Volume-X Oct.-Dec., 1984 Number-4

I.A.S.R.I.
STATISTICAL NEWSLETTER

INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
(I. C. A. R.)
LIBRARY AVENUE, NEW DELHI-110012

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Complied and Prepated

By

R. K. KHOSLA

A. K. MUKHERJEE MAHARAJ SWAROOP

P. P. SINGH

PREFACE

This is Vol. X, No. 4 issue of 'IASRI Statistical Newsletter' and covers the activities and allied information in respect of this Institute during the quarter Oct.-Dec., 1984.

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 member of the staff of the Institute who supplied the requisite material for this issue of the 'IASRI Statistical Newsletter'.

I am also thankful to S/Shri Som Dutt, K.G. Dewale, Kunwar Pal Singh and R. Datt for the help rendered in compilation and printing of this Newsletter.

PREM NARAIN
DIRECTOR
INDIAN AGRICULTURAL STATISTICS
RESEARCH INSTITUTE, NEW DELHI-110 012

CONTENTS

IASRI MOURNS (MRS.) INDIRA GANDHI'S BARBARIC ASSASSINATION

The news of the barbaric assassination of Shrimati Indira Gandhi, the beloved Prime Minister of India was received with great shock by the staff members of the I.A.S.R.I. The Scientists, staff and students of this Institute expressed their profound sorrow at the martyrdom of Smt. Indira Gandhi on 9th Nov., 1984 (delayed due to curfew clamped in the Delhi Metropoliton City), Prof. Prem Narain, Director of the Institute addressed the condolence meeting at the Institute. A two minute silence was observed as a mark of respect to the departed soul. The following resolution was adopted in the meeting.

"The Scientists, staff and Students of the Indian Agricultural Statistics Research Institute, express their great shock and profound sorrow at the dastardly and barbaric assassination of our beloved Prime Minister Smt. Indira Gandhi on Wednesday, the 31st October, 1984. She was the epitome of democratic and Socialist values and most ardent advocate of secularism and peace. She was a tireless crusader of the uplift of the poor and under privileged. She belonged not only to India but to the whole world. Her contributions to the cause of Science in general and Agriculture in particular were stupendous. It will be difficult to find one to match the calibre and stature of Smt. Gandhi.

All of us pray that the soul of our beloved leader may rest in peace. We also pray that God may give strength to Shri Rajiv Gandhi and other members of the bereaved family to bear this irrepairable loss".

(The condolence message was conveyed to the Honourable Prime Minister of India by Prof. Prem Narain, Director, I.A.S.R.I. on behalf of the Institute).

1. EXPERIMENTAL DATA AND USE OF COMPUTER

A large amount of experimental data is being collected by the research worker and other and processed manually or by the computing machines. However, fine techniques a research worker may use, if the experimental data is not properly scrutinized, the computation results are inaccurate and the conclusions he draws from an analysis of numerical data will generally be wrong and very misleading. It is essential, therefore, that every research worker should acquire some knowledge about the sources of inaccuracies in numerical computation and the ways to avoid them.

The results are affected by different type of errors. The variation in the results from sample to sample is known as sampling fluctuation. Though it is unavoidable, its magnitude can be ascertained by using the calculus of probability. An altogether different type of error may arise from in-accuracies in the primary returns coming in at different stage of compilation. In any investigation of some size, the data are seldom collected by a single investigator. It is known from experience that data collected by different investigator from the same informant usually differ. This discrepency can arise because the psychological reaction of an informant to different investigator is different or because investigators differ in their interpretation of the items in the questionnaire or schedule and the concepts and definitions used therein.

Sometimes there may be genuine omissions in recording the information collected, in duplication of records copying errors may creep in. Derived figures like totals, ratios, indices may have mistakes in computation. The possibility of dishonest manipulation of data by investigator cannot be overlooked. Therefore, it is essential that primary data should be cross-examined for genuineness.

Some mistakes will even arise, even though extreme care is taken at the time of compilation.

Some principles of scrutiny for the detection of such mistakes, when compilation is complete should be applied.

If multiple sets of primary returns are available, they should be compared among themselves and also against the original set, if available.

When observations on the same characteristic of a number of individuals are recorded, any observation which deviates too much from rest is called an outlier. Statistical tests are available to decide whether an outlier is too rare to be acceptable without further examination.

A study of associated characteristics, often helps in detecting suspicious observations. For instance among a list of statures of adult males, an observation of 2 meter height may not be rare, however, if the corresponding weight recorded is 40 Kg., the figure would appear to be extremely doubtful. Cross classification of the data by a number of associated characteristics is thus a very useful tool in scrutiny work.

A large deviation from the general trend is unusual, too much close agreement also arouses suspicion in some cases.

Statistical returns should also be checked for constant errors of rounding off, specially if these are obtained from crude measuring instruments. The procedure of analysis and use of machines for computations leads to sometimes to mistake. This is a third type of inaccuracy, which we shall call an error. This is different from the other two types on the reasons that it is usually impracticable and some-times even impossible to avoid. Errors may arise from one or more of the following source:

(a) The mathematical formulation is only an idealized and very seldom an exact description of reality.

(b) Parameters occuring in mathematical model are almost always subject to errors of estimation.

(c) Many mathematical problems can only be solved by an infinite process, whereas all computations have to be terminated after a finite number of steps.

(d) Because of the limited digit capacity of computing equipment, computations have to be carried with numbers rounded off conveniently or truncated. However, it is not necessary to try to avoid all errors because usually the final answer need be corrected only to a certain number of figures. The problem can be solved by the theory of calculations with approximate numbers.

We are mainly interested at present to minimize the mistake in computations. The only way to avoid mistake is, of course, to work carefully, but a general knowledge about the nature of mistakes help us to work

carefully, mistakes in copying, transferring and reading fall into three broad classes—digit substitution, juxtaposition and repetition. One mistake is very common to substitute hurriedly one digit for another in a number, for instance 0 for 6, 0 for 9, 1 for 7, 1 for 4, 3 for 8 or 7 for 9. Only remedy is to write the digits distincly. Another mistake is to alter the arrangement of the digits in a number to write 32, for 23. or 547 for 457. The third type of mistake occurs when some number of digit occurs repeatedly, for instance 12,225 may be copied as 1225, or in the series of number 71, 63, 64, 64, 64...one or more of the 64' may be forgotten. These mistakes can be avoided, if one is careful.

Certain mistake in computations be avoided by checking the accuracy of computations. Computations should be properly laid out, in tabular form, with check columns whenever possible. To summarise; the following five principles for avoiding mistakes in computation.

Write the digits distinctly

Cut down copying and transferring operations. Use tabular arrangements for computations. Keep provisions for checking. Guess the answer beforehand.

Electronic computer may be used to locate the some of the above mistakes and correction of records before any analysis is carried out on experimental data. Some-time numerical field contains alpha character in between. For example 5 for S, o for 0, I for 1, U for 1, M for 7, etc. If S is present in numerical data it is generally read as 2, instead of 5. 0 is generally, read as 6 instead of zero, which leads to wrong results. Therefore, data must be cleaned for all these mispunching, column shifting, outlier, and associated characteristics by scrutiny programs.

2. VARIOUS BALANCED CONCENTRATE MIXTURES IN DIFFERENT REGIONS OF THE COUNTRY

India with her 370 million livestock and 115 million poultry birds-the largest in the world-suffers with low productivity. Besides their low genetic potentiality, poor management is mainly responsible for this dismal picture. Among the various component perhaps feed plays the most predominant role. Livestock feed has three main constituents : concentrates, dry roughages and greens; whereas poultry ration consists of only concentrate mixture supplemented with minerals, antibiotics and

vitamins. The term concentrates is uesd to denote those feeds which are low in cellulose but high in digestibility. They are condensed reserve of energy and protein. Seeds and their by-products are included in the class of concentrates. In most seeds like corn, the principal store of energy is in the form of carbohydrates, but oil bearing seeds such as soybean, cotton seed, groundnut are quite rich in fat and protein. Oil bearing seeds are used as commercial source of oil leaving oil meals as by-products for animal feeding. For balanced ration the animals are usually fed with mixture of concentrates rather than single concentrates.

Balanced concentrate mixtures are needed for maintenance as well as for production purposes. An ordinary farmer may know of only a few concentrate balanced mixtures but may not be aware of many more available in the region of the country in which he resides. The knowledge of balanced concentrate mixtures which are available in the region would be of great help in formulating the least cost ration schedule. This article aims at presenting the possible available balanced concentrate mixtures for different regions of the country. This information has been extracted from different compendia of nutrition experiments prepared by the Institute under the project 'National Index of Animal Experiments'.

Regionwise available balanced concentrate mixtures :

Taking into account the availability of green grasses, green fodders and dry roughages, the entire country can be divided into five regions. For each region in addition to the type of vegetation grown, a list of balanced concentrate mixture is given below.

A. Temperate Himalayan Region :

It includes hilly part of Assam, Sikkim, Kumaon, Garhwal, Simla, Kulu, Chamba and Kashmir. In this region there is enough scope for grazing in Alpine pastures during summer and monsoon seasons and grazing lasts for 7 to 8 hours a day. Although grasses are quite rich in protein varying, of course, with the stage of growth but even then balanced concentrate mixtures are needed, particularly during winter season. The cereal crops grown are largely wheat and paddy. In addition some horticulture crops like apple, apricot, etc., are also grown. The balanced concentrate mixtures recommended for this region are as follows.

Mixture	*Ratio*
GNC* : Rice bran	1 : 4
GNC : Wheat bran	1 : 2
GNC : Crushed barley	1 : 2
GNC : Maize	7 : 3
GNC : Wheat bran : Maize	2 : 2 : 1
GNC : Wheat bran : Barley	18 : 45 : 37
Maize : Molasses : Urea : Min. Mix. : Salt	40 : 40 : 15 : 3 : 2

B. Dry Northern Region :

This region comprises states of Punjab, West Uttar Pradesh, western Madhya Pradesh and Rajasthan. Here vegetation is scanty and cultivation is mostly by irrigation. The main crops are wheat, gram and maize. The balanced concentrate mixtures for the region are :

Mixture	*Ratio*
GNC : Wheat bran : Barley	20 : 25 : 55
GNC : Wheat bran : Barley	20 : 25 : 45
GNC : Wheat bran : Barley	10 : 40 : 50
GNC : Maize : Wheat bran	30 : 50 : 20
GNC : Wheat bran : Crushed Maize : Crushed gram	1 : 2 : 3 : 4
GNC : Wheat bran : Crushed Gram : Barley	1 : 2 : 1 : 2
GNC : Maize : Wheat bran : Min. Mix.	50 : 30 : 18 : 2
Maize : Molasses : Urea** : Min. Mix. : Salt	40 : 40 : 15 : 3 : 2
GNC : Wheat bran : Maize : Gram : Barley	35 : 25 : 10 : 15 : 15
Wheat bran : Maize : Barley : Gram : Skim milk powder	10 : 27 : 50 : 10 : 3

C. Wet Eastern Region :

This region comprises states of Assam, West Bengal, Bihar, Orissa, Eastern U P., eastern M.P. and north-eastern Tamil Nadu. The principal crops of this region are rice and jute. Balanced concentrate mixtures for this region are :

---

*Groundnut cake

**To supply 15% DCP.

(a) Poultry

Mixture	*Ratio*
For starter	
Tapioca : Rice bran : Coconut cake : Gingelly oil cake : Fish meal : Mindiff.	17 : 20 : 10 : 32 : 20 : 1
For grower —do—	29 : 15 : 11 : 32 : 12 : 1

(b) Animal

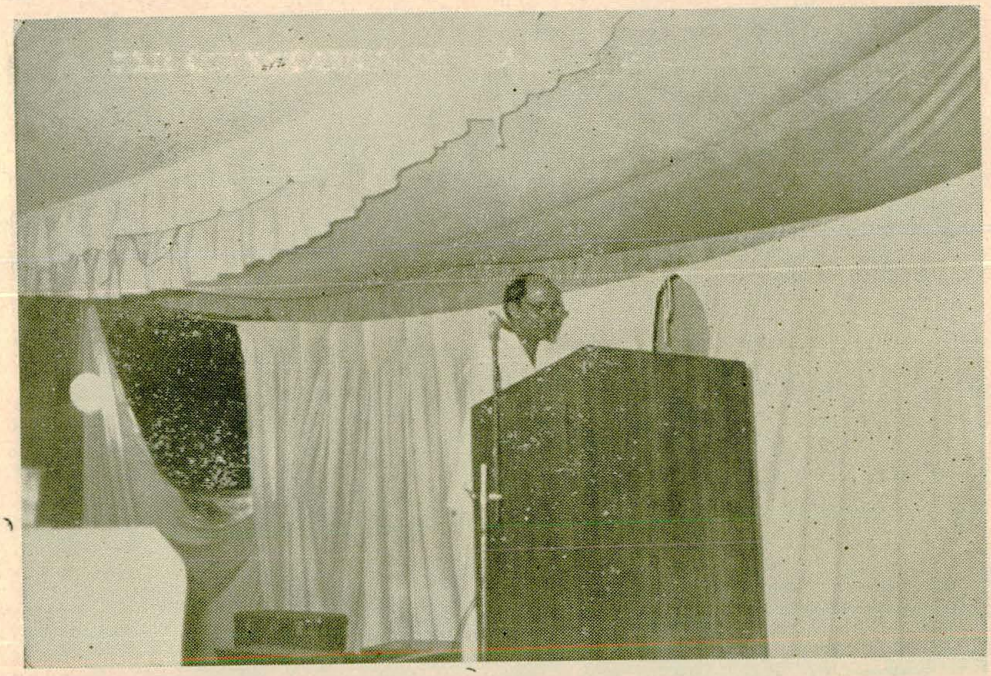
Mixture	*Ratio*
GNC : Rice bran	1 : 4
GNC : Crushed Maize : Crushed barley : Tapioca flour	40 : 40 : 10 : 10
Coconut cake : Arhar chuni : Wheat bran : Crushed gram	20 : 30 : 25 : 25
GNC : Mustard cake : Wheat bran : Katar chuni	30 : 30 : 20 : 20
GNC : Linseed cake : Arhar chuni : Crushed gram : Wheat bran	10 : 10 : 35 : 20 : 25

D. Southern Region :

This region consists of district Jhansi of U.P., whole of M.P., east of Andhra Pradesh, West Tamil Nadu, Baroda district of Gujarat, Maharashtra and part of Karnataka. Millets are the main crops of this region. For this region certain millets alone form balanced concentrate in ration. For example, ragi grain, jowar, crushed gram, gram chuni, arhar chuni, cotton seed cake, etc. form balanced concentrate rations for the region and any combination recommended for wet eastern region can also form balanced concentrate mixture depending on their availability in the region.

E. Coastal Region :

Southern India boardering eastern and western ghats, part of Karanataka and part of Kerala constitute this region. In this region, there are many single concentrates like cotton seed cake, rubber seed cake, tapioca leaves, which could form balanced concentrate rations. Other important concentrate mixtures of this region are :



Chief Guest Dr. Maharaj Singh D.D.G. (Education), ICAR Addressing the Function.

