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(भा० कृ० अ० सं०)

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नई दिल्ली-११००१२

भा. क. सा. अ. सं.

निदेशक

प्रम नारायण

श्री श्री सोमदत्त, श्री खेमदास गणपतराव देवले और श्री अनिल कुमार भल्ला का भी आभारी हूँ, जिन्होंने इस सूचना-पत्र के संकलन एवं मुद्रण में अपना भरपूर सहयोग दिया है।

श्री. अ. सं. सांख्यिकीय सूचना-पत्र के इस अंक के लिए अधिष्ठित सामग्री प्रदान की है।
श्री संस्थान के उन सब अधिकारियों तथा उन सदस्यों का आभारी हूँ, जिन्होंने भा. क.

टिप्पणी और सुझावों का मैं आभार सहित स्वीकार करूँगा।
लिए लाभदायक सिद्ध हो रहा है। इसके अलावे अंकों, संसुधार जाने हेतु किसी भी प्रकार की मुझे आशा है कि यह सूचना-पत्र कृषि अनुसंधान सांख्यिकीविदों तथा अन्य प्रयोक्ताओं के

जानकारी का विवरण दिया गया है।
इसमें इस संस्थान की अक्टूबर-दिसम्बर, 1983 की तिमाही गतिविधियों से सम्बन्धित यह भारतीय कृषि सांख्यिकीय अनुसंधान संस्थान, सूचना-पत्र खण्ड नौ का चतुर्थ अंक है।

प्रकाशक

PREFACE

This is Vol. IX, No. 4 issue of 'IASRI Statistical Newsletter and covers the activities and allied information in respect of this Institute during the quarter Oct.-Dec., 1983.

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

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

I am also thankful to Shri Som Dutt, Shri Khemdas Ganpatrao Dewale and Sh. Anil Kumar Bhalla for the help rendered in compilation and printing of this Newsletter.

PREM NARAIN

DIRECTOR

INDIAN AGRICULTURAL STATISTICS
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1. ESTIMATION OF RESOURCES OF INLAND FISH IN 24 PARGANAS DISTRICT OF WEST BENGAL

Inland fisheries of India are known to comprise of two types of water, viz., fresh and brackish. The two types of fisheries have further been categorised as capture and culture fisheries. In capture fishery management, effort is directed towards adjustment of fish population so as to optimize the intrinsic, bio-production capacity of the aquatic ecological system, while in culture fishery management optimal growth opportunities are provided to the stock organisms within the culture compartment for maximising the fish production. The main sources of the freshwater capture fisheries are rivers and their tributaries, canals, lakes, backwaters and reservoirs and of brackishwater are estuaries and brackishwater lagoons while those of culture fisheries are ponds, tanks, swamps, etc. While statistics of riverine resources and their tributaries, canals and lakes, etc. are available with some degrees of reliability, those of ponds, tanks and reservoirs are not available with any degree of accuracy. Even the figures of areas under ponds, tanks and reservoirs as available in the reports of the department of Agriculture are divergent from those given by the National Commission on Agriculture. Studies conducted in the past for estimation of extent of various inland resources have not resulted in a definite methodology which could be recommended for large scale adoption.

Keeping in view the need for a suitable methodology a pilot sample survey was conducted in 24-parganas district of West Bengal State. One of the objectives of the survey was to evolve a suitable sampling methodology for estimation of inland fishery resources. The survey was undertaken jointly by the Indian Agricultural Statistics Research Institute, New Delhi and the Central Inland Fisheries Research Institute, Barrackpore. The first round of the survey was conducted in 1978-79 to estimate the inland fishery resources in the district. The study was confined mainly to estimate the resources under ponds and tanks. The other sources like rivers and canals etc. were left out from the purview of the present study as the methodology required for estimating these resources and catch from them would be different from that of ponds and tanks etc. The present article deals with the enumeration of water units and their characteristics such as seasonality, extent of utilisation for fishing purpose and pisciculture techniques followed as obtained in the first round of the survey.

The field work of the survey was conducted by field staff of the Central Inland Fisheries Research Institute while the responsibility of statistical analysis of data and preparation of report etc. primarily rested with the Indian Agricultural Statistics Research Institute. The sampling design followed in the survey consisted of two stage cluster sampling, clusters of villages and ponds within villages constituted the first and second stage units respectively. A sample of 10 clusters of 4 villages each was selected from the district. The ponds and tanks in each of the selected villages were completely enumerated for estimating the area under them.

The inventory of all water bodies showed that 1686 water units covering an area of 166.6 hectares existed in the 40 selected villages. The water units in 24-Parganas district were reported to be mainly consisting of fresh water ponds and tanks and were rainfed. Average number of ponds in a village was worked out as 42 while the average area per pond was estimated as 0.097 hectares. The area of these ponds was found to vary between 0.018 and 0.912 hectares. The study revealed that about 94 per cent of the water units covering as much the area under ponds were perennial in nature. 67 per cent of the ponds had a depth of 1 to 3 metres at the time of visit by the enumerators while during the monsoons almost all the ponds had depth exceeding 1 metre.

The study revealed that only about 33 per cent of the ponds were used mainly for fish cultivation while about 60 per cent of them were used mainly for other purposes but also used for fish cultivation. Only about 3.3 per cent of the ponds were not used for fish cultivation at all. Among the ponds used for fish cultivation 33 per cent were perennial and 30 per cent were seasonal in nature.

Silting and weed infestation were not reported to be the major problems of water units. 68 per cent of ponds were not reported to have any problem of silting while 76 and 77 per cent of ponds had no problem of submerged weeds or floating weeds respectively.

Various reasons were cited by the pond owners for non-utilisation of ponds for fish cultivation. Among them the major causes reported were multiple ownership, the poaching and wilful destruction and lack of capital etc., 38 per cent of water units yielded fish throught the year while 50 per cent of them yielded fish during summer months only. In 79 per cent of the ponds ordinary pisci-culture technique was adopted.

71 per cent of the water units were used for stocking purpose, while 27.6 per cent of ponds were used as nursery-cum-stocking ponds. In about 72

per cent of ponds fish seeds were obtained locally while in the remaining ponds fish seed was obtained from other sources.

Fish feed was not used in majority of the ponds, only in a few cases mustard oil cake, rice bran and fertilizers such as urea, superphosphate and potash were used.

3 major species of fish cultured in the area were Catla, Rohu and Mrigal released in different ratios which accounted for about 79.6 per cent of the ponds. Other species cultured were common carp, silver carp, grass carp, Magur, Singhi, Koi and Chital, etc. These various species were stocked in varying ratios. The expected fish yield was reported to be 131 Kg per pond per year.

For estimation of inland fishery resources, alternative estimators were tried using cluster sampling (\bar{y}'_n), simple random sampling (\bar{y}'_n) and ratio method estimation (\bar{y}''_n) for estimating the area under water units. These estimators alongwith standard errors are given in the following table.

Table : Estimates of the average area per water units of ponds (in ha.)

Estimator	As per revenue records	At the time of visit	Max. in monsoon	Min-in summer
I \bar{Y}'_n	0.1321 (0.036)	0.1049 (0.019)	0.1211 (0.018)	0.0789 (0.011)
II \bar{Y}'_n	0.1324 (0.026)	0.1050 (0.013)	0.1221 (0.014)	0.0794 (0.007)
III \bar{Y}''_n	0.1404 (0.039)	0.0900 (0.013)	0.0961 (0.018)	0.0617 (0.010)

It would be observed that the estimator II is based on village means by ignoring clusters obviously, this estimator would be more precise than the other two estimators. Estimator I is based on mean of cluster means while Estimator III is a ratio estimator which takes into account the variation in number of ponds from cluster to cluster.

It is seen that Estimator III is more precise than Estimator I except in case of revenue records although the gain is only marginal. The estimators obtained from revenue records are based on much smaller number of observations and hence may not be relied upon.

2. PRICE SPREAD OF VEGETABLES IN AHMEDABAD DISTRICT OF GUJARAT STATE

2.1 Introduction :

Vegetables are the cheapest source of Vitamins and minerals salt and are required as an essential component of human diet. Besides this, millions of people are involved in its cultivation, trade and transport and depend entirely upon it for earning their livelihood.

Being perishable in nature, vegetables require careful handling in its marketing. Also it has to reach the consumer after harvesting in a very short span of time. Therefore, it requires very efficient marketing system. A number of intermediaries are normally involved in the marketing of vegetables. There are normally three stages in marketing of vegetables. In the first instance vegetables are brought to the whole sale market by the producer where these are auctioned by the wholesalers by open auction held at regular interval. The wholesaler charges a fixed commission from the grower for marketing his produce. Most of this produce is purchased by the middlemen (called Dusseras in Gujarat) who in turn sell these to the retailers in units of 5 Kg. or multiples there of. Retailers than take away these vegetables to their shops in different localities for selling them to consumers.

Collection of price data of agricultural commodities is very important for number of agencies. While it helps the agricultural scientists to study the price trends and lay policies for increased production, it helps the administrators to regulate and determine the prices of these commodities.

It is generally felt that in marketing of vegetables, intermediaries take away an unproportionate share of the consumer's rupee spent on vegetables whereas the cultivator who has to bear the cost of all the inputs and also the natural hazards involved gets a smaller share. The intermediaries claims that due to highly perishable nature of vegetables, there is greater risk involved in their trade transport and thus a higher share. To get a clear picture, it is necessary to study the price spread of vegetables at different stages of marketing alongwith the losses taking place if any, in transit and storage.

2.2 Description of the survey :

A pilot sample survey was carried out in Ahmedabad city of Gujarat state during 1977-78 to evolve a suitable sampling technique for collection of data on price spread of vegetables. Data on price spread of vegetables were collected from the wholesale markets and retailers in different localities.

Vegetables considered for the study of price spread were tomato, brinjal, lady's finger, cabbage, cauliflower, bitter gourd, gowar and lobia. The sampling plan of the survey was as follows :—

For estimating the price spread, data were collected at three levels viz. wholesaler, Middleman (Dussera) and retailer. At the wholesale market 2-3 wholesalers and middlemen per vegetable were selected for collection of data. Information from selected agents regarding prices were collected at hourly interval. At the retail level 2-3 retailers of vegetables in each locality were selected for collection of price data. The information on prices was collected for all the days in a month. The selection of the units was made afresh after each round consisting of three months. Information was collected on prices of vegetables, losses taking place in their transit and overnight storage and prices of partially damaged vegetables. Information was also collected on various other relevant items. The selection of units at every stage were done with simple random sampling without replacement.

2.3 The Price Spread :

Price spread of a vegetable is the share of different intermediate agencies in the consumer rupee spent on that vegetable and is given by

$$G^* = \frac{W}{R} \times 100$$

$$M^* = \frac{M-W}{R} \times 100$$

$$R^* = \frac{R-M}{R} \times 100$$

where G^* , M^* and R^* are the share of grower, middleman (Dussera) and retailer respectively in the consumer's rupee spent on vegetable where as W , M and R are the average prices of a vegetable at wholesale, middleman and retailer's level in that order.

The average price per kg and price spread of vegetables varied considerably from month to month and vegetable to vegetable. On overall basis the price spread during January to December 1977 was found to be 66 paise for the grower which also includes the commission to be paid to the wholesaler and 17 paise each to the middleman and retailer. The analysis of data during different periods revealed that the share of middleman (Dussera) and retailer increased considerably during lean period and decreased during the peak period of marketing of the crop. The average minimum and maximum prices of different vegetables at retail level in Ahmedabad in 1977 (January-December) and average price spread over the year are presented in table I and table II.

The losses in transit of vegetables were observed to be very small in comparison to the quantity handled. The results indicate that in the region under survey more than 50% share of the consumer's rupee spent on vegetables goes to the grower.

Table I:- Average minimum and maximum retail prices of vegetables in Ahemdabad during 1977.

Sr. No.	Name of the vegetables	Minimum average price Rs/kg.	Month in which observed	Maxi. average price Rs/kg.	Month in which observed
1.	Tomato (Kutcha)	0.68	Feb.	1.42	Aug.
2.	Tomato (Pucca)	1.12	Dec.	2.63	July
3.	Brinjal (Small)	0.80	Jan.	2.12	Sept.
4.	Brinjal (round)	0.80	July	1.92	Oct.
5.	Cabbage	0.67	Jan.	2.69	Aug.
6.	Cauli-flower	1.18	Jan.	3.05	July
7.	Lady's finger	1.43	Oct.	2.93	Feb.
8.	Bitter gourd	1.49	May	2.77	Oct.
9.	Gowar	1.26	July	3.52	March
10.	Lobia	1.14	Aug.,	3.14	March

Table-II:- Price spread of different vegetables in Ahemdabad during 1977.

Sr. No.	Name of the vegetable	Grower	Middleman	Retailer
1.	Tomato (Kutcha)	51	26	23
2.	Tomato (Pucca)	66	16	18
3.	Brinjal (small)	64	17	19
4.	Brinjal (round)	58	22	20
5.	Cabbage	65	17	18
6.	Cauliflower	73	13	14
7.	Lady's finger	72	13	15
8.	Bitter gourd	75	12	13
9.	Gower	71	15	14
10.	Lobia	72	14	14
Overall		66	17	17

3. TRAINING AND BASIC RESEARCH

3.1 Training Activities :

The following lectures/training programmes were arranged :—

<i>Sl. No.</i>	<i>Organisation</i>	<i>Period</i>	<i>Category of Trainees</i>
1.	ISEC, Calcutta	20 Oct., 83	General Course on Official Statistics
2.	ISEC, Calcutta	9 Nov., 83	Specialised Course on Ag. Statistics

3.2. Basic Research in Statistics

3.2.1 Some methods of construction of orthogonal resolution IV plans have been advanced using the foldover technique and the concept of d resolvability of orthogonal arrays. The plans obtained are minimal.

3.2.2 Some desirable patterns of the M-matrix of incomplete block designs for symmetrical parallel line assays have been obtained. Designs with these patterns leave the important bio-assay contrasts unconfounded. The loss of information on remaining bio-assay contrasts can be worked out from the component designs only.

3.3 Hostel Activities :

The students celebrated annual day function in the evening of 3rd October, 1983. Dr. (Mrs) Kapila Vatsayayan, Additional Secretary, Ministry of Education & Culture, Govt. of India was the Chief guest at the function. Prizes were awarded to the students, who distinguished themselves in various sports and other extra curricular activities during the academic year 1982-83. A variety entertainment programme was there after presented by the students of the hostels alongwith their fellow students of the Indian Agricultural Research Institute and Others.

A new executive committee for the Hostel activities, manned by the students, was elected for the academic year 1983-84.

The Christmas and the new year eve were also celebrated.

4. XXI CONVOCATION OF THE TRAINING COURSES (IASRI)

The XXI Convocation of the training courses of the Institute was held on 3rd October, 1983 which was presided over by Dr. O. P. Gautam, Director General of ICAR. Dr. Gautam expressed satisfaction over the changes being

contemplated in the training and research programmes of the Institute and suggested some measures for further improvement. In particular he emphasized the need for undertaking more and more multi-disciplinary research and computerisation of data. Dr. J. S.P. Yadav, Chairman, Agricultural Scientists Recruitment Board was the Chief guest and delivered the convocation address. The welcome Address was given by Dr. Prem Narain, Director, I.A.S.R.I. At this convocation 28 candidates were awarded certificates, 21 for Senior Certificate Course, 7 for Professional Statisticians Certificate Course besides various prizes in the form of books for the best candidates.

As a part of convocation programme an elocution contest was organised on 1st October, 1983 in which the students of various courses of the Institute participated. The topic for the elocution was 'Statistics for Rural Development'. The session was chaired by Dr. D. Singh, Ex-Director of the Institute. Three best speakers among the competitors were adjudged by these judges appointed for the purpose and three prizes were awarded to the three best speakers. Dr. P.N. Mathur Asstt. Director General (Extn.), I.C.A.R., Dr. P.K. Majumdar, Head, Div. of Horticulture and Fruit Technology, IARI, New Delhi and Dr. C.S.S. Rao, Jt. Commissioner of Extn., Ministry of Agri., acted as judges on this occasion.

The Advisory Board meeting was held on 1st October, 1983 and the full dress rehearsal of the convocation was held in the evening of 1st Oct., 1983.

5. COMPUTER SCIENCE AND NUMERICAL ANALYSIS

5.1 Data Processing :

During the quarter under report, the division of C.S. & N.A. continued to provide facilities for the data analysis and computer programming to the Scientists, research scholars and students from various Institutes under ICAR, Agricultural Universities and Colleges, Directorate of Economics & Statistics, Ministry of Agriculture and Department of Agriculture (U.P.)

5.2 Computer Utilization :

During the quarter under report, about 3800 production and 500 testing jobs were processed on B-4700 and IBM-1620 Computer Systems.

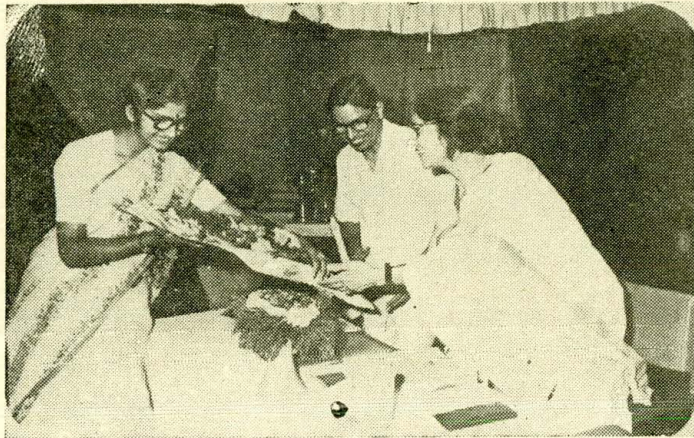
5.3 Programming Facilities :

Programming facilities and guidance in Data Analysis on Computer Systems were provided to 57 Ph.D., 25 M.Sc. Students and 14 other research workers during the quarter. A few new computer programs were developed to meet their analysis requirements.

**STUDENTS' ANNUAL DAY FUNCTION
OF THE IASRI, 1983**



Chief Guest Dr. (Mrs.) Kapila Vatsyayan,
Addl. Secretary (Ministry of Education
& Culture) Govt. of India,
Addressing the function.



Dr. Prem Narain, Director & Warden & Students
are welcoming the Chief Guest.



A scene of play at Cultural Programme.



Participants of Cultural Programme with
Mrs. and Dr. Prem Narain.

