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सांख्यिकीय सूचना–पत्र

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(भा० कृ० अ० प०)

लाइब्रेरी एवेन्यू, नई दिल्ली—११००१२

INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE

(I. C. A. R.)

LIBRARY AVENUE, NEW DELHI- 110012.

PREFACE

This is the Fifteenth issue of 'IASRI Statistical Newsletter' and covers the activities and allied information in respect of this Institute during the quarter July-Sept., 1978.

I hope this Newsletter has been proving useful to the Agricultural Research Statisticians and other users. I would welcome and appreciate any comments and suggestions for its improvement in the subsequent issues.

I am thankful to all officers and other members of the staff of the Institute who supplied the requisite material for this issue of the "IASRI Statistical Newsletter".

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CONTENTS

1. INTEGRATED TECHNIQUE FOR ESTIMATION OF LIVESTOCK PRODUCTS

The available sampling techniques for estimation of principal livestock products, viz., milk, eggs, wool and meat are suitable for estimating a single product at a time (1,2,3,4). Thus, if year to year estimates of all the four products have to be obtained for a given area, four surveys would have to be conducted in each year and expenditure involved will be very huge. Thus there is a need of developing a sampling technique through which estimates of all the four products could be obtained through a single survey conducted in each year. The past experience of the surveys on livestock products indicated the possibility of collecting data on more than one livestock product at a time. Integrated approach for estimation of principal livestock products aims at devising a sampling technique so that in each year study on one product can be undertaken on an intensive scale so as to provide estimates with adequate precision whereas other products are studied from a sub-sample so as to provide indices of changes from year to year.

With this objective in view the Indian Agricultural Statistics Research Institute had conducted two pilot sampling investigations, one in the Northern region comprising Punjab, Haryana and Himachal Pradesh during 1969-72 and the other in the Southern region of Andhra Pradesh during 1971-74.

The sampling design adopted under the surveys was one of the stratified multi-stage random sampling. The tehsils/taluks covered by the surveys in each of the regions were combined into three strata. Stratum I comprising tehsils/taluks important for poultry alone, stratum II comprising tehsils/taluks important for sheep alone and stratum III Comprising tehsils/taluks improtant for both poultry and sheep. This stratification was made on the basis of number of live-stock and poultry available from the 1966 livestock census. Stratum III was further divided into three sub-strata. In the Northern region the criteria adopted for this was geographical contiguity. Thus all the tehsils of this group falling in

Punjab were classified as stratum III and those falling in Haryana and Himachal, Pradesh were classified as stratum IV and V respectively. In the southern region, all the taluks of stratum III which were important for only mutton type sheep were classified into stratum III; those important for poultry and woolly type sheep into stratum IV and the remaining taluks in stratum V. The total number of strata was thus five in each of these regions.

A cluster of two adjoining villages/a town ward was the primary sampling unit (p.s.u.). The sampling unit at the second stage was a cluster of two households for study on milk, 5 households for study on eggs and 10 households for study on meat and a flock for study on wool. The ultimate unit of sampling for recording milk yield was a cow/buffalo in milk, for recording wool yield a sheep and for egg and meat production information on all the layers/animals slaughtered in the selected households was recorded. For recording data on meat prodution, in addition to households and butchers, the registered slaughter houses in each stratum were also covered for recording body weight before and after slaughter whereas the data on the number of animals slaughtered was obtained from all the three sources. The information on body weight before slaughter, dressing percentage and meat production was recorded only from registered slaughter houses.

A total of 75 p.s.u.'s were selected for the survey. This sample was allocated to the different strata on the basis of bovines, ovine and poultry population as per 1966 livestock census. The clusters of villages and households were selected using clustering after sampling (CAS) approach. The initial sample of 75 villages was selected with equal probability and without replacement and clusters were then formed combining with each one of these villages, the nearest village. A similar approach by was used for selecting the clusters of households. The selection of sampling units at the subsequent stages was done with equal probability and without replacement. The sample size at the second stage varied from 17 to 31 clusters of households for estimation of milk, eggs and meat production from each p.s.u. in different seasons whereas for estimation of wool production, only 5 flocks were selected from each p.s.u. in each of the two shearing seasons. For recording milk yield, not more than 2 animals in milk were selected from each selected household whereas for recording wool yield, 2 rams (or 1 ram & 1 wether), 2 ewes and 2 lambs selected at random were observed from each selected flock. For recording data on body weight before slaughter, meat production and dressing percentage, etc., a sample of 3 animals of each species was selected at random from each selected slaughter house out of the animals brought for slaughter on the day of visit.

As already mentioned, the survey was carried out for a period of three years, i.e., from 1969-70 to 1971-72 in the Northern region and from 1971-72 to 1973-74 in Southern region. In each of the regions during the first year, milk was the main product covered on which the data were collected from the entire sample of p.s.u.'s. The data on other products were collected from about 40 per cent of the sample of p.s.u.'s. Similarly data on egg production were collected from the entire sample of p.s.u.'s during 1970-71 in the Northern region and 1972-73 in the Southern region and the other products were covered from about 40 per cent of p.s.u.'s. In the third year, i.e., 1971-72 in the Northern region and 1973-74 in Southern region, the emphasis was on wool and meat and milk and eggs were covered in about 50 per cent of the p.s.u.'s.

The survey was carried out over a period of 3 years, each year comprising 3 seasons and thus data were collected for 9 occasions. With a view to study the changes from occasion to occasion the technique of successive sampling was adopted. Out of 75 primary sampling units selected for the survey in the first season of the first year 20 p.s.u.'s in the Northern region and 25 p.s.u.'s in the Southern region were observed for all the 9 occasions, 21 units in the Northern region and 17 units in the Southern region selected in a season of the first year were also observed during the corresponding season of the subsequent years. However, this part of the sample was selected afresh during second and third seasons of the first year. The remaining sample of 34 p.s.u.'s in the Northern region and 33 units in the Southern region was selected afresh in each season of each year and this sample was studied only for the main product under study in that year/season. It may be seen from the above that in each of the matched p.s.u.'s (both types) more than one product was studied at a time.

In the matched p.s.u.'s, matching of the sampling units at the second and subsequent stages was not practicable. For studying the changes in the number of bovines and poultry from round to round, an independent sample of 7 clusters of 10 households each was selected from each of the p.s u.'s in the sample.

For estimating the production of main product for a season/the year of the survey, the unbiased minimum variance estimator utilizing all the information available was employed. For the products covered on a smaller scale, regression/ double sampling estimator was used utilising the information collected on that product from a larger sample on the previous occasions.

The reports on (i) Sampling methodology for estimation of milk production in the Northern region (1969-72); (ii) Sampling methodology for estimation of egg production and study of poultry keeping practices in Northern (1969-72) and Southern regions; and (iii) Sampling methodology for estimation of meat production in Northern (1969-72) and Southern (1971-74) regions; under pilot investigations for developing an integrated technique for developing an integrated technique for estimation of principal livestock products and study of attendant animal husbandry practices have been published. However, the reports on (i) Sampling methodology for estimation of milk production in the Southern region (1971-74); and (ii) Sampling methodology for estimation of wool production in the Northern (1969-72) and Southern (1971-74) regions, under integrated approach are being finalised for publication.

Northern Region

The number of cows and buffaloes in milk was estimated at 1.11 million (S.E. 4.6 per cent) and 2.18 million (S.E. 3.3 per cent) respectively in 1969-70. The estimate of milk production was 1025 thousand tonnes (S.E. 4.6 per cent) from cows and 3540 thousand tonnes (S.E. 3.9 per cent) from buffaloes. The milk yield per day per cow and per buffalo in milk was 2.53 kg (S.E. 3.6 per eent) and 4.45 kg (S.E. 2.9 per cent) respectively. The number of layers was 1.19 million (S.E. 6.8 per cent) while the total egg production was 175.7 million (S.E. 8.5 per cent) in 1970-71. The average egg yield per day per layer was estimated to be 0.41 (S.E. 4.0 per cent).

The number of sheep and annual wool production in the region was estimated at 2260 thousand (S.E. 13.8 per cent) and 2779 tonnes (S.E. 15.5 per cent) respectively during 1971-72. The average wool yield per sheep was 1.23 kg (S.E. 3.2 per cent) for the year 1971-72.

