

ABSTRACT OF PAPERS*

SECTION : A

1. SUCCESSIVE SAMPLING STUDY : A PARTICULAR CASE OF DYNAMIC POPULATION

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The population with changeable structure with a particular case of matched and unmatched units on three occasions has been considered. A sample of size n' i.e. say $S_{t_1}(n')$ is selected on first occasion by SRS. On second occasion $S_{t_2}(n'')$ is partitioned as $S_{t_2}(n_{12m})$ from $S_{t_1}(n_{12})$, $S_{t_2}(n_{12u})$ from $N_{12} - S_{t_1}(n_{12m})$ and $S_{t_2}(n_2)$ from N_2 (i.e. population units belonging to second population only). On third occasion $S_{t_3}(n''')$ is partitioned as $S_{t_3}(n_{123mm})$ from $S_{t_2}(n_{123m})$, $S_{t_3}(n_{123mu})$ from $S_{t_1}(n_{123}) - S_{t_2}(n_{123m})$, $S_{t_3}(n_{123um})$ from $N_{123} - S_{t_1}(n_{123})$ i.e. $S_{t_2}(n_{123u})$ and $S_{t_3}(n_{123uu})$ from $N_{123} - S_{t_1}(n_{123}) - S_{t_2}(n_{123})$, $S_{t_3}(n_{23m})$ from $S_{t_2}(n_{23})$ and $S_{t_3}(n_{23u})$ from $N_{23} - S_{t_2}(n_{23})$ and lastly $S_{t_3}(n_3)$ from N_3 i.e. totally unmatched units on third occasion. An attempt has been made to suggest MVLUE and its expression for variance using the entire samples from the populations on all the three occasions.

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2. FORECASTING OF CROP YIELD WHEN AUXILIARY CHARACTERS ARE ESTIMATED

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Pre-harvest forecast of crop yield is attempted when information on auxiliary characters is not available at the level at which it is available for character under study. It is suggested to estimate the auxiliary characters by further sub-sampling of units. An estimator of total, variance of estimator and variance estimator are proposed for the year of forecast based on the previous year standardized model incorporating both design and model based features. Also the empirical study carried out on Jowar crop for the two years 1977-78 and 1978-79 revealed that adjustment of variance-co-variance matrix for sampling errors resulted in inflation of the estimated regression co-efficient as well as their estimated standard error as compared to ordinary least square. The error of prediction was found to be higher when sampling errors were taken into account.

3. CLUSTER SAMPLING PROCEDURE FOR THE ESTIMATION OF YIELD LOSS

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Estimation of parameters in a mixture population has been a topic of interest in the recent past, more so in the plant population of plots where healthy and diseased plants are intimately mixed up. The estimation of loss in yield due to disease is a major problem faced by the plant pathologists. Although methods are available to assess the loss, there is a lack of either efficiency or applicability of such methods within a given framework. Two different loss functions appropriate to study the total loss in yield have been considered here. Single stage cluster sampling has been used to estimate the loss. Three estimators of the loss function have been proposed and their variances are compared.

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4. ON OVERLAPPING CLUSTERS

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In cluster sampling, non-overlapping clusters are generally taken as sampling units. However, in some situations, particularly in agricultural surveys, overlapping clusters are formed. Formation of clusters by selecting "Key-Villages" and associating nearby villages to form the clusters is an example of overlapping clusters. The probability structure of the sampling design for non-overlapping clusters as sampling units gets disturbed, when the clusters are overlapping. The sampling design, considering the clusters as non-overlapping, yields biased estimators and the nature and extent of the bias is not known. Changes in the sampling design due to overlapping nature of the clusters may be accounted for if the corresponding changes in the probability structure may be ascertained. This is feasible but not always simple. Some of these aspects related to overlapping clusters are investigated in this paper. An unbiased estimation procedure based on multiplicity sampling is suggested. The nature and extent of the bias of the usual estimator of population total, treating the clusters as non-overlapping, are examined. It is observed that the usual estimators, are nearly unbiased in many practical situations. Comparisons of efficiencies are also made for these estimators.