5.4 Visitors to Computer Centre :

- (i) 27 foreign trainees from 13 different countries of Asia-Africa region of 'Official Statistics' visited Computer Centre. The use of Computers in Agriculture was explained to them.
- (ii) 16 participants trainees to the short course training in Soil Testing visited the computer centre.

5.5 M. T. Unit :

During the quarter under report about 1.5 lakhs of cards were punched & verified for the research workers and Scientists from various Institutes and Universities including I.A.S.R.I. About 400 jobs were under taken on sorter, tabulator and producing punch machines.

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 below in brief :—

6.1 Training & Basic Research :

Guidance provided to Dr. N.K. Jain, Director, Tea Research Association Jorhat, Assam on analysis of a series of experiments with rotatable designs.

6.2 Crop forecasting Methodology :

(i) Technical advice and guidance on procedures for crop forecasting was given to senior officers from Food and Agriculture Department, Govt. of Nepal on training at the Institute.

(ii) Advice was given to Dr. B.K. Bhattacharya, Associate Prof. of Statistics, College of Agriculture, Assam Agriculture University, Jorhat, Assam in planning of a survey on "Estimation of incidence of pests and diseases of rice in sibsagar district."

6.3 Sample Survey Methodology :

(i) Advice was given to Director, Bureau of Economics and Statistics Orissa, in finalising the sampling design for the Central Sector Scheme on Estimation of Area and Production of fruit and Vegetables.

(ii) Guidance was given to Dr. G.D. Diwakar, Ag. Marketing Economist in Indian Grain Storage Institute, Hapur, U.P. in the Statistical Analysis of data regarding percentage loss due to moisture in transportation of grain from village to Mandi.

(iii) Tech. advice was given to Dy. Director (A.H.S.) regarding the programmes to be taken under Animal Husbandry Statistics during Seventh Five Year Plan.

6.4 Computer Science and Numerical Analysis :

Advice was given to Dr. S.K. Mittal, NBPGR on storage of germplasm data on Wheat & Barley and how to retrieve data as required by him.

7. FIELD SURVEY WORK

7.1 Field Training :

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

- (i) Pre-harvest forecasting of apple yield in Himachal Pradesh-H.P.
- (ii) Sample survey on cost of cultivation, agronomic practices, area & yield rates of potatoes-Farukhabad (U.P.)
- (iii) Pilot Sample Survey for estimating the energy requirements for different levels of adoption of modern technology in agriculture in Meerut District (U.P.)—IASRI, New Delhi.

7.2 Field Work Inspection/Supervision :

During the period under report the field work of the following schemes was inspected/supervised by the officers of the field unit at the places/areas mentioned against them :

- (i) Development of suitable methodology to study the effect of housing conditions and other related factors in milk production under village conditions—District Gurgaon, Haryana.
- (ii) Pilot sample survey for estimating the energy requirements for different levels of adoption of modern technology in agriculture in Meerut district (U.P.)
- (iii) Pilot sample survey to study the impact of National Demonstration Trials on crop production in Rohtak district of Haryana.

8. LIBRARY

8.1 Books :

During the period under report 63 books on various subject field of the Institute were added to the Library.

8.2 Reprints :

As a part of continuous practice the library has procured the following reprints written by the scientists of our Institute and published in scientific journals for free distribution among the scientists working in the same field on exchange basis.

- | | | | |
|-------|-----------------------------|--|---|
| (i) | Jain, J.P. & Jain,
R. K. | Rates of genetic improvement under two schemes of progeny testing for cross bred dairy herds of various sizes. | Ind. Jr. Dairy
Sci. 34(4) 1981 |
| (ii) | Nadkarni, U.G.
et. al. | Cost of maintenance of pigs | Ind. Jr. Ani. Sci,
53 (8)/Aug.,
1983 |
| (iii) | Raheja, S.K. et.
al. | A methodological study on estimation of straw to grain ratio in wheat crop | Jr. Ind. Soc.
Agri. Stat. 35(2)
Aug., 1983. |

8.3 Reprography :

Reprographic unit of the Library has attended 58 jobs covering 1297 pages sent by scientific, technical and administrative officers of our Institute

8.4 Bindings :

During the above stated period 550 sets of books and journals etc. were sent for annual binding for better preservation of publications.

8.5 Issue & Return :

Issue and return work at the Library Counter has involved a transaction of approx. 5600 publications.

8.6 Report Binding :

The bindings of the Library have bounded 400 reports.

8.7 Visitors :

During the period under report approx. 4,500 users visited the library for consultation purpose.

9. LAB TO LAND PROGRAMME

Under the ICAR Lab-to-Land Programme (Phase-II) the Institute carried out the following activities in village Nilothi of Delhi during the quarter under report :

9.1 Demonstrations on improved practices of wheat cultivation :

The farmers were educated about the improved package of cultivation practices of wheat crop. During the course of training programme it was found that the farmers were not having good quality seeds. Hence, 30 quintals of certified seed of wheat was procured from IARI and N.S.C., New Delhi. The seed of different varieties was supplied to 76 farmers for sowing in as many plots. The distribution of seed of different high yielding varieties of wheat is shown below :

Variety of wheat	Quantity of seed supplied	No. of farmers covered	Area to be sown
HD-2285	6 Quintals	15	15 acres
HD-2281	4 „	10	10 „
F.D-2329	4 „	10	10 „
HD-2204	8 „	20	20 „
HD-1553	4 „	11	10 „
WH-147	4 „	10	10 „
Total	30 Quintals	76	75 acres

The Institute also provided N.P.K. fertilizer for basal application to all the 76 farmers covered under the programme of demonstrations on wheat cultivation. Urea was supplied to 31 farmers only for application as basal dose as well as top dressing in wheat crop. Others were advised to procure urea for meeting the fertilizer requirement of the crop from their own resources.

Urea was also supplied as critical input to 5 marginal farmers and 5 agricultural labourers for top dressing in wheat crop.

9.2 Popularisation of cultivation of huskless varieties of barley :

Three plots of 20 cents each were sown under the huskless varieties of barley viz., Karan-231, Karan-163 and Karan-4. Five Kg. of seed of each variety was obtained from the IARI Research Station, Karnal for the purpose.

9.3 Demonstrations on use of weedicides for weed control in wheat crop :

During the field day programme it was reported by the farmers adopted in the village that they were facing problem of weed infestation particularly that of Phalaris Minor and Wild oats in their wheat crop. M/s. May and Baker were approached to conduct demonstration on the use of Tolken produced by them for controlling the weeds. They sprayed the weedicide on 1000 sq. meters of wheat crop in the field of an adopted farmer and supplied 1 kg. of the weedicide for spraying in another 1.5 acres of the crop. The use of Tolken was found to be very effective in destroying the weed population in wheat crop. Impressed by the result of Tolken spray, five farmers purchased the chemical from their resources for spraying in 9 acres of the crop.

The institute also supplied another weedicide viz., Hilproturon to 8 farmers for spraying in 7 acres. The farmers were convinced about effectiveness of the weedicide. As a result 5 more farmers made their own arrangement for treating the crop with Hilproturon in an area of 12 acres. There was no practice of use of weedicide for controlling weeds in wheat crop by the farmers prior to the implementation of L.L.P. in this village. But during the current rabi season an area of about 30 acres of wheat crop has been treated with the weedicides. The results of the spray of weedicides have been found to be very satisfactory.

9.4 Land levelling and shapping :

During the course of survey of households it was found that large pockets of land belonging to 50 farmers was undulating and could not be irrigated properly. Hence, arrangement was made for levelling and shapping of 24 acres of undulating fields/belonging to 27 farmers through the Delhi Administration. Out of the area levelled, 4 acres were brought under cultivation for the first time. After levelling the land has been put under different crops as shown below :

19 acres	Wheat
1 acre	Tomato
4 acres	Fallow for vegetables

9.5 Demonstration on compaction technique

In order to improve the water use efficiency of light soils four demonstrations were laid out on compaction technique in the fields of four farmers. The demonstrations have been planned for raising good crop of wheat in light soils in collaboration with the project, ICAR, New Delhi. The crop in all the project Coordinator, All India Coordinated Soil Physical Condition project, ICAR, New Delhi. The crop in all the demonstration plots is progressing well. A saving of 25% of water has been reported in successive irrigations by the use of compaction technique.

9.6 Creation of self employment opportunities and vocational training of village youths & women :

Ten women belonging to the adopted families were deputed for receiving training in tailoring w.e.f. 1st Oct., 1983. They are receiving training at Nangloi and getting a monthly stipend of Rs. 150/- per month from the Delhi Administration.

One village youth was also selected for training in motor driving under the vocational training programme of Delhi Administration. He has completed his training. He is now expected to receive loan from the Bank for purchasing three wheeler scoter.

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

10.1. CHANDRAHAS; BAPAT, S.R. and SINGH, B.H.—On pre-harvest forecasting of yield of Sugarcane. *Agricultural Situation in India, Vol. XXXVII, No. 5, Aug., 1983.*

In this paper an attempt has been made to study the relationship between the yield of Sugarcane and different morphological characters measured at various stage of crop growth, with a view to forecasting the yield of sugarcane before harvest. The data of 134 fields from 56 villages of Kolhapur district were used for this study. The simple correlation coefficients between yield and morphological characters (No. of canes, height & girth of cane, length and width of 3rd leaf) were positive and significant at all stages of crop growth. The regression analysis showed that the contribution to total variation in yield due to height of cane is maximum (50 per cent) following by millable cane and girth of cane at all stages of crop growth., the predictions equations corresponding to early growth (July-Aug.), brand growth (Aug.-Sept.), flowering (Sept. Oct.), maturity (Oct.-Nov.) and at harvest (Dec.-Feb.) stages have been given.

- 10.2 CHENGAPPA, P. G. ; MURALIDHARAN, M.A. and MAHESH KUMAR—The nature of price movements during Pool sales auctions of Coffee. *Agricultural Marketing, April, 1983, pp, 31-36.*

The price paid at pooled sales auctions of coffee vary from sale lot to sale lot and the magnitude of these price fluctuations depends on a number of factors. Data collected for important grades namely plantations—PB, Plantation A, Arabica Cherry-BBB and Robusta Cherry-AB for the period Dec., 1978 and March, 1979 at Bangalore, Coimbatore and Vijayawada for the pool sale auctions and analysis.

- 10.3 GOEL, B.B.P.S. and MAINI, J.S.—Estimation of pig population and number of pigs slaughtered using random sampling technique. *Ind. Jour. of Anim. Sci. 53(10), pp. 1134-38, October 1938.*

To evolve a suitable sampling methodology for the estimation of pig population and the number of pigs slaughtered a pilot sample survey was conducted in the district of Aligarh and Allahabad (Uttar Pradesh) during 1978-79. There was considerable variation in pig population and the number of pigs slaughtered from season to season. A count of these at any point of time cannot provide an estimate for the year as a whole. The estimates can be obtained by conducting a survey covering the entire period of the year including all the seasons. The seasonal fluctuations in the number of pigs slaughtered could be ascribed to seasonality of slaughtering which in turn depends upon the seasonality of farrowing. The survey provided adequately precise estimates of pig population, number of pigs slaughtered and related aspects.

- 10.4 JAIN, T.B. and NADKARNI, U.G.—On economics of pig farming in a rural area. *Ind. Jour. Agril. Eco. Vol. 38, No. 3, 1983.*

Pig industry is practically neglected in India. The technology of pig rearing here has not been properly developed on economic and scientific lines. The study to find out the practices of rearing pigs in the rural area and factors responsible for bringing out economics in rearing cost would help in further formulating the development programmes for pig rearing on scientific lines. In the present study the component wise costs of maintaining pigs of different categories and the effect of flock size on cost under rural conditions were estimated from the data collected from villages in Aligarh district of Uttar Pradesh during the period 1978-79. The average daily cost of maintenance of an adult pig was 76 paise for male and Rs. 1.05 for female. The cost per creeper of either sex was nearly of same order, being 12 paise for male and 13 paise for

female. The cost on family labour formed about 85 per cent of the total gross cost per pig. The average cost per pig of each category decreased with the increase in size of flocks. In the rural conditions maintaining large number of pigs per households appears to be economic.

10.5 KAMAL KISHORE, SETHI, I.C. and BASUTHAKUR, A.K.—Study on Milk Production in Avikalin and Avivastra ewes,—*Cherion*, 12: 5, 1983.

Avikalin and Avivastra yield 41.36 kg. and 43.52 kg. of milk in lactation of 92 days. Sex of the lamb and the total milk consumed appears to determine the gain in weight of the lambs. The milk production was comparable to other indigenous and crossbred ewes in the country.

10.6 LAL CHAND and NARAIN, P.—Genetic Parameters of Lactation Performance Index in Sahiwal Cattle.—*Indian Jour. Anim. Sci.* 54 (2), pp. 238-239, February, 1984.

Lactation performance index, based on four economic characters lactation yield, lactation length, calving interval and dry period, developed by Narain and Chand (1980) by using data for Sahiwal herd maintained at Military Farm, Meerut was found to be more heritable ($h^2=0.66$) than the component traits and it had a high positive correlation with lactation yield ($r_G=0.66$) and lactation length ($r_G=0.53$). This index can, therefore, be

used for improving the overall genetic merit of the animals for lactation performance.

10.7 NADKARNI, U.G., JAIN, T.B. and KUMAR RAMESH—Survivorship of some breeds of bovines in Punjab. *Jour. Ind. Soc. Agril. Stat.*, Vol. 35, No. 2, Aug., 1983.

Survivorship measures viability of the species in different environments. The survivors (l_x) to any age x from a given cohort depend on the mean length of life of the species. For comparison of survivorship of bovines of different breeds, percentage deviations from mean length of life are first obtained. The curves are drawn for survivorship against these percentage deviations for Hariana, Sahiwal and Non-Descript breeds of cattle and Murrah, Nili and Non-Descript breeds of buffaloes found in ICD (Amritsar) and Non-ICD of (Ferozepur) areas of Punjab. It was found that except in the case Non-Descript cattle of either sex in ICD area the curves were of positively skew rectangular type.

- 10.8 NADKARNI, U. G. SOMAYAZULU, L. B. S., JAIN, T. B., GUPTA, H. C., and AGARWAL, S. C.—Cost of maintenance of pigs. *Ind. Jour. Anim. Sci.*, Vol. 53, No. 8, Aug., 1983.

The componentwise cost of maintaining pigs of different categories were estimated. The cost of maintenance of pigs of Large White Yorklist and Landrace breeds differed over farms. Average cost per pig under field conditions was very much less than that under farm conditions. The cost on feed formed the major component of cost at research farms whereas under field conditions labour formed the major component. Variation in costs was observed over flock sizes.

- 10.9 NARAIN, P. ; BHARGAVA, P. N. and BHATIA, A. K.—Response to Application of Potash for Wheat and Rice. *Fertiliser Marketing News*, Vol. 14, No. 11. November, 1983, pp: 7-12

It is observed from the past 10-15 years experience that the business of crop production cannot go ahead without the use of fertilizers. With the continuous cropping over period of time N; P and K nutrients are removed by the crops when harvested. Out of which it is generally observed that K is removed in large quantities. In the present paper a critical examination of the fertilizers response data for paddy and wheat from the experiments conducted on cultivators' field during 1977-80 under AICARP was attempted. The results were also studied in relation to availability of K in the soil. For paddy, it is observed that the response decreases for each level of fertilizer application with the increase in the availability of K in the soil. It is interesting to note that the response to 60 kg. K_2O/ha is higher in some of the regions as compared to that for 40 kg N/ha.

For wheat the trend in response is found the similar to that of rice. The responses to 60 kg K_2O/ha are higher as compared to that for 40 kg N/ha for all status soils in all the regions except subhumid Sutlej-Ganga Alluvial plains.

The frequency distribution of the district according to the magnitude of response to 20, 40 and 60 kg K_2O/ha over $N_{40}P_{20}$, $N_{80}P_{40}$, and $N_{120}P_{60}$ respectively was also prepared. In respect of paddy, it is observed that application of K at the rate of 60 kg K_2O/ha gives a very high response of more than 6.7 g/ha in most of the districts. For wheat it is observed that pattern of distribution of districts among different levels of K varies in each case.

- 10.10 NARAIN, P. and KATHURIA, O.P.—The Status of Fisheries Statistics in India. *Agricultural Situation*. 38(5) : 259-265, August, 1983.

Fisheries of India broadly consists of two types viz. i) marine fisheries and (ii) inland fisheries which include fresh water, estuarine and back water

fisheries. For planning the development and exploitation of marine and inland fisheries the availability of comprehensive and reliable statistics on a regular basis is very essential. Another equally important field requiring concerted action by statisticians and fishery biologists etc. is fisheries statistics research. This involves application of scientific method of statistics of exploitation and survey in fisheries work which result in data deviating from expectation by chance. Both the aspects of fisheries statistics viz. collection of reliable fisheries and statistics and fishery statistics research have been dealt with in this article.

The requirement of statistical data relating to fishery has been examined under three broad categories viz. a) Potential resources, b) production of fish and seed fish and (c) consumption, demand, market arrivals, price pattern and related statistics. The methodology evolved for estimating the production from marine resources and currently being adopted by the states for estimating the production of marine fish on all-India basis has been emphasised. Similarly stress has been laid on the need for developing appropriate methodology for estimating the resources and catch of fish for inland fisheries. With regard to fishery statistics research the need for developing appropriate statistical techniques to improve the existing data base such as of estimating resource potential, recruitment and catch effort employing dynamic population model approach for capture fisheries has been emphasised.

10.11 NARAIN, P. ; PANDEY, R. K. and SARUP, SHANTI—Economic study of crop productivity in Indian Agriculture. *Conference papers, 66th Annual Conference, Indian Economic Association, December 1983, pp. 1928-30.*

The main objectives of this study were to examine the productivity levels and growth rates of productivity of selected foodgrains alongwith the productivity of various resources used in crop production. The future productivity levels in 2000 A. D. for the country as a whole have also been predicted. The study is based on secondary data and covers rice, wheat, jowar, maize, bajra and pulses. Regression equations have been estimated for examining the contribution of different factors to the productivity of crop mentioned above. The future productivity levels have been predicted and compared with the productivity levels projected by National Commission on Agriculture and in a book by Sanderson and Ray. The yield levels predicted by these two sources are consistently higher than the predicted yield levels obtained in this paper.