The number of animals slaughtered in registered slaughter houses was about 6.6 lakh during 1971-72 and those slaughtered privately during the year was 2.2 lakh (S.E. 13.7 per cent). The total annual meat production from sheep and goats was estimated at 9.7 thousand tonnes (S.E. 4.2 per cent) of which 74.5 per cent was from registered slaughter houses and the remaining from households and butchers. The estimate of average meat production per animal was 11.1 kg (S.E. 2.6 per cent) for sheep and 11.3 Kg for goats (S.E. 3.3 per cent)

Southern region

The number of cows and buffaloes in milk was estimated at 1.11 million (S.E. 6.0 per cent) and 1.67 million (S.E. 7.1 per cent) respectively in 1971-72. The estimate of milk production was 170 thousand tonnes (S.E. 12.0 per cent) from cows and 941 thousand tonnes (S.E. 7.6 per cent) from buffaloes. The average milk yield per day per cow in milk was estimated at 0.42 kg (S.E. 7.3 per cent). The corresponding estimate for buffaloes was 1.54 kg (S.E. 7.9 per cent).

The number of layers in the tract was estimated at 5.57 million (S.E. 5.6 per cent) while the total egg production at 567 million (S E. 7.4 per cent) in 1972-73. The average egg yield per day per layer in the year was estimated to be 0.28 (S.E. 4.5 per cent).

The number of sheep and the total wool production in the tract was estimated at 8.4 million (S.E. 10.8 per cent) and 3915 tonnes (S.E. 9.9 per cent) respectively during 1973-74. The average wool yield per sheep was estimated at 0.47 kg (S.E. 3.8 per cent) in the year.

The total number of animals slaughtered in registered slaughter houses during the year 1973-74 was 18.4 lakh and those slaughtered privately during the year was estimated at 10.0 lakh (S.E. 9.1 per cent). The estimate of total annual production of meat was 28.8 thousand tonnes (S.E. 10.3 per cent) of which 62.7 per cent was from registered slaughter houses and the rest from unregistered slaughter houses and households. The estimate of average meat production per animal was 10.6 kg for sheep and 11.0 kg for goats (S.E. around 18 per cent).

The detailed results of the pilot surveys in these two regions are embodied in the reports published/being published. It may, however, be mentioned that the estimates of milk production and egg production were obtained for all the three years, viz., 1969-70, 1970-71 and 1971-72 in the Northern region and 1971-72, 1972-73 and 1973-74 in the Southern region. But the estimates of wool production for the years, viz., 1969-70 in the Northern region and 1971-72 and 1972-73 in the Southern region and also the estimates of meat production for the years, viz., 1969-70 and 1970-71 in the Northern region and 1971-72 and 1972-73 in the Southern region could not be prepared due to non availability of adequate data on these products. It may be mentioned that full data on wool and meat production envisaged under the surveys could not be obtained on account of certain

operational difficulties. It would be necessary to deploy additional field staff during the period of shearing of sheep in order to obtain estimates of production of principal livestock products using an integrated sampling approach.

It may, however, be mentioned that in Northern region during 1969-72 and Southern region during 1971-74 the changes in the estimates of milk production, egg production, wool production and meat production were not found to be statistically significant. In the years when the various livestock products were studied on a smaller scale the percentage standard errors were quite low or moderately low. In Northern region, the standard errors of the estimates of milk production were around 6 per cent. For egg and wool production the percentage standard errors were around 10 per cent. In Southern region, the percentage standard errors for estimates of milk production and egg production were around 10 per cent.

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2. DATA BANKS AND INFORMATION SYSTEMS

Over view

With the increasing complexity of the socio-economic structure, and the requirements for planned development there is a growing awareness among decision making agencies of the need for quantitative information of various kinds. A large mass of information accrues every day in widely scattered locations as a result of routine administration work in governments, commerce and industry and from ad-hoc studies, surveys and censuses. It needs no mention that it is very difficult to have an integrated analysis of the information so collected because the resources required for such work will be quite enormous. Modern computur technology has given a solution to this complex problem by providing facility for building up data banks.

What is a data bank ?

A Data Bank can be defined as an information system capable of growth, composed of sets of data known as files. Data from various sources are brought

together and edited for internal consistencies before the creation of the files. Each individual file in the bank is known as a "data base", and contains data items belonging to the same category (e. g. land utilisation statistics, villagewise). The files are organised by a filing system which has the capability to integrated data from different files. The utility of the data bank is derived from the data processing system which helps in quickly retrieving the relevant information from different files depending on the users requirement.

Types of data banks

Data banks can generally be classified into two major categories, one which contains bibliographical files such as data stored in the International Information System for Agricultural Sciences and technology (AGRIS). This type of information system helps research workers by making available at a central place information on the results of research in diverse fields of scientific activity in the form of titles of documents with authorship, source of publication and some times abstracts, in machine processable form. This is a system where the files keep on growing with time with no change in the information already stored. The other category contains data bases which help the decision makers in government and industry in making their decisions.

The data contained in the files of such a data bank require constant up-dating, and after the lapse of some time since the creation of the bank most of the data items would have undergone charge. Organisation of this type of data bank will require a wide network for collection and compilation of data on a continuing basis. The problems in standardisation of code structures, concepts and definitions and co-ordination between various departments of Governments, and Public as well as private sector undertakings are quite enormous in this case.

Usually, data stored in a data bank will be of various types. The data stored in a digital computer has ultimately to be in digital form. The stored information can be classified as Statistical data, either in the raw or processed from; analogue data, and library of related files containing alphameric information The information stored may relate to observations made on the values of various entities, or may be data relating to the plans, forecasts, etc, which are not physical entities. There will be information on National standards, maps and reports scientific and technical data. Data bank files need not necessarily be computer based. The use of fast computers is made depending upon the volume of data, the frequency and

volume of data, the frequency and volume of updating required, the processing required to be done on the data in the bank for practical use, the extent of cross referencing between files, the variety of output required, the desired response time in retrieval and the range of the users of the bank.

Advantages

The classical way to process data is to operate one programme at a time on the data file which has been suitably sorted to optimise the processing of that programme. In order to run other programme on the same data file re-sorting of the data to create new sub-files will have to be usually done. In many applications this method of handling the problem oriented files is quite satisfactory. However, in situations where multiple programmes are required to access the same data, the approach of making program-oriented files breaks down. In such cases, data have to be organised into suitable files, reducing data redundancy to the maximum. A data base organisation system will have essentially the following features :

(i) It provides a flexible data structure, allowing data to be organised in such a manner that all applications can access the data with least difficulty,
(ii) allows more than one programme to access the data simultaneously for retrieval or updating,
(iii) provides various access methods for retrieving the desired data,
(iv) ensure security of data against use of information by unauthorised persons,
(v) provides reasonable independence of programmes and data, and
(vi) provides device independence for the programmes.

The files handled in a data bank can vary from one to a very large number. The data collected in an agricultural census can be put in a single voluminous file, while the data for an Agricultural Research Information System may consist of many files, one file for each discipline. Some files undergo change relatively very slowly, the census file is one such. There can, however, be a data bank on agricultural prices, which will be structured in various files, all the entries undergoing change very rapidly. The method of organising the data bank will, therefore, depend upon the nature of files in it.

Structure of a typical data bank

Computer manufacturers develop Data Base Management Software for their

systems to facilitate creation, maintenance and querying data bases. The main aspects of a typical data base management system will be described below :

Before organising the data base a critical study of the data and their inter-relationships is made and then an analysis of the users data handling problems is done. The formulation of the logical data base structure is the next work taken up. The assignment of the storage media and actual storage is done after making all checks on consistency and redundancy. Data base application programmes are then prepared and stored. These programmes interface with the user programmes which will be written in future for retrieval of data. The operational procedures for the on going management of the data base are then laid down.

The heirarchical structure of data in a data base will be as follows :

A data item is the smallest unit of named data. A named collection of data items is a vector. A repeating group will be composed of arbitrary number of data items, vectors and other repeating groups. A record type is a named collection of zero or more data items or repeating groups. There may be any number of occurances of each record type in the data base. A set type is defined as a named collection of record types. A set will consist of an owner and any number of members. A named subdivision of the addressable storage space in the data base, which may contain arbitrary occurances of records and sets is known as a realm. The data base consists of all record occurances, set occurances and realms which are controlled by data description language statements given to the data base management system.