5. THE EFFECT OF TWO-STAGE SAMPLING
ON OLS ESTIMATORS

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Two-stage sampling is commonly adopted by selecting a sample of clusters at the first stage and then a sample of individuals within selected clusters at the second stage. The regression model

$$y_{ij} = \beta_0 + \beta_x x_{ij} + \beta_z z_{ij} + \alpha_i + e_{ij} \quad \begin{array}{l} i = 1, 2, \dots, a \\ j = 1, 2, \dots, n_i \end{array}$$

may be considered to reflect the effect of clustering on the character under study where the subscript (i, j) refers to individual j in cluster i and α_i is the effect of i th cluster, x 's and z 's are the two explanatory variables. β_x and β_z are the regression coefficients of x and z respectively and β_0 is the average effect. Under some suitable assumptions, the optimum sample size

has been found to largely depend upon intra-class correlation coefficient ρ and cost ratio of including a cluster in the sample to the cost of including an individual.

The *misspecification effect* described by Scott and Holt (1982) increases as we increase the value of η^2 where η^2 is proportion of variance in x or y explained by the clusters. We further see that sample size inversely affects the misspecification effect. It has been seen that for large values of intra-class correlation coefficient (ρ) when the proportion of the variance explained by x or y is not very high, it hardly matters whether we include the cluster effect in the regression model or not. Even at the low values of η^2 if optimum sample size is reasonably small then we should take a serious concern about the inclusion of cluster effect α_i in the regression model.

6. BIAS ASSOCIATED WITH THE USE OF MATCHED SAMPLE IN EVALUATION STUDIES

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In evaluation studies the major concern is on the use of proper control group. Control group is required to represent adequately the participant's situation, which would have observed had they not participated in the programme. Matching technique is commonly used in an attempt to reduce the differences in the distributions of the disturbing factors affecting the response. The use of matching technique results in a trade off between the choice to obtain matched participant and non-participants pair that are extremely similar to each other. Use of any choice will not make the estimate of programme effect free from bias. Different matching techniques which attempt to form the compatible control group are compared with respect to their ability to remove the bias due to the disturbing factor. The matching methods compared are caliper matching methods and the mean matching method. The ability of the matching method in reducing the bias is investigated by using simulation technique for normal population with different population parameters. In practice, sample selected for studying the effect of the programme may not adequately represent the population under consideration in the absence of complete frame for selecting the sample and also with the use of disproportionate stratified sampling scheme. Use of unrepresentative sample also makes the estimate of programme effect biased. The expression has been derived for the bias due to unrepresentative sample in the estimate of programme effect under different sample schemes. Bias due to un-

representative sample is examined in the context of the matching technique which gives either the exact or inexact matched sample.

7. A CLASS OF UNBIASED PRODUCT-TYPE ESTIMATORS FOR POSITIVE AND NEGATIVE CORRELATION SITUATIONS

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A class of unbiased estimators is derived, by weighting two product-type estimators and sample mean, for estimation of a population mean. Numerous interesting estimators including those which may be used as dual to ratio estimator may be obtained from the proposed class. An exact expression for the variance is obtained, an optimum estimator in the class is found and the situations are identified under which estimators better than sample mean and usual ratio and product estimators may be generated from the class.

8. A STUDY ON EFFICIENCY OF MILK PRODUCTION

BHUPAL SINGH and S. B. AGARWAL

N. D. R. I., Karnal

The present study was conducted in the rural areas of Karnal District of Haryana State during 1984-85. The survey design employed was multi-stage stratified random sampling. Simple random sampling without replacement was adopted for selecting the milk producing households at each stage. The input-output data for 125 dairy animals (49 cross-bred and 76 indigenous local cows) was collected through enquiry method. The technical efficiency of milk production through cross-bred cows in comparison to indigenous local cows was estimated by introducing dummy variable in the milk production function. The contributions of new technology (cross-bred cow) and feed inputs in total change in milk production were estimated.

The study revealed that significant increase in milk production could be effected through cross breeding of local cows. The contribution of new technology (cross-bred cow) to the total change in milk production

was found to be 30 per cent. The use of green fodder and concentrate inputs in the ration of cross-bred cows contributes about 8 percent to the total change in milk yield. Feeding of dry fodder to cross bred cows affected milk yield adversely which had decreased the contribution of feeds and fodder in the overall change in milk yield through cross-bred animals.