10.12 NARIN, P, BHARGAVA, P.N. and JAIN, H.C.—Profitability in Systems Approach. *Fertilizer News, Vol. 28, No. 12, Dec., 1983 : 64-73.*

With the introduction of high yielding varieties and availability of proven production technology for the principal cereal crops namely rice and

wheat, there has been a steady increase in the total production of foodgrains during the last one and a half decade. But still the rate of increase of food-grain production is not sufficient to meet the demand of 205 to 225 million tonnes by 2,000 A.D. In order to accelerate the tempo of production, it is necessary to increase the intensity of the land use in the country without unduly disturbing the eco-system. This requires development of suitable cropping systems in different agro-climatic conditions with a view to producing more per unit of area per unit time. The multiple cropping systems exhaust the nutrients from the soil and as such it becomes necessary to develop the system with efficient fertilizer management practices. This calls for a systems approach. The concept of integrated nutrient supply system has to be superimposed on the multiple cropping system to help maintain soil fertility and enhance crop productivity and profitability.

On the basis of the data collected under the AICARP it has been found that in Sutlej-Ganga alluvial tract of Punjab, U.P. and Bihar and also in the Arid Western plains of Haryana, Rajasthan and Gujarat, it is feasible to raise three crops in a year under adequate input conditions fetching a goods profit of about 10 to 12 thousand rupees per hectare. The number of idle days was only 40 to 60 days in the year, for most of the cropping systems indicating employment opportunities for the family over the whole year. For some of the two-crop systems, some reduction in the use of recommended fertiliser dose could be made e.g. in rice-wheat system, 25 per cent reduction in fertilisers could be made for rice, but not for wheat. Further, for this system it is useful to apply potassic fertiliser in the Kharif season and phosphatic fertiliser in the Rabi Season. There is a possibility of economising fertilisers by complementary and supplementary use of farm yard manure. Its application should, however be restricted to Kharif crop only. Thus, a "System Approach" can provide better profits to the farmers than the mono-cropping system.

- 10.13 RAHEJA, S.K. MELHOTRA, P.C. and AHUJA, D.L.—A Methodological Study on Estimation of Straw to Grain Ratio in Wheat Crop—*Jour. Ind. Soc. Agri. Stat. Vol. XXXV, No 2, 1983.*

Straw production is normally obtained as the product of grain production and straw to grain ratio. However, although appropriate sampling technique is available for estimation of grain production by conducting crop cutting experiments in randomly selected fields, no reliable technique is yet available for estimation of straw to grain ratio, With the development of high yielding varieties for which the straw to gain ratio may vary from one variety

to the other, there is an urgent need to develop appropriate survey methodology to estimate the straw to grain ratio with a good precision. In this paper different procedure for estimation of straw to grain ratio for wheat crop have been investigated. The effect of agronomic factors on straw to grain ratio is also studied. The methodology developed has also been illustrated with the help of empirical data.

- 10.14 RAI, S.C.—Adoption of Soil and Water Conservation Programmes in Dry Farming-A Case Study. *Eastern Economics, Vol. 1, No. 3, 1983.* pp. 39-42.

The paper deals with the adoption of various improved agricultural practices in dry farming conditions where soil and Water conservation programmes exist in Andhra Pradesh. The capacity to assimilate changes and adopt new levels of farm technology is not the same with all farmers. Social circumstances and economic resources available with the farmers influence the level of technology adopted on the farm. The adoption pattern of improved farming methodologies had been studied with reference to (i) Caste (ii) age (iii) family size (iv) educational status (v) Urban contacts, (vi) organisational participation and (vii) subsidiary occupation of farmers. A differential behavior in adoption of improved technology had been observed in respect of characteristics like age, urban contacts and organisational participation.

- 10.15 REDDY C.E., TANEJA, V.K. and MAHESH KUMAR, Influence of inbreeding on first lactation traits of Murrah & Nili Ravi Buffaloes. *Chirion. 12: 3. 1983. pp. 123-129,*

Unless specific mating are practised, effect of inbreeding is inevitable in closed herds. Gurnani et al (1971) reported that average inbreeding Co-efficient of 9.76% had no significant effect on a age at first calving in Jharparkar herd maintained at Karnal. Since such information is scanty for buffaloes. the average levels of inbreeding co-efficient were calculated for Murrah, as well as Nili-Ravi Buffaloes and the influence of inbreeding on the first lactation traits in the two breeds were investigated.

- 10.16 SARUP, SHANTI and PANDEY, R.K. Productivity trends of major oil seed, *Yojana Vol. 27, No. 23, December, 16 to 31st, 1983. pp. 6 to 8.*

This paper examines the productivity trend of mojour oilseed during the period of 1968-69 to 1978-79. The analysis reveals that the yield rates of all the major oilseed crops in India are lower compared to world average. Among different oilseed crops in the country, the yield level of groundnut are the highest followed by Rape-seed and mustard, caster seed linseed and sesamum

During the period under the study the yield rates of castor only has shown significant increase of 77 percent while for other oilseed crops, the increases are of the order of 5 percent to 23 percent and observed to be statistically non-significant for the country as a whole. Wide fluctuations in productivity level were also noticed during this period because of adverse seasonal conditions. In respect of groundnut crop, in different states the pattern of productivity level compared to all India average has not changed except for Gujarat where the yield rate excelled the national average while in Andhra Pradesh and Uttar Pradesh the yield rates became below par. Productivity of this crop in the states of Gujarat and Rajasthan has shown significant increase whereas it has shown declining trend in Kerala. In the remaining states there is no change in productivity level.

In respect of rape seed and mustard the growth rate of productivity is quite small and statistically insignificant in almost all the states except for West Bengal and Jammu & Kashmir. The productivity of the crop has remained state around 5 quintal per hectare at all-India levels during this period. The productivity of sesamum has shown highly significant increasing trend in the states of Karnataka & Rajasthan where as it has shown a declining trend in Uttar Pradesh. The productivity level have continued to be low in the states of Rajasthan, Madhya Pradesh, Uttar Pradesh & Punjab compared to national average of 210 kg/ha during 1978-79. In respect of linseed crop, though the states of Rajasthan & Maharashtra have shown significant increases in their productivity level yet the productivity of the crop in Maharashtra has continued to be lower compared to all India average. In case of castor, only Gujarat state has shown significant improvement in yield rates. This implies that not much progress has been achieved in improving the productivity of oilseed crops during the period under study.

- 10.17 SAXENA, B. C., SINGH, H. P. and VERMA, S. P.—Role of Dairying Towards Industrialisation—*Ind. Jour. of Agri. Economics. Vol. 38, No. 3 July-Sept., 1983.*

The paper is based on the data collected by I.A.S.R.I. for milk collection areas of three major milk supply schemes viz. Delhi Milk Scheme (DMS), Dudh Sagar Dairy (DSD) Mahsana and Madhavaram Milk Supply Scheme, (MS) Madras. The study was undertaken to examine the role of dairying in terms of productivity, income as also in the field of rural employment. The main findings of the paper are that rural employment through dairying alone has shown a considerable progress in both DMS and MNS areas. An appreciable increase in employment through dairying as a subsidiary occupation

was seen in all the Milk collection areas indicating thereby that setting up of urban milk supply scheme is another way of rural industrialisation. In addition to generation of employment in rural areas, there has been considerable improvement in the income of rural people,

10.18 SINGH, R, -A. Sampling Scheme for study of two characters. *Biometrical Jour*, Volume 25.

The paper deals with the use of appropriate sampling scheme for estimating the means of a finite bivariate population. The conditions here been obtained for choosing from the two sampling schemes, one being the observing of sampling units for both the characters and the other being observing first character above for a part of the sample, second character alone for another part of the sample and observing both the characters together on some other part of the sample.

10.19 SINGH, R.—On the use of incomplete frames in Sample Survey—*Biometrical Jour.*, Vol. 25.

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 design 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 the present investigation, procedure suggested by HANSEN, HURWITZ and JABINE (1964) has been used for estimating the population total for the characteristic under study in the two situations namely (i) when the units missing from the frame are random and (ii) when the missing units differ from units available in the frame.

10.20 SINGH, RANDHIR and SINGH, D.—Sampling with partial enumeration from bivariate populations—*Jour. of Stat. Planning and Inference*, No. 7., pp. 343-351.

In multi-character surveys, determination of sample sizes for studying various characters poses a difficult problem. In some situations, instead of observing the same units for all the characters it may be desirable to have some units observed for all the characters whereas some extra units for each character are observed separately.

Such type of sampling has been defined here as sampling with partial enumeration. In the present investigation the efficiency of sampling with partial enumeration has been examined as compared to the usual two phase sampling for the study of only two characters.

- 10.21 SINGH, R. K ; SINGH, M. and DOSHI, S. P.—Estimation and interpretation of population genetic parameters from F_2 -diallel data. *Current Approaches in Cyto-genetics* (by R. P. Sinha and U. Sinha), Spectrum Publishing House, Patna, 1983.

In the original Hayman's components model, the expectations for the second degree statistics obtainable from F_1 diallel data were given. As such expectations are not available for F-2 diallel, the equations meant for F1 analysis are being used for F2 analysis also. The F-2 being a segregating generation whereas F1 is not, the expectations for the second degree statistics are likely to change.

Keeping this in view, a new set of statistics was derived. For comparison both F1 and F2 expectations were used for the analysis of F2 data. The results showed significant differences in the amount of various estimates in these two cases, giving altogether different conclusions.

- 10.22 SUKHATME, P. V. and NARAIN, P.—Intra-individual variation in energy requirement & its implications. *Indian J. Med. Res.* 78 December, 1983 pp. 857-865.

It is generally assumed in nutrition studies that the energy requirement of an individual is fixed and that any variation from day to day is negligible relative to variation between individuals of the same age, sex and body weight. However, this assumption does not find support in the available data. On the contrary, the requirement in an individual is found to vary over time and this variation is found to persist even when data are averaged over a week. Further, the requirement follows a stochastic stationary distribution implying that as man advances in time, the genetic entities possessed by him interact with the environment to keep the variance constant. An attempt has been made by the authors to relate the genetic component due to this interaction with the auto-regulatory mechanism.

11. PAPERS ACCEPTED FOR PUBLICATION

- 11.1. GOEL, B.B.P.S.—Quality control in censuses and surveys in Agriculture. *Proceedings of the 71st Session of the Indian Science Congress Association.*

- 11.2. NARAIN, P. GOEL, B.B.P.S.—Optimum deployment of resources for research and development in Agricultural Science and Technology. *Proceeding of the 71st Session of the Indian Science Congress Association.*
- 11.3. SARUP, SHANTI; PANDEY, R.K. and VERMA, GEETAM—An economic study of pulse production in Madhya Pradesh *Margin, NCAER, New Delhi, Oct., 1983.*
- 11.4. SINGH, RANDHIR—Estimation from incomplete multiple observations. *Jour. of Statistical Planning and Inference.*

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, sequential 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 CHANG, B.C. (*Mathematics Department, National University of Singapore, Kent Ridge, Singapore 0511*)—Price—Adjusted Attribute Single Sampling with Polynomial In difference. *IIE Transactions, 15, No. 2, 99—103, June 1983.*

To formulate a price adjusted sampling plan, find a price function P_T (n, x), such that

$$E [P_T (n, x)] = h(p), \quad \dots (1)$$

where p is the average price per acceptable item the consumer is willing to pay, $h(p)$ is the indifference function representing the price the consumer is willing to pay for a lot with quality level p and $P_T (n, x)$ is the actual price the consumer pays for the lot when x is observed. The marginal distribution of the number of defectives is $b(x; n, p)$. Given a polynomial $h(p)$ it is always

possible to find a polynomial $P_T(n, x)$ satisfying (1). The consumer's indifference to p can will be described by the corresponding price function of x .

For determining a price adjusted sampling plan for a given consumer's indifference, an appropriate value of n is to be determined. In case of quadratic indifference, n is obtained from either of the two expressions

$$\begin{aligned} P_r[\text{Price per non-defective item} \leq L/p = p_1] &\leq \alpha, \\ P_r[\text{Price per non-defective item} \geq U/p = p_2] &\leq \beta. \end{aligned}$$

where p_1 and p_2 are some predetermined quality levels, L and U are some pre-specified price limits, and α and β are the producer's and consumer's risk, respectively. For a small value of p_1 , say $p_1 < 0.1$, use Poisson distribution as an approximation to binomial distribution. Similarly, for $0.1 \leq p_1 \leq 0.9$, use the standard normal distribution to approximate binomial distribution.

The solution procedure developed here is applicable to price—adjusted sampling plans with general polynomial indifference.

The complete a price—adjusted sampling plan, determine $h(p)$ of the form

$$h(p) = a_0 + a_1p + \dots + a_m p^m.$$

The values of the unknowns a_0, a_1, \dots, a_m are so determined that $h(p)$ represents the consumer indifference over the range of the quality level. The constants can be determined using simplex algorithm to the linear programs.

(V.K. Gupta)

12.1.2 SETHUMADHVI, R. and SUKHATME, B.V.—Stratification in surveys on fruit crops. *Journal of Indian Society of Agricultural Statistics, Vol. XXXI, No. 1, April, 1979, pp 63-76.*

For a population of high positive skewness and along positive tail the various aspects involved in stratification viz. construction of strata, type of sample allocation, number of strata, expected gains from stratification and determination of sample size were studied. The data used were collected in a sample survey on fruit crops conducted by I.A.S.R.I. in Mahasu district of Himachal Pradesh in 1965-66. Considering the area under fruit as a stratification variable the different methods of stratification viz. Dalenius and Hodges, Ekman, Equalisation of strata totals, Durbin, OPS for proportional allocation and optimum allocation were compared. It was found that Ekman's method gave the least variance whereas the proportional allocation was the best efficient. Although Dalenius and Hodges, method gave somewhat higher variance yet it can easily be adopted in practice.

Four different methods of allocation of the sample to the different strata were considered. It was found that with the increase in the number of strata the difference between the variance ratios and various allocations disappear to a great extent and a considerable reduction in variance is achieved through stratified sampling. The optimum allocation based on the number of trees gave the highest precision.

It was concluded that the population should be divided into five strata with a sample size of 200 allocated to the different strata according to optimum allocation based on the number of trees so as to than a fair degree of precision for both the estimation variables viz. area under fruits and number of fruit trees.

(Kharag Bahadur Singh)

- 12.1.3 SISODIA, B.V.S. and DWIVEDI, V.K.—A modified ratio estimator using coefficient of variation of auxiliary variable. *J. of Ind. Soc. Agri. Stat.*, Vol. 33, No. 2, August 1981.

A modified ratio estimator using coefficient of variation of auxiliary variable X is proposed in the paper. It is shown that the absolute bias of the modified ratio estimator is always less than that of the ratio estimator when α , the intercept of the regression line of Y on X in the population, is positive and greater than βC_x where β is the regression coefficient and C_x is the coefficient of variation of X. The proposed estimator is found to be more efficient than both ratio and simple mean estimator when ρ , the coefficient of correlation between X and Y lies between a certain range. Empirical comparison of the different estimates is done on a number of populations.

(J.N. Garg)

- 12.1.4 SRIVASTAVA, V.K. and BHATNAGAR, SHARAD—A Revisit to the use of Coefficient of Variation in Estimating Mean. *Jour. ISAS—Vol. XXXV*, No. 1, April 1983, pp 67-71.

In this paper, the authors have proposed a family of improved estimators for the population mean if the property of unbiasedness is ignored. The estimators proposed are

$$t_{k_g} = \bar{y} \left(1 + \frac{n\bar{y}^2 - g s^2}{k s^2} \right),$$

where k and g are the characterising scalars and s^2 is an unbiased estimator of the population variance σ^2 .

It has been shown that the estimators studied by Srivastava (1974) and Upadhyaya and Srivastava (1976) can be derived as particular cases of the

estimators proposed above. This estimator t_{k_g} provides a unified type of treatment and analysis of its properties may help in the development of possibly more efficient estimators for population mean \bar{T} .

When σ^2 is known, another family of estimators on the pattern of t_{k_g} is defined as follows :

$$t^*_{k_g} = \bar{y} \left(1 + \frac{k\sigma^2}{n\bar{y}^2 + g\sigma^2} \right)$$

A comparison of the estimators t_{k_g} and $t^*_{k_g}$ may furnish an idea of the change in properties attributable to lack of knowledge of population variance σ^2 .

The authors have been shown that t_{-11} will have smaller mean squared error than t_{-10} until the population is highly positively skewed. At least for all negatively skewed and symmetrical populations, t_{-11} will definitely be better than t_{-10} . It has also been shown that t_{k_g} and $t^*_{k_g}$ have identical bias to the order of approximation for symmetrical populations.

(G.S. Bassi)

12.2. Design of Experiments :

12.2.1 OYEJOLA, B. A. and MEAD, R.—Statistical Assessment, of different ways of calculating Land Equivalent Ratios (LER). *Experimental Agriculture* (1982), Volume 18, pp. 125-138 (Great Britain).

Research into intercropping is expanding rapidly and data from intercropping experiments are being analysed in many different ways. Much of the work has been done with emphasises on indices of combined yield from intercrop and sole crop plot yield. The only one index which has sound agronomic meaning in the context of inter cropping is Land Equivalent Ratio (LER). LER is sum of Partial Land Equivalent Ratios (PLER). PLER of a crop is ratio of yield of a crop in intercropping system to the yield of same crop when grown singly.

It has been shown in this paper that there is more than one way to generate LER values from plot wise yield data and that the Non-normality is not serious, provided the mean yields of sole crops (averaged over replication) are taken for the purpose of standardisation. The six ways of standardisation discussed by the authors in case of germ plasm screening trials, depending upon the choice of sole crop yield, The six ways are :—

- L1—The average of all treatments from all blocks,
- L2—The average of each treatment from all blocks,
- L3—The average of the best treatment from all the blocks,

- L4—The average of all treatments from each block,
 L5—The average of each treatment from each block, and
 L6—The average of the best treatment from each block.

The use in analysis of variance of six different ways of calculating Land Equivalent Ratio (LER) was assessed. Criteria used are i) normality of the residuals of LER values after fitting block and treatment effects, (2) precision of comparison arising from the analysis of variance, and (3) possible bias in the means. These were examined in detail for data from one experiment and consistency of the results was investigated from seven other sets of data. The results suggested that if the LER is calculated using the corresponding treatment sole crop yields as divisor, then the results using separate divisors from each block (L5) are highly unreliable and should not be used in analysis of variance. If the same divisor are used for each block, then the results are more reliable though normality assumptions can still rather be doubtful. Separate standardisation in each block had no advantages over using the same standardisation in all blocks. The use of many different divisors can lead to problems in the statistical analysis of LERS.