Prof. Prem Narain, Director and Warden delivering the welcome address.

Chief Guest, Dr. Maharaj Singh, DDG (Education), ICAR, distributing the prizes.

A Scene of the Cultural programme.

Mixture	*Ratio*
GNC : Rice bran	1 : 4
GNC : Crushed Maize : Crushed barley : Tapioca flour	40 : 40 : 10 : 10
GNC : Maize : Wheat bran : Steamed bone meal : Molasses : Common Salt	35 : 25 : 27 : 2 : 10 : 1
GNC : Thippi : Wheat bran : Steamed bone meal : Molasses : Common Salt	40 : 20 : 27 : 2 : 10 : 1

3. TRAINING AND BASIC RESEARCH

3.1 Training Activities :

The following ad-hoc training programme/lectures were arranged.

Sl.No.	organisation	Period	Category of trainees
1.	ISEC, Calcutta	25-10-84	Official Statistics and Ag. Statistics
2.	IVRI, Izatnagar	1-11-84	PG students of National Diploma in Animal Husbandry.
3.	ISEC, Calcutta	15-11-84	Specialised training in Ag. Stat.

3.2 Basic Research in Statistics :

For large scale complex surveys variance estimation is made possible by using main effect orthogonal plans with proportional frequencies.

3.3 Hostel Activities :

The students celebrated Annual Day function in the evening of 10th Oct., 1984. Dr. Maharaj Singh, Deputy Director General (Education), Indian Council of Agriculture Research, New Delhi was the chief guest on this occasion. As a part of the celebrations, several sports, Indoor games and atheletic events were held and the prizes were awarded to the winning teams and individual students. A variety entertainment programme was presented by the students with active participation of the members of the staff of the Institute and other guests.

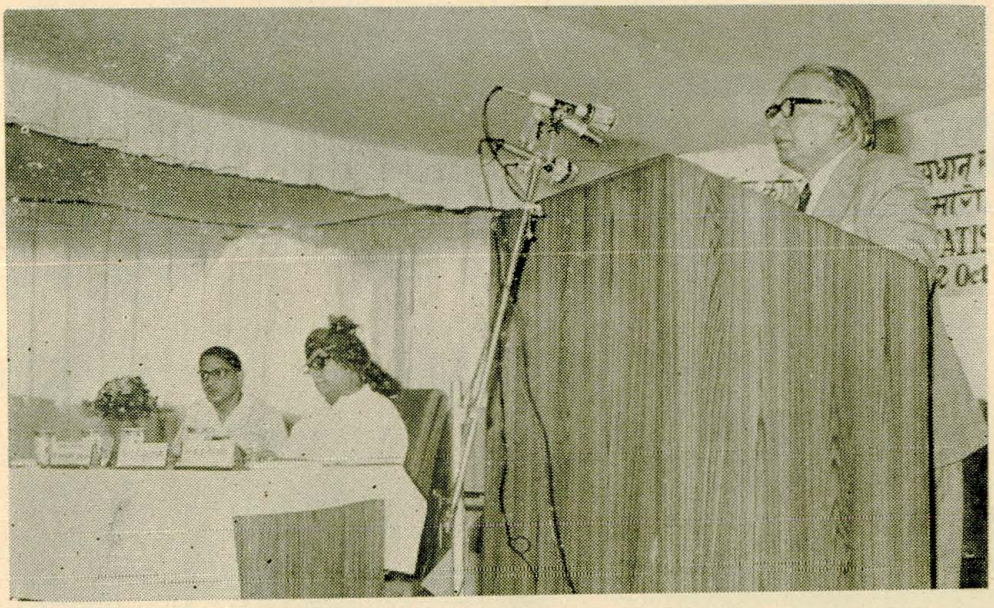
A new executive committee for the hostel activities for the academic year 1984-85 was elected.

Diwali, Christmas and New Years' ewe were also celebrated at the hostel.

4. SILVER JUBILEE CELEBRATION OF I.A.S.R.I. (1959-1984)

The Silver Jubilee of the Institute was celebrated in the 2nd week of Oct., 1984. Hon'ble Union Minister for Agriculture, Rao Birendra Singh inaugurated the celebration on the 9th Oct., 1984. The Minister, in his inaugural address, called for a nutritional dimension to crop planning and asked the agricultural Statisticians to help bridge the gap between "What we produce and what we require". The Minister wanted increased use of computer in integrating mathematical and statistical approaches in research with social and biological objective. To mark the Silver Jubilee Occasion a "Silver Jubilee Souvenir" was also released by him. Dr. O.P. Gautam, Director General, ICAR who graced the occasion by his benign presence, said that the methodologies evolved by this Institute were helping the country in formulating its agricultural strategy and were considered quite good. He assured the agricultural Scientists that the council would provide all necessary support and assistance for future development of the Institute. Prof. Prem Narain, Director of the Institute presented an overview of achievements in research, training and computer application at the Institute.

The XXII Convocation of the training courses of the Institute was held on 10th October, 1984 which was presided over by Dr. O.P. Gautam, Director General, ICAR. Mr. Yogendra Makwana, Hon'ble Minister of State for Agriculture was the Chief Guest and delivered the convocation address. Mr. Makwana gave away diplomas, certificates and prizes to the successful students of the Institute. Dr. O.P. Gautam, Director General, ICAR, in his Presidential address, exhorted agricultural scientists to play their rightful role in policy making. He also urged them to quantify their achievements. Prof. Prem Narain, Director of the Institute presented the Institute's Progress Report. Prof. Narain indicated that this Institute had been recognised as a Centre of Advanced Studies in Agricultural Statistics and Computer Application under UNDP assistance. This was the only Institute in the country where statistical problems applicable to agriculture were dealt with in their entirety. During the convocation a total number of 26 candidates, viz., 15 for senior certificate course, 10 for Professional Statisticians' Certificate Course and 1 for Diploma Course in advanced computer programming were awarded certificates.



Dr. G. P. Gautam, Director General, I C.A.R. delivering the welcome address.

Prof. Prem Narain, Director, IASRI, presenting the report of the Institute.

Rao Birendra Singh, Hon'able Union Minister for Agriculture delivering the Inaugural Address.

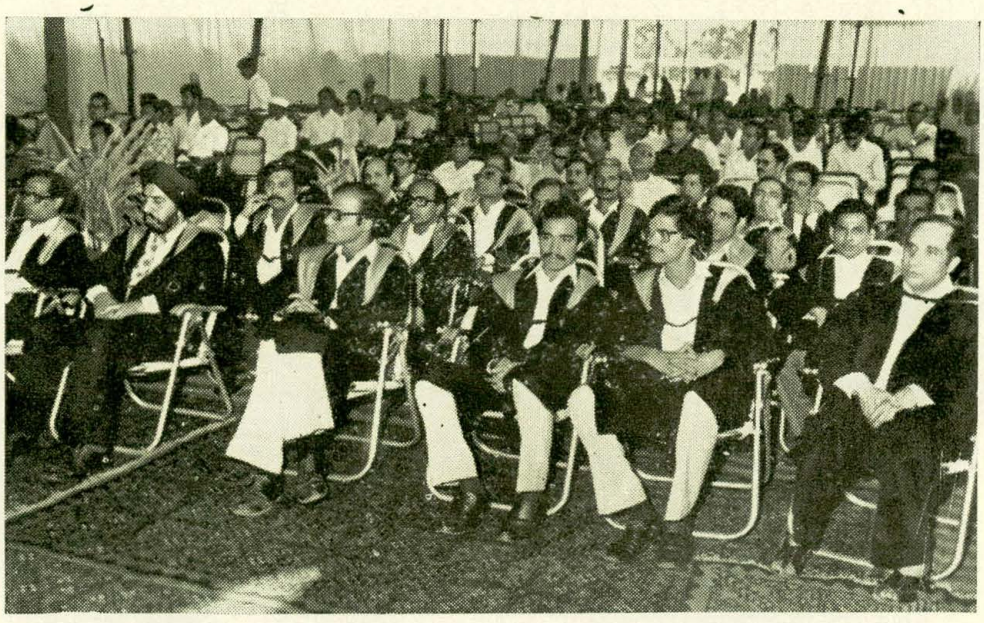
A view of the participants at the Inaugural Function.

XXII CONVOCATION OF TRAINING COURSES OF IASRI.

Prof. Prem Narain, Director of the Institute delivering the Welcome Address.

Sri Yogendra Makwana, Hon'able Union Minister of State for Agriculture delivering the Convocation Address.

Hon'ble Union Minister of State for Agriculture Shri Yogendra Makwana awarding the Certificates/Diploma



A View of the participants at the Convocation.

As a part of Convocation Programme an elocution contest was organised on 8th Oct., 84 in which the students of various courses of the Institute participated. The topic for the elocution was ' Role of Design of experiments in the fields of Agriculture and Animal Husbandry''. The session was chaired by Dr. M.N. Das, Ex. Director (Statistics), CWC, New Delhi. Three best speakers among the competitors were adjudged by the judges appointed for the purpose and three prizes were awarded to the three best speakers. Three prizes of Rs. 50/-, Rs. 30/- and Rs. 20/- in the form of books were awarded to the speakers who were adjudged first, second and third respectively in the elocution contest.

A symposium on "Statistical Methodology" having four sessions on the topics, viz., ''Sampling Methodology'', "Genetics and Population Ecology'', ''Crop Forecasting Methodology'' and on "Linear Models and Design of Experiments'' were arranged during this period. The four sessions were chaired by Dr. D. Singh, Ex. Director of the Institute, Prof. Prem Narain, Director of the Institute, Prof. P.K. Bose, Ex. Pro Vice-Chancellor, Calcutta University and Dr. M.N. Das, Ex. Director (Statistics), CWC, New Delhi respectively.

About 250 delegates from India and abroad participated in the deliberations of the Silver Jubilee Celebration.

The titles and authorship of the papers published by the Scientists of the Institute in the Silver Jubilee Souvenir are given below :

1. AGRAWAL, RANJANA; JAIN, R.C. and ANEJA, K.G.— Yield forecast based on weather parameters.

2. ANEJA, K.G. and CHANDRAHAS—Preharvest crop yield forecasts based on plant biometrical characters.

3. BAHUGUNA, G.N; ANEJA, K.G. and MAHAJAN, V.K — Crop loss due to pests and diseases.

4. BATRA, M.S.; KATHURIA, O.P. and KAUL, B.L.—Estimation of cost of production of some important fruit crops and their marketing.

5. BHATIA, V.K. and MALHOTRA, P.K.—Heritability of threshold characters.

6. DEY, A. and BHATIA, V.K. – Training activities at IASRI.

7. GHAI, R.K.; SAXENA, M.P. and BHARGAVA, P.N.—Agricultural Field Experiments Information System.

8. GOEL, B.B.P.S. and MAINI, J.S.—Methodological developments for collecting statistics of livestock numbers and products.

9. GUPTA, S.C.; CHOUDHARY, H B. and KAUL, B.L.—Statistical evaluation of yield constraints in operational Research Project Areas.

10. GUPTA, V.K.; NIGAM, A.K. and KUMAR, PRANESH—On Inclusion Probability Proportional to Size Selection Procedure.

11. KATHURIA, O.P. and BATHLA, H.V.L.—Estimation of fish catch from Inland Resources.

12. KUMAR, PRANESH.; GOEL, B.B.P.S. and GUPTA, V.K.—On Estimation of Unequal Probability with out replacement.

13. MATHUR, S.N. and SATHE, K.V.—24-25 years of Data Processing.

14. NADKARNI, U. G.—Discriminatory analysis of some biological data.

15. NARAIN, P. and BHATIA, V.K.—Statistical aspects of genotype X environment interactions in plant breeding.

16. NARAIN, P. and BHATIA, V.K.—Some statistical aspects of culling pattern in Indian herds of dairy cattle.

17. NARIAN, P.; GOEL, B.B.P.S. and MALHOTRA, J.C.—Cost-benefit evaluation of progeny testing programme under Indian conditions.

18. NARAIN, P. and KHOSLA, R.K.—Functions, activities and achievements of Indian Agricultural Statistics Research Institute.

19. NARAIN, P. and KHOSLA, R.K.—Estimation of foodgrain losses.

20. RAHEJA, S.K. and MEHROTRA, P.C.—Performance of high yielding varieties of rice and wheat in selected districts-an appraisal.

21. RAUT, K.C. and SINGH, SHIVTAR.—Methodological investigations for estimation of cost of livestock products and allied studies.

22. SAKSENA, ASHA and BHARGAVA, P.N.—Some statistical studies for crop planning in rainfed areas.

23. SARUP, SHANTI and PANDEY, R.K.—Statistical assessment of production potential and yield gap in rice and wheat-statewise analysis.

24. SINGH, H.P. and JAIN, J.P.—Standardisation of techniques for assessment and evaluation of livestock development programmes.
25. SONI, P.N. and BHARGAVA, P.N.—Experiments in cultivators' field-a review.
26. SRIVASTAVA, S.S.—The Growth of Library and information activities at IASRI.

5. COMPUTER SCIENCE AND NUMERICAL ANALYSIS

5.1 Data Processing :

The Division of Computer Science and Numerical Analysis continued to provide facilities for computer programming and data processing on electronic computer to Scientists, Students and Research workers from various ICAR Institutes, Agricultural Universities and Colleges, Directorate of Economics and Statistics, Govt. of India and Deptt. of Agriculture, U.P. State.

5.2 Computer Utilisation :

B-4700 computer system was run in two shifts from 8.00 AM to 8.00 PM. The four interactive terminals were also used by scientists and students of this Institute for development and up-dating of programs. About 3554 production jobs in different streams were processed. About 270 testing jobs of students and Staff Members were also processed during the quarter.

5.3 Programming Facilities :

The Scientists of the division attended to the computer programming and data processing requirements of 48 Ph.D., 18 M.Sc. and 14 research scholars from various Institutes and colleges. To meet the programming requirements 4 new programs were developed and a number of existing programs were modified.

5.4 Data Base Application :

Updating of AGRIS Information system on receiving of Magnetic Tapes from Vienna and Selective dissemination of Information based on this data Base was continued.

5.5 M.T. Unit

During the quarter under report, approximately 1.25 lakhs cards were punched in about 300 punching jobs. 20 Jobs were taken up on unit-record machines comprising of sorting and reproduction.

6. ADVISORY SERVICES

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 ICAR and other organisations. Some details of the technical advice and guidance given by the Institute are given in brief;

6.1 Crop Forecasting Methodology :

(i) Guidance was given to Shri Tribhuwan Rai, Scientist—S, Indian Institute of Horticultural Research, Bangalore on the use of Principal component technique and its application to horticultural data.

(ii) Guidance was given to Shri M. Mallick, I.S.S. Probationer from C.S.O. in his project report on problems in forecasting crop yields.