9. TRENDS IN MARINE PRODUCT EXPORT FROM INDIA

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Export of marine products is an important source of foreign exchange. An attempt has been made to study some of the aspects of the same such as source, fish landings and its trend, contribution of various states to total landings, specieswise contribution, trends in seafood exports in terms of quantity, share of various items to the total export, contribution of various states to shrimp landings (i.e. an item holding major share of export both in terms of quantity and money), trends in penaeid, non-penaeid and total prawns catch etc. Linear, quadratic or cubic curves were fitted on the basis of the results of test of significance. Explained variation between various cases ranged between 60 to 85 percent.

10. USE OF VEGETATION INDEX FOR IMPROVED YIELD ESTIMATION AND DROUGHT MONITORING

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Presently the yield estimates for major crops are obtained through yield estimation surveys based on crop cutting experiments. These surveys are based on a stratified multi stage sampling design where strata are formed based on geographical and political units of blocks or Talukas. However crop conditions within a block may vary quite considerably depending upon the use of improved technologies and inputs as well as soil and other factors. With the advent of remote sensing technology, the spectral reflectance of the cropped area will be a close manifestation of all the factors affecting the crop condition. Hence the use of colour coded vegetation index may be most efficient criteria for stratifying the cropped area according to the crop vigour or the crop condition into areas of homogeneous crop conditions, say very good crop, average crop, poor crop, etc. A more efficient estimation of crop yield may thus be obtained by using a post stratified estimation where the post stratification of crop is

based on crop vigour. The spectral data from IRS-1A can be efficiently utilised for such studies,

The generation of colour coded vegetation index at regular intervals can similarly be used for monitoring the drought for both estimating area under drought and the extent of loss in crop yield due to drought very efficiently. For drought monitoring of the whole country, the very cheap and easily available NOAA data can prove quite useful and cost effective.

11. A STUDY ON LABOUR UTILISATION IN CULTIVATION OF CROPS IN FLOOD AFFECTED AREAS

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Flood prone areas in India experience more or less flood fury every year, resulting in large scale damage of Kharif crops. The cultivation of crops in the subsequent rabi season provides a potential study for man power utilisation in flood affected and unaffected fields. The study is based on the data collected in 'Pilot sample survey to study the impact of flood on Agricultural production in U.P.' conducted by IASRI during the year, 1981-83. In the present paper the attention is concentrated on Rabi crops in Ballia district only. The study revealed that in flood affected field human labour and bullock labour utilized per hectare was 835 hrs and 458 hrs respectively whereas in the case of unaffected fields the labour utilized in the respective order was 675 hrs and 183 hrs/hectare for wheat crop. However in case of Paddy crop, the family labour utilized/hectare was 1455 hrs and 1393 hrs in flood affected and unaffected fields respectively whereas the bullock labour in the same order worked out to be 262 and 195 hrs.

12. COMPARISON OF AREA UNDER PONDS/TANKS COLLECTED FROM DIFFERENT SOURCES

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A pilot sample survey for estimating the area under various inland fishery resources and catch from them was taken up by IASRI, New Delhi in collaboration with Department of Fisheries, Orissa in Cuttack, Bolangir and Sambalpur districts. For estimating the extent of area under various resources the sampling design adopted was two stage stratified sampling, blocks of Gram Panchayats and ponds within Gram Pancha-

yats constituting the first and second stage units respectively. All the ponds/tanks in the selected Gram Panchayats of the three districts were completely enumerated. Four types of areas were recorded for all the ponds/tanks i.e. area from revenue records, area at the time of visit, minimum area in summer and maximum area in monsoons. In the present study these areas have been compared. The total number of ponds/tanks in the selected Gram Panchayats was 5278 in Cuttack, 433 in Bolangir and 447 in Sambalpur districts. The area under these ponds and tanks in Cuttack was 519.52 hectares as per revenue records, 540.68 hectares at the time of visit, 257.51 hectares during summer and 608.83 hectares during monsoon. The corresponding areas in Bolangir and Sambalpur districts were 448.60, 181.97, 111.56, 255.19 and 767.53, 307.66, 328.40, 587.50 hectares respectively.

