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D. P. SINGH and S. D. BAI



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(भा० कृ० अ० सं०)

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R. K. KHOSLA
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PREFACE

This is the Eighteenth issue of 'IASRI Statistical Newsletter' and covers the activities and allied information in respect of this Institute during the quarter April-June, 1979.

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".

DAROGA SINGH,
DIRECTOR
INDIAN AGRICULTURAL STATISTICS
RESEARCH INSTITUTE,
NEW DELHI-110012.

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1. SAMPLING INVESTIGATIONS INTO HIGH YIELDING VARIETIES PROGRAMME

A major breakthrough in Indian agriculture was the introduction of the high yielding varieties of major cereals in the mid-sixties, popularly known as the 'Green Revolution'. The varieties being highly fertilizer-responsive and with a high potential, their performance under cultivators' conditions over different soil and agro-climatic regions of country assumed crucial importance in the context of achieving higher foodgrain production targets. Thus in order to monitor the different components of the programme there was a need to collect adequate and reliable data on the spread and yield rates of these varieties as also on the agronomic and management practices actually adopted by the cultivators in growing these varieties as against the recommended practices. To meet the above requirements the Institute planned and initiated large scale surveys for assessment of the performance of high yielding varieties of major cereals, viz., rice, wheat, maize, jowar and bajra in 1968-69. The main objectives of these surveys were to collect objective and reliable data on (i) the spread of the HYV of major cereals (ii) the yield rates of HYV of these crops and comparable estimates of local varieties and (iii) the extent of adoption of associated improved practices recommended for these varieties.

These surveys covered 88 districts spread over 15 States of the country. Two types of enquiries were conducted viz. (a) agronomic and agro-economic for objectives (i) & (iii) above and (b) yield estimation surveys by conducting crop cutting experiments for objective (ii) above.

The sampling design adopted was stratified multistage random sampling with strata as Community Development Blocks or groups thereof. For agronomic enquiry, villages and cultivators constituted the first and ultimate stage sampling units while for yield estimation surveys, villages, cultivators, fields and 'plots of specified shape and size' were the first, second, third and ultimate stages of sampling. The sample size was 320 cultivators for the first enquiry and 80 crop cuts each on high yielding and local varieties per studied crop for yield estimation surveys.

The assessment surveys were continued upto 1973-74 and the results have been brought-out in the form of annual reports. These surveys provided valuable

data on the progress of HYVP in terms of yield rates, area under HYV, extent and intensity of adoption of improved agricultural practices etc. as also in identifying the factors that impede the large scale adoption of these varieties.

With new varieties of major cereals and important cash crops being developed and introduced rapidly in different regions of the country, an acute need was felt for monitoring the progress of high yielding varieties programme and investigating causes for constraints and bottlenecks in the adoption of new technology in agriculture as also for an objective evaluation of the impact of HYVP in terms of changes in area, productivity etc, from year to year. Realizing the need for collection of data on these important aspects relating to HYVP the Institute undertook sample surveys for methodological investigations into high yielding varieties programme, in typical areas of different States. The main objectives of these surveys were (i) to develop suitable sampling methodology for studying changes in area, productivity and extent of adoption of agricultural practices under cultivators' conditions for high yielding/improved varieties of important cereals and cash crops. (ii) to study the extent to which the potential of high yielding/improved varieties has been realized under field conditions and investigate limiting factors.

These surveys were initiated in 38 districts covering 15 States of the country during 1974-75. Three types of enquiries were conducted under these surveys (i) area estimation enquiry (ii) agronomic and agro-economic enquiry and (iii) yield estimation surveys. The sampling design adopted was the same during the Fourth Five year Plan. However, to study the changes in area, productivity and adoption of agricultural practices under field conditions, a part of the sample selected each year was retained for the next year also, for estimating the change in area, productivity etc. as well as for building up the current estimates with increased precision. The crops covered were the five major cereals listed above and two important cash crops namely cotton and groundnut. For the area estimation enquiry, villages and cultivators growing the crop (s) under study were the first and second stage sampling units resp. while for the agronomic and agro-economic enquiry, villages and cultivators growing HYV of the studied crop (s) were the first and second stage sampling units resp. In case of yield estimation surveys, villages, cultivators, fields and plots of specified size and shape, constituted the first, second, third and ultimate stage units of sampling resp. The sample size was 600 cultivators for the first enquiry, 288 cultivators for the second enquiry and

93 crop cuts each on high yielding and local varieties for studied crop (s) for the yield estimation surveys.

Salient results :

Some of the salient results of the surveys on HYVP pertaining to average yield, fertilizer use and coverage under high yielding varieties in respect of the two major cereals namely rice (kharif) and wheat during the period 1970-71 to 1975-76 are briefly discussed in the following paragraphs.

Average yield

Rice (Kharif) :—

Kharif rice was covered in 66 districts spread over 14 States in the 4th Plan and in 25 districts spread over 12 States during the 5th Plan. The commonly grown high yielding varieties of rice in most of the districts were IR-8, Ratna, Jaya, Co-29 and IET-1991. The average yield of HYV rice varied considerably from year to year, State to State and also between districts within a State. Yield rates of 25 q/ha or more were obtained in about 45 per cent of the districts in the first two years, in 35 per cent of the districts in the next three years and in 40 per cent of districts in 1975-76. In general the average yield showed a declining trend after 1971-72. The average yield, of HYV rice was higher than the average yield of local varieties by 50 per cent or more in 42-62 per cent of the districts in different years.

Wheat

Wheat crop was covered in 12 States spread over 68 districts during the 4th Plan and 26 districts during the 5th Plan. Sonalika and Kalyan Sona were the most extensively grown HYV of wheat in a majority of the districts. The other HYV of wheat cultivated were WG-357, UP-301, PV-18, K-68, Hira, Moti, NI-917, 747-19 and Arjun. The average yield of HYV wheat also varied widely from year to year, State to State, as also between districts within a State. Yield rates of 25q/ha or more were recorded in about two-thirds of the total districts during 1970-71 and 1971-72. The proportion of such districts declined sharply to 18 and 8 per cent respectively in 1972-73 and 1973-74. Nevertheless, in the last two years, there was an appreciable improvement in this proportion, being around 35 percent in each year. The average yield of HYV wheat was higher than the average yield of local varieties by 50 percent or more in 75 percent of the districts during 1970-71 and

1971-72. The proportion of such districts was between 46 and 53 in the latter four years.

Fertilizer Use

Rice (Kharif)

The distribution of average rates of application of nitrogen adopted by the farmers was fairly uniform over the first four years, the proportion of districts reporting nitrogen application in the range of 50-100 Kg/ha being about 80 per cent in each year. However, this proportion declined to 67 per cent in 1974-75 but again picked up in the next year to 75 per cent. The proportion of districts applying phosphorus in the lower range of 20-40 Kg/ha increased consistently over the years. In case of potash, there was no specific trend, however, a majority of districts (80-100 per cent) reported its application in the range of 20-60 Kg/ha.

Wheat

A majority of the districts (87-96 per cent) reported nitrogen application in the range of 50-100 Kg/ha in each year. In 1971-72, the proportion of districts reporting nitrogen application in the higher range of 75-100 Kg/ha increased to 36 per cent from 22 percent in the previous year, but in the next two years this proportion registered a fall, being around 26 per cent in each year. However, in the latter two years, it again picked up and was about 42 percent. Almost all the districts reported phosphorus application in the range of 20-60 Kg/ha. However, the proportion of districts applying phosphorus in high range of 40-60 Kg/ha declined sharply from 42-60 per cent in the first five years to only 26 percent in the last year. Almost a similar trend was observed in respect of potash.

It is seen that there was a fall in the proportion of districts adopting higher doses of N, P and K in 1974-75. This may partly be ascribed to increase in fertilizer prices in mid 1974. Subsequently, these prices were reduced and accordingly this proportion also picked up in 1975-76.

Area under HYV

Rice (Kharif)

An examination of the distribution of districts according to the area under HYV of rice as a proportion of total area under the crop showed that the

proportion of districts reporting 25 per cent or more of the area under HYV consistently increased from 27 percent in 1970-71 to 75 percent in 1975-76.