Usually application programmes are written in COBOL. The data base control system (the part of the data base software which is present during the execution of the Users job) analyses the statements written in the application programme and initiates the input/output operations necessary to execute the user's statements. The operating system transfers data between data base and buffers provided in the data-base control system. The Data Base Control System, on the other hand, transfers data as required by the user's programme between the system buffers and the user record area.

A complete data base system design will cover the overall system design and operational procedures for the management of the data base. These will include (i) How to start a run, handle abnormal conditions and halt processing, (ii) How to interpret messages to and from the system, and (iii) Device dependant operator actions required by the data base software.

Data Banks in Agriculture

Several data files are proposed to be created in the new computer system installed at the IASRI. A computerised agricultural research information system has been initiated as part of a global system being implemented by F.A.O. Under this specialised services like supplying retrospective information on documents like technical papers, theses, books and other documents in agriculture through abstracts deep indexing and other forms of service to users will be available. The IASRI is getting every month a magnetic tape from the AGRIS head-quarters in Vienna with the bibliograpic records stored during the previous month in the AGRINDEX data base. The author has prepared a retrieval programme which is now being used for "Selective Disemination of Information" service which is a service meant for all research workers in the country. The Agricultural Information Centre of IASRI contributes to AGRIS by sending 350 inputs every month. Ours is the third, (next to USA & Japan) among the National Input Centres of AGRIS, in terms, of number inputs per month. The Institute is also developing retrieval systems for CAB data base. Other data files proposed to be created are those relating to the National Index of Agriculture and Animal Husbandry Experiments, Germ Plasm Data Base, data files consisting of Soil Test Crop Response Values, spread and performance of high yielding varieties programme, animal and plant breeding data and management information system for the Indian Council of Agricultural Research. Preliminary work for establishment of computerised Germ Plasm Data bank for different crops in South and South-East Asia, has already been started. About 50,000 accessions have been made todate. Data collected from Soil Test Crop Response Studies involving more than 11 lakh Soil Samples each year and data from 2 lakh samples under All India Soil Survey Scheme will be stored in data files to facilitate making fertiliser recommendations and for use in a variety of studies in Agricultural Chemistry, efficient use of available fertilisers and preparation of Soil maps for small and large regions of the country. The setting of the data banks will call for standardisation of methods of collection and recording of information, for which preliminary work has already started.

3. TRAINING ACTIVITIES

(i) During the quarter under report, the final examinations of S.C.C., P.S.C.C. and III Trimester of the session 1977-78 of M.Sc. and Ph.D courses were held.

(ii) The interview for admission to Ph. D. and M.Sc. courses (Session 1978-79) for the regular candidates was held on 28th and 29th August. 1978 respectively.

(iii) During the session 1978-79, four students were admitted to M.Sc. (regular), three students to Ph.D. Programme (regular) and three to Ph.D. Programme (Faculty upgraduation scheme).

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4. THE XVIth CONVOCATION OF TRAINING COURSES

The Sixteenth convocation of the training courses of the Institute was held on 29th September, 1978 at which Dr. P.C. Chunder. Minister for Education, Social Welfare and Culture, Govt. of India, was the chief guest and delivered the convocation address. At the convocation, 48 candidates received certificates including 10 for Junior Certificate Course, 15 for Senior Certificate Course, 17 for Professional Statistician's Certificate Course and 6 for Diploma Course. In all, 5 gold medals one each for the best student in the three courses, viz., Junior Certificate Course, Senior Certificate Course and Professional Statistician's Certificate Course and two for best Diploma thesis for the year 1978 were awarded, besides, V.V.R. Murthy memorial prize of Rs. 100/- in the form of books and two cash prizes of Rs. 50/- in the form of books each for the students securing highest percentage of marks (and exceeding 75%) in individual papers.

As a part of the convocation programme, an 'Elocution contest' for the students undergoing training at the Institute was conducted on 27th September, 78 in the

forenoon under the Chairmanship of Dr. D. Singh, Director, I.A.S R.I, Dr. P.N. Saxena, A.D.G. (stat.), I.C.A.R., Dr. R.N. Singh, Jt. Director (Research), I.A.R.I. and Dr. O.P. Bagai, Prof. Stat., Punjab University, Chandigarh acted as judges to adjudge the best speaker.

In the afternoon session on 27th September, 1978, the students of Diploma, Ph. D. and M. Sc. whose theses were accepted for respective Diplomas and Degrees, presented their significant research under the Chairmanship of Dr. M.N. Das, Director (Stat.), Central Water Commission, Ministry of Agri. and Irrigation, Govt. of India, New Delhi.

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5. ADVISORY SERVICE

During the quarter under review, technical advice and guidance was rendered to research workers and students of the Research Institutes, Agricultural Universities and other research organisations in planning of their experimental investigations and statistical analysis/computerisation of their research data as also in regard to research projects referred to the Institute by the I.C.A.R. and other organisations. Some details of the technical advice and guidance given by the Institute during the quarter under review, are given below in brief:

Crop Sciences

(i) Nimbkar Agricultural Research Institute, Phaltan (Maharashtra) was given advice regarding design and analysis of data on Safflower.

(ii) The Asstt. Agronomist from M.A.E. Centre, Tiruchirapalli (T.N.) was given advice in the implementation of the technical programe of (All India Co-ordinated Agronomic Research Project.

(iii) Sh. T.J. Khatri, Assoc. Prof., Gujarat Agricultural University, Anand (Gujarat) was advised in regard to the incidence of Pests and Diseases on crops and Consequent crop lesses and predicatfon of Crop Yield and acreage.

Animal Scinces

(i) A.D.G. (AP & B), I.C.A.R., New Delhi, was given advice regarding "Reproduction, Mortality, etc. in Sheep" for consideration in the panel meeting.

(ii) Dr. C. Krishna Singh, Director, Central Cattle Breeding Farm, Avadi (Madras) and Dr. M. P. Nagpal, Central Cattle Breeding Farm, Dhamrod (Gujarat) was given technical advice in connection with the progeny testing of *Murrah* and *Surati* buffaloes.

(iii) Mr. U.K. Das Gupta from Calcutta University was given technical advice in regard to the problem entitled "Fitting of Production Function in Stages".

(iv) Dr. Nasikkur, Dy. Director from Seminar Hills, Nagpur, was given technical advice in regard to "Statistical analysis of the data collected on broilers."

Sample Survey Methodology

(i) Dr. D. Jha and Dr. J.G. Rajan from ICRISAT (International Crop Research Institute for Semi-Arid Tropics), Hyderabad (A.P.) were given technical advice in planning/formulation of project "Fertiliser use and determinants of fertiliser demand at farmers' level in Semi-Arid Tropics."

(ii) Sh. Ram Singh, Sr. Marketing Officer, Directorate of Marketing and Inspection, Govt. of India, was given technical advice regarding estimation of marketable surplus.

(iii) Sh. T. Ramakrishnan from Dte. of Eco. & Stat., New Delhi, was given technical advice in connection with the planning of survey on "Cost of cultivation of Apple in H.P."

(iv) Sh. A. R. Rao, Research Officer, Directorate of Lac Development, Ranchi (Bihar), Ministry of Agri. and Irrigation, Govt. of India, was given technical advice regarding the finalising of the technical programmes of the "Pilot survey for estimation of lac production in important lac growing regions of India."

6. FIELD WORK

(a) Field Training :

During the quarter under review, field training was imparted in connection with the projects mentioned below at the places shown against them.

(i) Pilot sample survey for estimation of number of Pigs slaughtered and study of attendant Swine practices-A refresher training programme-Allahabad and Aligarh (U.P.)

(ii) Pilot Sample survey for estimation of area of grazing land and its utilisation-Bhubaneswar (Orissa).

(iii) Statistical investigations on economics of pig production-Jabalpur (M.P.).

(iv) Pilot sample survey for estimating the yield of cotton on partial harvest data-Jalgaon (Maharashtra).

(v) All India Co-ordinated Agronomic Research Projects-Hyderabad (A.P.) Machilipatnam. (A.P.).

(b) Inspection/Supervision of Field Work :

During the quarter under review, inspection/supervision of the field work of the following projects was carried out in the areas/places shown against them.