Normally, it is expected that the maximum area observed during monsoons should correspond to the area in the revenue records. But it was observed that there was a significant difference in area from revenue records in the two districts of Bolangir and Sambalpur. In Bolangir district it was observed that as per revenue records as many as 148 ponds/tanks have area more than 0.9 hectare each, the number of such ponds and tanks during monsoon season decreased to 61. Similar trend was also observed in case of Sambalpur district. This may perhaps be due to diversion of pond area for cultivation of crops like Paddy etc. In case of Cuttack district there was no significant difference between the revenue records area and monsoon area, as in this district 2393 ponds were very small each having area less than 0.01 ha as per revenue records and large ponds were very few.

13. ESTIMATION OF FISH CATCH FROM CHILKA LAKE

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The Department of Fisheries, Orissa is maintaining the records of fish catch from Chilka Lake. The catch is recorded from each of the eleven landing centres by observing catch from the three randomly selected boats on each observed day. The number of observed days in a month varied from 1 to 6. Out of the 11 landing centres the complete data for all the five years 1982-83 to 1986-87 were available only for 8 centres. For the remaining three landing centres the data were available from 1984-85 to 1986-87 for Baradi centre and 1985-86 to 1986-87 for Pathara and Sabulia centres. These data have been utilized for the present study for estimation of fish catch from the lake. Almost in every month

some catch was taken out on the observed days from all the landing centres. The average number of boats arrived on an observed day at different centres in different years varied from 6 to 195. The average number of observed days per year for different landing centres varied from 15.3 days for Pathara centre to 37.2 days for Nairi centre. The variations in estimated average catch per observed day in different years for different landing centres alongwith their per cent standard errors have been worked out. With the sampling design adopted it has been possible to estimate the average fish catch for different years and landing centres with the percent standard error varying from 12.14 to 31.95. Using number of observed days as the auxiliary variate the ratio method of estimation has been tried which increases the precision of the estimates.

14. PREHARVEST FORECASTING OF YIELD OF JOWAR FODDER CROP

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The present study was conducted in the rural area around Karnal during 1987 with the objectives to predict the yield of Jowar fodder crop on the basis of biometrical characters, to estimate the contributions due to each character to the total yield and to determine the optimum period of forecasting the yield of jowar fodder. The estimates of biometrical characters in jowar fodder worked out at various stages of growth revealed that the average number of plants per plot declined from 45 days to 75 days after sowing. Whereas the average height per plant increased consistently upto 75 days after sowing. In order to identify the biometrical characters which can be used with advantage in forecasting the yield, simple correlation coefficients between green yield and individual biometrical characters at various stages of growth were worked out. It was observed that the average height, number of green leaves per plant, breadth of fully opened leaf and stem thickness had shown positive and significant effect on the yield of jowar fodder. To select most appropriate statistical model for forecasting the yield of jowar fodder, linear, semi-log, semi-square root, semi-inverse, log-linear, square root and inverse functions were fitted at various stages of growth. The most appropriate statistical model on the basis of R^2 value, sign and significance of regression coefficients was selected for forecasting the yield of jowar fodder.

15. EXTENT OF LABOUR EMPLOYED IN MIXED FARMING

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Farm sector in India is an important source of providing employment and income for millions of farmers and farm workers at their native place. In this paper an estimate of total human labour employed per cultivator household in raising of crops, maintenance of bovines and rearing of poultry and fish has been prepared utilizing the data collected in a sample survey carried out by I.A.S.R.I., in Cuttack district of Orissa state during 1985-86.

The labour employed per household in a year was 4227 hours, of which 53 per cent was on crop production, 44 per cent on bovine keeping and about one per cent on poultry and two per cent on fish rearing. Of the total labour utilised, man's contribution was 79 per cent as against woman's contribution of 21 per cent. The contribution of child to total labour was negligible. About 77 per cent of man labour utilised in the area was hired. Further, over 92 per cent of woman labour expended was paid labour. It may be mentioned that the family women normally do not participate in farm activities due to socio-religious stigma. Majority of the hired woman labour was from lower caste/category of households. The labour spent per ha was 2157 hours on jute cultivation and 182 hours on production of pulses. The labour expended on paddy and vegetables per ha was respectively half and three fourths of the labour utilised on jute cultivation.