Wheat

The proportion of districts reporting increased coverage under HYV of wheat consistently progressed over the years. The proportion of area brought under HYV wheat was 50 per cent or more in 40 per cent of the districts in the first two years and in 60 per cent of the districts in the next two years. This proportion went up to 80 and 87 per cent in 1974-75 and 1975-76 respectively.

2. ESTIMATION OF COST OF CULTIVATION OF APPLE

Apple cultivation can make a significant contribution to the removal of poverty in economical backward hill areas of the country in Uttar Pradesh, Himachal Pradesh and Jammu and Kashmir. This was recognised by the Committee of Direction for development of hill areas in U.P. and they wanted representative and reliable data on the economics of apple cultivation as a preliminary to drawing up plans for development of this crop in hill areas of that state. The I.A.S.R.I. agreed to take up this work in collaboration with the state government. Accordingly, the scheme was launched in September 1972 in the districts of Nainital, Almora, Tehri and Uttarkashi of that state.

Apple is a perennial crop and its cost of cultivation has to be ascertained in two stages. Firstly it is necessary to estimate the cost of raising an orchard to the bearing stage and next the cost of maintaining a bearing orchard and harvesting produce has to be estimated. Estimate of production is also to be obtained to permit calculation of cost production per unit output (Kilogram in case of apple). The sampling design adopted for the survey is described in the next section. Data were collected for two years, viz. 1972-73 and 1973-74. Details of design, analysis and results obtained are given in the following paragraphs.

Sampling design and method of study :

The design adopted was two stage stratified random sampling design with clusters of 3 villages as the primary sampling units and apple orchards within clusters as the second-stage units. Though according to plan 20 clusters had been selected, owing to shortage of field staff data could be collected in 17 clusters only.

The four districts served as strata and the number of clusters from which data were collected in the 4 districts were as follows : 5 in Nainital, 2 in Almora, 3 in Tehri and 7 in Uttarkashi. In each selected cluster 12 orchards were selected for recording of data, six from the non-bearing class and six from the bearing class of orchards. Thus in each class data were available for about 100 holdings. On the basis of non-bearing sample of orchards the cost of raising the orchard to the bearing stage was estimated. From the sample of bearing orchards the cost per kilogram was also estimated. Data for the past period had to be collected by enquiry but for the bearing orchards data were recorded by cost accounting, that is data on labour and materials spent in apple cultivation were recorded from day to day as operations took place. For this purpose one fieldman was posted in each selected cluster on a whole-time basis all the year round.

In converting all inputs to money value, prevailing wage rates and prices were used. The concepts of cost adopted in the study are those commonly adopted namely, cost A, cost B and cost C but cost was also calculated according to one more concept (cost-D) which does not include value of land. This was done as land had been allotted by state government on nominal rent to a number of orchardists. In working out of the cost of cultivation for bearing orchard the concepts A, B and C were adopted, the interest on the cost of raising the orchard according to concept D being included as an item of cost. The results obtained are given in the next section.

RESULTS

(a) Cost of raising the orchard

The estimated cost per hectare and per 100 trees according to various concepts and the item-wise costs are given below.

<i>Cost item</i>	<i>Cost in Rupees per hectare</i>	<i>Cost in Rupees per 100 trees</i>
Land	1000	427
Labour	2087	884
Planting material	212	89
Manures & Fertilizers	451	189

Cost A	3750	1589
Cost B	5052	2141
Cost C	5052	2141
Cost D	3634	1535

There is no difference in cost B and C as the labour was taken as hired. For calculating interest on investment estimates of cost were worked out yearwise for the five-year non-bearing period and interest calculated at 6% compound on investment in each year.

(b) **Cost of maintenance of bearing orchards and cost per kilogram of apple.**

The estimates of cost according to concept A, B and C utilising the estimate of cost D for calculating interest on investment in raising the orchard, are given below.

<i>Cost item</i>	<i>Cost in Rupees per hectare</i>		<i>Cost in Rupees per 100 trees</i>	
	1972-73	1973-74	1972-73	1973-74
1. Human labour	393	395	201	197
2. Material inputs	68	93	35	47
3. Depreciation	203	203	104	103
4. Interest on investment	539	537	275	271
<hr/>				
Cost A	456	474	233	238
Cost B	995	1011	509	509
Cost C	1203	1228	615	617
<hr/>				
Yield in kilogrammes				
Per hectare	1573	1198
Per 100 trees	804	601
<hr/>				
Cost per killogram				
Cost A	0.29	0.40	0.29	0.40
Cost B	0.63	0.85	0.63	1.85
Cost C	0.76	1.03	0.76	1.03

The costs per hectare and per 100 trees did not differ appreciably in the two years. However, because of substantial difference in yield, the costs per kilogram differed a good deal.

The survey has not only demonstrated the feasibility of collecting useful data on cost of cultivation of apple but has also provided methodological guidance for future surveys on perennial crops.

3. TRAINING ACTIVITIES

During the quarter under report, the III Trimester of the session 1978-79 of M.Sc. and Ph. D. courses started.

Specialised training to the students of Junior Certificate Course of C.S.O., New Delhi was imparted for the following subjects :

<i>Special Subject</i>	<i>Number of Trainees</i>	<i>Duration</i>
(a) Data Processing and computer programming	9	18th May, 1979
(b) Agricultural Statistics	11	11th-16th June, 1979
(c) Large Scale Sample Surveys	1	11th-20th June, 1979

The students of B. Stat. and M. Stat. of Indian Statistical Institute, Calcutta were acquainted with the functions and activities of the Institute on the 14th June, 1979.

Seven participants of the fifth course in 'Epidemiology and Control of Animal Disease' of I.V.R.I., Izatnagar were familiarised with the general activities of live stock statistics and cost benefit studies in Animal Health programme on 16th June, 1979. In addition to this, a guided visit to the Computer Centre was also arranged.

4. BASIC RESEARCH

New fractional factorial designs for asymmetrical factorials were developed.

Investigations on a class of response surface designs called Slope rotatable designs were made and some series of new designs were obtained.

Analysis of multi-response, response surface designs was worked out.

5. ADVISORY SERVICE

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

Crop Sciences

Shri A.K. Biswas from Tea Association, Assam was given advice regarding the analysis of rotatable design of experiment to find out the optimum dose for tea.

Crop Forecasting Methodology

S/Sh. R.K. Shrestha and Y.P. Gautam from Agricultural Statistics Division of the Food and Agricultural Marketing Services Department, Kathmandu, Nepal were given advice on the crop forecasting Methodology.

Econometrics

Sh. S.N. Pareek, Asstt. Prof., Deptt. of Agricultural Economics, College of Agricultural, Jobner (Rajasthan) was given technical advice regarding analysis of data of his Ph. D. thesis on green revolution and its impact on Indo-Canadian Trade.

Sh. G.C. Shrivastava a Ph. D. Student of Benares Hindu University (B.H.U.) Varanasi (U.P.) was given technical advice in regard to the analysis of data of his thesis.

Animal Sciences

The officials of the Operations Research Group, Baroda (Gujarat) were given advice in regard to the assessment of some dairy projects in the country.

Mr. Douglas Perry from Food Research Institute (Applied Economics) Stafford University, California, U.S.A. was given advice on the statistical problems relating to dairying in India.

Sh. Karan Singh, Deputy Director (Stats.), Directorate of Animal Husbandry, H.P. Simla was advised on estimation of mortality rates in poultry.

Statistical Genetics

Sh. Dharamender Kumar, Joint Director (Stat.) Directorate of Animal Husbandry, U.P. was given advice on analysis of cattle breeding data.

Sh. Davinder Sharma, Scientist, National Physical Laboratory (N.P.L.) New Delhi was given advice regarding the method of fitting regression with auto-correlated errors.

Sh. Sudarshan Kumar, Statistician, Department of Animal Husbandry, Punjab, Chandigarh was given advice regarding progeny testing programme under field conditions.

Dr. Karan Singh Deputy Director (Stats.), Directorate of Animal Husbandry H.P. Simla was advised on assessment of genetic change in cattle herds.

Sample Survey Methodology

State Farms corporation of India (S.F.C.I.) New Delhi was advised on planning of Experiments for study of urea top dressing of paddy by air Vs manual.