(i) Index of cost of raising calves and study of changes in rearing practices of bovines in rural areas of Haryana-Hissar, Sirsa and Bhiwani districts of Haryana.

(ii) Pilot sample survey for estimation of number of pigs slaughtered and study of attendant swine practices—Allahabad and Aligarh districts (U.P.)

(iii) Sample survey for methodological investigations into high yielding varieties practices-Delhi.

(iv) Pre-harvest forecasting of yield of Sugarcane-Meerut and Gaziabad districts (U.P.).

(v) National Index of Agricultural Field Experiments Scheme-Hyderabad (A.P.).

(vi) Pilot sample survey to evolve a sampling methodology for estimation of losses taking place in the transit and price spread at various stages of marketing and cost of cultivation of important vegetable crops-Ahmedabad (Gujarat) and Delhi.

(vii) Pilot sample survey for estimation of area of grazing land and its utilisation-Puri district (Orissa).

(viii) Pilot sample survey to estimate the incidence of pests and diseases on HYV of Paddy in South Arcot district-Cuddalore (T.N.).

(ix) Study of yield constraints in O.R.P. (Operational Research Project) area of Chittorgarh (Rajasthan)-Three Panchayat Societies of Krishi Gyan Kendra, Chittorgarh (Rajasthan).

Other Field Work :

A small enquiry was planned and data were collected from sample villages to estimate the extent of loss of vegetable crops due to floods in flood affected villages of Union Territory of Delhi.

Discussions were held at Jalgaon (Maharashtra) for the Pilot sample survey for estimating the yield of cotton on partial harvest data.

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7. ABSTRACTS OF PAPERS PUBLISHED

1. AGGARWAL, D. K. AND SINGH, PADAM. Role of Sampling in Prediction. *Sankhya Series* C, Pt. 2, Vol. 40, 1978.

Regression relations are of very much use in predicting the values of one variable on the basis of given values of other variables. This paper deals with the determination of regression relationship in two or more variables on the

basis of a sample and then predicting the value of one variable on the basis of the given values of other variables. The expressions of variance of prediction have been obtained for various situations and their relative efficiencies have also been compared.

2. JAIN, J. P. Stochastic models for structure of dairy female production. *Jour. Ind. Soc. Agri. Stat.* Vol. 30, June, 78, pp. 27-38.

Two stochastic analogues of the deterministic discrete model (Jain and Narain, 1974) for studying the growth of female dairy population grouped in unequal stage-groups have been presented. The number of individuals born during any arbitrary interval of time is assumed to follow a Poisson/ Binomial distribution and the number of transfers occuring duing the same interval, a binomial distribution, linear matrix recurrence relation is derived which determines precisely the first two moments of the stage group random variables at each unit of time. Results about the asymptotic behaviour of the population are mentioned. Monte Carlo experiments using the two models are described and their results compared.

3. JAIN, J. P., SAXENA, B.C , ANEJA, K.G. AND NARAIN, PREM. Growth of milk producers' co-operatives in Mehsana. *Indian Dairymen*, Vol. 30, August, 1978, pp. 549-552.

This study is based on a part of the comprehensive data secured under the bench-mark and repeat surveys carried out by the IASRI during 1968-69 and 1973-74 respectively for studying the impact of Dudsagar Dairy, Mehsana on rural economy of its' milk-shed areas. The growth of milk producers' co-operatives in this district was quite marked as judged from a number of indicators. An important gain of this growth was an overall increase in the number of persons employed by these co-operatives. In addition, the number of households adopting milk production as a subsidiary occupation increased by about 12 per cent. Also the income of milk producer families from dairying expressed as a percentage of their total income through all sources increased in the area from 31 to 37 per cent between the two occasions.

4. MANWANI, A.H. AND SINGH, K. B. Studies in systematic sampling for two-dimensional finite populations with special reference to survey for crop estimation of Guavas. *Jour. Ind. Soc. Agri. Stats.* Vol. 30, No. 1, June, 1978.

The paper deals with comparing efficiencies of different sampling schemes for estimating mean of finite population spread in space and time. For the type of data studied in this paper and the pattern of intra-class correlation revealed by the data over time, it has been found that two-stage sampling design with special units (villages) as primary and time units (days) as secondary sampling units, selected in the form of a systematic sample is in the optimum feasible design. The optimum intervals of systematic sampling are found to be 5 or 6 days, both being equally efficient. Systematic sampling with alternative or weekly intervals, have been found to be the worst sampling schemes.

5. SAXENA, B.C., JAIN, J. P. AND ARYA, S. R. S. Dairying improves village economy of District Mehsana. *Indian Farming*, August, 1978.

The paper summarises briefly the extent of improvement brought about by dairy industry in rural economy as measured in terms of various indicators. The response indicators studied were milk production and its utilization in the area, number of milch animals maintained, additional employment generated and income accruing through dairying. The data utilized for this purpose were collected under large scale bench-mark and repeat surveys conducted by I. A. S. R. I. during 1968-69 and 1973-74 respectively in milk collection areas of Dudhsagar Dairy, Mehsana (Gujarat).

6. SINGH, **M.** AND DEY, A. Two-way elimination of heterogeneity. *Jour. Roy. Stat. Soc.* Series B, Vol. 46 (1978), pp. 58-63.

A general method of analysis of non-orthogonal three-way designs (Designs eliminating heterogeneity in two directions) is proposed and the utility of the method is demonstrated by proposing simplified analysis of known three-way designs.

7. SINGH, R. P. AND NIGAM, A.K. A class of optimal designs for cultivators' field trials (1978). *Jour. Ind. Soc. Agri. Stats.* Vol. 30, pp. 94-100.

In a factorial, $s_1 \times s_2 \times \ldots \times s_m$ with m factors such that the ith factor is experimented with s_i levels. If it is desired to experiment with only n runs where n is the sub set of $N(=s_1 \times s_2 \times .. s_m)$, then such a design can be chosen in (N_n) ways. Out of the (N_n) possible designs, the best choice is known

to be the one which is optimal in some sense. In this paper, various optimality criteria like A-,D-, E- and a new criteria viz., coptimality have been discussed in detail and have examined all possible choices for a class of designs needed for cultivators' field trials. The best design seems to be more efficient than the one currently being used by I.C.A.R. for cultivators' field trials.

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8. PAPERS ACCEPTED FOR PUBLICATION

1. BATHLA, H.V.L. Study of correlations betwecn cane yield and different characters attributing to yield. *Indian Sugar Crops Journal.*

2. NADKARNI, U.G. and RAUT, K.C. Optimum flock size of ovines under stationary and migratory conditions *Indian Journal of Animal Sciences.*

3. NARAIN, P. and GARG, L. K. A note on milk production and calving interval of crossbred cows of military dairy farms. *Indian Journal of Dairy Science, Karnal.*

4. SINGH, M. On the reduction of bias of ratio estimators to a desired degree. *Biometrical Journal.*

5. SINGH, PADAM. A sampling scheme with inclusion probability exactly proportional to size. *Sankhya C.*

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9. I.A.S.R.I. PUBLICATIONS

1. ANAND PRAKASH and BOKIL, S.D. *Estimation of production of cultivated fodder crops.*

The methodological survey to develop the sampling survey technique for estimation of production of cultivated fodder crops was undertaken in Karnal district of Haryana state during 1974-75 & 1975-76. The sampling plan adopted was a three-stage stratified multi-stage sampling with villages as the primary unit of sampling, a field within selected village as the second stage unit and a plot of specified size as the ultimate unit of sampling.

The estimates of area and production of principal fooder crops namely, Jowar and Berseem were estimated with fairly good precision in both the years. The other fooder crops namely Bajra, Lobhia, Rijka, etc. which are grown to a smaller extent, were estimated with high percentage standard error.

The yield per hectare of Jowar and Berseem in 1975-76 was estimated to be 23.5 tonnes (S.E. 1.80%) and 85.0 tonnes (S.E. 3.5%) respectively. The total production of all the fodder crops was placed at 21.24 lakh tonnes (S.E. 5.6%) in 1975-76 as against 18.93 lakh tonnes (S.E. 6.3%) in the previous year. The survey thus demonstrated the feasibility of estimating output of fodder crops by means of crop-cutting surveys and also provided guidance for the conduct of such surveys in future. It also provides some information on the cultivation practices followed for these crops.

