation of area under tobacco in Gujarat. The multiple regression method was used for the purpose.

The study was restricted to two major crop growing districts (*viz* : Kheda and Vadodara) of the State by taking area under the crop as dependent variable and the harvest (farm) prices of tobacco and cotton for the previous years, and also the total rainfall for the transplanting period of tobacco as the independent variables. The results revealed that the variables considered explained as much as 44.6% of the total variation in Kheda district while the same was only 19.47% in Vadodara district and it was 30.17% for the State as a whole. The individual contribution of each of the variable was also observed and it was found that the effect of total rainfall was almost negligible. In Kheda district, the price of competing crop (cotton) explained 72% of the total variation explained by the variables considered while in Baroda district 88% of the total variation was explained by price of Tobacco. The deletion of the third variable (total rainfall) did not effect the results much.

89. Dynamics of Fertilizer Price and Consumption Relation

BY

R.K. PANDEY

IASRI, New Delhi.

The price system, under conditions of perfect competition, allocates resources to maximise consumer's satisfaction. The prices of factors of production reflect the scarcity of resources in view of consumer demand for commodities for whose production these resources are used. The demand for fertilizers is a derived demand because the fertilizers are used in producing agricultural products.

The consumption of nitrogeous fertilizers in terms of nutrients has increased by 170 per cent from 1970-71 to 1981-82. During the same period, the consumption of phosphatic fertilizer grew by more than 140 percent. The prices of nitrogeous fertilizers during 1981-82 rose by 154 percent as compared to 1971-72 level. In the case of phosphatic fertilizers, the increase during the same period was 85 percent. The procurement prices of major foodgrains *e.g.* paddy, wheat and Sorghum increased by 117 percent, 71 percent and 111 percent respectively during 1981-82 as compared to 1971-72. In another study by Patil and Pandey, it has been shown that during 1955-56 to 1974-75, the consumption of nitrogeous fertilizer on per hectare basis in the states differed mainly due to differences among states in the levels of irrigation and product and nitrogeous fertilizer prices. For the same period the increase in relative prices of phosphatic fertilizers did not have significant effect on the consumption of phosphatic fertilizers. These findings are based on the state level data. More researches using farm level data are necessary to understand the dynamics of fertilizer price relationship.