The Institute of Techno-Economic Studies, Madras (T.N.) was given technical advice on the project "Effect of mechanisation of fishing on the Socio-Economic conditions of fishermen".

The Officers of Directorate of Marketing and Inspection, Govt. of India Faridabad (Haryana) were given advice regarding finalisation of report on marketable surplus of wheat.

Dr. S.P. Pant of Directorate of Eco. & Stats., New Delhi was advised regarding analysis of data on cost of cultivation of crops.

S/Sh. R.L. Shrestha and Y.P. Gautam from Agril, Stats. Division of Food and Agril. Marketing Services Deptt., Kathmandu, Nepal were given advice in the organisation of sample survey in livestock and their products in Nepal.

6. FIELD WORK

(a) Field Training

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

- (i) All India Co-ordinated Agronomic Research Project (AICARP)—Palampur (H.P.), Ludhiana (Punjab), Hissar and Kurukshetra (Haryana) Kanpur (U.P.), Chittorgarh (Rajasthan), Bangalore (Karnataka), Pattambi (Kerala), Bapatla (A.P.), Imphal (Manipur), Gauhati (Assam) Bhubaneswar (Orissa), and places in Gujrat, Maharashtra and M.P. States.
- (ii) Development of suitable methodology for estimation of cost of poultry and egg production under small scale poultry farming conditions in A.P.—Hyderabad (A.P.).
- (iii) Pilot Sample Survey for studying the relative merits of the data obtained by actual weighment and those through enquiry for estimation of milk production—Barabanki (U.P.) and Rohtak (Haryana).

(b) Inspection and Supervision of Field-Work

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

- (i) Pilot sample survey to evolve a sampling methodology for estimation of cost of cultivation of important vegetable crops in the Union Territory of Delhi—Delhi.
- (ii) Sample Survey for methodological investigations into High Yielding Varieties Practices (H.Y.V.P)—Delhi and Meerut (U.P.).
- (iii) Study of economics of raising cattle and buffaloes in rural areas of West Bengal—Nadia and 24 Paragans districts (W.B.).
- (iv) Statistical investigations on Economics of Pig production in the district of Aligarh (U.P.)—Aligarh (U.P.).
- (v) All India Coordinated Research Project (AICARP)—Agronomic Research Station Bhawanisagar (T. N.), Bagatesheroo and Talab Tilloo (J&K), Imphal (Manipur), Bhubaneshwar (Orissa), and Kurukshetra (Haryana).
- (vi) Pilot Sample Survey to evolve a sampling methodology for estimation of losses taking place in the marketing of vegetables and price spread at

various stages and cost of cultivation of important vegetable crops in Ahmedabad and Delhi—Delhi.

- (vii) Pilot sample survey to study the impact of new technology on crop production and its disposal and employment in agriculture—Villages in the union territory of Delhi.
- (viii) Pilot sample survey for estimation of number of pigs slaughtered and attendant swine practices—Allahabad and Aligarh (U.P.).

7. ABSTRACTS OF PAPERS PUBLISHED

1. BHARGAVA, P.N and KAPOOR J.K. "A row and column design" —*Jour. Ind. Soc. Agril. Stats. Vol. XXXI No.1 April 1979 pp. 111 to 120*

Some designs based on orthogonal partitioning of Latin square are suggested. Finney (1945) gave the concept of orthogonal partitioning of latin square. The orthogonal partitioning of latin square was defined in more general form as the partitioning of s^2 cells of a 'sxs' latin square into sets of 'sni' ($i=1,2,\dots,k$) cells where $n_1+n_2+\dots+n_k=s$ in such a way that the i th set has n_i cells in each row, n_i cells in each column and n_i cells for each letter. Each such set is an orthogonal portion of latin square. In this paper the orthogonal partitioning of the latin square of size 'sxs' is done in two groups (s^2-s, s) and if the (s^2-s) group is considered as a row and column design with 's'treatments' and each replicated ($s-1$) times then this provides a row and column design of the T:TT type as classified by Pearce (1960). If in the cells which were not considered earlier were substituted by a treatment other than the one included in the design, then the design so formed will be of the type O:TT as classified by Pearce. The method of analysis of these two class of designs has been given in the present paper.

2. BHATIA. D.K. and PRABHAKARAN, V. T. - "Rural Uplift through organised milk schemes - Realities and Possibilities"—*Indian Dairyman Journal. Vol. XXXI. No. 5. May 1979 pp. 311 to 317*

With the introduction of any new technology in the existing system of production or management in an area it is desirable to know its effect on the economy of that area. The effect may be measured over space or over the time. Following the space concept, the study has revealed that by the introduction of

milk supply schemes the suppliers of milk to organised agencies have not uniformly scored above those who are not supplying their milk to organised agencies.

However, the study has indicated that there is a scope for improvement of rural economy provided (i) Availability of sufficient quantity of milk in the rural areas is ensured by motivating the average milk producer to keep good breeds of animals under proper management and care; (ii) Supply of superior breeds of animals to the rural farmer on loan basis and veterinary aids are arranged and (iii) the net work of producer's co-operatives are set up in the rural area to help and protect them from the middleman.

3. KUMAR DHARMENDRA and NARAIN, P. "Effect of season of calving on lactation yield and length in Red Sindhi, Jersey and their crosses." — *Cherion the Tamil Nadu Jour. of Vet. Sci. and Animal Husbandry* Feb. 1979.

Lactation yield and lactation length records of Red Sindhi, 'Red Sindhi X Jersey cross-bred' and Jersey cows were analysed to study the effect of season of calving on lactation yield and lactation length. In Red Sindhi, Jersey and cross-bred cows the average lactation yield was not significantly affected by the season of calving. The lactation length, on the other hand, was affected significantly by the season for the Red Sindhi and the cross-bred cows. Winter calvers seem to have smaller lactation lengths of the order of 361 and 383 days for Red Sindhi and cross-bred cows respectively. Their lactation yields, in the winter season, were of the order of 2032 and 1986 litres respectively.

4. NADKARNI, U.G. and RAUT, K.C. "Optimum flock size of ovines under migratory and Stationary conditions". — *Ind. Jour. of Animal Science* Vol. 4, No. 5, May 1979 pp. 356 to 360.

An attempt was made to work out the optimum flock size for sheep and goats under migratory and stationary conditions utilizing data collected in the survey for the estimation of cost of production of sheep and wool in Mandi and Mahasu districts of Himachal Pradesh. In all, data for 109 migratory flocks in Mahasu district and 134 stationary flocks in each of Mandi and Mahasu districts were utilized. In Mahasu district 83.5% of the migratory flocks had both sheep and goats and the remaining 16.5 per cent had only sheep. Stationary flocks having only sheep accounted for about 68 per cent of the total number of flocks in both

Mandi and Mahasu districts and the remaining 32 percent had both sheep and goats. For migratory flocks the optimum flock size in sheep was 41 and for stationary flocks it was 17 in Mahasu district and 9 in Mandi district. Including goats, the optimum flock strength was 59 for migratory flocks in Mahasu district, 18 for stationary flocks in Mahasu district and 11 for stationary flocks in Mandi district.

5. NARAIN, P. (1979) "A new Sire Index for milk production corrected of an auxiliary trait" -- *Ind. Jour. of Animal Genetics and Breeding, Vol. 1 No. 1, PP 20 to 22.*

In a programme for the genetic improvement of dairy cattle, a major problem is to assess the breeding value of a sire. The average performance of 'n' daughters of a sire gives the most efficient procedure for judging this breeding value, since the correlation between this value and the average performance of sires' daughters tends to one as 'n' is increased indefinitely. In order to take into account the unequal production levels of the dams mated to a sire, the daughters' average for a character is usually corrected on the basis of the regression of daughters' performance on those of dams for this character. A new sire index is given in which we correct the corrected daughter average index for the given character (y) with the help of an auxiliary character (x) by using the averages of daughters, dams and herd in terms of the phenotypic index $I = P_y - bp_x$. The heritability of the character is also replaced by the heritability of the phenotypic index which depends on the heritability of the main character, phenotypic correlation between main character and auxiliary character and C, which equals the product of the genetic correlation between the two traits and the square root of the ratio of the heritabilities of the auxiliary and the main character respectively. This index is given by

$$S_I = A_I + \left(\frac{2nW}{n + a_y} \right) \left[D_I - \frac{1}{2} h_I^2 (\bar{M}_I - A_I) - A_I \right]$$

It has been shown that this sire index is more efficient than the previous index in a large number of cases which were examined with the help of data on dairy cattle.