2. JAIN, J.P., NIRMAN, K.P.S., ANEJA, K.G. and NARAIN, PREM. *Impact of Milk Supply schemes on the rural economy in milk collection areas of Delhi Milk Scheme (1978).*

With the object of developing a suitable sampling technique for assessing the impact of urban milk supply schemes as measured in terms of various socio-economic response indicators, benchmark and repeat surveys were carried out in the rural milk collection areas of Delhi Milk Scheme (DMS) during 1966-77 and 1972-73 respectively.

The results of the study showed that contrary to expectations, the impact of DMS was negligible in that increase in the level of milk production, employment and income in the area supplying milk to DMS was not commensurate with that

in the non-supplying area. This is due to the DMS having remained so far largely a consumer oriented scheme without any regard to the interests of the milk producers. To make any dent in the area, the DMS must provide the necessary infra-structure for the milk producers to form their own milk collection-cum-marketing unions and in addition provide them liberal loans for purchase of high yielding milch animals and cattle feeds as also improved fodder seeds at subsidized rates and facilities for veterinary aid.

3. RAUT, K.C., NADKARNI, U.G., SRINATH, P.R. and SAXENA, B.C. *Estimation of area of grazing land and its utilisation, Jhansi District (U.P.).*

In order to evolve a suitable technique to get reliable estimates of grazing resources under Indian conditions, a pilot survey, first of its kind in the country, was taken up in Jhansi district of Uttar Pradesh. This enquiry has showed the feasibility of employing sampling technique to estimate the area of grazing land and the availability of grasses through grazing. The average grazing area per village in Jhansi area was estimated to be 121.4 hectares in rainy season and 83.5 hectares in winter season. This contributed about 15 per cent of the geographical area in a village in rainy and 9 per cent in winter season. Average yield per one square meter cut taken before grazing in rainy and winter seasons was 62.4 gms and 17.9 gms respectively. The yields obtained from cuts taken after grazing in these two seasons were 54.4 gms and 15.2 gms respectively. On an average 19 kg of grass in rainy season and 7 kg. in winter season were consumed per cattle head per day through grazing. Major species of grasses observed in the samples collected during rainy and winter seasons were Eragrostis Viscosa, Hetropogon Contortous, Cynodon Dactylon, Doctyloctenium Sindicum Boiss, Bothriochloa, Pertusa and Aristida. Half the weight of the grasses sample was Nitrogen Free Extract and one-fourth crude fibre. The percentages of ash, crude protein and other extract in the sample were about 13,8 and 1.7 respectively in rainy season and 11,6 and 11.5 per cent respectively in winter season.

4. SINGH, D., GOEL, B.B.P. S., GARG, J.N., SINGH, K.B. and RAJAGOPALAN, M. *Sampling methodology for estimation of egg production and study of poultry keeping practices.*

This report presents the results of the statistical analysis of the data collected

under the scheme Pilot investigations for developing an integrated technique for estimation of principal livestock products and study of attendant animal husbandry practices in Northern region (1969-72) & Southern region (1971-74). During the second year of the survey, the emphasis was on egg production in both the regions. The results of the survey for that year are as follows :

(i) The total egg production was estimated at 176 million (standard error 8.5 %) in the Northern region and the corresponding estimate for the Southern region was 567 million (standard error 7.4 percent)

(ii) The average egg yield per layer per day was the lowest in the rainy season in both the regions whereas it was the highest in summer season in the Northern region and in the winter season in Southern region. The average egg yield per layer per day during the year was 0.41 & 0.28 (standard errors around 4 percent) in the Northern & Southern regions respectively.

(iii) The per capita availability of egg for human consumption was worked out to be 6 & 9 per year in the Northern and Southern regions respectively.

5. SINGH, D., MAINI, J.S., GOEL, B.B.P.S. and BASSI, G.S. *Sampling Methodology for estimation of meat production.*

Two pilot investigations, one in Northern Region comprising the states of Punjab, Haryana and Himachal Pradesh (1969-72) and the other in Andhra Pradesh of Southern Region (1971-74), were conducted over three successive years by the Institute with the object of developing an integrated sampling technique for simultaneous estimation of production of milk, eggs, wool and meat. Estimation of meat production was covered in a large scale in the third year whereas this aspect was studied on a reduced scale in the first two years of the survey. The tehsils in the region were suitably grouped into five strata. A cluster of two adjacent villages was the primary sampling unit. The units of sampling at the second and subsequent stages were a household and an animal respectively. Over the nine seasons of the three years, successive sampling procedure with partial matching for a season over different years as also over all the seasons was used in the survey. This report deals with the estimation of total annual meat production along with their S.E.s and such related aspects as dressing percentage, average meat production per animal, estimation of number of animals slaughtered in registered slaughter-houses and privately with their S.E.s, etc. for both the regions.

6. SUBBARAO, D. V. S. and BOKIL, S. D. *Estimation of Production of Lac.*

A pilot sample survey for the estimation of lac production was carried out in Khunti Sub-division, Ranchi district and Palamau district of Bihar State during the years 1975-77. The main objective of the survey was to develop a suitable sampling technique for the estimation of number of lac hosts, number cultivated, total production of stick lac and average yield per tree. The design adopted was a stratified two-stage random sampling design with villages as p.s.u.'s and cultivated Ber and Palas trees as s.s.u.'s. In Khunti sub-division, the estimates of number of cultivated Ber varied from 0.50 to 3.2 lakhs in different seasons while the number of cultivated Palas varied from 0.63 to 3.84 lakhs. The estimates of number of Ber hosts varied from 3.05 to 4.97 lakhs and that of Palas from 10.79 to 15.04 lakhs in different surveys. The quantity of stick lac produced was estimated at 1131 to 1265 tonnes in Baisakhi season and 542 tonnes in Katki season. The average yield of stick lac obtained from a cultivated Ber was of the order of 2.64 to 2.72 kg. in Baisakhi and 0.56 to 1.06 kg. in Katki season. The corresponding estimates for cultivated Palas were 1.41 to 1.45 kg. in Baisakhi and 0.65 to 1.27 kg. in Katki season.

Similar estimates have been worked out for Palamau ditstrict. The estimates of number of cultivated Ber and Palas were worked out to be 0.30 to 10.61 lakhs in Katki 1976. The corresponding estimates of number of Ber and Palas trees and the average yield of stick lac per Ber tree and Palas tree were estimated at 3.11 lakhs, 37.88 lakhs, 0.96 kg. and 0.92 kg. respectively. The estimates of number of Ber and the average yield of stick lac per cultivated Ber were worked out as 0.82 lakhs, 2.30 lacks and 3.26 kg. in Baisakhi, 1977. The corresponding estimates for Palas were 8.89 lakhs, 30.0 lakhs and 1.49 kg. respectively. The estimated total production of stick lac was 1004 tonnes during Katki 76 and 1587 tonnes in Baisakhi 1977.

As regards the percentage of idle lac hosts in both the regions, it was observed that this percentage was 56 to 65 of the total trees among Ber and 72 to 80 per cent of the total trees among Palas. The distribution of villages according to the number of trees and number of cultivated trees alongwith the distribution of number of cultivated trees according to their yields of stick lac for Ber and Palas have been given. In addition, some studies on socio-economic aspects of lac cultivators and on prediction of average yield of stick lac are given in the report.

10. ABSTRACTS OF DISSERTATIONS APPROVED

Ph.D Degree

SINGH, H. P. *Effect of bio chemical polymorphism on the production traits in farm animals.*

The thesis entitled "Effect of biochemical polymorphism on the production traits in farm animals" was submitted to the P. G. School, IARI, New Delhi in 1977. From the beginning of cattle blood typing, the idea has been put forward that it might be possible to establish inter-relationship between certain blood types and some important economic traits, such as age at first calving, milk yield, fat percentage, etc. of the animal. It would be a tool for the breeder in selecting the animals with good performance and to cull out the undesirable stocks at the early stages. The immunogenetic traits have an edge over other auxiliary traits in that, they remain stable all through the life time of the animals. The present investigation was undertaken to study the association, if any, between the biometrical and immunogenetic traits so that the performance of an animal may be predicted on the examination of its blood type at an early stage and the decision for selection of the animal may be taken. The statistical methodology for studying the association between the two traits has been investigated and utilized in the analysis of the data pertaining to only 4 indigenous breeds of cattle and 3 breeds of buffaloes for which adequate records were available.