6.2 Animal Science :

(i) Dr. N. Natarajan, Professor & Head, Sheep Breeding Research Station, Sandynallata—643237. The Nilgiris, Tamil Nadu was advised regarding the card design for statistical analysis of data —AICRP on sheep breeding for fine wool.

(ii) Guidance was given to Dy. Director(Statistics) of Punjab Government incharge of the project, "Cost of Milk Production, Patiala" regarding their project.

6.3 Sample Survey Methodology :

(i) Advice was given to Director of Horticulture, Punjab, in planning of survey on Fruits/Vegetables.

(ii) Advice was given to Dr. S.K. Sinha of WTC, IARI in the task force on analysis/data collection under the project, "Problem in wheat production."

7. FIELD SURVEY WORK

7.1 Field Training :

During the period under report training was imparted to the field staff of the following schemes in the collection of data and canvassing of different schedules at the places mentioned against them:—

(i) Development of a suitable methodology for estimating extent of labour utilization in live-stock and poultry keeping in rural areas of Meerut district (U.P.)-IASRI, New Delhi-12.

(ii) Pilot Sample Survey to estimate the Post-harvest foodgrain losses in Bulandshahar district (U.P.)-IASRI, New Delhi-12 and Indian Grain Storage Institute, Hapur (U.P.).

(iii) Sample Survey for study of constraints in transfer of new agricultural technology under field conditions-Nasik (Maharashtra).

7.2 Field work Inspection/Supervision:

The field work of the following schemes was inspected/supervised by the officers of the Institute at the places/areas mentioned against them:—

(i) Pilot sample survey for estimating the energy requirement for different levels of adoption of modern technology in agriculture -Meerut district (U.P.).

(ii) Pilot sample survey to study the impact of National Demonstration Trials on crop production-Rohtak district (Haryana).

(iii) Development of suitable methodology to study the effects of housing conditions and other related factors on milk production under village conditions-Gurgaon district (Haryana).

(iv) Development of suitable methodology for estimating extent of labour utilization in live-stock and poultry keeping in rural areas-Meerut district (U.P.).

(v) Pilot studies on preharvest forecasting of apple yield on the basis of data on biometrical characters, weather variables and agricultural inputs-Simla district (H.P).

(vi) Pilot studies on preharvest forecasting of yield of groundnut-Rajkot district, Gujarat.

(vii) A study of employment and income of small farmers and landless labourers-Sultanpur district (U.P.).

(viii) All-India Co-ordinated Agronomic Research Project-Kanpur (U.P.). and Kalyani (W.B.).

(ix) Pilot studies for estimation of birth and death rates in Ovines-Tiruchirapally (Tamil Nadu).

(x) Cost of milk production, Patiala-Patiala (Punjab).

(xi) Statistical investigations on economics of pig production-Ranchi (Bihar).

(xii) Pilot sample survey on cost of production of chikoo and its marketing practices-Valsad district (Gujarat).

8 LIBRARY

8.1 Books:

As a part of continous library practice 144 books on various subject field of the Institute were added to the library collection.

8.2 Reprints:

Following reprints of the articles written by the scientists of our Institute and published in scientific journals were procurred by the library for distribution and exchange.

S.No.	*Title*	*Author*	*Source*
1.	Productivity enhancement in milk yield through breeding, ...input in a rural area.	Raut, K.C.	Ind. Jr. Ani. Sci. 54 (6), June, 1984
2.	Increase in breeding Coefficient in a progeny testing programme.	Narain, P. ; Jain, J.P.; & Jain, R.K.	Ind. Jr. Ani. Sci. 54 (8) :Aug., 19 84
3.	Rates of genetic improvement by progeny testing in dairy herds of various sizes.	Jain, J.P.; Narain, P.; & Jain, R.K.	—do—
4.	Method of sampling with equal or unequal probabilities without replacement.	Nigam, A.K. and Gupta, V.K.	Applied Statistics 33 (2), 1984

8.3 Reports:

The library report collection has been enriched with the addition of 25 reports procurred from different organisations.

8.4 Reprography:

The reprography unit of the library system has attended 75 jobs covering 22000 pages on the requisition from the scientific, technical community of the Institute.

8.5 Issue and Return:

The charging and discharging of publications at the library counter has involved transaction of approx. 3500 publications.

8.6 Visitors:

Approx. 3400 visitors from the Institute and bonafied research Institutions and organisations have visited the library for consultation, borrowing, etc.

9. LAB. TO LAND PROGRAMME

Adoption of Village Akbarpur Majra in Alipur Block of Delhi :

Under phase III of the ICAR Lab-to-Land Programme implemented w.e.f. June, 1984, a number of villages in Union Territory of Delhi were surveyed for the purpose of adoption of families in a suitable village under the programme. Taking into account various aspects, the village Akbarpur Majra has been selected for the purpose. This village is situated at a distance of about 30 Kms. from the Institute. It is located about 5 Kms. off the Delhi-Karnal road in the North-East direction from the Alipur block headquarters. The total geographical area of the village is 743 acres of which 662 acres (611 acres irrigated and 51 acres unirrigated) were under cultivation during the year 1984-85. The bench mark survey of the village was conducted in December, 1984 and list of families belonging to different categories was prepared. There are 274 families in the village out of which 74 belong to the Scheduled castes and 85 to backward Classes. The number of marginal and small farmers is 57 and 60 respectively.

Excluding the families engaged exclusively in non-agricultural occupations like service or business all the remaining 250 families belonging to the following categories have been adopted under phase III of the Lab-to-Land programme :—

Category	No. of families				
	S.C.	S.T.	B.C.	Others	Total
Landless Agri. Labourers	74	...	44	15	133
Marginal farmers	...	...	33	24	57
Small farmers	...	...	8	52	60
Total	74	...	85	91	250

Programme of work :

On the basis of the benchmark survey of the families, the following programmes were identified for implementation among the adopted families :—

(i) Demonstrations on the use of balanced fertilizers in wheat crop.

(ii) Demonstrations on the use of weedicides for eradication of weeds in wheat crop.

(iii) Demonstration on the use of balanced cattle feed for increasing milk yield.

(jv) Demonstration on the use of balanced fertilizers, HYV of seeds of summer moong and summer vegetables.

10. ABSTRACTS OF PAPERS PUBLISHED BY THE SCIENTISTS OF THIS INSTITUTE

10.1 NADKARNI, U. G. and ARYA, S.N.—Cattle in the field. *Farmers' Journal, Vol. IV, No 3 (July, 1984)*

This paper describes the sample survey technique adopted for estimation of specific fertility and mortality rates for cattle in field conditions. Estimates of the parameters obtained from a survey in Kamrup district of Assam are also given.

About 98% of the cattle population comprised non-descript animals. Age-specific fertility rates in cows maintained in village situations were quite low compared with corresponding values in organised dairy farms. Age-specific mortality rates were not high, except for youngstock and for animals in the age groups 14-15 years. The predominant cause of cattle mortality in the area was found to be diarrhoea. A few suggestions are made to further contain the death rate and thereby save our cattle wealth.

10.2 NARAIN, P. and BHARGAVA, P.N.—Strategies for improving fhe protein availability in the country. *Agricultural Situation in India, August, 1984.*

Proteins are essential to life and every cell of animals and plants is composed in part of these large molecules compounded in differing proportions from more simple units called aminoacids. The nutritive value of food in terms of protein is dependent both on quantity of protein contained in it as well as on its quality. The protein content of different foodgrains varies considerably being of the order of about 6 to 14%. Leafy vegetables contain around 13% on a moisture free basis. In case of pulses, oilseeds and nuts, it is around 20 to 25%. Animals products such as cheese, meat and fish contain about 15 to 25% but much more on a moisture free basis. The quality of protein is generally in the ascending order of grains, pulses, oilseeds and animal products. Available supply per capita protein in India is around 50 gm. which is much lower as compared to other countries like USA, Europe and USSR. In India, grains are the staple food and are the major source of protein, the proportionate supply through this source is about 70% and about 27% through pulses, oilseeds and nuts. The contribution due to animal protein is only 3%.

The progress of agricultural production since 1967 has been quite impressive. The growth rate of agricultural production during the period 1967-68 to 1978-79 is estimated to be about 2.8 per cent per annum. It was quite significant in respect of cereals being of the order of about 3 per cent. On the other hand, the growth rate of production of oilseeds was not very impressive being only about 1.6 per cent. In case of pulses also, the production is stagnant at about 11 million tonnes so that the present per capita availability of pulses is only around 13 grams per day as against the recommended 60 grams per day. To augment the overall supply of protein in the country, therefore, there is a need to develop strategies for increasing the overall production of foodgrains particularly pulses and oilseeds.

These strategies involve proper development of crop systems for different agro-climatic regions taking into account the soil type and water resources. For areas under irrigation and assured rainfall, cropping systems could be developed in which a forage crop is one of the components. But in dryland areas depending solely on rainfall, cropping systems would involve pulses and oilseeds as components. In this paper, these aspects are discussed with the help of the data collected in experiments conducted under the All India Coordinated Agronomic Research Project of the ICAR.

10.3 NARAIN, PREM, KUMAR, DHARMENDRA and DUTTA, O.P.—Inheritance of Part-lactation and estimation of persistency of milk yield in Sahiwal Cattle—*The Indian Journal of Animal Genetics and Breeding 3(2) : 4-10 July, 1981.*

The inheritance of Part-lactation records and persistency in Sahiwal cattle were studied. Considering the estimates of heritability and genetic and phenotypic correlations it may be concluded that for sire indexing, estimating the breeding value of cows and bulls and selection for maximum genetic gain in lactation yield, part-production records based on cumulative production of 150 days (first 5 months) would be as efficient as on 300 days production. The persistency of the milk yield in the first lactation was highest whereas it was least in the fifth.

10.4 NARAIN, P. and KHOSLA, R.K.– Review of the Proceedings of the Indian Statistical Institute Golden Jubilee International Conference, "Frontiers of Research in Agriculture", held at Calcutta from September 27-October 1, 1982, *Jour. Ind. Soc. Agri. Stat., Vol. 36, No. 2, pages 68-78, August, 1984*

The review of the Inaugural Address, Special Lectures, Key Note Addresses in the different six Sessions and the lectures of the invited speakers, presented discussed and various recommendations made in the Conference by the Eminent International Scientists of different subjects, has been made in brief for the benefit of the workers, engaged in fundamental and applied research.

10.5 NIGAM, A.K. and GUPTA, V.K.,—A Method of Sampling with Equal or Unequal Probabilities Without Replacement—*Applied Statistics, 33, pp. 227-229, Dec., 1983.*

The purpose of this article is to give a method of computing the m-th element in the ordered set of $\binom{N}{n}$ samples arranged lexicographically without enumerating the whole set. A selection procedure with preassigned probability of selection of population units without replacement is suggested. The method has several interesting applications in the areas of simulation studies and in problems of obtaining repeated samples with some number of units common in the repeated sample.

Keywords : Mass selection; sample space; Repeated samples.

10.6 RAI, S.C.—Non-parametric Inference in Designed Experiments—*Jour. Ind. Soc. Agri. Stat., Vol. 36, 1984*

This is a review paper to introduce techniques of non-parametric analysis without the knowledge of specific probability distribution from

which the observations have arisen. The techniques of analysis of two related samples in the form of Mc. Nemar test, Sign test, Wilcoxon Matched-Pairs Signed Ranks test and Randomisation test have been presented with their merits and demerits. In case of K related samples (K>2), Cochran Q test, Friedman test and Likelihood Ratio test are described stating the situations, when one is preferred over the other. Fisher's exact probability test, χ^2—test, Median test, Mann-Whitney test, Kolomogorov—Smirnov test and Kruskal-Wallis test are reviewed indicating their merits and demerits. Tests based on Sensory evaluation have also been given. Models for paired and triad comparisons are presented. Non-parametric method for analysing groups of experiments in randomised block design has been given. The method can be used even when the error variances are heterogeneous and interaction absent.

10.7 RAI, S.C....Samvedi Mulyyankan...Parikshan and Vishlashan... *Hindi Prasarika-June 1984, pp. 5-8.*

In this paper the experimental procedures of Sensory evaluation have been described. Designs for selection of efficient judges have been given. A model for paired comparisons has been presented for analysing the results of sensory evaluation. The procedure is simple and it can be used over a wide range of observations.

10.8 RAI, S.C. and RAO, P.P... Rank Analysis of Groups of Split-Plot Experiments...*Jour. Ind. Soc. Agri. Stat., Vol. 36; No.3, pp. 159-167*

Research in the field of agriculture necessarily involves field experimentations with combination of levels of more than one factor so as to study a very important aspect of interactions between factors. For carrying out such experiments, several statistical designs are available and one of the most important and popular design is the split-plot design. The problem of combining the results of groups of split-plot experiments is a long standing one. No successful attempt has been made to find a solution especially when the corresponding error variances are heterogeneous. A non-parametric method using order statistic has been suggested in the paper. The procedure is simple and it can be used on a wide range of data because it does not require any assumption of normality, etc.

10.9 SARUP, SHANTI and PANDEY, R.K....Performance Gap in Productivity of Jowar, Maize and Bajra.. *Seeds & Farms, Vol. IX, No. 6, 1984.*

An attempt has been made in this paper to quantify this performance gap for jowar, maize and bajra crops and also to analyse the causes inhibiting realization of the production potential of these crop in different states of the country. The study is based on the results of the National Demostration Trials conducted during the Fifth Plan period and the actual productivity of these crops achieved in each state during this period. The data on recommended levels of crucial input factors have been compared with the actual input-use for production of these crops.

The study reveals a dismal performance of these crops in most of the states. In case of jowar and bajra, it is observed that the performance gap indices in most of the states are around 85 while for maize crop it is comparatively lower, indicating a better performance of this crop compared to jowar and bajra crops in the country. Even the state of Tamil Nadu achieving the highest productivity of jowar and bajra in the country is topping only one fourth of the existing production potential of these crops, while in the case of maize, the highest productivity state of Karnataka is realising a little more than half of the yield potential of maize crop. The analysis brings out that while the variation in productions potential between different states may be explained in good part, as due to the regional differences in soil and climatic conditions, the performance gap may be attributed to the extent and level of adoption of modern technology in the state. The analysis further reveals a wide difference in the actual and recommended levels of input-use and practices resulting in low productivity of those crops in the country.