6. NARAIN, P. and GARG, L.K. (1979) "Milk Production and calving interval of crossbred cows" -- *Indian Jour. of Dairy Sciences Val. 32 (2) year 1979 pp 193 to 195.*

Several attempts have been made in the past to improve productivity by cross-breeding. The most significant attempt in this direction has been the cross-breeding policy adopted in Military Dairy Farms where now a large number of animals belonging to various genetic grades and maintained under good managerial practices are available. For studying the comparative performance of different grades of cross-bred cows, Amble and Jain (1967) analysed the data from 9 Military Dairy Farms in respect of different characteristics related to production and adaptability. However, no attempt was made to quantify the increase or decrease in the character studied due to increase in the level of exotic inheritance. This has been achieved in this paper. The data relating to 516 cows of different Friesian, sahiwal grades from 9 Military Farms with lactation records mostly from 1930 to 1955 were analysed. The data were adjusted for grade differences, farm to farm variation as well as differences due to changes in environmental factors over time by fitting a least square model. The results showed significant differences due to grades for first lactation yield and calving interval. Weighted regressions between the least square constants for grades and exotic level of inheritance were therefore fitted, the weights being the inverse of the variances of the estimates of least square constants. It was found that lactation yield increases with increase in the percentage of exotic level upto about 60 to 65 per cent and decreases thereafter. On the other hand, calving interval decreases with the increase in the level of exotic blood upto about 25 % but increases thereafter. It was concluded that for cross-breeding programme in cattle level of exotic inheritance should be between 50 per cent to 75 per cent.

7. RAUT, K.C. "Statistical Research in relation to Animal Sciences"—*Souvenir of Third All India Workshop on Animal Husbandry and Dairy Statistics, May 1979.*
8. SINGH, BHAGAT. "Economics of Tractor Use"—*Yojna, 16th May 1979.*

This paper compares the economics of holdings using tractor and those depending solely on animals for draught power with respect to employment of human labour, availability of power on farm, cropping patterns, costs and returns for sugarcane and wheat crops. The study is based on data for 74 operational holdings—37 tractor holdings and 37 bullock holdings, spread over 17 villages of a C.D. block of Meerut district of Uttar Pradesh.

Results of the study show that the use of tractor resulted in superior cropping pattern, reduces direct employment of human labour on farm, provides possession and utilization of more power on tractor holdings as compared to bullock holdings. Higher costs of cultivation for sugarcane and wheat crops on tractor holdings are generally associated with higher returns.

It has been suggested that broad based studies encompassing total farm economy and effects of tractors on employment generation in secondary and tertiary sectors also should be undertaken to finalize this issue.

9. WIN, KYI. and RAI, S.C. "Analysis of Experiments involving rankings in Triad comparisons."—*Jour. of Ind. Soc. Agri. Stats. Vol. XXXI No. 1 April 1979 pp. 97 to 110.*

In this study we have developed a method of analysis of experiment involving triad comparisons which permits tests of hypothesis of general class and estimation of treatment ratings or preferences. In the null hypothesis we assume that the treatment ratings are equal whereas the alternative hypothesis makes no assumption regarding the equality of the treatment ratings. The probability of the sums of ranks $p(r_1 < r_j < r_k)$ involves three paired comparisons consisting of pairs of treatment (T_1, T_j) , (T_1, T_k) and (T_j, T_k) . These comparisons should be consistent in which $r_1 < r_j$; $r_1 < r_k$ and $r_j < r_k$.

The approach here may also be used for the generalisation of ranking in Block of size greater than 3. In subjective testing involving taste or odours, paired or triple comparisons will satisfy most of the requirements of the experimenter.

Formulae for the variances and covariances of estimates of treatment ratings π_1, \dots, π_v have been obtained. A test for the appropriateness of the model is given. The method of combining the results is also presented.

8. PAPERS ACCEPTED FOR PUBLICATION

1. JAIN, J.P., NIRMAN, K.P.S., ANEJA, K.G. and NARAIN, P.—Study of impact of milk supply schemes on rural economy in the milk collection areas of Delhi Milk Scheme. *Indian Dairyman*.
2. MARUTIRAM, B., NADKARNI, U.G., SOMAYAZULU, L.B.S. and JAIN, T.B.—Productivity of Commercial Poultry farms in relation to capital. *Indian Journal of Animal Science*.

3. NADKARNI, U.G., SOMAYAZULU, L.B.S. and JAIN, T.B.—Cost of maintainance of layers and cost per egg in commercial poultry farms of different categories. *Poultry Guide*.
4. RAUT, K.C., SINGH, SHIVTAR and CHANDRA, VIMAL—Production traits and economic worth of cows in a rural area. *Indian Farming*.
5. SAXENA, B.C. and ANEJA, K. G.—A comparative study of impact on rural economics of urban dairies under Alternate Management Systems. *Indian Journal of Dairy Science*.
6. SINHA, K., MATHUR, S.N. and NIGAM, A.K., Kronecker sum of incomplete block design. *Utilitas Mathematica, Deptt. of Computer Science, University of Manitoba, Canada*.

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

1. NARAIN, P., BHATIA, V.K. and MALHOTRA, P.K. A Handbook of Statistical Genetics (1979)

The handbook contains chapters on estimation of linkage, components of phenotypic variance repeatability, heritability, genetic correlation, analysis of diallel and partial diallel cross, progeny row selection, response to selection, simultaneous selection for several characters, correlated response to selection, combined selection and coefficients of inbreeding and relationship. An attempt has been made to illustrate the methodology with the help of fully worked out examples. Unsolved exercises have also been given at the end of each chapter. The handbook would be useful to researchers and the students interested in statistical tools for analysing plant and animal breeding data. It would also benefit the statisticians and geneticists who teach the subject to post-graduate students.

2. NIGAM, A.K. and GUPTA, V.K. A Handbook of Analysis of Agricultural Experiments (1979).
3. SINGH, PADAM, MITTAL, M.G. and CHANDNA. P.P. Bulletin of Seminar Association (1979).
4. SINGH, R. P. Estimation of performance characteristics in cattle under village conditions, —Bikaner region, Rajasthan (1979).
5. Proceedings of the "Workshop —cum Training Course in methodology of constraints analysis" organised by the division of Econometric Analysis, I.A.S.R.I. New Delhi-12, held during November 1978 (1979).

10. ABSTRACT OF DISSERTATION APPROVED

M. Sc. Degree

GANGADHARAN, P.—A statistical study on the interaction effects of factors influencing the yield rates of High Yielding Varieties (HYV) of Wheat in India.

The study can be grouped into three parts :—

- (i) Interactions involving two or more qualitative factors ;
- (ii) Interactions involving two or more quantitative factors ; and
- (iii) Interactions involving quantitative and qualitative factors.

The material used for the study has been drawn mainly from two sources, (i) The All India Coordinated Agronomic Research Project, 1971-77 and (ii) The coordinated experiments under the All India Coordinated Wheat Improvement Project, 1975-78.

Two distinct approaches have been made under this study. The first approach is mainly to express the interaction effects in terms of mean yields of treatments. This provided information on the nature (positive or negative) and magnitude of the interaction. By the second approach, the trend of factor interaction i.e., whether it was linearly increasing or decreasing, whether there was any deviation from linearity etc. was determined. This helped to investigate the relationship between the factors involved in the interaction. Consistency of interactions of various factors taken for study has also been examined.

Some of the salient results of practical importance are indicated below ;—

- (i) Generally, interaction of the effects of Phosphorus (P) and farmyard manure (FYM) was negative in all phases, direct, cumulative and residual. This revealed that at all the centres studied, the combined application of P and FYM decreased the yield to a considerable extent.
- (ii) Consistent and significant interaction effect between irrigation and variety was observed in Jhansi (U.P.) and Rudrur (A.P.) centres. Significant linear association between yield and number of irrigations was observed in respect of varieties Sonalika, Kalyan Sona, Raj 911 and J 142 at Jhansi (U.P.) and in respect of varieties Kalyan Sona and NI 5439 at Rudrur (A.P.).