The estimates of the various antigenic frequencies have been obtained. The estimates of an average effect of each factor and the variance controlled by different antigenic factors individually as well as collectively have also been obtained. Selection indices combining information on blood groups and the production character have also been obtained. The results of different estimates have been critically discussed.

(Guide : Dr. Prem Narain)

Diploma

1. ANAND PRAKASH. *Some contributions to two-stage sampling.*

In two-stage sampling design, the primary sampling units (p.s u.'s) are generally of unequal size. For the choice of number of secondary sampling units (s.s.u.'s) from different p.s.u's, the most common method is to take them either equal or in proportion to their sizes. The first method based on equal number of s.s.u.'s from each p.s.u. does not take into account the size and the variability of s.s.u.'s in different p.s.u.'s and thus results in less efficient estimators. Alternately, if s.s.u.s' are taken in proportion to the size, the ultimate sample size becomes a random variable which poses serious problems from field operation point of view. The problem of allocation and selection of a sample of fixed size in two-stage sampling design has been investigated through three allocation procedures. Of these, the allocation procedure utilising the variability of the s.s.u's has been found to be superior to the other two methods of allocation.

Also a new sampling scheme of selection of a sample of fixed number of s.s.u.'s has been suggested. Under this scheme, three estimators namely Horvitz-Thompson estimator, post-identification estimator and estimator based on sample mean have been considered and their relative efficiencies compared. For the populations examined, the Horvitz-Thompson estimator is found to be the best among the above estimators and estimators based on the aforesaid allocation procedures.

(Guide : Dr. Padam Singh)

2. DWIVEDI, V. K. *Some investigations in planning of surveys on fruit crops.*

For estimating the production of fruits, generally the sampling design adopted is stratified multi-stage random sampling. In the present study the aspects of choice of sampling units, their method of selection and corresponding method of estimation has been tackled. Generally, villages or a cluster of villages are taken as primary sampling units with orchards as secondary stage units and cluster of trees as ultimate units of selection. The appropriateness of selection of orchards at the second stage, selection has been examined alongwith suitability of probability proportional to size method of selection for primary stage unit. On the basis of data collected in an apple survey conducted in Nainital in 1973-74,

it was observed that dropping orchards as a stage of selection has brought substantial improvement in the efficiency of estimator of production. Selection of primary stage units with probability proportional to the number of bearing age apple orchards has also contributed towards the efficiency.

Information available in the form of some other auxiliary information could be exploited for improving the efficiency of estimators. In fruit surveys, number of bearing trees has direct bearing on fruit production. Invariably these are also available in selected primary stage units. Sometimes, they are available even at the stratum level. It is observed that the application of this information to form ratio estimators has been substantially rewarding.

(Guide : Dr. A. K. Srivastava)

3. GUPTA, S.K. *Some contributions to sampling with varying probabilities without replacement.*

The efficiency of the estimator can be considerably increased by properly utilizing an auxiliary variable for the selection of sampling. A number of sampling strategies have been suggested by various research workers in sampling with varying probabilities without replacement. But none of these procedures is entirely satisfactory. Some of the procedures lack simplicity whereas in some it is not possible to estimate the variance of the estimators. Even if the variance estimator is available it may not be non-negative always. In some cases the computation of revised probabilities of selection is required which becomes too complicated for even moderate sample sizes.

In this work, two sampling strategies have been proposed by suitably combining with Desraj ordered estimator and Rao, Hartley and Cochran method with Durbin's sampling scheme. The suggested strategies, besides being simple, provide non-negative variance estimator always. On comparing the efficiency on the generated 'g' model finite populations, it has been observed that the performance of the suggested sampling strategies is highly satisfactory. Thus keeping in view all the aspects viz. simplicity of selection, availability of non-negative variance estimator and the efficiency, the suggested sampling strategy should be preferred over the existing sampling strategy for application in practice.

(Guide : Dr. Padam Singh)

M. Sc. Degree

CHANDAK, R.R. *Sampling on successive occasions for clusters of units.*

In the present study, an attempt has been made to find the estimates of mean and its variance for two occasions, the sampling scheme being that a fixed proportion of the clusters taken on the first occasion are retained on the second occasion and supplemented by clusters of units drawn afresh from the remaining units.

A cost of function for the sampling design has been obtained and the problem of optimum allocation of sampling units between matched and un-matched samples has been studied for varying sample sizes at each occasion. The optimum value of replacement fraction in terms of intra-class correlation coefficient as well as 'g' has also been obtained under the assumption that sample sizes remain same on each occasion. Then a comparative study has been made by obtaining the efficiency of the estimator so obtained in relation to the estimator obtained through simple random sampling.

(Guide : Dr. O.P. Kathuria)

2. DURAI, D. *Relative Costs and Returns of various types of Fishing methods in Marine Fisheries in Thanjavur District (Tamil Nadu).*

The objective of the present study was to analyse the relative costs and returns of four different types of fishing methods in the study area. Analysis was carried out to examine the comparative economics of four types of fishing methods, (i) Stern trawl boat and trawlnet combination denoted as fishing method I; (ii) Illigausin boat and trawlnet combination denoted as fishing method II; (iii) Tuticorin type of vallam boat and gillnet or trawlnet combination denoted as fishing method III; and (iv) Balanced board boat and gillnet combination denoted as fishing method IV.

The results of the analysis show that the average total cost of marine fishing per craft per month was the highest in fishing method I, followed by fishing methods II, III and IV. The same trend was observed with respect of average total revenue per craft per month. However, fishing method II received the highest net return per craft per month followed by fishing method IV and fishing

methods I and III incurred net losses. It was found that fishing method IV, which utilized non-mechanised Balanced board boat reaped positive net returns while methods I and III incurred losses. The analysis shows similar results for each of the three three months under investigation. Fishing method II earned the highest average net return in each month, while the other three fishing methods showed negative net returns in at least one of the months under investigations.

(Guide : Dr. R.K. Pandey)

3. GARG, SAVITA. *Use of Auxiliary information in Cluster Formation-Unequal Clusters*

In cluster sampling, from efficiency point of, view, units within clusters should be heterogeneous and mean square between cluster means on totals should be as small as possible. In this research, a procedure has been suggested for forming clusters with the help of auxiliar information so that cluster totals become more or less equal. The suggested method also takes into account the aspect of nearness of units and is simple, objective and convenient. The clusters formed by this method will have unequal number of elements in general but the unbiased estimator available for such clusters is more efficient than the other estimators available. The suggested method of cluster sampling is more efficient than sampling of individual element, or sampling of equal clusters (formed without using auxiliary information selected with probabilities equal or proportional to their sizes for a fixed sample size).

(Guide : Dr. B.B.P.S. Goel)

4. GOVINDASWAMY, M. *Estimation of Labour Use in Crop Production (U.P.).*

Production function analysis has emerged as one of the most useful and common tool used by economists in explaining different economic aspects of the production process. The theoretical basis of this analysis is quite elegant and straight forward and so, in most cases, is the econometric estimation of parameters. Thus, one rarely encounters any problems in specifying and estimating production functions. Precise specification of variables to be included in the production function, however, poses problems for researchers. The most difficult is the task of specifying and measuring quality factors associated with each input and also the intangible management input. Also defining a measure of the actual level of

input used in the production function analysis. This study focusses attention on the human labour input. An attempt has been made in this study to derive macro-level estimates of labour actually used in crop production.

Estimates of labour use have been derived for the state of Uttar Pradesh. The data for labour use for crops were taken from the published and unpublished sources. Tabular analysis was carried out to determine the average labour use for different crops in different areas and the actual use of human labour input in crop production. The state was divided into homogenous agricultural zones.

The average labour use of different crops showed that the maximum amount of labonr was used for sugarcane crop followed by potato. The per hectare labour use was minimum for Jute (40 man-days per hectare).