12.3. Statistical genetics Plant and Animal Breeding

- 12.3.1 CLARK, J. H. and DAVIS, C. L.—Future improvement of milk production ; Potential for nutritional improvement. *Journal of Animal Science*, Vol. 57, No. 3, Sept. 1983. pp. 750-764.

This paper deals with the potential for increasing milk production through feeding. Potential for nutritional improvement of milk production resides in two broad areas viz. (i) optimization of the amount and balance of nutrients absorbed from the gut and (ii) partitioning of absorbed nutrients as well as those in body tissue stores toward support of milk production.

Accepting, the physical limitations of gut capacity, much can be done in formulating diets to assure maximum dry matter intake. Dietary factors such as ratio of forage to concentrate, moisture level of the feed, extent of feed processing, energy to protien ratio, form of supplemental nitrogen and the addition of mineral buffers play a role in regulating the amount of dry matter a lactating cow will consume.

Efficient utilization of absorbed nutrients for milk production involves a partitioning of a high proportion of the nutrients to the mammary gland. First priority among other tissues in the dairy cow in early lactation is the mammary gland. High producing cows partition a larger percentage of absorbed nutrients to the mammary gland than do low producing cows.

The literature available on these specific points have been reviewed in this paper.

(T.B. Jain)

- 12.3.2 DONKER, J.D., MARX, G.D. and YOUNG, C.W.—Feed intake and milk production from three rates of concentrates for cows bred to differ in size. *Journal of Dairy Science*, Vol. 66, No. 6, June, 1983, Pages 1337-1348.

To ascertain effects of three rates of feeding concentrate (high, medium and low) to small and large lactating Holstein cows on feed intake and refusal, on quantity and composition of milk produced, and on feed energy cost per unit of milk produced, two groups of Holstein cows sired by bulls were selected partly for transmitting ability for size averaged 525 and 570 Kg. weight after 30 days of second calving. Within weight groups and before first lactations, cows were assigned randomly to three feeding schemes over several years. Specified amounts of concentrate were fed from 20 days before calving to 45 days after calving. Thereafter concentrates were adjusted every 2 weeks according to milk production in the preceding 2 weeks. Generally equal quantities of alfalfa haylage and corn silage were fed each day in weighed amounts to exceed consumption. At times, haylage constituted the only forage fed.

Weekly samples of each feed stuff andorts by grade were analysed for Cry matter, crue fiber and crude protien. Milk was also analysed for fat and protien monthly. Consumption of TDN per kilogram of fat corrected milk produced connotes feed, efficiency of milk production : gross efficiency from total TDN consumed and net efficiency in which TDN weight change were factored out.

From the analysis, it is observed that well bred Holstein cows produced reasonably well when rather nominal rates of concentrates were offered and adequate quantities of high quality forage were available. As more concentrate was used more milk was produced, but the relative increase was much higher in going from low to medium than from medium to high rates. The small and large Holstein cows did not differ greatly in body weight yet as a result of selective breeding. The smaller cows produced as much milk per cow, more per unit body weight, and more per unit of feed consumed.

(S.C. Agarwal)

- 12.3.3. FRANK, G.R., AHERNE, F.X. and JENSEN, A.H.—A study of the relationship between performance and dietary component digestibilities by swine fed different levels of dietary fibre. *Jour. of Animal Science*, 57, No. 3, September, 1983.

In this paper, a digestion trial using randomised complete block design with selected individual pigs as experimental units, based upon a 49-d feeding

trial, using 192 growing-finishing pigs and resulted in widely differing average daily gains (ADG) with linear effects on feed and energy efficiencies, when fed 16% CP diets containing either 0,7.5 or 15% corn cobs; was conducted to determine if previous performance of the selected pigs could be related to the digestibilities of dietary components. Differences in daily feed intakes of pigs were due to amount of feed proportional to body weights.

Decreases in N digestibility, N retention (% of N intake) were not significantly different among diets or performance groups (pigs of above average, and below average rates of body weight gains). Dry matter digestibility and digestible energy contents of the diets decreased linearly ($P < .001$) and were found insignificant. Plasma glucose levels decreased ($P < .01$) linearly, but Urea N tended to increase (15.9, 18.1 and 19.0 mg/100ml) with increasing level of dietary corncob. The digestibilities of dietary neutral detergent fibre (NDF) and acid-detergent fibre (ADF) decreased both with no significant effects. The digestion coefficients of hemicellulose did not differ significantly among diets.

(G.C. Chawla)

12.3.4 SETHI, K.L. and SAPRA, R.L.—Variability in two Natural Populations of paimarosa. *Indian Journal of Genetics and Plant Breeding* Vol. 43 (1983) Number : 37-39

In this article the data considered for the study were samples of 63 and 72 plants from the tract of Vindhya and Satpura and Ajanta and northern slopes of river Tapti and denoted as region 1 and 2 respectively. Five characters namely plant height (cm), number of tillers, breadth of sixth leaf (cm), length of sixth leaf (cm), from top and florescence length were studied for the coefficient of variability. In region 1, the coefficient of variability varies from 11% to 64% being lowest in plant height and highest in number of tillers whereas in region 2 the coefficient of variability varies from 23% in plant height to 88% in the number of tillers. Also these characters were compared in terms of probabilities providing thereby the variability that exceeds a particular value in both the regions. And it is suggested that region 2 has more variability and further collection from this region can be made for exploiting the wider natural variability available in that region for utilisation in the improvement of this taxon,

(P.S. Rana)

12.4 Statistical inference Sequential analysis & Stochastic Process with biological applications etc,

12.4.1 DEATION, MICHEAL L.—Estimation and hypothesis testing in regression in the presence of non-homogeneous error variances. *Commun. Statist.—Simula. Computa.*, 12(1), pp. 45-66 (1983).

The problems of estimation and hypothesis testing for the general linear model with a heteroscedastic variance structure are considered in this paper. The ordinary least squares procedures which ignore the variance heterogeneity are compared with the estimated generalised least squares procedures which use the replicate observations to estimate weights. It is argued and empirically demonstrated that guidelines for choosing between the two approaches must be partially based on a measure of the degree of variance heterogeneity. Monte Carlo experiments for the simple linear model suggest ordinary least squares procedures for estimation and testing are surprisingly robust to departure from the assumption of variance homogeneity. The guidelines for selecting one of the above procedures under different situations are given.

(Ranjana Agrawal)

12.4.2 GUNST, RICHARD F.—Regression analysis with multicollinear predictor variables : Definition, detection and effects. *Commun. Statist—Theor., Meth.*, 12(9) pp. 2217-2260 (1983)

The purpose of this paper is to review the topic of multicollinearity with special reference to research which has been conducted over the last ten to fifteen years. The nature and effects of predictor variables multicollinearities have been examined. Emphasis is placed on discussions of the multicollinearity problem itself rather than on classical or Bayesian solutions to the problem. Effective alternatives to least squares or Bayes estimators, if needed can be proposed only when multicollinearities have been identified and source of their occurrence has been discovered.

(R. C. Jain)

12.4.3 MAGER, PETER P. (KARE marx University, Leipzig, G.D.R.)-Response surface analysis for continuous regressors applied to neurotoxic organophosphorus pesticides. *Biometrical Journal*, Vol. 25, No. 2, pp. 201-206, 1983.

Let Y be any biological property and X_i , ($i=1, \dots, c$) be continuously distributed regressors. Consider the third order model.

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_{11}X_1^2 + b_{22}X_2^2 + b_{33}X_3^2 + b_{12}X_1X_2 + b_{13}X_1X_3 + b_{23}X_2X_3.$$

The solution of

$$\frac{\delta Y}{\delta X_i} = 0 \quad \forall i = 1, 2, 3$$

leads to the stationary point X_{ts} . The linear terms can be eliminated by changing the origin

$$X_i^* = X_i - X_{ts}$$

This leads to the equation

$$Y = b_0^* + b_{11}^* (X_1^*)^2 + b_{22}^* (X_2^*)^2 + b_{33}^* (X_3^*)^2 \\ + b_{12}^* (X_1^* X_2^*) + b_{13}^* (X_1^* X_3^*) + b_{23}^* (X_2^* X_3^*),$$

where $b_0^* = Y_s$ is the response at the stationary points. To eliminate the cross products, rotate the axes of the surface about its new origin,

$$Y = Y_s + \lambda_1 Z_1^2 + \lambda_2 Z_2^2 + \lambda_3 Z_3^2$$

where the new axes are given by

$$Z_i = v_{i1} X_1^* + v_{i2} X_2^* + v_{i3} X_3^*$$

where the determinial equation becomes

$$\det (B - \lambda_i I) = 0$$

or $(B - \lambda_i I) v_i = 0,$

with I as the unity matrix and

$$B = \begin{bmatrix} b_{11}^* & \frac{1}{2} b_{12}^* & \frac{1}{2} b_{13}^* \\ \frac{1}{2} b_{12}^* & b_{22}^* & \frac{1}{2} b_{23}^* \\ \frac{1}{2} b_{13}^* & \frac{1}{2} b_{23}^* & b_{33}^* \end{bmatrix}$$

Using the canonical form of the model it is seen that the maximum response is achieved when all eigen values are positive. A minimum response is obtained if they are negative and a saddle point if they have different signs.

The technique is then illustrated through an example adopted from organophosphorus pesticide research. It is found that the maximum neurotoxicity depends on lipophilic and steric substituent properties.

(A.K. Nigam)

12.4.4 RAMIG, PAULINE F. (The Standard Oil Company, Cleveland, Ohio 44115) — Application of the analysis of means. *Journal of Quality Technology*, Vol. 15, No. 1, pp 19-25, January, 1983.

Ott (1967) developed the technique of analysis of means (ANOM) which was extended by Schilling (1973) to the analysis of means for treatment effects (ANOME). Recently Nelson (1983) presented tables of sample sizes for ANOM and compared the power of ANOM with that of ANOVA.

In a one-way classified variable data, the techniques of ANOM involves computing the upper and lower decision lines, UDL and IDL, where

$$UDL = \bar{X} + h_{\alpha} s \sqrt{(k-1)/kn}$$

$$LDL = \bar{X} - h_{\alpha} s \sqrt{(k-1)/kn}$$

where
$$\bar{X} = \sum_{i=1}^k \bar{X}_i / k,$$

$$s^2 = \sum_{i=1}^k s_i^2 / k, \quad s_i^2 = \sum_{j=1}^k (X_{ij} - \bar{X}_i)^2 / (n-1)$$

X_{ij} = j-th observation from population i,
 $i = 1, 2, \dots, k.$

The value of h_{α} can be obtained from the table in Nelson (1983) for type I risk level α , number of means k , and degrees of freedom $(n-1)k$.

The means are plotted against the decision lines, If any mean falls outside the decision lines, then there is a statistically significant difference among the means.

Similar steps are followed for the case of crossed or factorial designs. However, the decision lines are expressed more generally.

For proportion or count data, the ANOM is similar to that for variable data. Here the decision lines at risk α are

$$\bar{p} \pm h_{\alpha} s \sqrt{(k-1)/k},$$

where $p_i = X_i/n, i=1, 2, \dots, k,$

$$\bar{p} = \frac{\sum_{i=1}^k p_i}{k}$$

$$s = \sqrt{\bar{p}(1-\bar{p})/n}$$

and n is the number of observations on each population sampled. Here h_{α} is the tabled value in Nelson (1983) for k means and infinite degree of freedom.

The proportions are plotted against the decisionline. If all proportions fall between the decision lines, then it is concluded that the k -population proportions are equal. Otherwise conclude assignable causes exist.

In case of count data, the proportions are replaced by counts.

(V. K. Gupta)

12.5 Econometrics :

12.5.1 ANTHONY LAWRENCE and STEVEN BRAITHWAIT—The Residential Demand for electricity with time of day pricing. *Journal of Econometrics* 9 (1979) pp. 59-77.

This paper develops an econometric model of residential demand for electricity by time-of day. The model is applied to individual residential users under both experimental time-of-day pricing and conventional declining block rate schedules. The model is designed to analyse the behavioural structure of time-of-day demands. The demand model is conditional on time-of-day prices, residential appliance stocks, and socio-economic characteristics of the customer.

The principal objective of this study is to analyse the effects of time-of-day varying prices on the demand pattern. The second important objective is to analyse the relationship between the time-of-day load pattern and the stock of major electric appliances in the residence. The third objective of the model is to understand more about the relationship between the demographic and economic characteristics of the individual customer and the resulting diurnal pattern of energy use.

(Ashok Kumar)

12.5.2 DAVID A. PIERCE. Sources of Error in economic Time Series. *Journal of Econometrics*, Vol. 17 (1981) pp. 305-321.

The present paper classifies and measures the major sources of error, uncertainty or noise in economic data, regarding such data as observations

from stationary and non-stationary time series. For a variety of reasons observed data on economic time series are subject to uncertainty or error. In some instances first published data are revised at a later date, so that these preliminary data errors can be observed and corrected, in other the error persists in the final data. Cutting across this classification are the numerous varieties of error including conceptual error, seasonal adjustment error, sampling error, etc.

In this paper uncertainty due to seasonal adjustment, sampling and transitory variation are studied both as observable error and as unobservable error. Correlation between different error sources are also derived.

(Ashok Kumar)

12.5.3 HENNING BUNZEL AND SVEND HYLLEBERG—Seasonality in Dynamic Regression Models. *Journal of Econometrics*, Vol. 19 (1982) pp. 345—366

There has recently been a growing interest in the problems of seasonality in regression. The rationale for the use of seasonally filtered data is that district models are considered necessary to explain various frequency components.

In this paper the author has compared the finite sample properties of several seasonal adjustment procedures when the objective is to estimate coefficients in a dynamic regression equation with autocorrelation errors and the variable data contaminated by seasonal noise.

Monte Carlo methods are used to compare the finite sample properties of several seasonal adjustment procedures. The methods compared are methods applying dummy variables, moving average correlations, band spectrum regression, and an iterative instrumental variable band spectrum regression estimator, developed as an iterative instrumental variable approach to an exact maximum likelihood estimator.

(Ashok Kumar)

12.6 Computer Science and Numerical Analysis :

12.6.1 EVANS, D.J. and ABDOLLEHZADEH, F.—Efficient construction of balance of binary trees. *The Computer Journal*, Vol. 26, No. 3, August, 1983, Page 193 to 195

An improved algorithm for balancing arithmetic expression tree is presented and its efficiency considered when binary trees are constructed to represent arithmetic expressions and vacant nodes occur then by making use of the vacancy in the tree we are able to insert a smaller tree of lower height resulting in a balanced binary tree (B.B.T.) which is more efficient than those

given by existing methods. The time to construct the trees for 9 simple arithmetic expressions by a new algorithm a four time units less than the time Evans and Williams. Also, the time to execute the trees for fifty arithmetic expressions is three time units less than the time by Evans and Williams.

Therefore, the new algorithm may be more efficient in terms of time as well as high level.

(Mahesh Kumar)

- 12.6.2 JEWELL, NICHOLAS P, BLOOMFIELD, PETER, and BARTMANN, FLAVIO C.—Canonical correlations of past and future for series Bounds and computations. *The Annals of statistics* 1983, Vol. 11, No. 3, pp. 848-855.

This paper continues in investigation into the canonical correlations and cononical components of the past and future of a stationary Gaussiantime series which were introduced by Jewell and Bloomfield (1983). Bounds for the maximum canonical correlation are provided under specified conditions on the spectrum of the series. A computational scheme is described for estimating the canonical correlations and component and the procedure is illustrated on the well known sunspot number series.

(Mahesh Kumar)

- 12.6.3 VLAYTON, D. G.—Fitting a General family of failure time distribution using GLIM. *Appl. Statistics* (1983) Vol. 32, No. 2, pp. 102—109.

An approximate likelihood is described which allows the fitting of a very general family of failure time distribution to censored data, using GLIM, the family of distributions, represents some transformations of the hazard function by a polynomial. Extensions to the basic method to allow two failure time distributions to be compared using (a) the constant hazard ratio model and (b) the accelerated failure model are described. Finally, it is shown that the general proportional hazards regression model for location shift may also be fitted in GLIM when the hazard function is fitted by a polynomial series.

The GLIM macros—referred to in this paper are available from the author.

(Mahesh Kumar)

13. ABSTRACTS OF DISSERTATIONS APPROVED

13.1 Ph. D. Degree :

- 13.1.1 AHUJA, D.L.—Some studies in Sampling from two dimensional populations.

The objective of the thesis has been to suggest some suitable sampling plans for studying two dimensional populations spread over space and time.

Various cases of a combination of equal probability sampling and systematic sampling, using systematic sampling over time dimension have been examined. The cases, when sampling is unaligned and when it is aligned in one or both the directions have been considered. The problem is approached through varying probability sampling without replacement. Applicability of various suggested procedures have been illustrated through vegetable survey data. The both way aligned procedure where equal probability sampling is used in space dimension and systematic sampling in time dimension (denoted as $r_1 sy_1$) has performed exceedingly well from efficiency point of view besides its practical advantages. Use of double sampling procedure in combination with suggested $r_1 sy_1$ procedure was examined. The performance of suggested Double Sampling procedure with respect to efficiency as well as cost reduction in comparison to usual one dimensional sampling procedure when selected space units are observed over the entire time span has performed quite satisfactory. It is also observed that reduction in variance due to application of systematic sampling is much more than the reduction due to application of double sampling technique.

(Guide : Dr. A.K. Srivastava)

13.2 M. Sc. Degree :

13.2.1 DASS, JAGANNATH—A Statistical Appraisal of fertilizers Response on Paddy Crop and its economy.

With the spread of the high yielding varieties of rice, highly responsive to fertilizers and with the steep rise in the fertilizer cost, the need for making available information on optimum use of fertilizer in actual field condition for fostering the agricultural planning has come to importance.

To obtain optimum dose, the marginal value of the produce has to be equated to the marginal cost of the fertilizer. But to know the marginal value of the produce a knowledge of the algebraic form of the response function is an essential pre-requisite. Same is the pre-requisite for working out Minimum Recommended Rate (M.R.R.) for getting high net return per rupee invested on fertilizer, where besides the cost of fertilizer the cost of its application plays an important role. However, the importance of M.R.R. is more viable to Small and marginal farmers as they are interested in higher returns per rupee-invested.

In this thesis the quadratic response function has been considered, which is of the form as follows.