- (iii) It was observed that date of sowing was an important factor influencing wheat production. Varieties Kalyan Sona and HD-2009 suffered notably in yield rates both at Hissar (Haryana) and Ludhiana (Punjab) when the date of sowing was delayed from second fortnight of October to second fortnight of December. However, in the case of Sonalika at Hissar (Haryana) dates of sowing had little influence on the yield.
- (iv) Under rainfed conditions, the variety C-306 was affected the least by delayed sowing at I.A.R.I. (Delhi), Under similar conditions at Rudrur (A.P.), the yield rate showed some increase when the sowing was delayed from second fortnight of October to first fortnight of November; however, further delay to the second fortnight of November resulted in a decrease in the yield rate.

(Guide : Sh. K. S. Krishnan)

11. PAPERS PRESENTED IN INTER-ORGANISATIONAL SEMINARS, WORKSHOPS, ETC.

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

1. *All India Seminar on "Non-parametric Statistics and Inference under order Restrictions" sponsored by University Grant Commission (U.G.C.) held at the Department of Mathematical Stats. of Delhi University, during 10th to 14th April, 1979.*
 - (i) ANEJA, K.G.—Distribution of two-sample rank order statistics when the sample sizes differ.
 - (ii) RAI, S.C. and SINGH, D.—Ordered observations in Block Designs.
2. *11th Workshop of the All India Co-ordinated Agronomic Research Project (AICARP) held at Jabalpur (M.P.) during 25th to 28th April, 1979.*
 - (i) JAIN, H.C.—Response of rice and wheat to fertilisers in relation to initial soil fertility in Eastern and North-Eastern Regions.
 - (ii) IYER, V.N.—A study on trends in response of rice to plant nutrients in relation to initial soil fertility.

- (iii) SONI, P.N.—Responses of wheat to fertilisers in relation to initial soil fertility status in Northern and North-Western regions.
 - (iv) SONI, P.N. and BHATNAGAR, K.C.—Some studies on intensive farming systems based on consolidated analysis.
 - (v) SONI, P.N. and MUKHERJEE, A.K.—Some studies on manurial requirements of fixed “two-crop-rotation” based on consolidated analysis.
3. *4th Conference of Agricultural Research Statisticians held at H.P.K.V.V. Palampur (H.P.) during 25th to 27th June. 1979.*
- (i) BHARGAVA, P.N. and BATRA, P.K.—Quality of Experimental Data.
 - (ii) BOKIL, S.D. and SINGH, H.—A note on buffer stock policy with reference to foodgrains.
 - (iii) KRISHNAN, K.S.—Scope and steps needed for improving the efficiency of crop experiments.
 - (iv) NADKARNI, U.G.—Cost of Production of Poultry and Eggs.
 - (v) NARAIN, P. and MALHOTRA, J.C.—Data Analysis in Animal Breeding.
 - (vi) RAHEJA, S.K.—Investigation in Sampling Methodology for Survey in Agriculture.
 - (vii) RAHEJA, S. K.—Qualitative Aspects of Data of Agricultural Field Surveys.
 - (viii) RAUT, K.C.—Quality of data for Livestock & Allied Studies.
 - (ix) RAUT, K.C.—Status of Statistical Methodology for Animal Studies.
 - (x) SINGH, D. and KHOSLA, R.K.—Assessment of Food Grain Losses.
 - (xi) SINGH, H.P. and SAXENA, B.C.—Impact of Milk Supply Scheme on Rural Economy in Milk Collection Areas.
 - (xii) SINGH, RANDHIR—On the Use of Imcomplete Frames in Sample Surveys.

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

During the quarter under review, officers of the Institute participated in inter-organisational seminars, workshops, etc. The names of the officers who

participated and the particulars of the seminars, workshops etc. are given below :

1. *Seminar on "Computers in Education and Research" organised by ORG Systems at India International Centre, New Delhi, on 7th April, 1979.*

Dr. S. S. Pillai and Sh. M.P. Jha.

2. *All India Seminar on "Non-Parametric and Inference under order Restrictions" sponsored by U.G.C. held at the Deptt. of Mathematical Statistics of Delhi University, during 10th to 14th April, 1979.*

Dr. D. Singh, Dr. K. G. Aneja, and Sh. S.C. Rai.

3. *11th Workshop of the All India Co-ordinated Agronomic Research Project (AICARP) held at Jabalpur (M.P.), during 25th to 28th April, 1979.*

Sh. K. S. Krishnan, Sh. P. N. Soni, Sh. V. N. Iyer, Sh. H. C. Jain and Sh. Y. R. Deshmukh.

4. *3rd All India Workshop on Animal Husbandry and Dairying Statistics held at Punjab Agricultural University (P.A.U.) Ludhiana (Punjab), during 8th to 10th May, 1979.*

Dr. D. Singh and Sh. J.C. Malhotra.

5. *9th Workshop of the 'All India Co-ordinated Soil Test Crop Response Correlation Project' held at Madurai Campus of the Tamil Nadu Agricultural University, during 22nd to 24th May, 1979.*

Sh. K.S. Krishnan.

6. *4th Conference of Agricultural Research Statisticians held H.P.K.V.V., Palampur (H.P.), during 25th to 27th June, 1979.*

Dr. D. Singh, Dr. K.C. Raut, Sh. S.K. Raheja, Sh. K.S. Krishnan, Dr. R. K. Pandey, Dr. B.B.P.S. Goel, Sh. P. N. Bhargava, Sh. R.N. Bakshi, Sh. R.K. Khosla, Sh. J.C. Malhotra, Sh. U.G. Nadkarni, Sh. S.N. Mathur, Sh. R.S. Khatri, and Sh. D.S. Aneja.

13. COMPUTER SCIENCE AND NUMERICAL ANALYSIS

(a) Data processing :

During the quarter under report, the Division of Computer Science and Numerical Analysis continued to give facilities for data preparation and electronic

data processing to students and research workers from various Institutes under ICAR, Agricultural Universities Agricultural Colleges and Faculties of other Universities and Directorate of Economics and Statistics.

(b) Computer Utilization

About 4000 production jobs and 2290 testing jobs were processed on the system.

(c) Programming Facilities :

During the quarter under report, 75 Ph. D., 46 M.Sc. and 27 Research Workers were given help in programming and analysis of their research data on the computer. To meet their programming requirements, about 35 new programmes were developed.

(d) Other Activities :

- (i) One issue of Newsletter of the Division was released and source programme Library was made upto date.
- (ii) 15 participants from Asia, Pacific and African countries attending training course on INFOTERRA Concepts and Operation, visited computer center and also attended a talk on AGRIS System on 9th April, 1979.
- (iii) 9 trainees of Junior Certificate Course of C.S.O., New Delhi specialising in Data Processing visited the Centre on 18th May, 1979.
- (iv) 15 students of B. Stat. and M. Stat. from ISI, Calcutta visited the Centre on 14th June, 1979.
- (v) 16 Participants of training course in Epidemiology and control of animal diseases of IVRI, Izatnagar (U.P.), visited the centre on 16th June, 1979. Also another batch of 9 Junior Certificate Cours estudents from CSO, New Delhi, specialising in Agricultural Statistics visited the Centre.

(f) M.T. Unit

Data preparation facilities for punching, sorting, tabulation and reproduction of cards were provided to a large number of scientists/research workers from Institutes under ICAR and Agricultural Universities. During the quarter, about 2.5 lakh cards were punched, 398 listing, 117 reproduction punch and 113 sorting jobs were undertaken by the unit.

14. LIBRARY

- (a) During the quarter under report, 113 books on various subject-fields of the Institute were added.
- (b) During the quarter under report, 121 Indian and foreign journals were bound.
- (c) The following reprint was procured for distribution by the Library.

S. No.	Author	Title	Source
1.	Nadkarni, U.G. and Raut, K. C.	Optimum flock size for ovines under migratory and stationary conditions.	Ind. Jr. Animal Sci. 49(5), May, 79.

(d) During the quarter under report, nearly 4,000 persons visited the Library.

(e) **Reprographic Service**

During the quarter, 35 jobs consisting of about 800 pages were done on Majox- 121 Electro-copier.