The use of human labour input in crop production in the State as a whole came about 21830 lakh man-days. Among all crops, in the aggregate, utilization of labour was maximum in wheat and minimum in Jute. The above exercise indicated that nearly 40 to 60 per cent of the available work force was engaged in crop production activity. For the state as a whole, nearly half of the available worker force appears to be directiy employed in crop production activities. These figures were highest for the western and lowest for the Eastern and Central Zones. This appears consistent with the earlier studies on regional variations in employment levels.

Finally, this exercise indicated that with some efforts, it should be possible to generate estimates of labour utilization at a aggregate level. Different agricultural universities and institutions located in the state should take up such work so that similar estimates are generated for other states and regions also. The usefulness of such data, however, depends upon its subsequent use, primarily in macro-production function work.

(Guide : Dr. R. K. Pandey)

5. KAUR, SURINDER. *On estimation of price spread.*

The study of price spread helps in ascertaining from time to time the share of the producer and the margins of various intermediates involved in the sale and purchase of a commodity at various stages of marketing in the Consumer's rupee.

The studies conducted on the estimation of price spread give simply the estimates of price spread without bothering about the standard error of the estimates. Zurmati (1977) considered four sampling schemes for the estimation of price spread and gave the estimators of price spread with standard error of the estimators However, the estimator considered by him were all biased. An attempt is made to obtain the almost unbiased estimators of different components of price spread by using Quenquilli's tenhnique. Also, the two error measures are considered for comparing the efficiencies of different sampling schemes. It is observed that the sampling schemes-1 is the best followed by sampling scheme-3, samplig scheme-4 and sampling scheme-2 under the regularity assumptions. Further a multiphase sampling scheme has also been considered for estimation of price spread and the optimum values of sample sizes at different stages of marketing, have been obtained by using the information on cost components.

The usefulness of different sampling schemes have been illustrated with the help of the data on four vegetables namely-Tomato, Brinjal, Peas and Cauli-flower for the months of January, February and March, 1977 collected by Indian Agricultural Statistics Research Institute under the project "A pilot sample survey to evolve a sampling methodology for the estimation of price spread and losses in transit at different stages of marketing of vegetables in Delhi".

(Guide : Dr. Padam Singh)

6. SINGH, RAVINDRA. *A study of price behaviour of vegetables in Delhi-Use of Fractile Analysis.*

Research in the marketing of farm products has assumed great importance in planning in India. The marketing process depends upon the reliable statistics on various aspects of marketing because of the fact that the prices of the farm products fluctuate substantially over time.

Indian Agricultural Statistics Research Institute undertook a project entitled 'A pilot sample survey to evolve suitable sampling methodology for estimation of price spread and losses in the marketing of vegetables in Delhi' to estimate the share of different intermediary operating in the marketing of vegetables in Delhi to the consumer's rupee spent and to ascertain the explanation of the intermediaries about the losses. A lot of valuable data have been collected on the whole-sale, semi-wholesale and retail prices for the important vegetables for

the periods Jan.-Dec., 1977 under this project. It is important to study the difference in the behaviour pattern/price behaviour of retail price with the whole sale price of vegetables at two different points of time. The present study aims at testing the behaviour pattern of retail price with the whole-sale price for the periods April-June, 1977 and Oct.-Dec., 1977. These periods have been chosen purposely because the period April-June represents the major summer season while the period Oct.-Dec. represents the major winter season and the prices are widely different in these two periods. The vegetables included in the study are Brinjal, Tomato and Lady's Finger.

Fractile Graphical Analysis and Fractile Analysis have been used for the present study to test the difference in the behaviour pattern of retail price with the whole sale price for the two periods. It has been observed that the behaviour pattern is significantly different for the periods April-June, 1977 and Oct.-Dec., 1977 for all the three vegetables.

(Guide : Dr. Padam Singh)

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11. COMPUTER SCIENCE AND NUMERICAL ANALYSIS

(a) Computer Utilization :

During the quarter under report, the Computer Centre worked during 9AM to 6 PM. The Centre caters to the data processing need of research workers, students from various I.C.A.R. Institutes and Central Agricultural Universities and Agricultural Colleges. About 2900 jobs were processed and 1400 programmes tested on the B-4700 System. About 240 jobs were processed and tested on IBM-1620 System.

(b) Programming Facilities :

Assistance was provided in programme development and data processing

problems of Scientists from Institutes under I.C.A.R., Agricultural Universities and other users of the system. During this quarter, about 65 Ph.D. students, 34 M.Sc. students and 32 other research workers were given help in analysing their data on the Computer. To meet their requirements, about 36 new computer programmes were developed.

(c) Training Activities :

The XVth Training Course in FORTRAN IV on Computer Programming was organised from 24th July to 19th August, 1978. Twenty two participants from various Institutes under I.C.A.R., Agricultural Universities and Govt. Organisations participated in this training programme.

(d) M.T. Unit

During the quarter, work relating to a large number of schemes/projects of the Institute was undertaken.

As usual, facilities for punching and processing of data on unit record equipment continued to be extended to a large number of students/scientists and research workers of I.A.R.I,, other Institutes under ICAR, and several Agricultural Universities and other research organisations.

During the quarter, approximately 4.2 lakh cards were punched. 5 jobs on Card Collation, 76 jobs of Reproduction and 358 Sorting jobs were done and 559 listings prepared.

Advice on data preparation, formulation of code structnre was given to a large number of students/scientists who came to IASRI for processing their research data on electronic computer. Card designs were also prepared for them.

(e) Other Activities

The Computer Centre has started developing a source programme library on magnetic tape. Any programme in the library can be executed and patches can be inserted in the programme. A list of these programmes has been given in Newsletter Nos. 2 and 3 of the Division of Computer Science and Numerical Analysis.

12. LIBRARY

(a) During the quarter under report, 205 books on various subject fields of the Institute were added to the Library.

(b) During the quarter under report, the following reprints were procured for distribution by the Library.

Sl. No.	*Author*	*Title*	*Source*
1.	Bhargava, P. N. *et. al.*	Size and shape of plots-field trials with banana	Ind. J. Hort. 35 (1), Mar., 78
2.	Jain, J. P. *et. al.*	Growth of milk producer's co-operatives in Mehsana	Ind. Dairyman. Vol. XXX, Aug,-78.
3.	Raut, K.C. and Singh, Shivtar,	Population structure and some production traits on buffaloes.	Ind. J. of Anm. Sci. 48 (5), May, 78.
4.	Narain, Prem	Conditional Markov chain in a genetic context.	J. of Genet. 63 (2), Dec, 77.
5.	Saxena, B.C. *et. al.*	Dairying improves village economy of district Mehsana.	Ind. Farming Aug, 78.

(c) During the quarter under report, nearly 2800 persons visited the Library. The Library was also visited by a large number of VIP'S including few F.A.O. experts.

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13. SEMINAR ASSOCIATION

During the quarter under report, 20 seminar talks were given by the distinguished visitor, scientists and the students.

Sl. No.	*Speaker*	*Topic*
A.	**Distinguished Visitor**	Randomisation analysis of Experimental data.
1.	Dr. D. Basu, Professor, Florida, State University, USA.	
B.	**Scientists of the Institute**	
2.	Dr. Padam Singh, Sr. Professor.	On a sampling scheme providing unbiased regression type estimators.
3.	Dr. O. P. Kathuria, Scientist (S-3)	Double sampling on successive occassions.
4.	Sh. L.K. Garg, Scientist (S-2)	The effect of including individual's egg weight in a selection index for rate of lay in chickens.
5.	Sh. S.S. Shastri, Scientist (S-1)	Fisheries development in India.
6.	Miss Ranjana Aggarwal, Scientist (S-1)	Preharvest forecasting of rice yield using weather parameters.
C.	**Students of the Institute**	
7.	Miss Surinder Kaur	Estimation of frequency distribution.
8.	Sh. Ravindra Singh	Fractile Graphical Analysis.
9.	Sh. P. R. Jat	Stratification for multiple characters.
10.	Miss Savita Garg	Some alternative estimators for estimation of yield of cultivated fodder.
11.	Sh. P. R. Chandak	Some problems of optimum allocations for sampling on two occasions.
12.	Sh. A. K. Vashisht	On T class of Estimators.