Quadratic Response Equation : is given by

$$Y = a_0 + a_1 x + a_2 x^2 \quad a_1 > 0, a_2 < 0$$

The quadratic equation is fitted to the data of 606 experiments on paddy crop taken up on cultivators' fields in 20 districts falling in different Agro-climatic regions under the All India Coordinated Agronomic Research Project of I.C.A.R. for the period 1980-81. In order to study the response behaviour of paddy crop to different levels of N, P and K fertilizer application a fractional factorial of 10 treatment combination consisting of 4 levels each nitrogen (N), phosphorus (P) and potash (K) is taken into consideration. The experiments were conducted using multistage stratified random sampling plan. The experiment revealed that the rice crop is highly responsive to combined application of all three nutrients.

Data pertaining to 10 districts which satisfied the law of diminishing returns for the quadratic functions have been taken into consideration for studying the economics of fertilizers under optimum dose and that under Minimum Recommended Rate (M.R.R.)

The optimum doses along with their approximate standard errors and Minimum Recommended Rate (M.R.R.) were worked out by the following formulae defined as follows :—

Optimum dose : Optimum dose maximises that net profit and for the the quadratic function, it is given by—

$$X_{opt} = \frac{q - pa_1}{2pa_2}$$

To work out the standard error for the optimum doses, the formulae which gives approximate estimate of the standard error with the co-efficients of x as above, is given by :

$$\begin{aligned} \sigma^2 X_{opt} &= \left(\frac{\partial X_{opt}}{\partial a_1} \right)^2 \sigma^2 a_1 + \left(\frac{\partial X_{opt}}{\partial a_2} \right)^2 \sigma^2 a_2 \\ \Rightarrow \sigma^2 X_{opt} &= \left(\frac{1}{2a_2} \right)^2 \sigma^2 a_1 + \left(\frac{a_1^2}{2a_2^2} - \frac{q}{2pa_2^2} \right)^2 \sigma^2 a_2 \end{aligned}$$

Minimum Recommended Rate : Minimum recommended Rate (M.R.R.) maximises the net return per rupee invested on fertilization and is independent of cost of produce. This is dependent on cost of fertilizer and its application and is derived from the solution of

$$\frac{f(x)}{f'(x)} = x + \frac{a}{q}$$

Where $f(v)$ is the above quadratic function, 'a' is the cost of application of fertilizer and q is the cost of fertilizer.

This gives rise to

$$\Delta \times \text{M.R.R.} = + \sqrt{\alpha^2 - \frac{a_1 \alpha}{a_2}} - \alpha$$

Where, $\alpha = \frac{a}{q}$

The quadratic equation was fitted to the data collected from 20 districts. In respect of only 10 districts the fitted response curve to the yield data indicated appreciable curvature, the quadratic co-efficient being significant, while for the remaining districts, curvature was negligible and optimum doses worked out fell beyond the level of dressings actually applied. In such situations it is necessary to apply higher fertilizer dressings in order to get the precise shape of response curve. To cater such situations economics of responses obtained with the application of N, P and K tried at the maximum level was studied which indicated by and large highest returns with $N_{120} P_{60} K_{60}$ followed by $N_{120} P_{60}$ and N_{120} .

Comparative study of the economics of fertilizer application under optimum doses and that under Minimum Recommended Rates revealed that percentage of profit for the Minimum Recommended Rates was invariably higher than those obtained with optimum doses for the corresponding districts. However, the ranking of the districts on the basis of percentage profit based on either Minimum Recommended Rate on optimum dose remained unchanged.

Inter-comparison of economics of fertilizer usage in various agro-climatic regions indicated wide variations both in respect of net profit and percentage profit. There were consistent increase in respect of both of these economic parameters in all the regions with application of potassium indicating deficiency of this nutrient.

(Guide : Sh. P.N. Soni)

13.2.2 DURAI RAJU, S.—Estimation from multiple observation surveys.

There are a number of situation in sample surveys where data has to be collected repeatedly for the same sampling units at different time-stages at specified intervals of time e.g. yield of vegetables at different-pickings, the milk yield of animals at weekly or fortnightly intervals etc. Sampling of such population is referred as two dimensional sampling. In all such situation,

requiring multiple observation for the same unit at specified time intervals, choice of sampling design poses a number of problems regarding whether the same sample should be observed over all the time-stages or different samples should be chosen at each time-stage separately. In the present investigation the relative efficiencies of the following three alternative sampling schemes have been examined namely' Sampling Scheme-I. To select a sample of size 'n' to be observed at each time-stage i.e. To retain the same set of units for recording at each time-stage. Sampling Scheme-II. To select independent samples to be observed separately for each time-stages, and Sampling scheme-III. To have a small common sample to be observed on all the time-stage and to have additional independent samples to be observed on different time-stages separately.

(Guide : Dr. Randhir Singh)

13.2.3 NEGI, (MISS) MALTI —Phylogenetic Analysis of Indian Bovine Breeds.

The importance of the use of Immunogenetic data in studying evolutionary relationships was recognised after some of the earliest papers on cattle immunogenetics were published (OWEN, Stormont and Irwin 1944, 1947), B locus allele of the blood groups system was most commonly used to study breed relationships. These studies measured similarity by relative number of B locus alleles common to the breeds. Two breeds having a recent common origin are supposed to have much more similar gene frequencies than too distantly related breeds. Until recently no method existed for simultaneously utilising available gene frequency data on several loci.

Cavallit-Storza and A.W.E. Edwards (1967), have given models and methods of analysis for studying evolutionary relationship of closely related populations using gene frequency data on several loci. The three methods of analysis given by them are (i) Maximum likelihood method, (ii) Method of minimum evolution, (iii) Additive or least square method. A bifurcating tree was used to represent the evolutionary relationships. A bifurcation represents the split of a single population into two daughter populations.

Kenneth-Kay-Kidd of University of Wisconsin, for the first time used the least square method of analysis for studying evolutionary relationships of Western European Cattle Breeds.

In India so far no systematic attempt has been made inspite of the fact that suitable gene frequency data on a number of cattle and buffaloes breeds is available at various research centres.

In this study an attempt has been made to study evolutionary relationships of Important Indian Cattle and Buffalo breeds. Gene frequency data on eleven cattle and six buffalo breeds was obtained from the published records at I.V.R.I., Izatnagar.

The methodology adopted comprises of transforming the gene frequency data to generate triangular distance matrices (Cavalli-Sforza & Edwards, 1967) which are then cluster analysed to give a number of promising tree forms. Least square method of analysis has been used to evaluate these tree forms. For every tree form we can write an equation of the form $D=BS$.

Where D is a column vector of pairwise distance, S is Column vector of segment lengths in the tree, B is a matrix of zeroes and one's specific to a tree form. Least square estimate of S is given by $S=(B'B)^{-1} B'D$.

This solution minimises $(BS-D)'(BS-D)=(\text{error})^2$. The conclusions are based on five or six good trees instead of a single best tree for which $(\text{error})^2$ is minimum.

But in the present study $(B'B)$ turned out to be a singular matrix for all the tree forms and we could not use the statistic $(\text{error})^2$ for choosing the best tree form. Thus only general conclusions could be drawn based on the relationship consistently shown by majority of the tree forms. In the study of eight cattle breeds viz. Ongole, Gir, Tharparkar, Kangayam, Kankrej, Hariana, Sahiwal and Red Sindhi; Kankrej, Kangayam and Gir showed close genetic relationship as well as Sahiwal and Red Sindhi consistently group together. The study of ten cattle breeds viz. Kankrej, Tharparkar, Hariana Rath, Gir, Red Sindhi, Sahiwal, Hallikar, Kangayam and Afghan showed that Kankrej and Gir are genetically very close but in this case Kangayam did not group with them. Two other groups showing genetic similarity are Hariana, Red Sindhi, Afghan and Tharparkar, Rath and Hallikar.

In the study of six buffalo breeds viz. Murrah (Jhansi), Bhadawari (Saidpur), Murrah (Izatnagar), Surti (Dharwad), Nili (Ferozepur) and Mehsana (Vallab Nagar), Murrah (IZ) and Nili (Ferozepur) showed a very close genetic similarity, D Bhadawari (Saidpur), Surti (Dharwad) and Meshana form another close group.

A further detailed study for the reasons of the failure of least square analysis due to singularity of $(B'B)$ matrix and for discrepancies in the results from different sets of data is necessitated.

(Guide : Dr. H.P. Singh)

14. ABSTRACTS OF SEMINAR TALKS

During the quarter under review, 14 seminar talks were delivered by the Scientists/Staff/Students of the Institute on various topics of interest in the fields of Agricultural Statistics and allied disciplines. The abstracts of Seminar talks are given below:

14.1 Seminar Talks delivered by Ph. D. Students :

14.1.1 Agricultural Statistics :

(i) DAS, U.S.—Construction of Group Divisible Rotatable Design.—Group-Divisible Rotatable designs forms an alternative series of response surface designs obtained by Das and Dey (1966) by modifying the restrictions imposed on the levels of the factors in a second-order rotatable designs introduced by Box and Hunter (1957). In these designs, the factors of the designs are split into two groups and the design is Rotatable for each group of factors when the levels of the factors in the other group are held constant and hence the name 'Group Divisible rotatable design'.

Various methods of construction of Group-divisible rotatable designs have been proposed by Das and Dey (1966). Construction of these designs through factorial and incomplete block design proceeds on the same line as these given by Das (1961) and Das and Narasimhan (1962) for the construction of second-order rotatable designs, with certain modifications. Different methods of construction of Group-divisible rotatable designs as proposed by Das and Dey (1966) were discussed with illustration.

(ii) JAISWAL, U.C.—Discriminant functions when variance and covariance matrices are unequal.

The basic problem under discriminant analysis is to assign an individual of unknown origin to one of the two (or more populations) on the basis of a vector X of observation the linear discriminant function introduced by R.A. Fisher (1936) is the optimal assignment rule when the assumption of equality of variance and covariance matrices of two populations is satisfied. But this assumption in practice is rarely satisfied. Gilbert (1969) studied the asymptotic performance of the quadratic and Fisher's linear discriminant function when the covariances matrices were unequal. Wall and Kronmal (1977) compared by Monte Carlo Methods the performance of Fishers linear quadratic discriminant function to classify the individuals into two multivariate normally distributed populations with unequal covariance matrices and moderate sized samples. The results indicate that sample size is a critical factor in choosing between the quadratic and linear function.

14.1.2 Agricultural Economics:

MUNIYANDI, B. - Impact of Technological Developments on the Pattern of income distribution, saving and Investment.

The green revolution in agriculture seems to have varying impact on income investment and savings of different sizes of farmers causing imbalances in the financial position of the farmers. Several studies have been made to study the disparities of income and savings between different sizes of holdings, progressive Vs Non-Progressive farmers and irrigated Vs. Non-irrigated holdings. Some of the important studies were discussed.

An important picture that emerges from the studies that large farmers and progressive farmers shared higher proportion of income than others. Pattern of savings and investment also increased with the increase in size of holdings. The reason for higher gross income on the large farms was the adoption of high-yielding varieties of crops on larger area by these farms which ultimately generated higher gross income.

So, the weakest section of farmers should be encouraged to adopt technology with the provision of credit facilities. Thus, the increments in income should be utilised continuously for increasing capital investment in the farm organisation.

14.1.3 Agricultural Extension :

JHAMTANI, AMITA—Measurement of Adoption.

Aim of Agril. Extension is to bring about desired changes in the farming people. Adoption of innovations is therefore, an important requirement. Unless the adoption behaviour of an individual is objectively and quantifiably known we cannot isolate the personality characteristics that act as impediments or accelerators in the process of adoption of innovations.

Based on these facts extension strategies as also the scientific investigations can be suitably designed. It is in this context that measurement of adoption is important.

Measurement of adoption requires factual events which are spread over long periods. This information gathered from individuals has to be synthesized and quantified according to a ratio scale. In preparing a tool for measuring adoption it is necessary to formulate precisely the developing concept of adoption and consolidate the variables into one composite unit to construct the measuring scale.

Although, a number of social scientists have attempted to quantify adoption, behaviour. Dr. Somnath Chattopadhyay's work reviewed here is perhaps

the only attempt that takes into account the important variables of adoption behaviour viz. the applicability, extent, time element, consistency, and weights of a practice.

His formula as also other measurements in social sciences can at best capture some of the overt behavioural aspects. Since adoption behaviour is a complex phenomena the adoption quotient naturally has to be used with care.

14.1.4 Agricultural Physics :

CHOPRA, (MISS) USHA KIRAN—Mulching Effects on Soil Water Status, Soil Temperature, Root Growth and Grain Yield of Summer Mung.

Field experiments were conducted for two years to study changes in soil water status and soil temperature under various mulches and the associated effects on root growth and grain yield of summer mung. The treatments were no mulch (M_0), straw mulch (M_s), black polythylene mulch (M_p), and polythylene covered with straw (M_{ps}).

The treatments significantly affected pre-irrigation water depletion in 0 to 90 cm soil depth for both the years. Maximum soil water conservation was observed under M_p and M_{ps} . M_s resulted in partial moisture conservation. The soil temperatures at 5 and 15 cm. depth were also significantly affected by the treatments. The maximum decrease in soil temperature was obtained under M_s and M_{ps} . The M_{ps} resulted in maximum soil temperature moderation and soil moisture conservation. Under M_p maximum soil moisture conservation was obtained but no soil temperature moderation. Under M_s maximum soil temperature moderation and partial moisture conservation was obtained.

The root weight density was significantly affected by the treatments and was highest under M_{ps} for both the years.

Finally, the grain yield was significantly increased under M_s , M_p and M_{ps} . The increase was 63,71 and 121% under M_s , M_p and M_{ps} , respectively, as compared with control (M_0). The grain yield was found to be correlated with preceding irrigation soil water depletion ($r = -0.83$) and soil temperature ($r = -0.76$). Regression of the yield (Y , t/ha) on soil water depletion (X_1 , cm) and soil temperature (X_2 , °C) was found to be

$$Y = 43.28 - 1.06 X_1 - 0.62 X_2 \quad (R^2 = 0.95)$$

The soil temperature mediated effect on grain yield can be obtained as a difference between M_{ps} and M_s . The study indicated that the grain yield of summer mung can be significantly increased with efficient moisture conservation and soil temperature moderation through mulches.

14.1.5 Genetics :

MISHRA, P. K.—North Carolina Designs in Plant Breeding

Quantitative genetics has played an important role towards the understanding and implication of breeding schemes for crop and animal improvement. Estimation of components of genetic variability, heritability, nature of gene action etc., are the Pre-requisites for deciding suitable selection scheme. North Carolina designs (I, II and III) developed by Comstock and Robinson (1948-1952) provide the above information for cross pollinated crops ($F=0$). However, NC-II can also be used for self pollinating crops ($F=1$). The essential feature of all the designs is to evaluate progenies that involve relationships among relatives having known genetic components of variance. Here, the genetic basis of the designs and their breeding implications in crop improvement were discussed.

14.2 Seminar Talks delivered by M. Sc. Students:

Agricultural Statistics :

(i) BHATNAGAR, (MISS) AMITA—Construction of Balanced Incomplete Block Designs.

There is no general method for the construction of BIB designs. In fact, there are specific methods for specific series of designs. These designs were first introduced by F. Yates in (1936). Later in 1939, R.C. Bose gave two systematic methods for the construction of BIB Designs. He made two approaches :

1. Using N-dimensional projective Geometry; and
2. Using symmetrically repeated differences in initial block.

In the present seminar method of construction due to Yates and above two methods due to R.C. Bose were discussed.

(ii) KALRA, (MISS) RANJANA—Review of various optimality criteria (associated with fractional factorial design)

In factorial experiments in which the effect of combinations of a number of factors at different levels is studied, the size of experiment increases as the number of factors and/or the number of levels increase, so a fraction of the design is taken. Out of all possible designs we try to choose that design which gives minimum possible value of variance of estimated effects. To achieve the objective various optimality criteria have been proposed, where we try to minimise one or the other function of the elements of variance-covariance

matrix. Here, some commonly used optimality criteria are discussed and an approach for the design which satisfies the various optimality criteria is made.

(iii) KARTHIKEYAN, M.—Testing of proportionate Hypothesis.

For analysis of experimental data a null hypothesis of the form $t_1=t_2=\dots=t_v$ is set up and inferences are drawn on the basis of a F-test of significance. In a recent paper by S. P. Singh *et al* an alternative procedure based on a modified null hypothesis called proportionate hypothesis—has been suggested. This is discussed and its merits and demerits are indicated. The conventional and alternative test procedure are illustrated with a suitable set of data.

(iv) KUMAR, KISHORE—Design and estimation in two way stratification.

One may encounter populations for which there are two effective stratifying criteria, both of which are desirable in a sample design. However, the number of permitted observations may be less than the number of strata formed by the usual double stratification technique. A method which will permit estimation in these cases is presented. Both biased and unbiased estimators are considered. If the substarta sizes (from two-way classification) are proportional to the product of the corresponding the one way strata sizes, the possible loss in efficiency compared to single stratification is trivial. Variances of both biased and unbiased estimators are given alongwith a method for obtaining essentially unbiased estimates of the variances.

(v) LAHIRI, ALOKE—Analysis of factorial experiment with missing observation.

There are mainly two methods which are used for analysis of experiments with missing observations. One of them is due to Yates (1953), in which unknowns are substituted for missing values and these are then estimated by minimising the error S.S. Next the data thus completed are analysed. The other method is the method of analysis of covariances due to Bartlett (1937). According to this method one concomitant variate which is the numbers of missing observation per plot is defined for each missing value and then the data are analysed by the method of analysis of covariance. In the case of varietal trials these two methods lead to identical results. But for factorial experiments with missing observations it will be shown that these two methods do not lead to identical results. It has been then pointed out that the analysis of covariance method is the only method which lead to correct results for analysing factorial experiments with missing observations.

(vi) MALHOTRA, RAVINDER—On some growth curves to poultry produce.

Growth curve is a mathematical relationship between the size of an animal and time. A large number of these are used in biological and other

situations. Egg production at commercial change over time according to season and demand. To study the variation in egg production over time, the data collected by the IASRI during 1960-70 for the project "Estimation of cost of production of poultry and Eggs" around Union Territory of Delhi. Sixty-seven farms were first divided into three groups on the basis of productivity. Out of these different models of available only linear, quadratic, cubic and wood's fit for yearly and seasonal data were fitted for each group of farms by taking the egg production of 100 layers as a dependent variable and time (weeks) as an independent.

(vii) SINGH, DHIRENDRA VEER—A note on Generalized R.P.D. estimator in double sampling.