11. PAPERS ACCEPTED FOR PUBLICATION

11.1 CHAWLA, G.C. and SHUKLA, P.C.—Use of Algebraic Equations for preparing feeds to obtain maximum milk production. *Ind. Jour. of Animal Sciences.*

11.2 DOSHI, S.P., GUPTA, K.C. and MISHRA, J.P.—Diallel cross techniques in rural development. *Journal of Computer society of India.*

11.3 GUPTA, A. K., GARG, R. N., SRIVASTAVA, A. K. and KUMAR, PRANESH—Impact of labour and irrigation on the yield of vegetables. *Annals of Agriculture Science, Dec., 1984.*

11.4 GUPTA, V.K. and NIGAM, A.K.—On a class of asymmetrical factorials of resolution—IV. *Jour. Stat. Plan. Inf.*

11.5 JAIN, J.P. and MALHOTRA, J.C.—Effectiveness of paternal sisters' and dam's records as supplement to progeny performance in dairy sire selection. *Ind. Jour. Anim. Sci.*

11.6 KUMAR, PRANESH, GUPTA, V.K. and NIGAM, A.K.—On inclusion probability proportional to size sampling scheme. *Jour. Stat. Plan. Inf.*

11.7 MEHROTRA, P.C., SRIVASTAVA, A.K. and Tyagi, K.K—on post stratification for cluster sampling. *Jour. Ind. Soc. Agri. Stat., Dec., 1984.*

11.8 NIGAM, A.K. and GUPTA, V.K.- Construction of orthogonal main effect plans using Hadamard matrices. *Technometrics.*

11.9 SAXENA, B.C., NARAIN, P. and SRIVASTAVA, A.K.—Robustness of Hartleys estimation for multiple frame survey. *Jour. Ind. Soc. Agri. Stat.*

11.10 (Miss) SHARDA and RANA, P.S—A discrete time queueing problem with S heterogeneous groups of channels. *Microelectronics and Reliability.*

11.11 (Miss) SHARDA and RANA, P.S.—A queueing problem with random memory arrivals and heterogenous servess. *Microelectronics and Reliability.*

11.12 SINGH, RANDHIR—Estimation from incomplete data in longitudinal surveys. *Jour of stat. Planning and Inference.*

11.13 SINGH, RANDHIR—Double sampling for two auxiliary characters. *Calcutta Statistical Association, Bulletin*

11.14 SOMAYAZULU, L.B.S. and AGARWAL, S.C.—Prediction of slaughter weights of pigs on the basis of early body weights. *Ind. Jour. Anim. Sci., March, 1985.*

11.15 SONI, P.N. and (Mrs.) RAJINDER KAUR—Cropping system for high productivity, *Journal of Indian Society of Agronomy, Vol. 29 (3).*

11.16 WAHI, S.D. and NADKARNI, U.G.—Optimum levels of grading in outbreeding programme. *Ind. Jour. Anim. Res., Vol. 18, No. 1, 1984.*

11.17 WAHI, S.D., SUMAN, C.L. and BHATTACHARJEE, S.K.—Studies of genetic distances in Gerbera Populations. *Ind. Jour. of Heridity, Vol. 15, 1984.*

12. ABSTRACTS OF PAPERS PUBLISHED BY THE SCIENTISTS OTHER THAN OF THIS INSTITUTE

During the quarter under report the following articles published in various journals were abstracted by the Scientists of this Institute whose names are given at the end of each abstract. The topics of the articles are broadly on (1) Sample Survey theory and applications, including good case studies, if any, (2) Design of Experiments (all aspects including combinatorial aspects), (3) Statistical Genetics, Plant and Animal Breeding (with sufficiently new statistical methodology), (4) Statistical inference, sequntial analysis and Stochastic Process with biological Applications, etc., (5) Econometrics and (6) Computer services and Numerical Analysis, etc.

12.1 Sample Survey :

12.1.1 DUFFY, JOHN C. and WATERTON, JENNIFER J.—Randomized Response Models for Estimating the Distribution Function of a Quantitative character. *International Statistical Review, (1984), 52, 2, pp. 165-171*

In the present paper the quantitative unrelated question model, the additive model and the multiplicative model have been discussed for the estimation of quantitative sensitive character. The one dimensional additive randomized response model is considered in some details. Simple formulae for the variances of the estimated distribution function under this model are developed for continuous and discrete random variables. The results of a simulation study to obtain the patterns of alcohol consumption are presented. A feasibility study of the additive randomized response technique was conducted on 54 adult males in Edinburgh during June, 1982 to determine whether the technique was suitable for the estimation of the distribution of alcohol consumption in a population. The standard quantities in which alcoholic beverages are sold were equated in

terms of their alcoholic contents. The randomized device used was a pack of cards on which exponential random numbers, rounded to nearest whole number, were printed, the mean of the exponential distribution was chosen to be equal to the mean weekly consumption of males as found from other surveys. The respondent was to tell the total of the number appearing on the card selected by him and his last week's consumption of alcohol. The pilot study revealed that a large proportion of respondents were unable to apply the method correctly without assistance due to complexity of calculating alcoholic intake, possibly for those drinking in unlicensed bars using bottles of varying sizes. The results of the pilot study suggest that the additive model may not be appropriate when the values of the sensitive attribute require calculations.

(D.L. AHUJA)

12.1.2 STEM (JR.), DONALD E. and STEINHORST, R. KIRK—Telephone Interview and Mail Questionnaire Applications of the Randomized Response Model. *JASA: Sept., 1984, Vol. 79, Number 387, pp. 555-564.*

The purpose of this article is to report the development and preliminary field testing of two new randomization devices. The first device combines a randomization device and telephone interviews and the second device is self-administered mail questionnaires. The advantages of both mail surveys and telephone interviews are that these are faster and less expensive while telephone interviews provide greater control over interviewer effects, the mail surveys eliminate this problem completely.

The randomization device for the telephone interview was respondents local telephone directory. The research specifies a page in the phone book. Using the phone numbers on this page, the respondent chooses a random starting point unknown to the interviewer and the least digit of the randomly selected telephone number—determines the type of the response.

For mail randomized response application a two-part spinner with a 6" × 9" Card containing a circle divided into eight white and eight grey areas (30% and 70%). White areas are divided into sections containing surrogate answers. The 2nd portion of the device is a disk with windows A, B and C. Window A is designed for discrete quantitative questions. Bipolar adjective or Likert questions are answered using window B. Window C is used for Yes/No answers to qualitative questions. Distributions were selected to be as close as possible to expected distributions for each question type.

To determine whether these adaptations of the RRM were practical for actual field use, three studies were conducted. The purpose of the survey sponsored by General Telephone of the North West was to determine the sensitivity of the questions pertaining to unauthorized telephone usage and to test the feasibility of the telephone RRM method and with the help of the results it was demonstrated that the technique is suitable for determining whether the question is sensitive or not and was at least partially successful in reducing the measurement error due to sensitivity. For Mail RRM techniques two studies were undertaken. For the first study to test the procedures the randomization devices and the respondent instructions, a convenient sample of students was selected and its topic was students' cheating behaviour. It is interesting to note, however that although the differences between RRM and DIR are not statistically significant, all estimates are in the predicted direction. In each case the acts of cheating behaviour are perceived as less dishonest by RRM group than by DIR group. The second last of the mail applications a response rate test conducted on automobile sales practices among salesmen in Washington. It was found that the direct questionnaire response rate was significantly lower and for the speed or return of the answere although the difference is not statistically significant, it is in the anticipated direction. For the mean number of items unanswered, the difference is not statistically significant but is however in the expected direction with DIR holding higher figure than RRM.

(D.L. AHUJA)

12.1.3 WATERTON, JENNIFER J. AND DUFFY, JOHN C.—Comparison of computer Interviewing Techniques and Traditional Methods in the Collection of Self Report Alcohol Consumption Data in a Field Survey. *International Statistical Review (1984) 52, 2, pp 173-182.*

In the present paper the results of a sample survey to obtain self-reported alcohol consumption data from adult males in Edinburgh are discussed. Over the last 20 years estimates of consumption inferred from self report survey data have typically under-estimated the amounts known to have been purchased by between 40% and 60% (Makela, 1971, Room, 1971; Peqanen, 1974). The aims of the study were to assess the feasibility of using computer interviewing techniques in a field survey of the general population and also to ascertain whether the computer interview method would show a significant increase in the reported consumption values when compared with direct interview.

The mean total consumption reported in the direct interviews was consistent with findings from other recent surveys of the demographic subgroups (Knight & Wilson, 1980; Kendale et al. 1982) The mean total consumption reported in the Computer interviews was some 30% higher, a difference which remained highly significant even after controlling for other variables known to affect consumption. The percentage increase for wine and spirits at 50% was greater than that for bear (25%). These results suggest that the bias of under reporting known to exist in survey measurement of alcohol consumption may be reduced by replacing the interviewer by a computer. Further studies are required to substantiate this preliminary findings, but the potential of the methodology has been demonstrated. The earlier methods like additive randomized response conducted in 1952, showed that although respondents were able to understand the confidentiality guaranteed by the method, they were not able to use the rather complicated conversion tables correctly by themselves. It is hoped that this study will stimulate interest in the use of computer interviewing techniques. This approach may be particularly appropriate for surveys of sensitive or threatening issues. Thus the computer may prove a worthwhile instrument for investigating not only alcohol conmsuption but also stigmatizing issues such as illicit drug use and criminal behaviour.

(D. L. AHUJA)

12.1.4 WOLTER, KIRK M.—An investigation of some estimators for systematic sampling. *Journal of the American Statistical Association, 79, No. 388, pp. 781-790, 1984.*

This article is devoted to give some guidance about the specific problem of estimating the design of variance for the systematic sampling mean. some theoretical and empirical properties of eight estimators of the variance of the sample mean are studied to gain some understanding of their range of applicability. The theoretical comparison are made using several super population modles while empirical comparisons are based on several real population. Recommendations are made about the appropriateness of the various estimators. Though the results apply primarily to survey of establishments and people, the properties of the estimators may be somewhat different in other applications.

(V. K. GUPTA)

12.2 Design of Experiments :

12.2.1 BAILEY, R. A., GOLDRAI, D.C. and HOLT, D.F.—Block designs with block size two. *Journal of Statistical Planning and Inference, 10, No. 2, pp. 257-63, Aug., 1984.*

The purpose of this article is to give algorithms for constructing binary block designs with block size two and replications and concurrences differing by at most one. The designs are resolvable and/or connected wherever the parameters permit.

(A. K. NIGAM)

12.2.2 HEDAYAT, A.S. and MAJUMDAR, DIBYEN—A-optimal incomplete block designs for control-test treatment comparisons. *Technometrics, 26, No. 4, pp. 363-370, 1984.*

The purpose of this article is to obtain optimal designs for comparing v test treatments with a control in b incomplete blocks of size k each. A-optimality is the most appealing criterion of efficiency as it minimizes the sum of variances of v control-test treatment contrasts. Many series of A-optimal designs when the parameters are in the range $2 \leqslant k \leqslant 8$, $k \leqslant v \leqslant 30$, and $v \leqslant b \leqslant 50$ are constructed. A-optimal designs for block size 2 are studied extensively through a combination of theoretical and numerical investigations. Tables of approximately A-optimal designs are given when A-optimal designs are not easily available for the case k=2.

(V.K. GUPTA)

12.2.3 NARAYANA REDDY, M. and RAMANATHA CHETTY, C.K—Staple land equivalent ratio for assessing yield advantage from intercropping. *Experimental Agriculture, Volume 20, No. 2, April, 1984*

Number of research scientists have reviewed the difficulties of assessing the yield advantages in intercropping practice and have developed some of the methods for their assessment. Willey (1979) defined the land equivalent ratio (LER), the total land area of sole crops required to achieve the same yield as the intercrops as the most satisfactory index since it is based on sound agronomic principles. The LER was defined as

$LER = L_i + L_j$

where L_i and L_j are the partial LERs representing the ratios of yield of crops i and j when grown as intercrops, relative to their yield in pure stands.

Mead and Willey (1980) pointed out that there is an inherent difficulty to use this index for identifying the suitable crop practice for a given proportion of partial LER of one of the crop to the total LER since it assumes that the harvest proportion of the two crops in each situation is exactly the one required and as such, to over come this difficulty they extended this concept to the 'effective land equivalent ratio' (ELER). But in the Indian agriculture, its use is further restricted particularly under the situation when the cultivator fixes the proportion of the yield of the staple crop in view of number of considerations like requirement for feed and income. Under such circumstances, the above two indices suggested cannot be used and the author in this paper has, therefore, suggested the concept of staple land equivalent ratio (SLER). This LER concept allows the interpretation of yield data from intercrop treatments based on the assumption of a basic requirement for a minimum supply of staple crop. The author has also established the mathematical relationship between the LER and SLER and has further illustrated their use in comparing the different intercropping practices under various situations through examples.

(RAJINDER KAUR)

12.2.4 SHARMA, H.C. and SHARMA, R.C.—An Alternative Approach for working out Fertilizer Needs of Crops based on the Soil Tests, *Jour. Ind. Soc. Agri. Stat., Vol. XXXV, No. 3, pp. 108-127.*

A modified approach for studying crop responses to the fertilizers in relation to soil tests, has been proposed. It consists of selecting the fields differing in native soil fertility. 4^3 confounded design in the three nutrients in blocks of 16 and 8 plots are suggested. The design with 16 plots has utilised soil variation between as well as within blocks while the other design uses soil variation between blocks only. The quadratic model for working out the economic doses of the fertilizer nutrients on the basis of soil test values and improved technique for estimating the contributions and efficiencies of the nutrients from soil and fertilizer sources are described. The proposed methodology has been illustrated by actual data from a 4^3 confounded experiment.

(H.C. JAIN)

12.3 Statistical Genetics, Plant and Animal Breeding :

12.3.1 ARAKI, C.T., NAKAMURA, R.M., KAM, L.W.G., and CLARKE, N.—Effect of lactation on diurnal temperature patterns of dairy cattle in hot environments. *J. Dairy Sci. : 67(8), pp. 1752-1760, 1984.*

By radio telemetry, diurnal temperature patterns of dairy cattle in various stages of lactation were studied under natural conditions to ascertain the effects of environment and management on these patterns. The

experimental animals were divided into three groups with five animals per group : (1) cows in early lactation, less than 100 days post partum. (2) cows in late lactation, greater than 240 days postpartum and (3) dry cows. Vaginal temperatures of all the experimental cows, monitored every 15 min. for 17 days, were considered alongwith the corresponding enviornmental data including dry bulb, wet bulb and black globe temperatures. Analysis of variance showed no significant difference in daily mean temperature between early and late lactating groups. However, differences were significant between each lactating group and dry cows, the difference being more pronounced on hotter days. Daily mean vaginal temperatures of cows in early lactation were correlated with daily mean dry bulb and black globe temperatures, as well as with relative humidity. Comparison of group temperature patterns isolated the differences to specific times of the day. In groups with early and late lactations temperatures were lower in either group after milking. The overall conclusions from the study are (1) the diurnal temperature patterns differed among groups, (2) lactating cows are sensitive to environmental changes and (3) animal management can effect patterns of animal temperature.

(V.T. PRABHAKARAN)

12.3.2 HAY, G.M. ; WHITE, J.M., VINSON, W.E. AND KLIEWER, R.H.—Components of Genetic variation for Descriptive Type Traits of Holsteins. *J. Dairy Sci., 66 : pp. 1962-66, 1983.*

Although estimates of additive variation for descriptive traits in dairy cattle are common in the literature, no evidence of non-additive source of variation was found. Hey et al (1983) showed that the non-additive genetic effects of many of the descriptive traits can be utilized to maximize the frequency of desirable codes in the progeny through the use of specific matings (corrective mating) where goal is improvement of individual traits.