16. PERFORMANCE OF IMPORTANT BEVERAGES
(TEA AND COFFEE) IN INDIA

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Tea and Coffee are the most popular beverages amongst Indians and have a long history in India. It is estimated that more than one million of people are engaged in the industries of these beverages. In India the area and production of Tea and Coffee is concentrated mostly in Assam, Kerala, West Bengal, Karnataka, Tamil Nadu and Andhra Pradesh but, its use is wide spread throughout the country. These crops play very significant role in the social life of people in the area by offering potentialities to increase industries based on it and create employment opportu-

ities to millions of people. The total area under Tea and Coffee comes to 368 thousand hectares and 208 thousand hectares with production of 565 thousand tonnes and 118.6 thousand tonnes, respectively. During the planning era of Indian economy since 1951-52 the area and production of these crops is increasing steadily. Tea and Coffee Boards played important role to enhance the productivity of these crops. Therefore, an attempt has been made to study the "performance of these two important beverages in India". The data were collected from published sources of the Government of India and analysed to work out the compound growth rates in area production and productivity with 2 sub-periods and overall period viz, period-I 1951-52 to 1965-66, period-II 1966-67 to 1980-81, period-III 1951-52 to 1980-81. Index numbers were also constructed to see the fluctuations in area, production and productivity of these crops. Index numbers of area, production and productivity of Tea increased to 120.86, 195.87 and 161.89, respectively whereas in case of Coffee the index numbers of area, production and productivity increased to 226.19, 480.16 and 212.24, respectively over the base year 1951-52. Thus it is seen that changes in area, production and productivity of Coffee were faster as compared to Tea. The performance of area, production and productivity of Tea and Coffee was satisfactory during the period under study. The growth rates were at higher magnitude in case of area under Tea and production in Coffee as well. Taking into consideration the economic importance and popularity of these beverages it is necessary to formulate suitable development policies for increasing the production by increasing primarily the productivity and area under the crop.

17. A STUDY OF GROWTH RATES OF RUBBER IN INDIA DURING 1951-52 TO 1980-81

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Rubber, a native of Brazil, is a most important plantation crop and plays a very significant role in national economy. This crop offers very good employment opportunities to millions of people in the country. The majority of rubber trees grown in India covering 2 lakhs hectares is confined to a narrow belt extending from the Kanyakumari district South West region of Tamil Nadu in the south to the Coorg district of Karnataka in the north and lying, in general, west of the Western Ghats and parallel to them for approximately 400 kilometer. The production

of natural rubber amounted to 165.9 thousand tonnes during 1982-83 in India. The production and productivity is steadily increased since 1951-52 due to adoption of scientific technique in rubber plantation. Therefore, it is felt necessary to study the growth rates in area, production and productivity of rubber in India. The data in respect of area, production and productivity for the years 1951-52 to 1980-81 were collected from published sources of Government of India. The data thus collected were analysed for compound growth rates for period-I (1951-52 to 1965-66), period-II (1966-67 to 1980-81), and overall period (1951-52 to 1980-81). The index numbers were constructed to see area, production and productivity during different periods. The index numbers of area, production and productivity were increased to 461.90, 1055.86 and 239.07, respectively. Higher increase in index numbers in case of production was observed as compared to area and productivity. Performance of rubber during the study period was satisfactory. But the higher production growth rate as compared to area and productivity implies that there is still scope to increase the production level to a considerable extent by adopting modern techniques in plantation of the crop. Therefore suitable policies should be formulated to increase the production by increasing the productivity level.

18. VARIABILITY IN AREA, PRODUCTION AND PRODUCTIVITY OF COCONUT AND ARECANUT IN INDIA

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Coconut and Arecanut these two plantation crops play a very important role in national economy and social life of millions of people in the country. These two crops have got several medicinal properties and their byproducts are used for several industrial purposes. India ranks second in Coconut production with 6088 million nuts in the world with 108 million hectares area. Arecanut is having 18.02 million hectares with 18.45 million metric tonnes of production. The area, production and productivity of the crop is fluctuating from year to year. Therefore, it is felt necessary to study the "variability in area, production and productivity of these two crops in the country." The data pertaining to area, production and productivity of Coconut and Arecanut for the period 1965-66 to 1982-83 were collected from published sources of Government of India. The data thus collected were fitted to exponential function and compound growth rates were estimated. The Index Numbers of area, production and productivity were worked out to see the fluctuations in