In this note it is shown that the generalized ratio product difference estimator in double sampling proposed by Ray and Singh (1974) attains the same asymptotic minimum mean square error as that attained by much simpler estimator defined by Srivastava (1970) and hence is unnecessarily complicated. Then an alternative equally simple estimator a linear function of the simple mean per unit estimator and ratio estimator in double sampling which also attains the same asymptotic minimum mean square error, has been shown to have the bias which is the twice that of the Srivastava's estimator.

(viii) THOMAS PAUL, M.—On some statistical transformations of data.

The assumptions made in the analysis of variance are that treatment and environmental effects are additive and that the experimental errors are independently and normally distributed with a common variance. The failures in the assumptions and the remedial steps to be taken have been summarized by Eisentart, Cochran, and Bartlett, in the forties Methods to test the validity of these assumptions and a study of the transformations which have been used on statistical data with a particular reference to analysis of variance were discussed.

14.3 In addition to the above Seminar Talks, the following four Seminar talks were also delivered by the distinguished visitors/Director during Oct-Dec., 1983.

1. Prof. Alan Robertson, FRS of the Institute of Animal Genetics, Edinburgh, U.K.

'Optimisation of breeding programmes for milk production using embryo transfer.

2. Prof. T. Calinski, Deptt. of Mathematical and Statistical Methods, Academy of Agriculture, 60--637, Poznam, Poland.

'A model for the analysis of a series of experiments repeated at several places over a period of years.

3. Prof. T. Calinski, Deptt. of Mathematical and Statistical Methods, Academy of Agriculture, 60-637, Poznam, Poland.

'Some examples of the application of simple partially efficiency balanced designs'.

4. Prof. Prem Narain, Director—Statistical Considerations in optimising progeny testing programmes in dairy cattle.

15. PAPERS PRESENTED IN INTER-ORGANISATIONAL SEMINARS, 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 37th annual conference of the Indian Society of Agricultural Statisticians held at Simla (H.P.) from 24th to 27th October, 1983.

- (i) BAJPAI, S.N.—On the relative importance of proportion of components of various concentrate mixtures used in Animal and Poultry nutrition experiments.
- (ii) GUPTA, V.K. and KUMAR, P.—On variance estimation in unequal probability without replacement sampling.
- (iii) KATHURIA, O.P. and BATHLA, H.V.L.—Estimation of fish catch from inland water resources in a region of W.B.
- (iv) KAUL, B.L., SAKUP, SHANTI and PANDEY, R.K.—Adoption pattern of modern technology viz. yield rates of rice in ORP area of Raipur district.
- (v) KHATRI, R.S., GOEL, B.B.P.S, and SINGH, K.B —Conducting sample surveys for estimation of livestock products using the field agency of animal husbandry departments.
- (vi) MEHROTRA, P.C.—On resampling for fixed sample size under clustering sampling.
- (vii) MEHROTRA, P.C. and RASTOGI, V.S.—A study on contribution of area and yield to growth in production of pulses.
- (viii) NADKARNI, U.G., JAIN, T.B. and RAMESH KUMAR—Survivorship of some breeds of bovines in Punjab.
- (ix) NARAIN, P., BHARGAVA, P.N., GARG, L.K. and RANA, P.S.—Estimation of genotypic and environmental variations in banana crop.

- (x) OHRI, N.K. and RAHEJA, S.K.—Profitability of fertilizer on ground-nut.
- (xi) PANDEY, R.K. and CHAUDHARY, H.B.—Study of factors effecting yield of ground-nut in Chittorgarh District, Rajasthan.
- (xii) PODDAR, J. and RUSTOGI, V.S.—Optimum points of stratifications for estimating area under H.Y.V. of cereal crops.
- (xiii) RAHEJA, S.K. and OHRI, N.K.—Average yield fertilizer use and constraints in the adoption of high yielding varieties of groundnut.
- (xiv) RAI, S.C.—Paired and Triad comparisons in sensory evaluation.
- (xv) RANA, P.S. and SHARDA—A queuing problem with two heterogeneous groups of channels and statistically dependent departures.
- (xvi) RAUT, K.C. and SATHE, K.V.—Evaluation of bullock labour—an exact method.
- (xvii) SARUP, SHANTI and PANDEY, R.K.—Assessment of regional variation in yield rates of oil seeds—A cropwise analysis.
- (xviii) SAXENA, B.C., SINGH, H.P. and KRISHAN LAL—Poverty line and fluid milk consumption in rural areas.
- (xix) SHASTRI, S.S.—A study on the effect of correlation coefficients and proportion of matching units on the efficiencies of linear estimators in the successive sampling.
- (xx) SINGH, H.P., SAXENA, B.C. and VERMA, S.P.—A critical aspects of the rural development.
- (xxi) SINGH, JAGMOHAN, and MATHUR, D.C.—A study on the use of tractor & Bullock labour in the cultivation of vegetable crops in Delhi.
- (xxii) SINGH, K.B. and GOEL, B.B.P.S.—Use of double sampling in estimation of milk production.
- (xxiii) SINGH, RANDHIR—Use of auxiliary information for imputations.
- (xxiv) SINGH, RANDHIR and DURAI RAJU, S.—Sampling for longitudinal surveys.
- (xxv) SINGH, RANDHIR and KHATRI, R.S.—Estimation from uncomplete data from a bivariate population in two stage sampling design.
- (xxvi) SRIVASTVA, A.K., MEHROTRA, P.C. and GOLA, R.C.—Forecasting yield of cotton on the basis of data collected at the first picking alone.
- (xxvii) TYAGI, K.K.—Multi-phase sampling in Multivariate Ratio-Product Estimators.

15.1.1 Symposium on "Hill Area Development Programmes in Agriculture and Allied Field" at the above conference.

1. KATHURIA, O.P. and BATHLA, H.V.L.—The state of forestry statistics with specific reference to the development of hill area of the country.
2. RAHEJA, S.K. and BOKIL, S.D.—Economics of Apple cultivation and its role in development of hilly areas.
3. RAHEJA, S.K. and MEHROTRA, P.C.—Estimation of area and yield of crops in hilly regions.
4. RAHEJA, S.K. and SRIVASTAVA, A.K.—Estimation of extent of cultivation and production of fruit crops in hilly areas.
5. SINGH, SHIVTAR, RAUT, K.C. and JAIN, J.P.—Production traits of cross, bred and indigenous cows under field conditions in a hilly area.

15.1.2 Symposium on 'Design and Selection Procedures for Animal Experiments'

NARAIN, P.—Status of Animal Experimentation in India and remedial measures for their improvement.

15.2 The I.C.A.R. Working Group Meeting on, "Statistical Assessment of yield Advantage in Inter-Cropping Systems in Dryland Agriculture", held at Hyderabad during 29th to 30th Nov., 1983.

NARAIN, P., BHARGAVA, P.N. and CHOUDHARY, B.L.—A Comparative assessment of statistical methods for analysis of inter-crop data.

15.3 43rd Annual Conference of Indian Society of Agricultural Economics held at C.S. Azad University of Agriculture and Technology, Kanpur from 22nd to 24th Dec , 1983.

- (i) JAIN, T.B. and NADKARNI, U.G.—On economics of pig rearing in rural area.
- (ii) PANDEY, R.K., SARUP, SHANTI and VED PRAKASH—Economic study of employment potential in rural industry-A case study of brick Kiln.
- (iii) SAXENA, B.C., SINGH, H.P. and VERMA, S.P.—Role of dairying towards rural industrialisation.

15.4 The Regional Conference on 'Statistics and Probability' at Indian Statistical Institute, Delhi Centre organised by the Institute in collaboration

with East Asian and Pacific Regional Committee of the Bernoulli Society for Mathematical Statistics and Probability from 12th to 14th December, 1983.

NARAIN, P.—An application of the conditioned diffusion process to the infinite allele genetic model.

15.5 The XV International Congress of Genetics held at Ashoka Hotel, New Delhi from 12th to 21st December, 1983.

(i) Session C—IB: Animal Genetics and Breeding

NARAIN, P.—Progeny Testing with Auxiliary Traits.

(ii) Session : C-VII C: Population Genetics

NARAIN, P.—Effect of linkage on the expected life of a gamete in selfed populations.

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

Date	Name of Conferences/Seminars/Symposia, etc.	Name of the Scientist with Designation
Oct., 24-27	The Thirty Seventh Annual Conference of the Indian Society of Agricultural Statistics held at Simla (H.P.)	Dr. Prem Narain*, Director Dr. B.B.P.S. Goel, Jr. Director (T. and B.R.) Dr. S.K. Raheja***, Scientist (S-3) Dr. K.C. Raut, Scientist (S-3) Dr. A.K. Nigam**, Scientist (S-3) Dr. H.P. Singh, Scientist (S-3) Dr. Shivtar Singh, Scientist (S-2)

*Presided over the Symposium, "Design and Selection Procedures for Animal Experiments."

**Convenor of the Symposium, "Design and Selection Procedure for Animal Experiments."

***Convenor and Discussant of the Symposium, "Hill Area Development Programmes in Agriculture and Allied Fields".

		Dr. N.K. Ohri, Scientist (S-1)
		Dr. K.K. Tyagi, Scientist (S-1)
		Dr. V.K. Gupta, Scientist (S-1)
		Dr. V.K. Bhatia, Scientist (S-1)
		Sh. S.S. Shastri, Scientist (S-1)
		Sh. Jagmohan Singh, Scientist (S-1)
		Sh. P.S. Rana, Scientist (S-1)
Oct., 7-8	Golden Jubilee function Seminar of Indian Library Association held at India International Centre, N. Delhi.	Sh. S.S. Srivastava, Librarian
Oct., 31	The Seminar on "Dairying in North Zone", organised by the Indian Dairy Association (North Zone) in New Delhi.	Dr. K.C. Raut, Scientist (S-3)
Nov., 1-3	National Workshop on Development of Inland Fisheries Resources held at Indian Institute of Management, Ahmedabad.	Dr. O.P. Kathuria,* Scientist (S-3)
Nov., 11	One day Seminar on "Science Information," held at National Physical Laboratory, New Delhi.	Shri S.S. Srivastava, Librarian.
Nov., 29-30	The I.C.A.R Working Group meeting on, "Statistical Assessment of yield Advantages in Intercropping Systems in Dryland Agriculture," held at Hyderabad.	Dr. Prem Narain, Director
Dec., 3	Seminar on Mid Year Review of the Economy, India International Centre, Lodi Estate, New Delhi.	Dr. B.B.P.S. Goel, Jt. Director,(T.&B.R.)
Dec., 5-8	The F.A.I. & F.A.O. Seminar on, (i) Profitability in Systems Approach.	Dr. Prem Narain, Director

*Attained as Discussant.

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| | (ii) Fertilizer Management in cropping System. | Sh. P.N. Bhargava,
Scientist (S-3) |
| | (iii) System Approach to Plant nutrition held at Vigyan Bhavan, New Delhi. | Dr. S.K. Raheja,
Scientist (S-3) |
| Dec., 5-9 | National Workshop on Monitoring and Evaluation held at Bhopal (M.P.) | Dr. M.G. Mittal,
Scientist (S-2) |
| Dec., 12-14 | The regional Conference on 'Statistics and Probability' at Indian Statistical Institute, Delhi Centre organised by the Institute in collaboration with East Asian and Pacific Regional Committee of the Bernoulli Society for Mathematical Statistics and Probability. | Dr. Prem Narain,
Director |
| Dec., 12-21 | The XV International Congress of Genetics held at Ashok Hotel, New Delhi. | Dr. Prem Narain,
Director |
| Dec., 15 | One day open house "Seminar on Computer Applications", organised by C.S.I., Delhi-Chapter. | Sh. K.C. Gupta,
Scientist (S-1)
Sh. M.L. Chaudhary,
Scientist (S-1) |
| Dec., 23-24 | III Annual Convention and Conference of Society of Information Science held at Hotel Morya Palace Sheraton, New Delhi. | Dr. S.S. Pillai,**
Jt. Director
(C.S. & N.A.)
Shri S.N. Mathur,
Scientist (S-2)
Dr. H.P. Singh,
Scientist (S-3)
Shri P.K. Batra
Scientist (S-1), |
| Dec., 22-24 | I National Conference on "Medical Rescue and Resuscitation" Organised by the National Association of critical care Medicine (India) at Vigyan Bhavan, New Delhi. | Sh. Ram Kumar,
Scientist (S-1)
Sh. B.C. Saxena,
Scientist (S-1)
Sh. D.C. Mathur,
Scientist (S-1)
Sh. D.S. Aneja,
Scientist (S-1)
Sh B.H. Singh,
Scientist (S)
Sh. Balbir Singh,
Scientist (S)
Sh. D.C. Pant,
(T-5)
Sh. V.P. Ahuja,
(T-5)
Sh. Sushil Bharihoke,
Jr. Stenographer |

**Chairman of Technical Session II on application of Information Services and Products on 24-12-83.

Dec., 22-24	The 43rd Annual Conference of the Indian Society of Agricultural Economics held under the auspices of C.S. Azad Univ. of Agriculture and Technology, (Kanpur).	Dr. R.K. Pandey, Scientist (S-3)
Dec., 26-29	IASLIC Seminar, held at INSDOC, New Delhi.	Sh. S.S. Srivastava, Librarian
Dec.,	Conference of Zonal Coordinators of Lab to Land Programme, at New Delhi.	Dr. S.K. Raheja, Scientist (S-3)

17. MISCELLANEOUS

17.1 Personnel Information :

17.1.1 Promotion, Retirement etc. :

(i) *Promotion* :—The following 3 Assistants have been promoted as Superintendent w.e.f. 1.12.1983.

(1). Sh. Narain Singh (2) Sh. R.S. Rana (3) Sh. J.K. Kasotia

(ii) *Retirement* :—

(1) Sh. D.K. Rastogi retired on 30.11.83 (A.N.) from the post of Administrative Officer.

(2) Sh. S.D. Bokil retired on 31.12.83 (A.N.) from the post of Scientist (S-3) at I.A.S.R.I.

17.1.2 The Scientists of I.A.S.R.I. were deputed to attend training/study tour/meeting and to deliver lectures, etc. during Oct. Dec., 1983.

(i) Dr. Prem Narain, (i) Attended Directors' Conference of ICAR Research Institutes on 21st and 22nd October, 1983 held at Krishi Bhavan, New Delhi.

(ii) Attended Second Meeting of the Panel for Hand Book on Quality Control (Statistical Methods) E:3:10:1 of the Indian Standards Institution at Manak Bhavan, New Delhi on 18-11-83.

(iii) Attended a meeting with Miss I.M. Field, Sr. Fellowship Officer, F.A.O., Rome in connection with the UNDP Project on 25-11-83.

(iv) Attended the Academic Council Meeting of the IARI, New Delhi on 28-11-83.

2. Dr. B.B.P.S. Goel, (i) Attended the Second Programme on Management of Research and Development Organized by Technical & Management Development Centre (India) from 7-10 December, 1983.
 Jt. Director
 (T & B.R.)
- (ii) He was associated with the following :
- (a) Working Group on Demand & Supply projection constituted by the Ministry of Agriculture.
- (b) Study Group on Degree holders and Technical Survey project constituted by C.S.I.R., New Delhi.
- (c) Study Group on Agriculture constituted by Planning Commission. Attended several meetings of these Groups and participated in the discussions during the quarter.
3. Dr. S.K. Raheja, Delivered a lecture on "Sample Surveys in Agriculture, to the participants of 37th refresher course in statistics at International statistics education centre, CSO, New Delhi in Nov., 1983.
 Scientist (S-3)
4. Dr. K.C. Raut, (i) Attended as a member the Management Committee meeting of IASRI on 14th Nov., 1983.
 Scientist (S-3)
- (ii) Attended the meeting of the working Group on "Economic Advice and Statistics", held on 21st Nov., 1983 in Sardar Patel Bhavan to discuss the plan proposals of the Govt. of Orissa.
5. Sh. S.N. Mathur, Delivered following lectures at Central Institute for Research and Training in Employment Services in the training for employment officer on 13th and 19th Dec., 1983.
 Scientist (S-2)
- (i) Techniques of Programming.
- (ii) I, II, III, & IV generations Computer Systems.
6. Sh. R.K. Khosla, Attended the meeting of Management Committee of I.A.S.R.I. on 14th Nov., 1983.
 Scientist (S-2)

7. Dr. A.K. Banerjee, Scientist (S-2) Delivered one lecture on Stat. Method-I to the participants on Refresher Course in Soil Science at IASRI on 21st Nov., 1983.
8. Smt. Ranjana Agrawal, Scientist (S-2) Gave lecture on pre-harvest forecasting of crop yields to CSO trainees on 9.11.83.
9. Dr. N.K. Ohri, Scientist (S-1) Delivered two lectures on 22-11-83 on statistical Methods in Short Course training in Soil Testing for soil Chemists incharge of Soil Testing Laboratories held at the Div. of Soil Science and Agricultural Chemistry of the Indian Agricultural Research Institute, New Delhi.

17.2 Distinguished visitors :

17.2.1 Dr. P. S. Nagpaul, Scientist, National Institute of Science, Technology and Development Studies (CSIR), New Delhi visited this Institute alongwith his team on November 8, 1983 and discussed with the Director with regard to "International Comparative study on Organisation and Performance of Research Units".

17.2.2 Dr. Schneider, School of Agriculture, La Trobe University, Malbourne, Australia, visited this Institute on 11th November, 1983 and discussed with the Director with regard to the functions & activities of this Institute as well as of her school of Agriculture.

17.2.3 Dr. R. B. Doharey, Dr. G.D. Diwaker and Mr. O. P. Gupta of I.G.S.I., Hapur visited this Institute on 24-11-1983 and 2-12-1983 to discuss about the finalisation of schedules for the "Pilot Sample Survey for the Estimation of Post-Harvest Foodgrain Losses", to be initiated in the Ludhiana district of Punjab State during 6th F. Y. Plan.

17.2.4 Prof. T. Calinski, Head of the Department of Mathematical and Statistical Methods of the Academy of Agriculture, Pazanai, Poland visited this Institute on 16th & 17th December, 1983 and had discussion with the Scientists of the Institute.

17.2.5 Prof. W. R. Harvey, Department of Animal Sciences, The Ohio State University, Ohio, U.S.A. visited this Institute on 19th December, 1983 and had a meeting with the Senior Scientists of this Institute.