In the present study the data on scores of 12 descriptive type traits i.e. final score, stature, head, front end, back rump, hind legs, feet, fore udder, rear udder, udder support and teats on 298, 875 registered Holstein cows and their dams were used. The covariance among cow-dam pairs, full sisters, paternal half-sisters and maternal half sisters were used to estimate the component of variation for the 12 traits. Heritabilities from sire components of variance ranged from 0.39 for final score to 0.26 for hind

legs with all traits except final score and stature less than 0.25. Dominance effects ranged from 2 to 6 times as great as additive variation whereas additive maternal effects were similar to additive direct effects. Effects due to additive direct and additive maternal covariance effects were small but consistently negative. This indicated a generally small but consistently negative relationship between additive effects of genes directly effecting the trait in the offspring and additive effects of genes for maternal performance.

(S.D. WAHI)

12.3.3 MCNUTT, S.D. AND EWAN, R.C.—Energy utilization of weanling pigs raised under pen conditions. *Journal of Animal Science, Vol. 59, No. 3, September, 1984, pp. 738-45.*

The objective of this study was to evaluate the utilization of metabolization energy (ME) for maintenance and growth by pigs in groups in a pen situation and to compare the utilization of ME by pigs housed in groups. Two comparative slaughter experiments were conducted to evaluate the energy utilization of weaning pigs raised in groups under pen conditions.

In trial 1, four repplications of four littermate groups of four crossbred pigs, averaging 5.4 kg at 29 days, were used in a randomised block design. The pigs were fed either ad libitum during the two daily feedings or 80, 60 or 40% of the intake per kg of body weight of the 100% intake group. After 28 days, two pigs per pen were killed for further analysis. It was observed that the efficiency of diatry energy and nitrogen utilization for carcass energy and nitrogen gains quadratically increased ($P<.01$) with increasing feed intake.

In trial 2, four littermate groups of six crossbred pigs, averaging 5.0 kg at 30 days, were used. The experiment was a splitplot design with the main plot being two pen types and the subplot being 3 feeding levels. The feed intake levels were 2, 3.5 or 5% of their body weight per day. At the end of 28 days experiment, all pigs were killed for body composition determinations. The efficiency of ME and digestible nitrogen (DN) utilization for carcass energy and nitrogen gains quadratically increased ($P<.01$) with increasing the level of intake. When compared with the individually caged pigs, the grouped pigs showed lower apparent digestibility of energy ($P<.05$) but improved efficiency ($P<.05$) of ME and DN utilization for carcass energy and Nitrogen gains.

(T.B. JAIN)

12.3.4 PARMAR, O.S. AND DEV, DALBIR SINGH—Additive and non-additive genetic effects for some economic traits in Holstein Friesian x Sahiwal crosses. *Ind. J. Dairy Sci., 31 (4) : pp. 316-320 (1978).*

Much of the earlier work is mainly related with the production and comparisons of grades with different levels of exotic inheritance with the main objective of bringing about the improvement by utilizing additive genetic effects, and there is very little information about the magnitude of non-additive genetic effects and as such their significance in crossbreeding programmes has not been realised. Here an attempt has been made to study the same. The statistical model suggested by Parekh, 1973 was assumed for the analysis, and the data of 106 cows of purebred Sahiwal and 727 cows of different grades of Holstein Friesian x Sahiwal crosses at six Military Dairy Farms of Northern India were analysed to estimate the magnitude of additive and non additive genetic effects for different economic traits. The estimates of heterosis were :—10.9% for age at first calving, 18.2% for 305-day first lactation milk yield, 30.58% for the milk yield per day of first calving interval, — 33.5% for the first dry period and 28% for the overall economic merit. The heterosis estimates for first lactation length and weight at first calving were very small viz. —0.7% and 6.4% respectively.

The maximum heterotic effect (33.50%) was observed for dry period which indicated that the superior reproductive efficiency of the crossbred cows may be largely due to the favourable heterozygotic combinations of genes from the local and the exotic breeds. Further, on account of the favourable heterosis for milk yield (18.20%) and age at freshening (—10.9%) the heterosis for overall economic value amounts to about 28% in the present investigation.

(RAVINDRA KUMAR JAIN)

12.3.5 RENGANATHAN, P., THIAGASUNDARAM, T.S., AYYAGARI, V., JOHARI, D.C., MOHAPATRA, S.C., CHOUDHURI, D. AND PANDA, B.K.—Efficiency of index selection with clutch size as a component *Indian J. Anim. Sci, 53 (8) : pp. 872—879, 1983.*

Clutch size is one of the very important components of egg production and has a high positive genetic correlation with egg production. This study was an attempt to evaluate the importance of clutch size as a supplementary trait along with other egg-production traits in a multi-trait index. The performance records of 2144 single-combed White Leghorn pullets, progeny of 512 dams and 136 sires belonging to four strains

were analysed. The traits considered were average clutch size, age at sexual maturity, egg production upto 280 days of age, egg weight during 38 to 40 weeks of age and egg mass upto 280 days of age. Since preliminary analysis revealed significant differences among hatches, data were corrected for hatch effects by Harveys' technique of fitting least-square constants. The heritability for average clutch size was 0.175± 0.041. The genetic correlations of clutch size with egg number, egg mass, egg weight and age at sexual maturity were 0.635, 0.530, −0.008 & 0.093 respectively. Nine selection indices were constructed utilizing clutch size, egg number, egg weight, age at sexual maturity and egg mass in different combinations. Pooled estimates of genetic & phenotypic variances and covariances were utilized for the construction of indices. The relative economic weights were calculated based on a priori consideration of farm profit.

The most efficient index was the one which included clutch size along with egg number, egg weight and age at sexual maturity based on the relative efficiency, aggregate genetic economic gain and net efficiency of the indices. Omission of clutch size reduced the net efficiency of the index by about 15 to 20%. Direct selection for clutch size was 18.6% less efficient than direct selection for egg number. Index selection including all the traits was more efficient than direct for egg number, clutch size, egg weight and age at sexual maturity. Whenever clutch size was included as a supplementary trait along with egg number, egg weight and age at sexual maturity in an index, the expected genetic gain in egg number improved to a considerable extent.

(J.C. MALHOTRA)

12.3.6 SAWAYA, W.N., SAFI, W.J., AL-SHALHAT, A.F. and AL-MOHAMMAD, M.M.—Chemical composition and Nutritive value of goat milk. *Journal of Dairy Science, Vol. 67, No. 8, August, 1984, pp. 1655-1659.*

In this article an attempt has been made to determine the chemical composition and nutritive value of goat milk through various samples collected from randomly of indigenous Aardi and Masri breed from the regions of the kingdom of Saudi Arabia. Various characteristics like pH, acidity, total solids, lactose, fat, crude protein, etc. were determined as per standard methods of analysis. The milk analyses of these breeds were compared with one another and with cow's milk analyses for these characters reported by other workers. The results indicated that Masri goat milk is slightly richer in protein and fat than Aardi milk. With regard to other constituents, they did not differ materially. Both the breeds

were slightly lower in their constituents as compared to most other goat milk in other parts of the world. The relatively lower milk constituents may be due to harsh environment under which the animals are maintained. Total fatty acids in Masri milk are almost twice that of the Aardi breed. Goat milk of both the breeds was richer in fatty acids than cows milk. No major differences in amino acids compositions were found. The higher value of protein efficiency ratio of Aardi milk was due to higher sulphur content. The In Vitro Protein Digestibility for Aardi and Masri (86.2 and 87.0 per cent respectively) was less than that of cow's milk This finding agrees with the observations of Jenness *et al* (1980).

(G. C. CHAWLA)

12.4 Statistical Inference, Sequential Analysis and Stochastic Processes with biological applications :

12.4.1 DORAN, HOWARD E.—Evaluating Quadratic Forms of the Matrix $(XX)^{-1}$ in a Regression Analysis, With Applications. *Applied Statistics (1984), Series C., 33, No. 2, pp. 141 - 144*

The usual procedure of computing the error variances at the r points Z_j (j=1, 2,....., r), where Z_j is a 1xk row vector of observations on k predictor variables, involves the evaluation of the quadratic form $Z_j (XX)^{-1} Z_j$ which is more combersom. Salkever (1976) had devised a simple procedure for estimating the parameters of the model $Y=X\beta+\mu$, by the least square technique alongwith the computations of predictions at Z_js and prediction error variances simultaneously. However, several areas of regression analysis involve the evaluation of quadratic forms of the matrix $(XX)^{-1}$. This paper deals with the applications of Salkever's technique for computing the quadratic forms needed in several areas of regression analysis. The technique of Salkever has been used in this paper for (i) evaluating the effect of multicollinearity, (ii) estimating or testing linear combination of parameters, (iii) computation of hat matrix defined by $H=X(XX)^{-1} X$ and for computation of index of efficiency loss from omitted observation x. This index is defined by $x (XX)^{-1} x$.

(CHANDRAHAS)

14.4.2 CHANG, WEI-CHIEN—On using principal components before separating a mixture of two multi-variate normal distributions. *Applied Statistics : 32, No. 3, pp. 267-275 (1983).*

In using principal components to reduce the dimension before clustering, it has always been the practice to select the components with the larger eigen values. This has been disapproved mathematically and by

use of hypothetical and real data in the present paper. A relationship between the distance of the two sub populations and any subset of principal components is derived, showing that the component with larger eigen values do not necessarily contain more information.

(R.C. JAIN)

12.5 Econometrics :

12.5.1 FEDER, GERSHON and SLADE, ROGER—The Acquisition of information and the adoption of New Technology; *American Journal of Agricultural Economics, Vol. 66, No. 3, Aug., 1984, pp. 312-320.*

This paper presents a dynamic model of diffusion of a new technology involving a variable input. The model highlights the role of information accumulation and distinguishes between active gathering of information, which entails costs, and passive information acquisition, which takes place in an autonomous manner.

The model generates a number of hypothesis regarding the likely pattern of adoption and the use of variable input over time by farmers of different holdings, different access to information and different human capital endowments. Results show that during the initial phase of diffusion large farmers are likely to allocate more resources to the acquisition of information and will therefore possess higher level of cumulative information at any given period. The analysis suggests that a certain critical level of cumulative information must be attained before adoption of a new variable input takes place. Therefore large farmers, farmers with better access to information, or farmers with more human capital will adopt earlier than other farmers. Once adopted, the quantity applied may increase over time upto some ceiling level, or it may remain constant, depending on the relationship between the critical level of knowledge for adoption and the level of information at which the marginal contribution of additional information becomes negligible.

This paper presents a formal decision model involving a new technology represented by a new input and explicitly incorporates the decision to acquire information. Unlike earlier works which have focused on a discrete innovation, or which have dealt only with the level of use of new inputs, the present discussion addresses both the issues of nonadoption and the intensity of use once adoption takes place. In the first section, the model and its implications are discussed and in the second section, a review of some empirical evidence, drawn from a recent farm sample survey in India, have been presented.

(ASHOK KUMAR)

12.5.2 SOETE, LUC and TURNER, ROY—Technology Diffusion and the rate of Technical Change. *The Economic Journal, 94 (September, 1984), pp. 612-623.*

The purpose of this paper has been to try to deduce from the readily under standable concept of technical progress at the micro economic level i.e. the adoption and diffusion of new technologies, the more nebulous concept of the rate of technological progress. What the model has shown is that there are two contributions to this rate, one is the weighted average of the micro 'disembodied' technical progress, whilst the second represents the contribution of the diffusion of innovations. The second contribution has been found to be a function of the distribution of the rates of return of the different technologies in use.

The authors have tried to establish a formal link between the micro concept of technology diffusion and the rate of technical progress. In section one, the micro economic model alongwith the relevent definitions and in the second section a new investment function which attempts to model some of the 'lag' features have been discussed. In section third, attempts have been made to define a rate of technical change and shows that with this definition, the model relates the rate of technical change to the spread of rates of return in the economy.

(ASHOK KUMAR)

12.5.3 YAMAGUCHI, MITOSHI and KENNEDY, GEORGE—A Graphic Model of the Effects of Sectoral Technical Changes. The case of Japan 1880-1970. *Canadian Journal of Agricultural Economics, Vol. 32, No. 1 (March, 1984). pp. 71-89.*

This paper combined growth accounting with a two-sector model to measure the effects of agricultural and non-agricultural technical change on sactoral resource use and output growth in Japan over the period 1880-1970. It provides a graphic model to explain the process by which agricultural resources are pushed and pulled to the non-agricultural sector by agricultural and non-agricultural technical change.

The main objectives of this study are : to measure and explain the the effects of technical change on sectoral output growth and resource transfers in Japan since 1980, and to provide a graphic version of the two-sector growth accounting model to explain the process by which technical change pushes and pulls agricultural resources and effects factors of demand. Two general types of approaches have been used to study

Japan's economic development. One is conventional growth accounting, the other involves the use of two sector models. The results of the study can be summarized as follows : Regarding agricultural output growth in Japan, the contribution of non-agricultural technical change, although small, was negative, given that it draws resources from the agricultural to the non-agricultural. Regarding non-agricultural output growth, the contribution of agricultural technology was small, but unlike the contribution of non-agricultural technical change to agricultural output growth, it was positive, given that it pushes resources from the agricultural to the non-agricultural sector.

(ASHOK KUMAR)

12.6 Computer Service and Numerical Analysis :

12.6.1 EL SAYED NOOR, A.—A Framework for the Creation and Management of national Computing Strategies in Developing Countries. *The Computer Journal, August, 1984, Vol 27, No.3, pp. 193-200.*

This paper suggests a frame work for the promotion of effective computing policies, practices, procedures, uses and applications in developing countries Such a framework characterises the main features of an overall strategy that should be helpful in narrowing the gap between developed and developing countries on the effective use of limited computing resources. Rurthermore, the conditions and requirements necessary for the framework to work are explained.

This paper outlines a triangular strategy for computing in developing countries. At the peak of the traingle is the computing council which should assume a strategic role in the national improvement of computing resources and their use. Schools of computing sciences and the National Computing Centre are the two major pillars upon which implementation of strategies would take place. Schools of computing sciences should create a healthy environment of computing education and research in an integrated and coordinated manner on the basis of priorties and resources allocated by the computing council. The National Computing centre should strengthen the computing contribution to the government, business and industrial sectors of the economy and to the society.

(S.L. GARG)

The probability densities of both $\alpha X - \beta Y$ and $\alpha X + \beta Y$; where X and Y are dependent F-variates with specified degrees of freedom and for α, $\beta > 0$ have been derived and used to obtain the expressions for theoretical probabilities of inadmissible estimates of heritability.

Algebraic expressions for probabilities of both negative and positive inadmissible estimates from intra-sire regression as well as half-sib and full-sib analyses have been derived. In certain cases, where the expressions for exact probabilities are too involved computationally, simpler formulae giving close approximations to the true probabilities have been obtained, following Satterthwaite (1946). The evaluation of these probabilities has been done with respect to different combinations of sire(s), dams (d) and non-additivity coefficients (c_1, c_2) for three levels of true heritability namely, 0.10, 0.25 and 0.50. In the light of the results obtained, the intra-sire regression based on atleast 1200 pairs of observations has been recommended in the estimation of heritability of a trait, governed by genes which are additive in nature. But when either σ^2_{AA} is large or large maternal effects are suspected, heritability will be obtained from half-sib correlation, preferably based on half-sib analysis with atleast 800 observations.