area, production and productivity by taking 1965-66 as base year. Index Numbers of area, production and productivity of Coconut and Arecanut were increased to 125.90, 112.49, 131.39, 155.46 and 117.70, respectively whereas the productivity Index Numbers of Coconut decreased to 89.29. The productivity of Coconut is consistently declining from year to year. Whereas productivity of Arecanut showed increasing trend. Increase in production of Coconut in 1982-83 was primarily attributed to increase in area under crop. The performance of area under Coconut during the period 1965-66 to 1982-83 was quite satisfactory but the production and productivity showed unsatisfactory growth. Performance of area, production and productivity of Arecanut during the period under study was satisfactory. There is a considerable scope to increase the production of Coconut to a considerable extent by increasing the productivity of area under Coconut cultivation. It is necessary to take

20. QUANTITATIVE AND QUALITATIVE INSUFFICIENCY OF
LIVESTOCK FEEDS BY 2000AD AND POSSIBILITIES OF
BRIDGING THE GAP

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This paper attempts to figure out the availability and requirements of feeds for livestock in 1990 and 2000AD and to delineate the steps to narrow down the gap. The basic information utilized in this study is based on more recent publications. Feed intake per cow and buffalo classifications of bovines is based on field surveys conducted at IASRI during 1963-83 in different parts of the country. The foodgrains and other feed resources available in the population of levels of income.

23. COMPARISON OF CULLING PATTERNS OF DIFFERENT CATEGORIES OF DAIRY ANIMALS—NON-PARAMETRIC APPROACH

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The present investigation deals with a study of the statistical aspects of survival of animals of different categories. The survival aspects include broadly the culling pattern of different categories of animals over the lactations, comparison of culling distribution and estimation of relative culling rates. In order to compare the culling patterns of different categories of animals, the probability of survival to different orders of lactation has been studied in detail with the help of the survival functions, viz. survivorship function and hazard function. From these two functions as well as their median i.e. 50 per cent survival, it is concluded that animals having proportion of foreign blood as 37.5 per cent or 3/8ths are best adaptive to our Indian conditions in comparison to animals having proportion of foreign blood as 87.5 per cent or 7/8ths which are shown to be least adaptive. The culling patterns of the two categories of animals are also tested statistically for the significant differences with the help of non-parametric test. Once again, it is seen that survival distribution of crossbreds having level of foreign blood as 75 per cent and 87.5 per cent are statistically highly significantly different from the survival distribution/culling patterns of all other categories of crossbreds, local breed of cattle (Red Sindhi) and graded buffaloes. It is further observed that for 3/8ths and 7/8th which are shown to be best and least adaptive respectively, the survival distributions are significantly different from every other breed of cattle and graded buffalo. The relative culling rates of 3/8th in comparison to other categories of animals are seen to be less than one, which implies that the culling for these animals is not that intense in relation to others and on the other hand the values of relative culling rates for the 7/8th in comparison to others are always more than one, indicating that the culling for these crossbreds is very severe. The relative culling rates are also tested for the significant departure from unity.

24. GENETIC PARAMETERS OF STAYABILITY OF DIFFERENT CATEGORIES OF DAIRY ANIMALS

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The concept of longevity in broad sense in dairy animal is mainly related to causes and components of the culling process which involves aptitude of an animal to remain productive in herd. This aptitude along with culling has been termed as stayability or survivability. The concept of stayability in terms of probability of survival has been defined in detail by Narain and Bhatia (1984) and Bhatia (1984) by using various non-parametric techniques. Bhatia *et al.* (1987) further examined the relationship of this probability of survival with a number of explanatory variables affecting the culling process using a logistic model. All the above mentioned studies however are at phenotypic level. Since stayability at the phenotypic level is expressed in an all-or-none manner so the conventional techniques of partitioning the total phenotypic variance of quantitative trait into genetic and environmental components of variation can not be applied directly. Further genetic studies of all-or-none traits are facilitated by assuming a threshold model. This multifactorial model assumes an underlying continuous variable. As the underlying continuous variable is the sum of many genetic and environmental effects so the stayability will also have both genetic and non-genetic effects. With this in mind the present investigation deals with the study of some genetic parameters of stayability for drawing the inference about the inheritance of this trait. The parameters studied are heritability of stayability at different orders of lactation as well as genetic correlation between stayabilities at two different orders of lactation. The applications of the procedures studied are made on the data collected at various Military Dairy Farms for various cross breeds, local breed of dairy cattle (Red Sindhi) and graded buffaloes. From the results different conclusions are drawn from different categories of animals. Further from the results it has also been seen that probably there are some common genes with similar actions during the initial period of stayability of dairy animal.