15. SEMINAR ASSOCIATION

During the quarter, following seminar talks were delivered by the distinguished visitor, scientists and the students at the Institute.

<i>Sl. No.</i>	<i>Speaker</i>	<i>Topic</i>
A. Distinguished visitor		
1.	Dr. M.L. Tiku Prof. of Statistics Mc Master University (Canada)	"Robust Parametric Procedures versus Non-Parametric Procedure."
B. Scientists of the Institute		
2.	Sh. V.T. Prabhakaran, Scientist (S-1)-	Prediction of Milking Time by a restricted regression approach.

3. Sh. V.T. Prabhakaran, Scientist (S-1)-8
- (i) Labour utilization in livestock keeping of a mixed farming system.
 - (ii) Importance of mixed farming as an effective instrument of rural transformation.

C. Students

4. M. Govindaswamy
Ph. D. (Ag. Eco.) Recent trends in inflation in India.
5. M.E.S. Elkady.
Ph. D. (Ag. (Ext.)) Role of Statistics in Social Sciences Researches.
6. P.G. Chengappear,
Ph. D. (Ag. Eco.) Application of spectral technique in the analysis of Economic Time Series.
7. Mahander Singh,
M. Sc. (Ag. Stat.) Production potential of H.Y.V. wheat under efficient application of irrigation at critical phases of crop growth.
8. Gulab Singh,
Ph. D. (Ag. Stat.,) "On Robust Experimental Designs."

16. FOURTH CONFERENCE OF AGRICULTURAL RESEARCH STATISTICIANS HELD AT H P.K.V.V., PALAMPUR (H.P) 25th to 27th JUNE, 1979.

The First and Second Conferences of Agricultural Research Statisticians were held in 1974 and 1976 respectively with the objective of mutually discussing the problems by them on Designs and Analysis of Experiments, Sample Surveys, use of Computer in Agriculture and Animal Sciences Research, Statistical Techniques in plant and Animal Breeding, Teaching of Statistics in Agricultural Institutes and Universities, Research and Training Facilities and Personnel Policies in six different technical sessions. These sessions were started with the speeches delivered by the invited speakers on the above mentioned topics.

The Third Conference was held from 24th to 26th April, 1979 and unlike earlier two conferences the pattern of session was changed where the participants discussed the main topic, i.e. the role of agricultural statistics research in Sixth Five Year Plan with a special reference to integrated rural development with

respect to agriculture, forestry, livestock and fisheries. This was done because one of the main policy objectives in the next Five Year Plan is the Agricultural and Rural Development which could play a great role in the growth of social justice, employment in rural areas and removal of poverty.

In the plenary session, the recommendation made in the earlier sessions, were discussed and finalised during each of conferences for taking action thereon by the concerned Agricultural University/Institute/Department and were reviewed in the subsequent conference.

The Fourth Agricultural Research Statisticians Conference was held at H.P.K.V.V., Palampur from 25th to 27th June, 1979. Some 78 participants from other Agricultural Universities, Agricultural Institutes and other offices were present. Besides 13 scientists from I.A.S.R.I. and 10 officers of H.P.K.V.V. Palampur also participated in the Conference. A total number of 101 Agricultural Statisticians, representing Agricultural Universities, I.C.A.R. Institutes, State and Central Departments of Agriculture/Animal Husbandry/Forestry/Fisheries, engaged in research, participated.

The sessions in the fourth conference held at Palampur (H.P.) were divided into five technical sessions besides, mentioned below, plenary session in the forenoon of 27th June, 1979. The sessions broadly related to (i) Agriculture and Forestry (ii) Livestock and Fisheries and (iii) Quality of Data.

There was an inaugural address by Sh. Shiv Kumar, Minister of Education, H.P. on 25th June, 1979. The welcome speech was given by Dr. H.R. Kalia, Vice-Chancellor, H.P.K.V.V., Palampur in the Inauguration. The Vote of thanks was given by Dr. D. Singh, Director, I.A.S.R.I., New Delhi on the first day.

The first session, held in the forenoon of the first day was devoted to the discussion on action taken on the recommendation made in the last conference.

The Session II, held on the afternoon of the first day was devoted to Agricultural Statistics in Crop Sciences and Forestry. The Session III held in the fore noon of 26th June, 1979 was devoted to Agricultural Statistics in Animal Sciences and Fisheries. The Session III was divided into two sessions vize IIIA and IIIB. The Session IIIA was devoted to Agricultural Statistics in Animal Sciences and the session IIIB was devoted to Agricultural Statistics in Fisheries. The Session IV, held in the afternoon of 26th June, 1979 was devoted to Quality of Data. The Plenary Session in the forenoon of the last day (27th June, 1979) was devoted to

the presentation of reports by the Chairmen of the various sessions. There was a field—visit in the afternoon of the last day.

Dr. G.R. Seth, Ex-Director, I.A.S.R.I., New Delhi and Dr. P.K. Bose Centenary Professor, Calcutta were special invitees at the conference.

The Five Technical Sessions were as follows :—

<i>Session</i>	<i>Chairman</i>	<i>Rapporteur</i>
I	Dr. D. Singh	Sh. R.K. Khosla
II	Dr. G. R. Seth	Sh. K.S. Krishnan
IIIA	Dr. P.N. Sexena	Dr. K.C. Raut
IIIB	Dr. D. Singh	Sh. K.K. Ghosh
IV	Prof. P.K. Bose	Sh. S.K. Raheja
Plenary	Dr. D. Singh	Sh. R.K. Khosla

17. MISCELLANEOUS

(a) Fellowships, Honours, awards etc.

Fellowship

S.No.	Name of the Course	No. of Fellowships	Amount of Fellowship per month (Rs.)	Total amount of fellowships during the quarter (Rs.)	Remarks
1.	P.S.C.C.	11	300/-	9900/-	
2.	M.Sc. I Year	4	300/-	3600/-	
3.	M.Sc. II Year	3	300/-	2700/-	
4.	Ph.D. I Year	4	400/-	4800/-	
5.	Ph.D. II Year	3	400/-	3600/-	
6.	Ph.D. III Year	1	500/-	1000/-	(Left on 1.6.79)
7.	Diploma	3	400/-	3600/-	

Total Rs. 29,200/-

(b) Exhibition Room

During the quarter under report, 2 charts and an oil painting "A BUSH" were prepared.

(c) Management Committee

The management Committee of the I.A.S.R.I. has been constituted vide Council's O.M. No. 5(16)/78-Cdn. I dated the 26-4-79 for a period of three years with effect from 12-4-79. A list of members of the Management Committee is given below :

List of Members of the Management Committee, I.A.S.R.I., New Delhi-12

- | | | |
|----|--------------------------------------------------------------------------------------------------------------------------------|----------|
| 1. | Dr. D. Singh,
Director,

Indian Agricultural Statistics Research Institute,
Library Avenue,
New Delhi-110012. | Chairman |
| 2. | Development Commissioner,
5/9-Under Hill Road,
Delhi Administration,
Delhi-110007. | Member |
| 3. | Dr. C. Mishra,
Director,
Bureau of Statistics & Economics,
Govt. of Orissa, Bhubaneswar. | Member |
| 4. | Dr. R.N. Singh,
Joint Director,
Indian Agricultural Research Institute,
Pusa, New Delhi-110012. | Member |
| 5. | Dr. Prem Narain,
Joint Director,
Indian Agricultural Statistics Research Institute,
Library Avenue, New Delhi-110012. | Member |

6. Sh. K.S. Krishnan, Member
Scientist, S-4,
Indian Agricultural Statistics Research Institute,
Library Avenue, New Delhi-110012.
7. Sh. H.P. Singh, Member
Scientist-S2,
Indian Agricultural Statistics Research Institute,
Library Avenue, New Delhi-110012.
8. Sh. L.K. Garg, Member
Scientist, S-2,
Indian Agricultural Statistics Research Institute,
Library Avenue, New Delhi-110012.
9. Assistant Director General (States) Member
Indian Council of Agricultural Research,
Krishi Bhavan,
New Delhi-110001
10. Chief Accounts Officer, Member
Indian Agricultural Research Institute ,
Pusa, New Delhi-110012.
11. Brijendra Bahadur Pal, Member
Village & P.O. Dhobaha, (Non-Official)
Via-Domariaganj, Distt. Basti (U.P.)
12. Sh. Harbans Singh Jalal, Member
Ex. M.L.A., (Non-Official)
Village : Jalal, Teh. Phul,
Distt. Bhatinda (Punjab).
13. Sh. R.N. Bakshi, Member-Secretary
Chief Administrative Officer,
I.A.S.R.I., New Delhi-110012.