The required sample size for a particular design may, at times, be beyond the resources of the experimenter. For such situations, a number of procedures of obtaining improved estimates have been described and illustrated with data on egg production in poultry. A logistic transformation estimator with exponential correction has been developed which has been shown to give more reliable estimates of heritability and is, therefore, recommended for wider use, when *a priori* information on the range of heritability is known.

(Guide : Dr. J.P. JAIN)

13.1.3 SINHA, A.C.—Estimation of Domain Parameters.

The objective of this study is the estimation of domain parameters. Domains are subgroups of population whose frequency (n_i) i.e., the number of individuals of the i-th domain in a random sample of size n from N, is a random variable. Since the frame of population domain size N_i is not available, a simple random sample without replacement is drawn from N whereby N_i becomes random variables. Estimators for situations when N_i is known but frame is not available, or when N_i is unknown, etc., have been developed. Sampling efficiency and the cost efficiency of the estimators when Y_{N_i} (N_i known) as compared with Y_{N_i} (N_i unknown) has also been developed.

When the population domain size (N_i) is unknown an important and useful estimator of N_i based on ratio method approach and which may at times before precise then the usual estimator of N_i based on mean per unit has been developed.

The problems of estimation of domain parameters for population consisting of clusters of units and multistage sampling units has been discussed. Such situations arise in the estimation of yield and area of any particular vegetable which is domain of interest in our case as also the number of cultivators growing that particular vegetable where villages and cultivators growing vegetable crops may comprise primary sampling units and s.s.u.s. respectively.

(Guide : Dr. O. P. KATHURIA)

13.2 M.Sc.

13.2.1 SINGH, N.K.—On the use of incomplete frames in sample survey.

The existence of a frame is the pre-requisite for designing any sampling inquiry or census. The quality of frame not only provides a basis for choosing the appropriate sampling designs but also affects the ultimate results obtained. However, the existence of an accurate frame is very rare and generally all the frames are subject to various shortcomings. The incompleteness of the frame is one of the most common defects of almost all frames, mainly due to the dynamic nature of the populations. SEAL (1962), HANSEN, HURWITZ and JABINE (1964) etc., have suggested various procedures to deal with the problem of incomplete frames.

In present investigation the use of incomplete frame has been discussed for estimating the proportion of units belonging to a particular class as well as the population mean for a quantitative character for that class.

The case of incompleteness has been considered arising due to omission of some of the units from the frame and also frame containing some extra units i.e. units which no more belong to the target population. A separate frame is assumed to be available for all those units which are not listed in the old frame. An appropriate estimator for population total is proposed with its variance and estimate of variance when sampling is done from the two frames. The optimum sample sizes to be selected is also discussed under suitable cost function.

Again incompleteness arising due to qualitative change of the units from one class to another is also considered. Suitable estimators for the proportion of unit belonging to a particular class and also population total for a character of the class have been proposed with their variance and estimate of the variances. Optimum sample size to be selected is also determined under suitable cost function with its optimum variance.

(Guide : Dr. RANDHIR SINGH)

14. ABSTRACTS OF SEMINAR TALKS

During the quarter under review, 17 seminar talks were delivered by the Scientists/Staff/Students of the Institute on various topics of interest in the field of Agricultural Statistics and allied disciplines. The abstracts of seminar talks are given below I

14.1 Seminar Talks delivered by the Ph. D. Students :

14.1.1 Agricultural Statistics :

SREENATH, P.R. – On some methods of construction of a symmetrical factorial Designs

The analysis of single replicated asymmetrical factorial experiment in incomplete blocks becomes complicated. The concept of balance was, therefore, introduced and these design required several replications. Some of the reported designs also suffered due to lack of independence of interaction contrasts. There was also necessity to obtain a general method of analysis. A method similar to the analysis of non-orthogonal data with reparameterised treatments was suggested. Sreenath (1962) has given the methods without the restriction on the co-efficients of treatments combinations to be $+1, 0$ and -1. The method also enables to check for the independent estimability of affected interaction of effects. Sardana and Das (1965) while points out that some of these designs available in the literature do not satisfy the condition of providing mutually independent estimates of all affected interaction effects have given alternative method of construction of designs p x 3 x 2 in 6 plot blocks, extended to the case of p x c x k in qk plots, where $p>q>k$. In order to reduce the number of replications required for balance, efforts were made to obtain these design which are not balanced but easily analysable by making use of BIB, PBIB

and other incomplete block designs. Designs q x 2^n in b and b-half replications, where b is the number of blocks in the BIB/PBIB design; in 2 replications when q is even ; in 2^{n-p+1} blocks of (q+1) x 2^p plots each; Designs q x 3^n in b, b ($\frac{1}{3}$), 2b ($\frac{1}{3}$) replications ; in 2 x 3^{n-p} blocks of 3k x 3^p plots where 3 (k −1) $< v \leqslant 3k$ have been reported by Sreenath (1965, 1967, 1971), Sardana and Sreenath (1965), Sreenath and Sardana (1967). Das and Rao (1967) gave methods of construction of the designs 3^n x 2^m based on confounded asymmetrical factorial designs with factors at 2 levels. The above referred methods were discussed.

14.1.2 **Agricultural Economics** :

(i) MARAWAR, S.S. : Regional Disparities in Agricultural Productivity : An Outcome of Biased Infrastructure : A Case Study.

Infrastructure plays an important role in agricultural developme t. In fact, the farmers of a region with adequate infrastructural facilities may be in better position to utilise their limited land resources than those of a region where necessary infrastructure is inadequate. The increasing role of infrastructure in agricultural development specially after the introduction of high yielding variety (H.Y.V.) technology in 1966 deserves special attention.

The present study examines the extent of inter-regional disparities in agricultural infrastructure in Allahabad district. An attempt has also been made to study the direct and indirect role of infrastructure in determining the level of agricultural productivity of the district.

Inter-tehsil variations in the level of agricultural infrastructure have been examined. This called for selection of indicators of agricultural infrastructure and thereafter determination of composite index of infrastructure based on selected indicators. The indicators are :

(1) percentage of net irrigated area to net area sown.
(2) percentage of area under commercial crops to gross cropped area.
(3) percentage of villages within a radius of 3 km. from Pukka roads.
(4) percentage of villages electrified to total number of villages.
(5) percentage of villages within the radius of 3 km. from primary agricultural credit coop. societies.
(6) percentage of villages within the radius of 3 km. from marketing centres.
(7) percentage of villages within the radius of 3 km. from senior basic schools.

The present study reveals that the existence of inter-regional differences in the level of infrastructural facilities in Allahabad. Trans Ganga and Doab regions are sufficiently endowed within the infrastructural facilities whereas these are mostly lacking in the trans Yamuna region. The same pattern of inter regional difference in the use of new agricultural practices and level of productivity is also indicated. It is found that the availability of infrastructure induces the farmers to go in for extensive use or new agricultural practices.

To sum up, infrastructure contributes a lot to modern agriculture and therefore, a suitable policy for infrastructure with a rural bias is needed for agriculturally backward regions.

(ii) PAL, SURESH : Sources of Variation in Agricultural Productivity.

Three basic problems of agriculture (i) the limited response of output to the additional use of known and measured inputs; (ii) the wide disparity in the level of output per unit of inputs in the different region of the economy and (iii) the variation in output from year to year, have been analysed by using the production function based on cross-section and time series data. It was found that a small proportion of the variation in output is explained by measured inputs. Decomposing the large residuals into regional effects and temporal effects-95 per cent of the variance of the total disturbances was attributed to the regional effect. Regional effects were dependent on productivity level whereas temporal effects were found to be independent to productivity level. The cyclical pattern of the temporal effects followed the broad climatic pattern experienced in India during the decade.

(iii) RAVI, P.C. :-Seasonal variation in prices of foodgrains.

Seasonal variation is one of the four components of economic time series data. Other three are secular trend, cyclical variation and random or irregular variation. A composite economic time series data may be expressed symbolically as

$$O = T \times S \times C \times I$$

The purpose of statistical analysis of economic time series are :

1. To discover and measure any regularities which characterise the movement of the variation through time.
2. To make predictions which help planning and decision making for the future.

The study of measurement of seasonal pattern constitute a very important part in agricultural price analysis. The price of the comodity in a market at a specified time depends upon the stock available and the effective demand for it at that time. Food grains being annual crops, their seasonal nature of production results in uneven distribution of supplies in the year with the result the prices oscillate considerably between seasons. The study of seasonal variations in foodgrains prices will be helpful so that the instruments of price policy can be adequately used to reduce the intra and inter-seasonal price variations to the minimum. A number of methods are used to analyse the seasonal variations. However, the most commonly used method is the ratio to moving averages. Several studies are available on structure and pattern of seasonal movements in arrivals and prices af foodgrains. These studies reveal that seasonal variation in prices is a regularly repeating pattern indicating that prices tend to decline in the immediate post harvest period and rise much higher than normal in the off season. This shows the need for a strong market structure and timely intervention of the Govt. agencies to evenout the inter-seasonal price fluctuations.

14.1.3 **Agricultural Engineering :**

SHARMA, R.K. : Probability and cost-benefit analyses for the optimum use of irrigation water.

Potential and actual evapotranspiration follows some type of probability distribution which can be estimated by using several years of data. By using a probability distribution of accumulated actual evapotranspiration for different durations (1,2,3, ...30 days) and readily available soil moisture for particular soil crop combinations, all possible irrigation frequencies can be determined. A methodology is presented for obtaining the most economical irrigation, frequency by using a marginal cost and benefit analyses of alternative irrigation system components applying different amounts of water. Farm water requirement for peak use and the timing of peak use can be estimated according to cropping patterns, soil-water climate systems and overall irrigation efficiency.

14.2 **Seminar Talks delivered by the M.Sc. Students :**

14.2.1 **Agricultural Statistics :**

(i) AGARWAL, R.C. : The problem of non-response in sample surveys.

The mail questionnaire is used in a number of surveys because of the economics involved. The principal objection to this method of collecting

factual information is that it generally involves a large non-response rate, and an unknown bias is involved in any assumption that those responding are representative of combined total of respondents and non-respondents.

Personal interviews generally elicit a substantially complete response, but the cost per schedule is, of course, considerably higher than it would be for mail questionnaire method. The purpose of this paper is to indicate a technique which combines the advantages of both procedures.

The principal followed is to mail schedules in excess of the number expected to be returned and to follow up by enumerating a sample of those that do not respond to the mail convass. Under reasonable assumptions as to the relative costs of the two methods of convass, an allocation of the sample can be made to mail and field convasses. An illustration is given to show for a given degree of reliability the varying sizes of mailing list for different expected response rates, and the rate of field follow-up on the non-response. For each response rate, the minimum cost of the survey is computed; from this computation, it is possible to determine the maximum number of schedules to be mailed independent of the rate of response. Then to achieve the desired precision the number to be interviewed would vary with the response rate actually found.

(ii) BHAVANI, P.L. : Ratio and Regression Estimators

This is a review of recent work on some of the wholly unbiased or approximately unbiased ratio estimators and also on some unbiased regression estimators. Some new empirical results on the performances of these estimators, using several sets of livedata which represent a wide variety of populations is also given. Attention is given to small and moderate samples since these are the cases in which freedom for bias is important.

(iii) CHANDER, SUBHASH ; Chain Ratio Estimator

This is a review of recent work on the chain ratio estimator and its modified form. It is commonly used in crop surveys, consists in obtaining the overall ratio estimators by considering ratio estimators based on different stages of survey. It is compared with unbiased estimator with respect to its efficiency. Alongwith its comparison is done with the usual ratio estimator in two stage sampling with respect to bias and mean square error. Also a modified chain ratio estimator is proposed. With the help of an example it has been shown that the gain in efficiency of the modified chain ratio estimator over the usual ratio estimator comes out to be substantial.

(iv) GARG, PANKAJ...Sampling with inclusion probabilities proportional to size.

Most sampling procedures with inclusion probabilities proportional to size are available only for samples of size two. For some of the procedures with sample sizes more than two only asymptotic variances are commonly provided. A sample technique for inclusion probability proportional to size is presented which permits a considerable degree of flexibility and is simple to execute.

Table : Relative efficiencies of Brewer—Ruewein Sampford and Rao Hartley—Cochran (RHC), schemes compared with the method presented.

Population	1	2	3	4	5	6	7	8	9	10
N	20	20	49	10	10	4	4	4	25	43
BDS	1.003	0.892	0.986	0.921	1.052	0.827	0.827	1.122	0.980	1.022
RHC	1.056	0.919	1.002	0.922	1.058	0.700	0.700	0.800	1.008	1.019
Population	11	12	13	14	15	16	17	18	19	
N	25	20	34	20	10	20	20	4	35	
BDS	1.057	0 901	1.034	1.078	0.964	0.931	1.018	0.827	1.011	
RHC	1.042	0.899	0.990	1.055	0.966	0.916	1.050	0.700	0.998	

(V) KANNAPAN, K.T. : ..An Estimator using auxiliary information in Sample Surveys.

In sample surveys it is as usual practice to make use of auxiliary information to increase the precision of estimators when the correlation between the character under study (Y) and the auxiliary variable (x) is positive, ratio estimator is used. If this correlation is negative, a product estimator instead of a ratio estimator may be used.

Sh. S.K. Srivastava has considered an estimator of the form

form $\bar{Y}\alpha = \bar{y}\left[\frac{\bar{x}}{\bar{x}}\right]^{\alpha}$

where α is a good guess of $-\rho\frac{C_y}{C_x}$

The variance and bias of this estimator is compared with that of the ratio, product and mean per unit estimators, when information on many auxiliary variables is available a corresponding multivariate estimator of the above form is compared with Olkin's multivariate ratio estimator.

(vi) KUMAR, ATUL : Use of Principal Components in Regression

The use of principal components in regression has received a lot of attention in the literature in past few years, but along with the use of principal component regression there appears to have been a growth of misconception that the principal component with small eigen values will very rarely be of any use in regression. The aim of this paper is to demonstrate that these components can be as important as those with large variance. This can be illustrated with examples.

The example are given by (i), Smith and Campbell (1980), (ii) Kung and Sharif (1980) and (iii) Hill-et al (1977). These example Shows that a strategy which rejects low variance components will give poor predictions.

(vii) NAGAR, V.C. :—Application of Discriminant Function in Plant Selection.

The problem of discriminant function in plant selection differs from ordinary problem. The genetic advance in the material selected by two methods viz. discriminant function method involving yield components only and straight selection based on yield have been compared. It has been shown that discriminant function model is advantagenous over straight selection only if such characters are included in the account.

(viii) NAGAR, V.C. :—Comparative study of different methods of indexing sires.