25. FITTING DISTRIBUTION TO TIME BETWEEN MARRIAGE AND FIRST CONCEPTION

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Data has been collected regarding time in months from marriage to first conception from 450 couples. A probability distribution generally considered in the literature was examined. Five different methods of estimating parameters of this model were considered. The chi-square-test of the goodness of fit showed that the method of moments gives the best fit.

26. SURVIVORSHIP OF PARTHENIUM HYSTEROPHORUS L.

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The survivorship pattern of two populations of spring germinated *Parthenium hysterophorus* Linn in two locations viz. Location 1 representing low lying high moisture retaining area and Location 2 representing elevated land with low moisture retentivity, at Bangalore, India are studied through Dynamic Life Table Technique and Survivorship curves. The populations exhibit positively skewed relationship as determined by monitoring the cohorts of 9,126 seedlings and 4,645 seedlings, respectively in Location 1 and Location 2. After germination in mid-April the seedlings die gradually till June when the regular monsoon begins. Approximately 0.59% individuals die without flowering and the remainder die in October after seed maturation in both locations. The survivorship pattern in both the locations remains same whereas the mortality patterns were not the same in two locations.

27. SHIFTS IN CONSUMPTION PATTERN OF MILK AND MILK PRODUCTS, FOOD AND NON-FOOD ITEMS IN INDIA

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N. D. R. I., Karnal

The study examines the temporal and spatial shifts in the consumption pattern of milk and milk products, food and non-food items in India

based on consumer expenditure survey reports of NSS for three periods, namely 1970-71 (period I), 1977-78 (period II) and 1983 (period III). The per capita per month expenditure was more in urban than in rural areas in all the periods. The expenditures on milk and milk products, food items and total expenditure was nearly double in period II and three times in period III over period I. The increase was of the order of 75 per cent from period II to period III. The per cent increase in expenditure on non-food items was higher than on other items and it was more pronounced in rural areas. Across states in the rural sector, Punjab and Delhi had the highest per capita expenditure on all the items in first two periods and Haryana also figured in higher expenditure group in period III while it was lowest in Bihar and Orissa in the first two periods and U.P. and M.P. also joined this group in period III. In the urban sector, northern states showed relatively higher expenditure on all the items considered save J & K while north-eastern and eastern states showed the lowest expenditure in all the periods.

The Gini's coefficient of concentration giving degree of inequality suggested that the inequalities were more in the urban sector except in the case of milk and milk products where rural sector showed higher inequalities. The inequalities reduced considerably in period III over period II. Generally, the inequalities for all the items were lower in the northern states in both the sectors (with J & K reporting the lowest inequality) than the remaining parts of the country.

28. EFFECT OF PARITY, BIRTH WEIGHT, GESTATION LENGTH AND SIRE ON MORTALITY IN YOUNG CALVES

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The study was undertaken for various breeds of cattle and Murrah buffaloes maintained at N. D. R. I., Karnal for the period 1952-84. However, different breeds came into existence at different points of time; Zebu since 1952; Karan Swiss-1963; Karan-Fries-1972 and Murrah buffaloes-1959. The data on date of birth, date of death/culling, birth weight, gestation length, parity and sire were collected for all the births.