(d) Distinguished Visitors

Dr. M.L. Tiku, Prof. of Statistics, Mc Master University, Canada visited the Institute and gave a seminar.

S/Sh. R.L. Shrestha and Y.P. Gautam, Food and Agriculture marketing Service Deptt, Kathmandu (Nepal) visited the electronic computer centre for familiarisation with data processing machines at IASRI.

Mr. Douglas Perry from Food Research Institute (Applied Economics) Stafford University California (U.S.A.) visited the Institute and discussed with Dr. K.C. Raut about the Statistical problems relating to dairying in India.

Dr. A.H. Kassan, F.A.O. Expert on Agro-climatology and crop-physiology, visited the Institute and had discussion with Dr. Prem Narain and Sh. M.P. Jha in regard to weather Maps in relation to Agriculture and work relating to crop forecasting methodology.

(e) Other Information

(i) Dr. D. Singh, Director visited Rome from 23rd April to 30th April, 1979 to attend the F.A.O. Statistics Advisory Committee of experts of the Food and Agricultural Organisation (F.A.O.) of United Nations (U.N.). He presided over one of the sessions.

He was selected as a member of the Food and Agricultural Organisation (F.A.O.) of United Nations (U.N.) Statistics Committee of Experts in his personal capacity and not as a representative of the Govt. of India for four years.

He visited Banaras Hindu University (B.H.U.) Varanasi (U.P.) during middle of June, 1979 to visit research farms and to acquaint with the research activities.

He was selected as a member of the Committee set up under Chairmanship of Secretary, Deptt. of Stats. to undertake a comprehensive review of the National Statistical System of the Deptt. of Statistics.

(ii) Dr. Prem Narain, Jt. Director (Trg. and Research) delivered a lecture on "Progeny testing in goats during the Summer Institute on Goat Production" organised by the National Research Centre on Goats, I.V.R.I. Campus at Makhdoon, Mathura on the 16th June, 1979.

He attended a meeting with Brig. Dahiya and Col. Dilbag Singh in regard to the Statistical Work involving military dairy farm data on 8th May 1979.

He attended a meeting in the Department of Agriculture, Ministry of Agriculture and irrigation, (Govt. of India), on Equine Breeding on the 28 May, 1979.

(iii) Dr. K.C. Raut, Head (Animal Sciences) had discussions with the officials of Operational Research Group, Baroda (Gujarat) about the assessment of some dairy products in the Country. He attended the executive meeting of the Indian Dairy Association, North Zones (East Branch) in New Delhi as its member in the middle of June, 1979.

(iv) Sh. S.K. Raheja, Head (S.S.M) organised a Summer Institute on Recent Advances in application of sampling methodology from 7-5-79 to 5-6-79. He was the Director of the Summer Institute.

(v) Dr. S.S. Pillai, Joint Director (Computer Science), Sh. S.N. Mathur, Scientist (S2), Sh. Ram Kumar, Scientist (S1) and Sh. S.P. Doshi, Scientist (S1) visited Delhi University Computer Center and discussed with Mr. Khandekar, Director, about their system for processing various users, maintainance jobs, records and staffing pattern.

(vi) Miss C.R. Leelavathi, Scientist (S2) offered comments on an article referred to, by the Secretary, Indian Society of Agronomy.

vii) Sh. S.R. Bapat, Scientist (S2) served as a Consultant statistician in F.A.O. attached to Rice project, Sierra Leone, West Africa.

18. संस्थान में हिन्दी कार्यशालाओं का आयोजन

गृह मंत्रालय के आदेशानुसार वर्ष १९७९ को “राजभाषाओं का वर्ष” मनाने के लिये इस संस्थान में हिन्दी कार्यशालाओं का आयोजन निदेशक महोदय के उद्घाटन भाषण से ५ मई, १९७९ को प्रारम्भ किया गया। मुख्य प्रशासनिक अधिकारी की देखरेख में ये कार्यशालाएं २९ जून, १९७९ तक चलती रही, जिसमें प्रशिक्षण हेतु इस संस्थान के उच्चाधिकारियों एवं वैज्ञानिकों के साथ-साथ श्री जगन्नाथ, उप-निदेशक, कृषि वैज्ञानिक नियुक्ति मंडल का बहुत योगदान रहा। इनके अतिरिक्त कृषि मंत्रालय के वरिष्ठ हिन्दी अधिकारी डॉ॰ पी॰ एस॰ बसल ने भी इन कार्यशालाओं में अपना पूर्ण सहयोग दिया। श्री हरबंस लाल सपरा, अवर सचिव, राजभाषा विभाग, गृह मंत्रालय द्वारा कार्यशालाओं में प्रशिक्षण हेतु लिखित रूप में ऐसे मसौदों का अभ्यास कराया गया, जिससे संस्थान के प्रशासनिक अनुभागों में कार्य करने वाले कर्मचारी लाभान्वित हूँ। इन कार्यशालाओं के प्रयोजन के उपरान्त अब संस्थान में प्रशासनिक कार्य अधिकतर हिन्दी में ही हो रहा है। दिनांक १७ जुलाई, १९७९ को हुई राजभाषा कार्यान्वयन समिति की बैठक में सुझाव दिया गया कि शेष कर्मचारी जो कि इन कार्यशालाओं से लाभ नहीं उठा पाये हैं, उनके प्रशिक्षण हेतु भी कार्यशालाएं चलाई जायें। यह कार्यक्रम भी विचाराधीन है।

19. उन्नत किस्मों के कार्यक्रम में प्रतिदर्शों परिक्षण

छठी दशाब्दी के मध्य में खान्दानों की उच्च पैदावार वाली किस्मों का प्रचलन भारतीय कृषि में एक वृहद उपलब्धि थी जो “हरित क्रांति” के नाम से जानी जाती है। ये किस्में उच्च खाद मात्रा के प्रति क्रियात्मक होते हुए भी, कृषक परिस्थितियों के अन्तर्गत विभिन्न मिट्टी एवं सस्य-मौसमी क्षेत्रों के तहत अधिक अन्न उत्पादन के लक्ष्य को प्राप्त करने के संदर्भ में पर्याप्त महत्वपूर्ण हैं। इस प्रकार इस कार्यक्रम के विभिन्न पहलुओं का मूल्यांकन करने के लिये इन किस्मों के प्रसार और उत्पादन दर के साथ-साथ सस्य और प्रबन्ध क्रियाओं पर जो कृषकों द्वारा इनके उत्पादन में वास्तव

में लगाई गई थी, उपयुक्त एवं विश्वसनीय भ्रॉकडों के एकश्रीकरण की आवश्यकता थी। उपरोक्त आवश्यकता की पूर्ति के लिये संस्थान ने १९६८-६९ में एक योजना बनाई और मुख्य खाद्य फसलों यथा चावल, गेहूँ, मक्का, ज्वार और बाजरे की उच्च पैदावार वाली फसलों के निष्पादन के निर्धारण के लिये बड़े पैमाने पर प्रतिदर्श सर्वेक्षण का कार्य शुरू किया। इन सर्वेक्षणों का मुख्य उद्देश्य (i) मुख्य खाद्य फसलों की उच्च पैदावार वाली किस्मों का प्रसार, (ii) देशी किस्मों की तुलना में उच्च पैदावार वाली किस्मों की उत्पादन दर, एवं (iii) इन किस्मों के उत्पादन में अपनाई जाने वाली सहायक विकसित कृषण विधियों की सीमा, पर उद्देश्यपूर्ण एवं विश्वसनीय भ्रॉकडे एकत्रित करना था।

यह सर्वेक्षण १५ राज्यों के ८८ जिलों में किया गया। इसमें दो प्रकार की पूछताछ की गई (अ) उपरोक्त उद्देश्य (i) एवं (ii) के लिये सस्य एवं सस्य-भ्रॉथिक तथा (ब) फसल कटाई प्रयोग उत्पादन आकलन सर्वेक्षण के द्वारा उद्देश्य (iii) के लिये।