17.3 Monitoring Cell :

Meeting of the Heads and Sr. Scientists with the DDG(AS)/ADG (ES&M) ICAR were convened by the Monitoring Cell on 5th & 6th December, 1983 to review (a) the salient findings of the recently completed research projects with their theoretical/practical utility and implications and (b) the progress of on-going research projects and to discuss the research programmes of new projects.

A meeting of the Monitoring Cell was held on 27th Dec., 1983 to review the progress of the Research Projects.

17.4 UNDP Cell :

This Institute has been recognised as Centre of Advanced Studies in Agricultural Statistics and Computer Application by the United Nations/F.A.O. under their development programmes from 1st October, 1983. The main objective is to develop a Centre of Excellence with adequate infrastructure facilities to undertake advanced training programmes and carry out research in various aspects of agricultural statistics and computer application.

Professor D. J. Finney of the Department of Statistics, University of Edinburgh, U. K. has been recognised as Key Consultant for advising on the over all planning of the activities at this Centre.

A UNDP Cell has been constituted in the Institute Vide O. O. No. 9 (9) /82-Admn. II (Pt.II), dated the 15th Nov., 1983 with Dr. Prajneshu, Professor, Shri S. C. Rai, Associate Professor and Shri Pradeep Kumar, Lower Division Clerk to look after the work to this centre. Dr. Prem Narain, Director will be the Sub-Project Coordinator and will be Officer-in-Charge of this centre.

A project entitled "Centre of Advanced Studies in Agricultural Statistics and Computer Application" has been approved by the United Nations under its Development Programme from 1st October, 1983.

17.5 IASRI Representatives at the meetings of Scientific Panel of I.C.A.R. :

Name of the Officers	Name of the Scientific Panel & Date.
1. Sh. H.C. Jain	"Agronomy", held on 12th & 13th Oct., 1983.
2. Sh. B.C. Saxena	"Home Science", held on 24th Oct., 1983.
3. Dr. M.P. Jha	"Plant Pathology", held on 25th to 27th Oct., 1983.

4. Sh. R.K. Khosla "Post Harvest Technology", held on 15th Nov., 1983.
 5. Sh. G.N. Bahuguna "Entomology and Nematology", held on 15th to 17th Nov., 1983.
 6. Sh. P.N. Bhargava "Soil Science", held on 22nd to 23rd Nov., 1983.
 7. Sh. P.K. Malhotra "Plant Breeding", held on 29th & 30th Nov., 1983.
 8. Sh. J.C. Malhotra "Animal Breeding", held on 2nd & 3rd Dec., 1983.
 9. Dr. R.K. Pandey "Agricultural Economics, Statistics and Marketing", held on 12th Dec., 1983.
 10. Dr. H.V.L. Bathla "Fisheries" held on 19th Dec., 1983.
 11. Dr. Basant Lal "Eloriculture" held on 19th Dec., 1983.
 12. Miss C. R. Leelavathi "Agricultural Engineering" held on 23rd & 24th Dec., 1983.
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17.6 Honours/Awards Won etc. :

17.6.1 Dr. Prem Narain, Director, was appointed as Chairman and Convener of the Session C-VIIC-Population Genetics at the XV International Congress of Genetics held at Ashoka Hotel, New Delhi from 12th to 21st Dec., 1983.

17.6.2 Dr. P.C. Mehrotra, Scientist (S-2), was awarded Ph. D. Degree in Statistics on, "Contributions to Sampling Techniques" from Delhi University in December, 1983.

17.6.3 Sh. S.S. Srivastava, Librarian declared successful in a Post graduate course i.e. Associateship in Information Science at (INSDOC) New Delhi.

17.7 Joint Council :

The Proceedings of last joint council meeting held on 29-8-83 were prepared. Circular regarding the agenda items for the next meeting was issued and agenda items from staff representatives had been received.

17.8 Management Committee :

A Meeting of the Management Committee was held on 14-11-1983.

17.9 Meetings of Heads of Divisions and Sr. Scientists :

During the quarter under report the following meetings were held :

(i) Hds and Sr. Scientists	on	31-10-83.
(ii) —do—	on	2-11-83.
(iii) Sr. Officers	on	11-11-83.
(iv) Hds and Sr. Scientist	on	16-12-83
(v) —do—	on	19-12-83

17.10 Other Information :

17.10.1 Dr. Prem Narain, Director gave a radio talk regarding the activities of the I.A.S.R.I. from Radio Shimla on 30-10-83. The Talk was earlier recorded at Shimla during 37th Conference of Indian Society of Agricultural Statistics.

He was appointed a member of the Technical Committee of Direction for the scheme 'Evaluation of Performance of Buffalo bulls under field conditions, of the Directorate of Animal Husbandry, Punjab, Chandigarh. He also attended the First Meeting of the Technical Committee of Direction on 23-11-83 at Chandigarh.

He was appointed a Member of the Working Group for the assessment of Inter-cropping Experiments for Dryland Agriculture formed by the ICAR's All India Coordinated Agronomic Research Project, Hyderabad.

He gave a Radio Talk in Hindi, "कृषि के नये अनुसंधान में एक वार्तालाप" Broadcast on the All-India Radio on 21-11-83.

He attended the Eleventh Meeting of the Project Working Committee of the UNDP/ICAR assisted Project on Post-graduate agricultural education and research for establishment of Centres of Advanced Studies (Project No. IND/83/020) on 22-11-83.

He was appointed as Chairman of the Sub-working Group for the discipline of Animal Husbandry Statistics for undertaking indepth studies and for formulation of suitable proposals for the Seventh Five Year Plan by the Ministry of Agriculture, Deptt. of Agriculture and Coopn., Government of India, New Delhi.

He was nominated a member of the Working Group on Demand and Supply Projections and Improvement of Agricultural Statistics set up by the

Planning Commission in connection with the formulation of the VII Five year Plan.

He attended as the Chairman of the Sub-Group meeting of the First Panel EC3: 10:PI of the Indian Standards Institution, New Delhi for preparation of the material on Statistical Methods of the Hand Book on Quality Control held at IASRI, New Delhi on 2-12-83.

Dr. Narain was also nominated a member of the Technical Advisory Committee on Training to review periodically the Training Strategy for Statistical Personnel other than those belonging to I.S.S., set up by the Government of India, Ministry of Planning, Department of Statistics, New Delhi.

17.10.2 Dr. S.K. Raheja, Scientist (S-3), acted as a discussant on a seminar on, "Injected Agriculture", organised by USAID, New Delhi, in Nov., 1983.

17.10.3 Sh. S.S. Srivastava, Librarian Inducted into teaching faculty of IARI for taking compulsory "Agricultural Information System (AIS)" classes for M. Sc. & Ph. D. Students.

17.10.4 In supersession of all previous orders on the subject and in pursuance of the guidelines contained in DARE's d.o. letter No. 7 (23)/79-IC-I dated the 28-9-1979, a committee consisting of the following officers is appointed to ensure fair and objective selection of scientists for assignment/deputation abroad:-

1. Director, IASRI	Chairman
2. Dr. B.B.P.S. Goel, Jt. Dir. (T & BR)	Member
3. Dr. R.K. Pandey, Head (E.A.)	Member
4. Sh. P.N. Bhargava, Head (C.S.)	Member
5. Chief Administrative Officer	Member

17.10.5 The following staff members attended the XXV course on Medical Rescue and Resuscitation held at C.S.I.R., New Delhi on 14th Nov., 83.

1. Sh. B.C. Saxena, Scientist (S-1)
2. Sh. D.S. Aneja, Scientist (S-1)
3. Sh. D.C. Pant, T.A. (T-5).
4. Sh. Sunil Bharihoke, Jr. Stenographer.

17.10.6 III ICAR Zone-I Inter Institutional Tournaments

After a gap of 2 years, ICAR once again decided to hold Inter-Institutional Tournaments among its Institutes. All the 39 Institutes of ICAR were grouped into 6 zones. Our Institute was grouped with NDRI, Karnal; CSSRI, Karnal; CPRI, Shimla and CSWCRTI, Dehradun in Zone-I. The responsibility of organising Zone-I Sports Meet was given to IASRI. The Director constituted the Zone-I Sports Organising Committee of which Dr.S.S. Pillai was the Chairman and Dr. K.K. Tyagi as Convenor. The Committee organised the Zone-I Sports Tournaments with the help of various sub-committees from 10th to 13th October, 1983. The Institute had taken the Talkatora Indoor Sports Stadium for Table Tennis, Badminton and Volleyball events while Football, Kabaddi and Athletics were conducted at IARI School Ground. The Zone-I Sports Meet was inaugurated by Dr. Prem Narain, Director of host institute at IARI School Ground on 10th Oct., 1983 in which a number of visitors were invited from the neighbouring ICAR Institutes. In the Sports Meet, the Institute contingent consisted of a Chef-de-mission, 4 managers and 42 sportsmen. The following positions were won by the Institute sportsmen:

<i>Game/Event</i>	<i>Position</i>	<i>Name</i>
Kabaddi	Winner	Captain : Sh. D.P.S. Mann
Table-Tennis	Runner	Captain : Dr. K.K. Tyagi
Football	Runner	Captain : Sh. Mirazuddin
200 metre race	I	} Sh. Sunil Bharihoke
400 metre race	I	
1500 metre race	I	
4x100 metre relay race	III	Sh. P.S. Rai, Sh. Ashok Kumar, Sh. Mirazuddin, Sh. H.R. Dagar.
100 metre race	III	Sh. Sunil Bharihoke

A good number of leading newspapers in the city gave wide coverage to the Sports Meet. All India Radio also broadcasted the results in the Sports News. The Delhi Doordarshan also covered the Volleyball (Shooting) Finals, played between CSSRI, Karnal and NDRI, Karnal. On the whole, the Sport Meet was conducted smoothly. The closing ceremony was held in the afternoon of 13th Oct., 1983 at the institute campus in which the Chief Guest Dr. H.K. Jain, Director, IARI distributed the prizes.

१८. पश्चिम बंगाल के २४ परगना जिले में श्रान्तःस्थलीय मछली साधनों का आकलन ।

भारत में अन्तःस्थलीय मत्स्यकी के अन्तर्गत दो प्रकार का अर्थात् अलवण जल और खारा जल पाया जाता है । इन दो प्रकारों के मत्स्य क्षेत्रों को आगे दो वर्गों में बांटा गया है जैसे— पकड़ी जाने वाली मछलियां और पाली जाने वाली मछलियां । पकड़ी जाने वाली मछलियों के प्रबन्ध के अधीन मत्स्य संख्या को निदेशित दिशा में व्यवस्थित करने के प्रयास किये जाते हैं, ताकि जलीय परिस्थितिक जीवन तन्त्र के नैज-जैव उत्पादन की क्षमता को अनुकूल बनाया जाये, जबकि पाली जाने वाली मछलियों के प्रबन्ध के अधीन मछली उत्पादन को अधिकतम बनाने के लिये पाले जाने वाले स्थान पर मत्स्यधन उपलब्ध किया जाता है । पकड़ी जाने वाली अलवण जलीय मछलियों के मुख्य साधन नदी एवं उसकी सहायक नदियां, नहर, भील, अप्रवाहित जल तथा तालाब और खारे जल की मछलियों के साधन, नदीमुख और खारे पानी वाले समुद्र तल हैं, जब कि पाली जाने वाली मछलियों के साधन, तालाब, टैक, दलदल आदि हैं । नदी और उसकी सहायक नदियों, नहर और भीलों की प्राप्त संख्या के विषय में तो कुछ सीमा तक विश्वसनीयता है जब कि तालाबों, कुण्डों और जलाशयों की प्राप्त संख्या किसी भी सीमा तक सही सही उपलब्ध नहीं है । यहाँ तक कि कृषि विभाग द्वारा अपनी रिपोर्ट में तालाबों, कुण्ड और जलाशयों के अधीन क्षेत्रों से सम्बद्ध दिए गए आंकड़े राष्ट्रीय कृषि आयोग द्वारा दिये गये आंकड़ों से भेल नहीं खाते । विभिन्न अन्तःस्थलीय मत्स्य क्षेत्रों के साधनों की संख्या के आकलन हेतु गत वर्षों में जो अध्ययन किये गए हैं, उनसे वांछनीय परिणाम नहीं निकले हैं ताकि कोई निश्चित पद्धति को बड़े पैमाने पर श्रपनाने के लिए नियत किया जा सके ।

उपयुक्त पद्धति की आवश्यकता को ध्यान में रखते हुए पश्चिम बंगाल के 24 परगना जिले में एक मार्गदर्शी प्रतिदर्श सर्वेक्षण किया गया । सर्वेक्षण के उद्देश्यों में से एक अन्तःस्थलीय मछलियों के संसाधनों का आकलन लगाने के लिए एक उपयुक्त प्रतिचयन पद्धति का विकास किया जाना था । सर्वेक्षण का कार्य, भारतीय कृषि सांख्यिकीय अनुसंधान संस्थान, नई दिल्ली और केन्द्रीय अन्तःस्थलीय मत्स्यकी अनुसंधान संस्थान, बैरकपुर द्वारा संयुक्त रूप से अपने हाथ में लिया । इस जिले में अन्तःस्थलीय मत्स्यकी संसाधनों के आकलन हेतु सर्वेक्षण का पहला दौर 1978-79 में चालू हुआ । यह अध्ययन मुख्य रूप से, तालाबों और टैकों के संसाधनों के आकलन तक ही सीमित था । नदियों और नहरों इत्यादि जैसे अन्य संसाधनों को इस अध्ययन में शामिल नहीं किया गया क्योंकि इन संसाधनों के आकलन के लिए अपेक्षित पद्धति तालाबों और कुण्डों इत्यादि के लिए प्रयुक्त पद्धति से भिन्न है । प्रस्तुत लेख, सर्वेक्षण के पहले दौर में प्राप्त जल इकाई की गणना और उनके लक्षणों जैसे मौसम सम्बन्धी मछली पकड़ने के प्रयोजन के लिए भर्हां तक उपयोग हुआ और अपनाई गई मत्स्य पालन तकनीकों से, सम्बन्धित है ।

क्षेत्रीय कार्य केन्द्रीय अन्तःस्थलीय मत्स्यकी अनुसंधान संस्थान के क्षेत्रीय कर्मचारियों द्वारा किया गया जबकि आंकड़ों के विरलेषण और रिपोर्ट इत्यादि तैयार करने का उत्तरदायित्व प्रारम्भिक रूप से भारतीय कृषि सांख्यिकीय अनुसंधान संस्थान पर रहा। सर्वेक्षण में ग्रपनाई गई प्रतिचयन अभिकल्पना, दो स्तरीय भुंड प्रतिचयन थी। गांवों के और गांवों में तालाबों के भुण्डों को क्रमशः प्रथम एवम् द्वितीय स्तरीय इकाई के रूप में लिया गया। जिले से प्रत्येक 4 गांवों के 10 भुण्डों का एक प्रतिदर्श चुना गया। प्रत्येक चयनित गांवों में तालाबों और टैकों की उनके अधीन क्षेत्र का आकलन लगाने के लिए पूरी तरह से गणना की गयी।

सभी जल निकायों की तालिका से ज्ञात होता है कि चालीस चयनित गांवों में 166.6 हैक्टेयर क्षेत्र में 1686 जल इकाइयाँ थी। 24 परगना जिले में सूचित जल इकाइयाँ मुख्य रूप से अलवणीय जल तालाबों और टैकों की थीं और ये सभी बरसाती थे। एक गांव में तालाबों की औसतन संख्या 42 निकाली गई जबकि प्रति तालाब औसत क्षेत्र 0.097 हैक्टेयर अनुमानित किया गया इन तालाबों का क्षेत्र 0.018 हैक्टेयर और 0.912 हैक्टेयर के बीच में बदलता बदलता रहा। अध्ययन से ज्ञात होता है कि जल इकाइयों का लगभग 94 प्रतिशत तालाबों के अधीन जितना भी क्षेत्र था वह स्वभाव से बारहमासी था। गणनाकारों ने जब दौरा किया उस समय लगभग 67 प्रतिशत तालाबों की गहराई 1 से 3 मीटर थी जबकि बरसातों में लगभग सभी तालाबों की गहराई एक मीटर से अधिक थी।

अध्ययन से ज्ञात होता है कि केवल लगभग 33 प्रतिशत तालाबों का उपयोग मुख्य रूप से मछली पालन के लिए किया गया जबकि लगभग 60 प्रतिशत तालाबों का उपयोग मुख्य रूप से अन्य कार्यों के लिए किया गया किन्तु उन्हें मछली पालन के लिए भी उपयोग में लाया गया। केवल लगभग 3.3 प्रतिशत तालाबों को मछली पालन के उपयोग में बिलकुल नहीं लाया गया। मछली पालन के उपयोग में लाये गये 33 प्रतिशत तालाब बारहमासी थे और 30 प्रतिशत मौसमी थे।

गाद जमना और अपतृण गसन को सूचित नहीं किया जाना जल इकाइयों की मुख्य समस्या थी। 68 प्रतिशत तालाबों में गाद जमने की कोई समस्या सूचित नहीं की गई जबकि 76 और 77 प्रतिशत तालाबों में क्रमशः विमग्न अपतृण या प्लवी अपतृण की समस्या न थी।

तालाब मालिकों द्वारा तालाबों का मछली पालन के लिए उपयोग न करने के विभिन्न कारण प्रकाश में आए। इनमें से बताए गये मुख्य कारण थे—एक तालाब के अनेक मालिकों का होना, अनाधिकार मछली मारना एवं जानबूझ कर नष्ट करना और पूंजी की कमी इत्यादि। 38 प्रतिशत जल इकाइयों से पूरे वर्ष मछलियां प्राप्त की गई जबकि उनके 50 प्रतिशत में से केवल गर्मियों के महीनों के दौरान मछलियां प्राप्त हुईं। 79 प्रतिशत तालाबों पर साधारण मत्स्यपालक तकनीकों को अपनाया गया।

संग्रहण के लिए 71 प्रतिशत जल इकाइयों का उपयोग किया गया, जबकि 27.6 प्रतिशत तालाबों को नर्सरी कम संग्रहण तालाब के रूप में उपयोग किया गया। लगभग 72 प्रतिशत तालाबों से स्थानीय मत्स्य बीज प्राप्त किये गये जबकि शेष तालाबों में मत्स्य बीज अन्य साधनों

से प्राप्त किए गए ।

अधिकांश तालाबों में मत्स्य चारे का उपयोग नहीं किया गया, केवल कुछ मामलों में सरसों की खली, चावल की भूसी, और यूरिया, सुपरफास्फेट और पोटैश जैसे उर्वरक उपयोग में लाये गये ।