Order of calving had significant effect on mortality. Though no systematic trend could be observed in cattle, yet a decreasing trend in mortality was discernible upto sixth parity. In the case of buffaloes, there was a continuous decline in mortality with the advancement of

parity. Calves with lower birth weight had higher mortality and it was more pronounced in the case of male calves. Calves born with lower or higher gestation length, than the normal, had a higher risk of mortality especially in birth — one month age group. The risk was more in lower gestation length than in higher gestation length groups. The effect of sire on calf mortality was found to be significant in all the breeds. About 10 per cent of the sires showed less than 5 per cent mortality among their progenies in birth—6 months age group compared to an average of 10 to 15 per cent mortality in cattle. In the case of buffaloes, 2 out of 21 sires showed less than 15 per cent mortality compared to an average of 25 per cent. Nearly, 20 to 25 per cent of the sires studied showed more than 30 per cent mortality in both the species. Significant effect of sires on mortality among progenies suggests that mortality rate should form one of the components in selection of sires.

29. SEASONAL AND SPATIAL VARIATION IN MILK AND GHEE PRICES IN HARYANA

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The study examines the seasonal and spatial variations in prices of milk and ghee in Haryana state on the basis of secondary data on weekly retail price for the period 1975-87 for various districts except Faridabad (1980-87) and Sirsa (1979-87). Monthly price indices were constructed by using monthly prices obtained from unweighted average of weekly prices, employing the method of Link Relatives. The peak price indices for milk were observed between May and July and lowest in January in majority of the districts. Winter season showed lowest price indices and highest in summer which are in conformity with the findings of Kumbhare and Patel (1982) and Arora and Singh (1986). The price variations in milk could be associated with productivity of bovines and availability of feeds and fodder.

The monthly price indices of ghee showed relatively narrow variations due to its longer shelf-life and easy transportability. The higher price indices observed during August to October could be attributed to general increase in price indices and observance of festivals during the period. March and April showed lower ghee prices in almost all the districts.

Spatial variability was observed to be significant both in milk and ghee prices. The milk prices were highest in Faridabad district followed by Mahendragarh, Bhiwani, Gurgaon, Rohtak and Sonapat while the

ghee prices were highest in Sirsa followed by Bhiwani, Mahendragarh and Rohtak.

30. AN INTER-STATE ANALYSIS OF OILSEED'S YIELD DURING LAST TWO PLANS

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Attempt has been made to analyse inter-state yield variations of sesame, groundnut, rapeseed-mustard and linseed, the four important oilseed crops, during V and VI Five Year plans with the help of analysis of variance technique. Cropping pattern and cropping intensity of twelve selected states were also calculated for the two plan periods to come to some specific conclusions. The results indicated that plan efforts did not increase the yield rate of sesame, groundnut and linseed except rapeseed-mustard crop in the country. Any increase, if witnessed, was due to increase in acreage. Gujarat and West Bengal showed 16.41 per cent and 7.48 per cent per year significant increase in rapeseed-mustard yield. Uttar Pradesh, which is the largest producer of this crop, showed 3.75 per cent decline in yield rate. Ratio of oilseed crops to food grain crops showed that except Gujarat, Andhra Pradesh, Karnataka, Maharashtra, Tamil Nadu, Uttar Pradesh and Punjab, rest of the states indicated a ratio of 1 : 7 to 1 : 20. Cultivation of cash crops was not very common in Bihar whereas Gujarat showed equal importance to cash crops as to food crops. Punjab indicated highest cropping intensity whereas Karnataka, Gujarat and Maharashtra showed lowest intensity during the two plans. Disease and pest-insect resistant varieties are required to give a boost to the yield rates of these oilseed crops. Linseed, which is a non-edible oilseed crop, has a bright future if it could be made edible by reducing the iodine value. Its stem gives fibre which could be used for making bags. This requires specific technology. Keeness of the scientists to evolve better double purpose varieties can also be helpful in boosting oilseeds production in the country in near future.

31. GROWTH PATTERN OF TOTAL FOODGRAIN PRODUCTION IN DIFFERENT STATES

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The present study consists of the relative contribution of the various

input factors such as area (unirrigated, irrigated), area under high yielding variety, total nutrient consumption (N + P + K) on foodgrain production and its productivity of seventeen Indian states of different agro-climatic conditions. The data on these characters are utilised to work out the respective per cent annual growth rates during pre/post green revolution and overall for the period 1954-55 to 1984-85. These growth rates enable us not only to spot out the statewise imbalances in existing resources but to project the future production under the limited agricultural resources.