We will discuss the 11 different methods of indexing dairy sires and also relative efficiency of different methods of indexing sires. Two of these 11 indices use information on daughters production only. Records of daughters and their dams are utilised in 3 other indices whereas the remaining 6 indices use information on daughters and their co-htemporaries with or without records of their dams.

Exact variance expression are derived for 8 of the above said 11 indices. These expression are rather involved to permit direct comparison of

their relative efficiencies, however meaningful comparison can be made possible for a systematic plan of progeny testing in which a fixed number of females at random are tested at a time.

The superiority of index

$A + \frac{1}{2} h^2 Q / (\bar{D}\text{-}CD) - b (\bar{M}\text{-}CM) /$

over other is established both from the consideration of logic and efficiency and from its variance expression. This index adjusts the daughters average for the differences in the production level of dams alloted to different sires, number of daughters available for testing as also for the variation in environmental conditions from period to period.

(ix) SHANKAR, RAVI K. ---Genotypic equilibrium with varying percentage of self-fertilization and cross fertilization.

In breeding of some crops, self-fertilization as well as cross-fertilization is required. Such genetic situation arising in population genetics was considered by Garber in 1951. He has obtained the genotypic frequency in n-th generation and deduced that for the population in equilibrium. This was studied for one autosomal gene-pair. GHAI generalised this for K-loci and obtained mean and variances.

In this seminar, studies made on one autosomal gene-pair was discussed.

(x) SHARMA, RAJIV : The Precision of Unbiased Ratio-Type Estimators

When each unit in a population of N units consists of an x and y measurement, where the population mean $\bar{x}$ of the x's is known, then the population mean $\bar{y}$ of y's is frequently estimated by drawing a random sample of n units and using one of the customary biased ratio type estimators, $\hat{y}$ (based on the ratio of the y sample mean and the x sample mean), or $\hat{y}$ (based on the sample mean of the ratios of the y and x measurement for each unit). The precision of these estimators is compared with an exact formula derived here when ($N < cn$) for the var. of an unbiased ratio type estimator y', a modification of $\hat{y}$ and $\hat{y}$. It is also shown that Variance (y') < Variance ($\hat{y}$) (When $n \to \infty$) if and only if the slope of the population regression line of y on x is closer to the population mean of the ratios of the y and x measurements for each unit than to $\bar{y}/\bar{x}$. Some numerical examples are presented to illustrate the comparison of the estimators.

(xi) Singh, Jaibir :— Controlled Simple Random Sampling

When units are drawn one after another with equal probabilities and without replacement from a finite populations it is well known that all possible samples of a given size and equally likely to materialise. As such the sampling procedure may result in the selection of a sample which is not quite desirable from the point of view of characteristic under study. Hence, comes the need of exercising control over the selection of non-preferred samples. A suitable sampling methodology has to be developed which reduces the risk of getting a non-preferred sample from the population to the minimum possible extent and yet conforming to the fundamental principles of random sampling procedures. The authors in the paper have attempted to develop a random sampling scheme by means of which the probability of selection of non-preferred samples can be reduced to the minimum possible extent without affecting the precision of the estimate of the parameter under consideration.

(xii) Yadav, P.P. :—A Representation of a matrix and its use in the Gauss-Mark off Model'

This paper investigates the unified approach of least squares given by Prof. Rao (1973) and a least squares method given by Khatri (1968). The latter method is investigated by a new technique which unifies and eliminates the defect indicated by Rao (1973). This has been achieved by establishing the result.

$\underset{\sim}{S}_1 = \underset{\sim}{S} + \underset{\sim}{B}\, K\, \underset{\sim}{S}^* = \underset{\sim}{S}\, \underset{\sim}{B}O\ (BO^*\ SBO) - B^*OS_1 + \underset{\sim}{B}\ (\underset{\sim}{B}^*\underset{\sim}{S}_1\underset{\sim}{B}) - B^*$ where $R(S_1) = R(\underset{\sim}{S}\,\underset{\sim}{B})$ $\underset{\sim}{S}$ is nxn p.s.d. matrix $\underset{\sim}{B}O^*\underset{\sim}{B} = Q$ and $R\ (\underset{\sim}{B}, \underset{\sim}{B}O) = n$, Here B^* and $\underset{\sim}{S}_1$ are conjugate transpose of B and g —inverse of S_1 respectively.

In addition to the above Seminar talks the following seminar talk delivered by distinguished Visitor during the quarter ending December 14.

Prof. A.R.Roy, Former Head of the Deptt. of Statistics Lucknow University.
'Some aspects of frequency chi Square.'

15. PAPERS PRESENTED AT INTER-ORGANISATIONAL SEMINARS, CONFERENCES, WORKSHOPS, ETC.

The title and authorship of papers presented and the particulars of the workshops, seminars, etc., at which these were presented are given below.

15.1 The Working Group Meeting on,"Statistical Assessment of Yield Advantage in Intercrop Systems in Dry Land Agriculture" held at IASRI, New Delhi from 21st to 22nd September, 1984.

(i) CHOUDHARY, B.L , BHARGAVA, P.N. and BHATIA, A.K.—Statistical assessment of Yield advantages in intercropping experiments.

(ii) RAJINDER, KAUR and BHARGAVA, P. N.—An economic assessment of yield advantages in different intercropping systems.

15.2 Silver Jubilee Celebration of IASRI, New Delhi held from 8th to 12th Oct.; 1984.

(a) Symposium on, "Advanced sample surveys"

SINGH, RANDHIR—Non-Sampling errors in surveys.

(b) Symposium on, "Linear Models & Design of Experiments".
NIGAM, A.K.—Experiments with mixtures-a review of recent developments.

(c) Symposium on, "Crop Forecastings".

ANEJA,K.G. – Crop yield Forecasting at IASRI.

15.3 First Convention and Symposium of Bio-energy organised by Bio-energy Society of India at New Delhi from October 14-16, 1984.

(i) NARAIN, P., KATHURIA, O.P and SINGH, K.B.—Study on availability and consumption of bio-energy.

(ii) BATHLA, H.V.L. and KATHURIA. O.P.—Growth in annual production of marine fish.

(iii) KATHURIA, O.P. and BATHLA,H.V.L.—Sample survey for estimation of fish catch from inland resources.

15.4 The XXXVIII Annual Conference of the Indian Society of Agricultural Statistics held at ISI, Calcutta (W.B.) from 24th to 26th Nov., 1984.

(i) AHUJA, D.L. and SATYA PAL—Estimation of stalk to grain ratio and availability of Jowar Fodder for Dharwar District of Karnataka State.

(ii) AHUJA, D.L. and SRIVASTAVA, A.K—A sampling procedure for two dimensional populations using systematic and double sampling.

(iii) AHUJA, D.L. and SRIVASTAVA, A.K.—Sampling for two dimensional populations spread over space and time.

(iv) BASSI, G.S., MEHROTRA, P.C. and BANERJEE, A.K....A study of controlable factors influencing the yield of wheat crop.

(v) BASSI, G.S., MEHROTRA, P.C. and BANERJEE,A.K....A study on fertilizer-yield relationship for sonalika wheat in Midnapur district.

(vi) KAISTHA, A.C... Growth Analysis of Area, Product & Yield of Sugarcane in Tamil Nadu State.

(vii) KAISTHA, A.C. and PANDEY, R.K....Study of response to rice in Tamil Nadu State.

(viii) MEHROTRA, P.C., BANERJEE, A.K. and RAHEJA, S.K....Adoption of recommended practices of fertilizer use under field conditions,

(ix) NADKARNI, U. G. and JAIN, T. B....Instrinsic rates of natural increase for some breeds of female bovines.

(x) PANDEY, R.K. and KAISTHA, A.C....Pattern of rice production in Tamil Nadu.

(xi) PANDEY, R.K. and SARUP, SHANTI...Changes in Agricultural Tenancy structure in India.

(xii) RUSTOGI, V.S., MEHROTRA, P.C. and BANERJEE, A.K....Varietal preference and yield performance of HYV wheat in relation to size of holding.

(xiii) RUSTOGI, V.S. and SARUP, SHANTI...Inter regional growth analysis of pulses in Uttar Pradesh.

(xiv) SARUP, SHANTI, and PANDEY, R.K.... Evaluation of Groundnut production Technology in Puri District.

(xv) SATYA PAL and AHUJA, D.L....Adoption of new crop production technology with and without credit facilities in Rice.

(xvi) SINGH, JAGMOHAN, SRIVASTAVA, A.K., GUPTA, A.K. and MATHUR, D.C....A study on effect of holding size in vegetable cultivation.

(xvii) SINGH, JAGMOHAN, SRIVASTAVA, A.K., MATHUR, D.C. and GUPTA, A.K....Role of effecient use of inputs in cultivation of vegetable crops.

(xviii) SINGH, RANDHIR . Imputation in panel surveys using two dimensional data.

(xix) SINGH, RANDHIR and SINGH, N.K....Estimating from samples from out dated frames.

(xx) SINGH, RANDHIR and SRIVASTAVA, A.K.—Revisit sample size to check the quality of data.

(xxi) SRIVASTAVA, A.K., AHUJA, D.L. and MATHUR, D.C.. Employment generation in vegetable cultivation.

(xxii) WAHI, S.D., SUMAN, C.L. and RAWAL, R.D.—Distribution and variation between samples of leaf spot diseases in sapota.

(a) The symposium on "Application of Robust Non-Parametric Inference Techniques in Agriculture".

(i) BHATIA, V.K.—Application of non-parametric inference techniques in studying the yield survival relationship in dairy cattle.

(ii) SINGH, RANDHIR...Non-parametric inference in sample surveys for categorical data.

(b) The Symposium on "Increase in agricultural productivity from non-monetary inputs" held on 25th Nov., 1984.

(i) BHARGAVA, P.N. and CHOUDHARY, B.L.—Study on statistical assessment of inter-cropping.

(ii) GOEL, B.B.P.S. and SINGH, K.B.—Increase in live-stock productivity from non-monetary inputs.

(iii) RAHEJA, S.K. and MEHROTRA, P.C—Effect of management practices in increasing productivity of rice and wheat in India.

15.5 Seminar on Recent Developments in Statistical Theory and Applications sponsored by U.G.C. and organised by University of Madras, Madras from 21st to 24th Dec., 1984.

JAIN, R. C. and DAS, M. N.—incomplete Block Designs through A—symmetrical Factorials.

16. CONFERENCES/SEMINARS/SYMPOSIA/WORKSHOPS, ETC. ATTENDED BY THE SCIENTISTS

Date	*Name of Conference, Seminar etc.*	*Name of the Scientists with designation*
1	*2*	*3*
Oct., 8-12	Silver Jubilee Celebration of IASRI held at New Delhi. (a) Symposium on, "Sampling Methodology"	Prof. Prem Narain, Director and all the Scientists of the Institute.

	(b) Symposium on, "Genetics and Population Ecology".	
	(c) Symposium on, "Crop Forecasting Methodology."	
	(d) Symposium on, "Linear Models and Design of Experiments".	
Oct., 14-16	First convention and symposium of Bio-energy organised by Bio-energy Society of India at New Delhi.	Dr. R.K. Pandey, Sr. Scientist Dr. O.P. Kathuria, Sr. Scientist,
Oct., 26-27	Director's Conference of the ICAR Research Institutes held at I.A.R.I., New Delhi-12	Prof. Prem Narain, Director
Nov., 24-26	The XXXVIII Annual Conference of the Indian Society of Agricultural Statistics held at ISI, Calcutta, West Bengal.	Prof. Prem Narain, Director. Dr. Randhir Singh, Scientist (S-2) Sh. V.K. Bhatia, Scientist (S-2)
Dec., 3-6	The Workshop on "Structured Systems Analysis and Design," Organised by Tata Consultancy Services held at Taj Palace, New Delhi.	Sh. S.L. Garg, Scientist (S-1)
Dec., 13-15	The FAI Seminar 1984 on Productivity, Cost of Production and subsidy in fertilizer Industry held at New Delhi.	Sh. P.N. Bhargava, Scientist (S-3)
Dec., 15-18	The II Annual Conference of Medical Rescue and Resusitation organised by National Council of Critical Care Medicine held at Vigyan Bhavan, New Delhi.	Sh. V.K. Bhatia, Scientist (S-2) Dr. K.K. Tyagi, Scientist (S-1)

Dec., 17	National Seminar on, "Quality Control of Fertilizers "held at Vigyan Bhavan, New Delhi.	Sh. S.C. Jain, Scientist (S-2)
Dec., 21-24	Seminar on, "Recent Development in Statistical theory and Applications," sponsored by U.G.C. and organised by University of Madras, Madras.	Dr. R.C. Jain, Scientist (S-2)

17. MISCELLANEOUS

17.1 Personnel Information :

17.1.1 Appointments/Promotions/Transfers/Retirements, etc. :

(a) Appointment :

Shri D.L. Dang, appointed as Assistant Administrative Officer with effect from 19.10.84.

(b) Promotion :

(i) The following Scientists (S-3) have been promoted in the next higher grade :...

(1)	Dr. K.C. Raut	...	01.01.83
(2)	Dr. R.K. Pandey	...	01.01.83
(3)	Dr. O.P. Kathuria	...	01.01.83
(4)	Dr. Aloke Dey	...	01.01.83
(5)	Dr. M.P. Jha	...	01.07.83

(ii) The following Scientists have been promoted from Grade S-2 to Grade S-3 :—

(1)	Sh. S.N. Mathur	...	01.07.81
(2)	Dr. J.S. Maini	...	01.07.82
(3)	Sh. R.K. Khosla	...	01.07.82
(4)	Sh. U.G. Nadkarni	...	01.01.83
(5)	Miss. C.R. Leelavathy	...	01.01.83
(6)	Sh. S.R. Bapat	...	01.01.83
(7)	Dr. K.G. Aneja	...	01.01.83
(8)	Dr. A.K. Banerjee	...	01.01.83
(9)	Sh. P.N. Soni	...	01.01.83

(10)	Sh. P.C. Mehrotra	...	01.01.83
(11)	Sh. S.C. Rai	...	01.01.83
(12)	Dr. A.K. Srivastava	...	01.01.83

(iii) The following Scientists have been promoted from Grade S-1 to Grade S-2.

(1)	Sh. P.P. Rao	...	01.07.81
(2)	Sh. S.P. Doshi	...	01.07.82
(3)	Sh. T.B. Jain	...	01.07.82
(4)	Sh. S.S. Shastri	...	01.07.82
(5)	Sh. Mahesh Kumar	...	01.07.82
(6)	Dr. V.K. Gupta	...	01.07.82
(7)	Dr. Pranesh Kumar	...	01.07.82
(8)	Dr. R.C. Jain	...	01.07.82
(9)	Sh. M.L. Sahni	...	01.01.83
(10)	Sh. M.L. Choudhary	...	01.01.83
(11)	Sh. R.K. Ghai	...	01.01.83
(12)	Sh. Shanti Sarup	...	01.01.83
(13)	Sh. O.P. Dutta	...	01.01.83
(14)	Smt. Asha Saxena	...	01.01.83
(15)	Sh. Lal Chand	...	01.01.83
(16)	Sh. R.L. Rastogi	...	01.01.83
(17)	Sh. J.K. Kapoor	...	01.01.83
(18)	Sh. H.C. Jain	...	01.07.83
(19)	Sh. V.K. Bhatia	...	01.07.83
(20)	Sh. P.K. Malhotra	...	01.07.83

(iv) The following Scientists have been promoted from Grade S-O to Grade S-1.