मछली पालन वाले क्षेत्र में लगभग 79.6 प्रतिशत तालाबों के लिए भिन्न-भिन्न अनुपातों में 3 प्रमुख जाति की अर्थात् कटला, रोहूँ और मृगल जाति की मछलियाँ जारी की गईं । पाली गई मछलियों की अन्य जातियाँ थीं—साधारण शफरी, सिलवर शफरी, मगूर, सिंगी, कोई, और चीतल इत्यादि । इन विभिन्न जातियों का भिन्न-भिन्न अनुपात में संग्रह किया गया । संभावित मत्स्य उत्पादन प्रति वर्ष प्रति तालाब 131 किलो ग्राम दर्ज किया गया ।

अन्तःस्थलीय मत्स्य संसाधनों के आकलन के लिए जल इकाइयों के अधीन क्षेत्र के आकलन के लिए समूह प्रतिचयन (\bar{y}'_n), सरल यादृच्छिक प्रतिचयन (\bar{y}'_n) और अनुपात पद्धति प्रतिचयन (\bar{y}''_n) का प्रयोग करते हुए अपरिवर्ती आकलकों का परीक्षण किया गया । ये आकलक मानक घुटियों सहित—नीचे दी गई तालिका में दिखाये गये हैं ।

तालिका :—तालाबों के प्रति जल एककों के औसत क्षेत्र का आकलन (हेक्ट० में)

आकलक	राजस्व के रिकार्ड के अनुसार	दौरे के समय	बरसात में अधिकतम	गर्मियों में न्यूनतम
	0.1321	0.1049	0.12१1	0.0789
I \bar{y}'_n	0.036	0.019	0.018	0.011
	0.1324	0.1050	0.1221	0.0794
II \bar{y}'_n	0.026	0.013	0.014	0.007
	0.1404	0.0900	0.0961	0.0617
III \bar{y}''_n	0.39	0.013	0.018	0.010

यह स्पष्ट रूप से देखा गया कि प्रत्यक्ष रूप से समूहों को छोड़कर आकलक II गाँवों के साधनों पर आधारित है, यह आकलक अन्य दो आकलकों से अधिक परिशुद्ध है । आकलक I समूह साधनों के माध्य पर आधारित है जबकि आकलक III एक अनुपात आकलक है जिसके अधीन तालाब की संख्या में एक समूह से दूसरे समूह के बीच विचलन लिया जाता है ।

ऐसा देखने में आता है कि आकलक III आकलक I के बनिस्बत अधिक परिशुद्ध है, हालाँकि राजस्व रिकार्डों के मामलों को छोड़कर लाभ केवल सीमान्त हैं । राजस्व रिकार्डों से प्राप्त आकलक काफी कम पर्यवेक्षणों पर आधारित होते हैं इसीलिए ये विश्वसनीय नहीं होते ।

अनुवादक :—श्री अखिलेन्द्र पालसिंह

निरीक्षक :—श्री महाराज स्वरूप एवं
श्री फणीन्द्रपाल सिंह

१९. पेड़ पौधों के प्रजनन अनुसंधान में संगणक का योगदान

बीसीवी शताब्दी के मध्य से पूरे संसार की सम्पत्ता को जिन दो बातों ने सबसे अधिक प्रभावित किया है, उनमें से एक है आणुविक ऊर्जा (Nuclear Energy) तथा दूसरी है संगणक (Electronic Computer) ! संगणक तकनीक का ज्ञान और उसका विकास अत्यन्त तेजी से हुआ है। व्यक्तियों के प्रयोग के लिए पहला संगणक यूनिवैक (Univac) द्वारा 1951 में बनाया गया और उसके बाद लगभग 30-32 वर्षों में ही इसने चार पीढ़ियों को पार कर लिया। जहाँ पहली पीढ़ी में विद्युत वाल्व का प्रयोग किया गया था वहाँ अब एकीकृत परिपथ (Integrated Circuits) तथा सूक्ष्मसंसाधित्र (Micro processors) का इस्तेमाल किया जाने लगा है। संगणक के माध्यम से गणितीय साँख्यकीय, वैज्ञानिक तथा औद्योगिक आँकड़ों का संसाधन बड़ी सुगमता से और ठीक ठीक किया जा सकता है। जिन कार्यों में पहले बहुत समय लगता था तथा जिन प्रश्नों को पहले असम्भव जैसा मान कर छोड़ दिया गया था अब संगणक की सहायता से वह आसानी से हल किया जा सका है।

संगणक का समाज के विभिन्न क्षेत्रों में बहुत बड़ा योगदान है। उदाहरण के लिए अर्थ-व्यवस्था, योजना, कृषि, विज्ञान तथा तकनीक, भविष्यवाणी, व्यवस्था, रेल तथा हवाई जहाज में सीटों का आरक्षण, विजली, गृहकार तथा आयकर के बिल तथा अनेकों रोजमर्रा के कार्यों में संगणक का प्रयोग बहुत तेजी से हो रहा है।

जनसंख्या की दृष्टि से भारत विश्व में दूसरे स्थान पर आता है। यहाँ पर अधिकांश लोग ग्रामों में रहते हैं और उनका मुख्य धन्धा कृषि है। लेकिन फिर भी हमें काफी खाद्यान्न विदेशों से आयात करना पड़ता है इसलिए यह आवश्यक है कि देश में अधिक से अधिक और अच्छी किस्म की खाद्यान्नों की पैदावार हो। नये नये और अच्छे किस्म के बीजों पर अनुसंधान कार्य हो, उसके लिए कब कौन सी तथा कितनी खाद्य एवं पानी की आवश्यकता है पर अनुसंधान कार्य हो। इस सारे अनुसंधान के लिए सरकार ने भारतीय कृषि अनुसंधान परिषद की संरचना की है।

कृषि अनुसंधान का कार्य तेज गति पर हो सके इसके लिए आवश्यक है कि विभिन्न क्षेत्रों में कार्यरत वैज्ञानिकों द्वारा एकत्रित आँकड़ों का संसाधन जल्दी तथा ठीक हो। इस कार्य के लिए भारतीय कृषि साँख्यकीय अनुसंधान संस्थान, नई दिल्ली में एक तृतीय श्रेणी (III Generation) का संगणक बरोज बी-4700 (Burroughs B-4700) लगाया गया है। इसकी क्षमता 200 K.B. है। इस संगणक का प्रयोग अनुसंधान की दृष्टि से देश में फँले 31 अनुसंधान संस्थान जो कि भा० कृ० अ० प० के अन्तर्गत कार्यरत है, 23 कृषि विश्वविद्यालय, 86 अन्य मिले जुले संस्थान, कृषि तथा सिंचाई मंत्रालय तथा विभिन्न प्रांतों के कृषि विभाग के वैज्ञानिक निःशुल्क कर सकते हैं।

संगणक पर कार्यरत वैज्ञानिकों ने अनुसंधान की दृष्टि से अनेकों संगणक प्रोग्राम बनाये हैं। जीव विज्ञान तथा पेड़ पौधों के प्रजनन सम्बन्धी विषयों पर आँकड़ों का संसाधन करने के लिए

बहुत से प्रोग्राम लिखे गये हैं जिनका उपयोग विद्यार्थी तथा वैज्ञानिक जो वन क्षेत्रों में कार्यरत है आसानी से कर सकते हैं उनमें से कुछ निम्न हैं ।

1. प्रारम्भिक सांख्यिकी (Elementary Statistics)
2. मैट्रिक्स ऐलजेब्रा (Matrix Algebra)
3. प्रसरण एवं सहप्रसरण विश्लेषण (Variance and Covariance Analysis)
4. पथ विश्लेषण (Path Analysis)
5. सोपानन परीक्षण तथा जनन (Scaling Test and Components of generation Means)

माध्य के घटक

6. व्यत्यासी विश्लेषण (Diallel Analysis)
7. आंशिक व्यत्यासी विश्लेषण (Partial Diallel Analysis)
8. त्रिपथ संकर विश्लेषण (Three way cross Analysis)
9. दूहरा संकर विश्लेषण (Analysis of Double Cross hybrids)
10. लाईन X टेस्टर विश्लेषण (Line X Tester Analysis)
11. नार्थ कोरोलिना डिजाइन (North Carolina Analysis)
11. श्रेणीनुसार विश्लेषण (Classificatory Analysis)
13. स्थायीत्व माडल (Stability Models)

२० हिन्दी प्रयोग में प्रगति

भारतीय कृषि सांख्यिकीय अनुसंधान संस्थान पर, 31 दिसम्बर 1983 को समाप्त होने वाली तिमाही के दौरान, हिन्दी के प्रयोग में उत्तरोत्तर वृद्धि करने के प्रयास निरन्तर किए जाने के साथ साथ हिन्दी के कार्य के विकास में अनेक उपलब्धियां हुई जो संस्थान पर हुए हिन्दी विकास के इतिहास में चिरस्मरणीय घटनाओं के रूप में गिनने योग्य है ।

दिल्ली में तृतीय विश्व हिन्दी सम्मेलन का आयोजन एक अभूतपूर्व घटना थी जो 28 से 30 अक्टूबर 1983 की अवधि में सम्पन्न हुआ और जिसमें विश्व के अनेक देशों के प्रतिनिधियों ने भाग लिया । इस संस्थान द्वारा प्रकाशित हिन्दी साहित्य भारतीय कृषि अनुसंधान परिषद के माध्यम से प्रदर्शनार्थ भेजा गया इस साहित्य में "हिन्दी प्रसारिका" का एक महत्वपूर्ण स्थान है । हिन्दी के प्रचार-प्रसार में इसका योगदान अत्यन्त सराहनीय है ।

हिन्दी कार्यान्वयन समिति की बैठकों में उठाए गए हिन्दी प्रकाशन सम्बन्धी मुद्दों को ध्यान में रखते हुए 31 अक्टूबर एवं 2 नवम्बर 1983 को हुई प्रभाग प्रधानों एवं वरिष्ठ वैज्ञानिकों की बैठकों में भी निर्णय लिया गया कि हिन्दी अधिकारी के अर्जित अनुभव का लाभ उठाते हुए, हिन्दी अनुभाग कुछ हिन्दी प्रकाशनों का उत्तर दायित्व संभाले । इस निर्णय के अन्तर्गत, हिन्दी में

सांख्यिकी समाचार निकाले जाने तथा संस्थान पर निःसृत 4 पैम्फलेटों के हिन्दी अनुवाद की प्रकाशित करने सम्बन्धी प्रेरणा प्रदान की गई। प्रकाशन सम्बन्धी इस प्रेरणा प्रद चर्चा को हिन्दी कार्यान्वयन समिति की 7 नवम्बर, 1983 को हुई बैठक में पुनः कार्यविधि सम्बन्धी निर्णय के लिए उठाया गया। समिति ने सांख्यिकी समाचार के हिन्दीप्रकाशन की सम्पूर्ण कार्यविधि पर विचार करने के लिए डा० एस० के० रहेजा की अध्यक्षता में एक उपसमिति का गठन किया जिसमें हिन्दी अधिकाारी के अतिरिक्त श्री आर० के० खोसला को भी सम्मिलित किया गया। 30 नवम्बर, 1983 को हुई इस उपसमिति की बैठक में सिफारिश की गई (i) कि हिन्दी संस्करण के इस प्रकाशन का नाम “ऋषि सांख्यिकी समाचार” रखा जाए, (ii) आवरण पृष्ठ का डिजाइन रंगीन सुभाषा जाए (iii) प्रकाशन सामग्री वर्तमान न्यूजलेटर की हिन्दी सामग्री के अतिरिक्त, मौलिक एवं अनुवादित भी हो (iv) आकार ऑनल संस्करण जैसा हो, (v) सम्पादक मण्डल निदेशक द्वारा मनोनीत हो तथा (vi) इस संस्करण की अवधि त्रिमाही हो और पहला अंक जनवरी—मार्च, 1984 की अवधि से सम्बद्ध हो।

नवम्बर 7, 1 83 को सम्पन्न हुई हिन्दी कार्यान्वयन समिति की बैठक में हिन्दी प्रकाशन पर उपरोक्त बल दिए जाने के अतिरिक्त कई अन्य भी महत्वपूर्ण निर्णय लिए गए। धारा 3 (3) के तहत सभी समान्य आदेश द्विभाषी रूप में जारी किए जाने के विषय में प्रशासनिक अधिकारियों ने विश्वास दिलाया कि आगे से सभी सामान्य आदेशों का हिन्दी रूपान्तर भी साथ साथ प्रचलित करने के प्रयास किए जायेंगे। इसके अतिरिक्त हिन्दी के प्रणामी प्रयोग से सम्बद्ध सभी कार्यक्रमों पर हुई प्रगति का निरीक्षण करने के लिए एक निरीक्षण उपसमिति का गठन किया गया जिसकी अध्यक्षता का कार्यभार मुख्य प्रशासनिक अधिकारी को सौंपा गया और श्री पी० एन० बली, श्री एस. एस. श्रीवास्तव एवं हिन्दी अधिकारी इसके सदस्य नियुक्त किए गए। यह उपसमिति शीघ्र अपना कार्य पूरा करने हेतु तिथि निश्चित करने वाली है।

पुरतकालय में अधिकाधिक हिन्दी साहित्य उपलब्ध रखने हेतु बजट प्रावधान, पुरतकों के रख-रखाव आदि अनेक मुद्दों पर विचार विमर्श करके सिफारिश प्रस्तुत करने के लिए पूर्व-गठित उपसमिति में आंशिक मंशोधन किया गया तथा इस उपसमिति से सभी सम्बद्ध पहलुओं पर विचार करने का आग्रह किया गया। तदनुसार 20 दिसम्बर, 1983 को इस समिति की बैठक श्री एस. डी. बोकिल की अध्यक्षता में हुई। डा. रमाकान्त पाण्डेय, श्री शब्द शरण श्रीवास्तव, श्री दुर्गा प्रसाद एवं हिन्दी अधिकारी ने इसमें भाग लिया जबकि विशिष्टतः आमन्त्रित श्री पी. एन. बली एवं श्री एस. एल. दुआ अन्यत्र व्यस्त होने के कारण सम्मिलित नहीं हो सके। इस उपसमिति ने पहले से ही चयनित विभिन्न हिन्दी पत्र, पत्रिकाओं एवं पुस्तकों की सूची प्रस्तुत करने, प्लान बजट से श्रावश्यक धन राशि हिन्दी साहित्य के क्रय के लिए पुनर्विनियोजित करने तथा सम्बद्ध साहित्य का रख रखाव पुरतकालयाध्यक्ष द्वारा किए जाने की सिफारिश की।

इस प्रकार हिन्दी साहित्य की खरीद सम्बन्धी सिफारिशें हिन्दी कार्यान्वयन समिति को प्रस्तुत करने की सिफारिश की गई।

हिंदी प्रथम सत्र-84 के वार्षिक कार्यक्रम की कार्यविधि करने के लिए सभी प्रयोग/अनुयायी से सृष्टिवादी कायदाही करने के लिए अनुरोध किया गया।

हिंदी टाइपराइटरों की खरीद पर विचार विमर्श करने के पश्चात्, अध्यापन धनराशि के कारण आने वाले हिंदी टाइपराइटरों की खरीद करने का निर्णय लिया गया।

केंद्रीय सचिवालय हिंदी परिषद की संस्थान शाला का सदैवना अधिधान बहिन उत्साह-जनक रही तथा इस वर्ष 201 सत्रय बनाए गए। शाला का वार्षिक सत्रय इस विमर्श के दौरान वित्तिक 24 सत्रय, 1983 की विधिवत किया गया। इस कार्यक्रम में सत्रय से पूर्व उपस्थित सदस्यों का स्वागत करने के उपरान्त शाला का गणवर्णीय वार्षिक प्रतिवेदन तथा 30-6-83 तक हुई आय एवं व्यय का विवरण प्रस्तुत किए गए जो कार्यकारिणी ने पढ़ले ही अनुमोदित कर दिए हैं। इन पर सभी ने सहमति व्यक्त की। तदुपरान्त सत्रय प्रयोग का प्रारम्भ हुआ और संरक्षक प्रधान, दो उप-प्रधान, एक सत्री, दो उपसत्री, कौशल्यक्ष, लेखा परीक्षक आदि के सत्रय के अतिरिक्त 20 सदस्य एवं चार केंद्रीय प्रतिनिधियों का सत्रयव किया गया। सत्रयव बड़े ही सदैवभावपूर्ण एवं शान्त वातावरण में सम्पन्न हुआ। इस कार्यक्रमकारिणी के सत्रयव की सत्रयवा अधिधान जनों एवं केंद्रीय सचिवालय हिंदी परिषद के महासमन्त्री की ओर दी गई है।

संस्थान के नाम के अनुवाद से सम्बन्ध विधायी एवं संरक्षित सत्रयय से उपलब्ध शाला पर भारतीय कौशल्यप्रधान परिषद तथा कौशल्य सत्रयय के राजभाषा निदेशक की प्रतिभाग्य की जा रही है।

केंद्रीय सचिवालय हिंदी परिषद की संस्थान शाला का वार्षिक सत्रयय करने के लिए सदस्यवर्गों की सूचना देते हैं।

संस्थान के सत्रयय करने के कारण सचिवालय में नई थी। अन्य विधियों पर प्रयास किए जायेंगे।

संस्थान की सूचना पुस्तिका के अतिरिक्त दो शोध प्रवर्तिकाओं (रिसर्च पब्लिकेशंस) का भी अनुवाद कार्य पूर्ण हो चुका है एक और शोध प्रवर्तिका का अनुवाद चल रहा है और शोध की पूर्ण हो जायेगा। संस्थान के निदेशक महोदय ने इनके प्रकाशन का कार्य भी हिंदी अनुयायी की सहायता के लिए कर लिया जायेगा।

हिंदी प्रकाशनों के सम्बन्ध में, वर्तमान है कि 'हिंदी प्रसारिका' के प्रकाशन का कार्य भी इस विमर्श के दौरान आरम्भ किया गया। यह संस्करण पढ़ले साइबेरियाई देल रूप में ही निकाला जायेगा। यह पढ़ले संस्करण ही हिंदी में मुद्रित करेगा। जना निश्चित ही गया है। पढ़ले प्रकाशित जा चुका है और मुद्रक की निदेश दिए गए हैं कि आगामी वार्षिकोत्सव से पढ़ले वे इसे मुद्रित करे।

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