13.	Sh. J. K. Purkar	Applications of diallel techniques in plant breeding.
14.	Sh. S. N. Tilekar	An application of variable price programming approach for estimation of normative demand function for fertilizer.
15.	Sn. P. M. Harihar	Estimation of demand function for fertilizer for Uttar Pradesh
16.	Sh. M. B. Meishri	Various designs used in soil science research.
17.	Sh. A. K. Sarkar	Use of statistics in soil testing fertilizer recommendations.
18.	Sh. A. S. Patil	Application of game theory models for decision making under uncertainty.
19.	Sh. Kyi Win	In-complete block designs for parallel line assays.
20.	Sh. M. P. Saxena	Economics of fertilizer use.

14. PAPERS PRESENTED AT INTER-ORGANISATIONAL SEMINARS, WORKSHOPS, ETC.

The title and authorship of paper presented and the particulars of the workshop, at which this was presented, is given below :

(i) *17th All India Workshop for Wheat Research Workers, held at Hyderabad (A.P.) during 18th August to 22nd August, 1978.*

1. BHARGAVA, P. N., KRISHNAN, K. S. AND KAPOOR, J.K. Effect of Weedicides on Wheat Crop.

15. PARTICIPATION IN INTER-ORGANISATIONAL SEMINARS, WORKSHOPS, ETC.

During the quarter under review, officers of the Institute participated in inter-organisational seminars, workshops, etc. The names of the officers who participated and the particulars of the seminars, workshops, etc. are given below :

(i) *17th All India Workshop for Wheat Research Workers held at Hyderabad (A.P.) during 18th August to 22nd August, 1978.*
Sh. P. N. Bhargava

(ii) *Seminar on 'Fertilizer use and determinant of fertilizer demand in Semi-Arid Tropical India' held at International Crop Research Institute for Semi-Arid Tropics, Hyderabad (A.P.) during 25th-26th Sept., 1978.*
Dr. D. Singh and Sh. S. K. Raheja.

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16. MISCELLANEOUS

(a) Exhibition Room

During the quarter under report, 18 new panels were fixed on the walls of the Exhibition Room after removing the wooden panels from the Room. The Exhibition Room was renovated for the 16th convocation of the Institute. For this, about 7 new charts and 50 old charts were arranged on these new panels. Division-wise. The publications of the scientists of Institute, were also displayed. A number of visitors including Dr. B. K. Soni, Deputy Director General, I. C. A. R., were taken round the Exhibition Room.

(b) Management Committee

(i) The 9th Meeting of the Management Committee of Institute was held on 30th Aug., 1978.

(ii) The present term of Management Committee has expired on 22.9.78. Action has been initiated by the Council to re-constitute the Management Committee of this Institute.

(iii) The Council has nominated the following two village representatives as Non-Official members to represent agricultural/rural interests on the Management Committee of I.A.S.R.I. These are (1) Shri Harbans Singh Jalal and (2) Shri Brijendra Bahadur Pal.

(c) Staff Research Council

The Staff Research Council met twice on 31st August, 1978 and on 4th, 7th & 12th September, 1978. The progress of the projects, continuing as well as new projects of various Divisions of the Institute was reviewed at the meetings.

(d) Honours/awards won, etc.

Sh. A. K. Banerjee, Scientist (S-2) was awarded Ph. D. degree by the University of Delhi in Mathematical Statistics.

(e) Distinguished Visitors

(i) Dr. D. Basu, Florida University, U. S. A. visited the Institute and delivered lecture to the scientists and students of the Institute.

(ii) Dr. Hickman from the F. A. O. visited the Institute and disccussed certain problems in Animal Breeding with Dr. Prem Narain, Jt. Director.

(f) Other Information :

(i) Dr. D. Singh, Director, addressed the participants of the Summer School in Agricultural Econometrics at Punjab Agricultural University, Ludhiana (Punjab) in the Concluding Session on the topic "Measurement Errors" on 29th July, 1978.

He attended the meeting of Co-ordinating Committee for organisation of Micro-Economic Studies in the field of Agricultural Economics organised by the Dte. of Eco. & Stats., New Delhi on 7th August, 1978.

He delivered a lecture on "Research in Agricultural and A. H. Statistics" to the trainees of Senior Certificate in Statistics at C S. O., New Delhi on 11th August, 1978.

He attended the Seventh Session of the "F. A. O.—Asia and the Far-East Commission on Agricultural Statistics" held at Bangkok (Thailand) from 17th August to 23rd August, 1978.

He discussed some of the Research projects relating to Agricultural development at Kathmandu (Nepal) at the request of the delegation of Royal Govt. of Nepal on 25th August, 1978.

He attended the meeting of the Technical Advisory Committee on 18th Sept., 1978 at Administrative Staff College of India, Hyderabad (A.P.) in connection with the Joint International Seminar on Socio-Economic Consequences of High Yielding Varieties (H.Y.V.) to be held from Nov. 13th to Dec. 15th, 1978 arranged by the Institute of Development Studies, University of Sussex (U.K.) and the Administrative Staff College, Hyderabad.

He participated in the group discussion on "Fertilizer Use and Determinants of Fertiliser demand in Semi-Arid Tropics" of International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Hyderabad (A.P.) on 25th & 26th Sept., 1978.

Dr. Singh was also selected as a member of the Sub-Committee for organising the I.C.A.R. Golden Jubilee Celebrations.

(ii) Dr. Prem Narain, Jt. Director, attended a meeting of the Board of Studies in Statistics of the University of Rajasthan at Jaipur (Rajasthan).

He was elected as a member of the Sectional Committee of the Indian National Science Academy.

He acted as Chairman of the Selection Committee for appointment of research fellows in the Council of Scientific and Industrial Research, (C.S.I.R.), New Delhi.

Dr. Narain also organised the 16th Convocation of the Training Courses of I.A.S.R.I.

(iii) Shri S.D. Bokil, Scientist (S-3) represented the Institute at the Parliamentary Consultative Committee meeting of the Ministry of Agriculture and

Irrigation, Govt. of India New Delhi on 24th August, 1978.

(iv) Shri P. N. Bhargava, Sr. Scientist (S-3) visited International Crop Research Institute for Semi-Arid Tropics (ICRISAT), Hyderabad (A.P.) to acquaint with the work done in the Climatology Division of that Institute.

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PERIODICAL PUBLICATIONS

ANNUAL REPORT

The Annual Reports issued by the Institute cover all the aspects of its functions and activities and provide useful information to research workers in the field of agricultural statistics.

NATIONAL INDEX OF AGRICULTURAL FIELD EXPERIMENTS

The results of statistical analysis of the data pertaining to agricultural field experiments (other than varietal trials) conducted at the various research stations all over the country, are published in the forms of compendia series. Three such series in respect of the various States pertaining to the periods 1948-53, 1954-59 and 1960-65 have already been completed and the data for the period 1966-71 have been collected and are under process.

The prices of the different volumes are given below :—

State/Region	*Series I (1948-53)*	*Series II (1954-59)*	*Series III (1960-65)*
Andhra Pradesh	Rs. 12.00	Rs. 12.80	Rs. 18.00
North-Eastern Region	Rs. 4.00	Rs. 6.80	Rs. 4.00
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Gujarat	Rs. 6.75	Rs. 9.25	Rs. 14.00
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Orissa	Rs. 3.50	Rs. 6.30	Rs. 7.00
Northern-Western Region	Rs. 19.50	Rs. 19.20	*
Rajasthan	Rs. 4.00	Rs. 6.20	Rs. 8.00
Uttar Pradesh	Rs. 35.75	Rs. 42.10	*
West Bengal	Rs. 7.75	Rs. 8.15	Rs. 7.00
Central Institutes	Rs. 11.00	Rs. 16.50	*
Total for the set	Rs.184.75	Rs.227.30	

*Price not yet fixed

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Sample Survey for Estimation of Milk Production in Eastern Districts of U.P. (1957-59)—*V.G. Panse , Daroga Singh and V.V.R. Murty.*	Rs. 4.25
Cost of Milk Production in Madras (1963)—*V.G. Panse, V.N. Amble and K.C. Raut.*	Rs. 4.75
Green Manuring of Crops (1965)—*V.G. Panse, T.P. Abraham and C.R. Leelavathi.*	Rs. 2.50
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Monograph on Estimation of Wool Production (1970)—*Daroga Singh, M. Rajagopalan and J.S. Maini.*	Rs. 2.60
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