(1)	Sh. Onkar Sarup	...	01.07.82
(2)	Sh. R.C. Gola	...	01.01.83
(3)	Sh. G.L. Khurana	...	01.01.83
(4)	Sh. D.K. Mehta	...	01.01.83
(5)	Sh. M.R. Vats	...	01.01.83
(6)	Sh. S.C. Aggarwal	...	01.07.83
(7)	Sh. B.H. Singh	...	01.07.83
(8)	Sh. Balbir Singh	...	01.07.83
(9)	Sh. Jagbir Singh	...	01.07.83
(10)	Sh. S.C. Mehta	...	01.07.83
(11)	Sh. H.O. Aggarwal	...	01.07.83
(12)	Sh. D.K. Sehgal	...	01.07.83
(13)	Sh. Ashok Kumar	...	01.07.83

(c) Transfer :

(i) Sh. P.N. Vali, A/Cs Officer, IASRI, has been transferred to CAZRI, Jodhpur to the post of Senior Accounts Officer. He was relieved from this Institute on 24.8.1984 (A.N.).

(ii) Sh. J.K. Kapoor, Scientist S-1 has joined duty at IASRI with effect from 29.9.84, on transfer from I.V.R.I., Izatnagar (U.P.).

(iii) Sh. S.S. Walia, Scientist S-O has joined duty at IASRI with effect from 29.9.84, on transfer from I.V.R.I., Izatnagar (U.P.).

(iv) Sh. A.S. Gupta, Scientist S-1 has joined duty at IASRI with effect from 22.10.84, on transfer from Directorate of Oil Seed Research, Hyderabad.

(v) Sh. Panna Lal, A.A.O. has been transferred to N.R.C.G. Junagarh (Gujarat) on promotion to the post of Admn. Officer and relieved at the IASRI w.e.f. 29.9.84 (AN).

(vi) Sh. H.C. Gupta, Scientist (S-1) has joined duty at IASRI with effect from 6.11.1984 on transfer from C.S.W.R.I., Avikanagar.

(d) Retirement :

Dr. M.P. Jha, Sr. Scientist has sought voluntary retirement from service w.e.f. 31.12.1984.

17.1.2 The Scientists of IASRI were deputed to attained training/study tour/meetings and to deliver lectures etc. during Oct.,—Dec., 1984.

1. Prof. Prem Narain, Director

(i) वैज्ञानिक तथा तकनीकि शब्दावली आयोग, शिक्षा तथा संस्कृति मंत्रालय के नवीनतम् प्रकाशनों को विमोचन समारोह में 21-11-84 को वैज्ञानिक तथा औद्योगिक अनुसन्धान परिषद् के सभागार में अपना वक्तव्य भाषण दिया।

(ii) Gave a lecture entitled 'Role of Statistical Science in Agricultural Research' In the Department of Statistics, Institute of Advance Studies, Meerut University, Meerut on 10th December, 1984.

(iii) Attended meeting of the M. Phil. Committee in Mathematical Statistics of the University of Delhi on 11th December, 1984.

(iv) Attended as Senior Advisor/Advisor of the Organising Council, the Inaugural Session of the Third Ground Water Congress for Technology, Equipment and Materials for Ground Water Extraction at Taj Palace Hotel, New Delhi on 18th December, 1984.

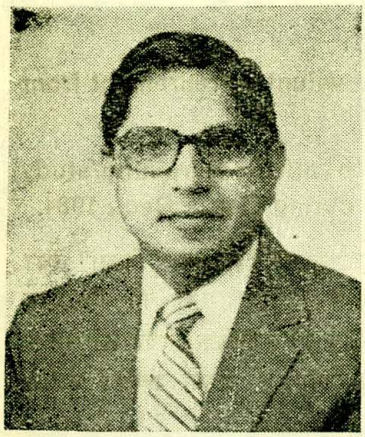
2. Sh. P.N. Bhargava, Scientist (S-3) — Gave a lecture to the trainees from ISEC (representing Asian and African Countries), Calcutta at IASRI, New Delhi on 25th Oct., 1984.

3. Mrs. Ranjana Agrawal, Scientist (S-2) — Gave a lecture on statistical Research in Pre-harvest Crop forecasting methodology to ISEC trainees from CSO at IASRI, New Delhi.

4. Sh. V.K. Bhatia, Scientist (S-2) — Attended the course on Medical Rescue & Resusitation held at Vigyan Bhavan, New Delhi on 15th Dec., 1984.

17.1.3 **Honours/Awards Won, etc. :**

(i) The University of Edinburgh, U.K., at its Convocation held on 24th November, 1984, honoured Prof. PREM NARAIN, Director, Indian Agricultural Statistics Research Institute, New Delhi, by conferring the degree of DOCTOR OF SCIENCE on him. This award is on the basis of his thesis entitled "Studies in Statistical Genetics", the first of its kind by an Indian Scientist.



(ii) Prof. Narain has also recently been elected a Fellow of the National Academy of Sciences, the oldest Academy in the country.

17.2 **Distinguished Visitors :**

17.2.1 Dr. Kawanchai A. Gomez, Head, Department of Statistics, The International Rice Research Institute, P.O. Box 933, Manila, Philippines, visited this Institute on October 11-12, 1984 and discussed with the Director, Joint Director and HD (CS) regarding statistical problems in crop science and computer application.

17.2.2 Dr. K. Krishnamurthy, Jt. Commissioner (S & R), Deptt. of Food, Ministry of Food & Civil Supplies, Govt. of India visited this Institute on 16.10.1984 to discuss with the Director and Sh. R K. Khosla,

Sr. Scientist regarding his Statistical problems and also with regard to project on Post-harvest foodgrain losses on wheat-crop to be started in Bullandshahar, district of U.P. during the current year.

17.2.3 Sh. N.K. Gandhi, Assistant Director (Ag.), National Productivity Council, New Delhi-16, visited this Institute on 23-11-84 and discussed with Sh. R.K. Khosla, Scientist (S-3) about the estimation of losses in storage at farm level.

17.3 Monitoring Cell :

Three meetings were convened by the Monitoring Cell under the chairmanship of the Director, IASRI regarding the formation of VII Plan on 1st Oct., 1984, 28th Oct., 1984 and 19th Dec., 1984. The Director gave the guidelines for the formulation of the VII plan of the Institute and asked the Heads of Divisions to prepare new projects under VII Plan to justify the additional posts. In the meeting on 28th Oct., 1984 the Director informed about the discussion that took place in the Directors' conference.

Meeting was held with Dr. R.M. Acharya, DDG (AS), ICAR and Dr. C.C. Maji, ADG (ES & M), ICAR at Krishi Bhavan on 17th Dec., 1984. Dr. Prem Narain, Director, Dr. S.K. Raheja & Dr. H.P. Singh attended the meeting.

About 52 files relating to the co-ordinated scheme for Primary Data Collection involving ad-hoc field staff were handled by the Monitoring Cell and the issue of sanction for 1984-85 was taken up in r/o 15 centres.

As desired by the ADG (ES & M), ICAR a detailed statement of progress of work relating to VI Plan co-ordinated scheme for Primary Data Collection involving Ad-hoc field staff for 25 centres was sent to the Council.

On the revised pattern suggested by the Director, a detailed note on VII Five Year Plan proposals of our Institute was prepared by the Monitoring Cell and was sent to the Council. This proposal was again revised with some reallocation of funds as desired by the DDG (AS) by the Monitoring Cell and was sent to the Council.

17.4 U.N.D.P. Cell :

Dr. H.K.F. Hoffman, Senior Agricultural Education Officer, F.A O, Rome visited this Institute on the 30th October, 1984 for assessing the progress concerning work on curriculum development for Post-Graduate

Training in various subject matter areas covered by U.N.D.P. Project. He was acquainted with the latest progress of the Project. A meeting was held with Dr. Maharaj Singh, D.D.G. (Edn.), I.C.A.R. and Project-Director of the U.N.D.P. Project on 17th December, 1984 regarding the implimentation of recommendations of the Key-Consultant Prof. D.J. Finney. Various recommendations of the Key-Consultant were reviewed for implementation. Ten Computer terminals have been procured from U.N.D.P. fund during the quarter under report and they are being installed at the computer Centre of the Institute.

17.5 Staff Research Council :

Meetings of the Staff Research Council were held on 6th and 7th September and 28th December, 1984 and the progress of the research projects was discussed. The objectives background information and technical programmes for some new research projects were also discussed.

17.6 IASRI Representatives at the meetings of Scientific Panel of ICAR :

Name of the Officer	Name of the Scientific Panel with date
1. Sh. S.C. Jain	"Plant Physiology and Bio-Chemistry" held on 15th and 16th Oct., 1984.
2. Sh. P.N. Bhargava 3. Sh. H.C. Jain	"Agronomy", held on 17th Nov., 1984.
4. Dr. R.C. Jain	"Plant Pathology" held on 4th to 6th Dec., 1984.
5. Sh. B.C. Saxena	"Home Science", held on 7th Dec., 1984.
6. Dr. H.V.L. Bathla	"Fisheries" held on 12th Dec., 1984.
7. Prof. Prem Narain	"Economics, Statistics and Marketing" held on 26th Dec., 1984.

17.7 Following meetings of Head of Divisions and Sr. Scientists/Sr. Officers were held during the quarter under report :---

Meeting	*Date*
Sr. Officers	12.11.84
HDS/Sr. Officers	14.11.84

17.8 ICAR Zone-III Inter-Institutional Tournaments :

During 1984-1985, the Council regrouped the various ICAR Institutes into 6 Zones taking into consideration the location and staff strength of

17.9.3 Sh. R.S. Khatri, Scientist (S-1) participated as Manager in the IASRI sports contingent for the ICAR Zone III Inter-Institutional sports Meet held from 12th to 15th Dec., 1984 at N.B.P.G.R., New Delhi.

18. PROGRESS OF HINDI USE IN THE INSTITUTE

During the quarter ending in December, 1984, following points, with regard to use of Hindi at the IASRI, are worth reporting :—

After the last quarter report had been sent, important activities held during September, 1984 were : competitions in Hindi Use, Essay, Noting and drafting, Debating and Quiz were held between 7th to 13th September. On 14th September, 1984, which also happens to be 'Hindi Diwas', Annual Day of Hindi Celebrations was celebrated when a senior parliamentarian and a literary dignitary in Hindi, Shri Ram Chandra Bhardwaj, was the Chief Guest who distributed the prizes to the competitors in Hindi. On 15th September, 1984, annual elections of the office bearers of the Executive of Kendriya Sachivalya Hindi Parishad Branch of the Institute were held.

Quarterly meeting of the Executive of Kendriya Sachivalya Hindi Parishad was conducted on 6th November, 1984 when some of the important decisions were taken to encourage and enhance the use of Hindi at the Institute. Some of the points of important considerations were : to increase the number of Shakha members, to hold Seminar on '7th Five Year Plan and Agricultral Statistics', purchase of Hindi literature and original writing and translation of books in Hindi with reference to the requests from the Commission for Scientific and Technical Terminology.

In the meeting of Inspection Sub-Committee constituted by the Official Language Implementation Committee, held in October, 84, a decision was taken that we should collect data on different aspects of Hindi use from the Administrative Sections of the Institute and then inspect the section in regard to actual implementation of the programmes.

Official Language Implementation Committee of the Institute met on 31st December, 1984 and took several decisions on encouragement and enhancement of Hindi use at the Institute.

the Institutes in each Zone. IASRI being grouped with NBPGR, New Delhi, ICAR Headquarters, New Delhi, NIRG, Makhdoom, Mathura and NDRI Karnal in Zone-III. NBPGR was entrusted with the responsibility of organising Zone-III Sports Meet, which was held from 12th to 15th Dec., 1984 at IARI Campus. The IASRI Sports Committee was constituted by the Director of which Dr. S.K. Raheja was the Chairman and Dr. K. K. Tyagi as convenor. In the Zone-III Sports Meet, the IASRI contingent consisted of Dr. S. K. Raheja as Chief-de-Mission, 4 managers and 44 sportsmen. The following positions were won by our Institutes Sportsmen.

Game/Event	*Position*	*Name*
Kabaddi	Winner	Captain : Sh. D.P.S. Mann
Volleyball (Shooting)	Runner-up	Captain : Sh. S. K. Batra
Badminton (open single)	Runner-up	Captain : Dr. K. K. Tyagi
Volleyball (Smashing)	Runner-up	Captain : Sh. P.S. Rai
400 Metre race	I	Shri Sunil Bharihoke
800 Metre race	I	Shri Sunil Bharihoke
4x100 metre relay race	II	Shri P. S. Rai and Shri Ashok Kumar Shri Amar Singh and Shri Sunil Bharihoke
Pole Vault	II	Shri P. S. Rai

The Zone-III Sports Meet was inaugurated by Dr J.S.P. Yadav, Chairman, ASRB on 12th Dec., 1984 at the IARI Ground. The closing ceremony was held on 15th Dec. 1984 at the same place in which Smt. Kiran Bedi, IPS renowned sportsman gave away the prizes to the winners. A number of officers from IASRI assisted in the organisation of the sports meet which proved to be a grand success

17.9 Other Information :

17.9.1 Dr. S.K. Raheja, Sr. Scientist visited Lab to Land Centres in Andhra Pradesh, Maharashtra, Gujarat and Rajasthan states as a member of the evaluation committee of ICAR Lab to Land Programme.

17.9.2 Dr. K.K. Tyagi, Scientist (S-1), assisted NBPGR, New Delhi in organising the ICAR Zone-III Inter Institutional sports Meet held at IARI Campus New Delhi from 12th to 15th Dec., 1984.

19. OBITUARY

It is with profound sorrow that we have to report the sudden demise of Shri Baldev Singh, Sr. Clerk of the Institute on Saturday, the 24th Nov., 1984. He was 42 years of Age. In order to give some financial help to the bereaved family, a token contribution was collected from the employees of the Institute and handed over to Smt. Shakuntala Devi w/o Late (Shri) Baldev Singh.

It is with profound sorrow that we have to report the sudden demise of Shri Shispal, S.S. Grade I on Wednesday, the 10th Oct., 1984. He was 26 years of age. A token contribution was collected from the employees of the Institute and was handed over to Smt. Lakshmi Devi w/o Late (Shri) Shispal.

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Gives information on the technique of hypophysation, with special reference to major Indian and Chinese carps, its advantages and its role in the development of acquaculture.

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A concise account of the present knowledge of the role of microbes in rumen digestion is presented in this book.

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