सर्वेक्षण अभिकल्प के लिये स्तरित बहुपदी प्रतिचयन विधि अपनाई गई जिसमें क्षेत्रीय विकास खण्ड या इसके एक गुण को एक स्तर माना गया। सस्य पूछताछ के लिए गांव तथा कृषक को क्रमशः प्रथम एवं अंतिम प्रतिदर्श इकाई माना गया। जबकि उत्पादन आकलन सर्वेक्षण के लिये गांव, कृषक, खेत और विशेष प्रकार की आकृति एवं परिमाण के प्लॉट क्रमशः प्रतिदर्श की पहली, दूसरी, तीसरी एवं अन्तिम इकाई थी। प्रतिदर्श का परिमाण प्रथम पूछताछ के लिए ३२० कृषक थे। उत्पादन आकलन सर्वेक्षण के लिए प्रत्येक फसल की उच्च पैदावार वाली एवं क्षेत्रीय किस्मों के ८० अंतक (cut) लिये गये।

निर्धारण सर्वेक्षण १९७३-७४ तक चलते रहे और उनके परिणाम वार्षिक रिपोर्ट के रूप में निकाले जाते रहे। इन सर्वेक्षणों ने उच्च पैदावार वाली किस्मों के प्रोग्राम में इनकी उत्पादन दर, क्षेत्र, विकसित कृषण विधियों के अपनाने की सीमा आदि के रूप में बहुमूल्य भ्रॉकडे प्रदान किये। इसके साथ ही साथ इन किस्मों का बड़े पैमाने पर अपनाने से सम्बन्धित बाधाओं को पहचानने में भी सहायता की।

ये सर्वेक्षण देश के १५ राज्यों के ३८ जिलों में १९७४-७५ में शुरू किया गए । सर्वेक्षण के अन्तर्गत ३ प्रकार की पूछताछ का कार्य शुरू किया गया (i) उत्पादक क्षेत्र के आकलन के लिये, (ii) सस्य एवं सस्य-आर्थिक, और (iii) उत्पादन आकलन के लिये सर्वेक्षण । सर्वेक्षण अभिकल्प बीबीए प्रबन्धन योजना की तरह ही अपनाया गया । फिर भी क्षेत्र, उत्पादन तथा क्षेत्रीय परिस्थितियों के अन्तर्गत अपनाने की सीमा के लिये सर्वेक्षण । सर्वेक्षण के लिये पहले वर्ष में वर्तमान हैआ प्रतिद्वंद्वी अगले वर्ष में भी बढ़ी रखा गया जिससे क्षेत्र, उत्पादन एवं आर्थिक परिवर्तनों के द्वारा विद्यमान आकलन का परिवर्धन किया जा सके । सर्वेक्षण के लिए पाँच खाद्य फसलें जो नीचे दी हैं और दो मुद्रादायिनी फसलें यथा कपास और मूँगफली चुनी गई । उत्पादन क्षेत्र के आकलन-पूछताछ के लिये गांव और उन उच्च पैदावार वाली फसलों की उगाते वाले कृषक सर्वेक्षण की क्रमशः पहली एवं दूसरी इकाईयाँ थीं जबकि सस्य एवं सस्य-आर्थिक पूछताछ के अन्तर्गत उत्पादन आकलन के सर्वेक्षण के मामले में गांव, कृषक, खेत एवं एक विशेष आकलित तथा परिमाण का लगात प्रतिद्वंद्वी की पहली, दूसरी, तीसरी और अन्तिम इकाईयाँ थी । पहली पूछताछ में प्रतिद्वंद्वी का परिमाण ३०० कृषक, दूसरी पूछताछ के लिये २०० कृषक

परिवेक्षण ।

देश के विभिन्न भागों में मुख्य खाद्य फसलों और मुद्रादायिनी फसलों की नई किस्मों के नेत्री से विक्रय व प्रदुर्भाव ने उच्च पैदावार वाली किस्मों के उत्पादन प्रोग्राम में उन्नति के मूल्यांकन और कृषि पद्धति में नये तरीकों का अपनाने में आने वाली कठिनाइयों के निरीक्षण की आवश्यकता पर बल दिया । इसके साथ ही साथ प्रत्येक वर्ष में उच्च पैदावार वाली किस्मों द्वारा निर्धारित लक्ष्य एवं उत्पादक क्षेत्र पर प्रभाव के मूल्यांकन पर भी बल दिया । उच्च पैदावार वाली किस्मों से सतबन्धित इन तथ्यों पर आँकड़ें एकत्र करने की आवश्यकता को दृष्टि में रखते हुए संशोधन ने विभिन्न राज्यों के प्रतिक्रिया क्षेत्रों में उन्नत किस्मों के कार्यक्रम में प्रतिद्वंद्वी परिवेक्षण सर्वेक्षण कार्य शुरू किया । इन सर्वेक्षणों के मुख्य उद्देश्य निम्न थे (i) उत्पादक परिस्थितियों में खाद्य एवं मुद्रादायिनी फसलों की उच्च पैदावार वाली या विकसशील जातियों के विभव की सीमा और सीमित तथ्यों का उपयुक्त प्रतिद्वंद्वी विधि, (ii) क्षेत्रीय परिस्थितियों के अन्तर्गत अपनाने गई उच्च पैदावार वाली या विकसशील जातियों के उत्पादन, क्षेत्र एवं अपनाने की सीमा अध्ययन करने के लिये परिवेक्षण सर्वेक्षण कार्य शुरू किया । इन सर्वेक्षणों के मुख्य उद्देश्य निम्न थे (i)

श्रीर उच्च पैदावार वाली श्रीर देशी किस्मों के उत्पादन आकलन के लिये ६३ अंतक क्षेत्र (cuts) अध्ययन के लिए चुने गये ।

संक्षिप्त परिणाम :

१९७०-७१ से १९७५-७६ में मुख्य खाद्य फसलों यथा चावल (खरीफ) और गेहूँ की उच्च पैदावार वाली किस्मों की श्रौसत उपज, उर्वरकों के प्रयोग एवं क्षेत्र पर आधारित संक्षिप्त परिणाम नीचे दिये गये हैं ।

श्रौसत उपज :

खरीफ चावल पर चौथी पंचवर्षीय योजना में १४ राज्यों के ६६ जिलों तथा पांचवी योजना में १२ राज्यों के २५ जिलों में अध्ययन किया गया । चावल की प्रायः सभी जिलों में बोई गई किस्में मुख्यतः आई० आर-८, रतना, जया, सी०ओ-२६ IET-१६६१ थी । चावल की उच्च पैदावार वाली किस्मों की श्रौसत उपज में प्रत्येक वर्ष में, प्रत्येक राज्य में तथा राज्य में भी प्रत्येक जिले में काफी अन्तर था । पहले दो वर्षों में ४५ प्रतिशत जिलों में, अगले तीन वर्षों में ३५ प्रतिशत जिलों तथा १९७५-७६ में ३५ प्रतिशत जिलों में श्रौसत उपज २५ कु०/हे० या अधिक थी । साधारणतः १९७१-७२ के बाद श्रौसत उपज अवनति पर थी । विभिन्न वर्षों में ४२-६२ प्रतिशत जिलों में देशी किस्मों की अपेक्षा उच्च पैदावार वाली किस्मों की श्रौसत उपज ५० प्रतिशत या उससे भी अधिक थी ।

गेहूँ :

गेहूँ की फसल का चौथी पंचवर्षीय योजना में १२ राज्यों के ६८ जिलों में तथा पांचवी योजना में २६ जिलों में अध्ययन किया गया । अधिकांश जिलों में गेहूँ की उन्नत किस्मों में मुख्य किस्म कल्याण सोना थी । गेहूँ की अन्य किस्में डब्लू० जी-३५७ यू० पी-३०१, पी० वी-१८, के-६८, हीरा, मोती, एन० आई-६१७, एन० आई-७४७-१६ और अर्जुन थी । गेहूँ की श्रौसत पैदावार में प्रत्येक वर्ष, प्रत्येक राज्य तथा एक राज्य के जिलों में भी पर्याप्त अन्तर था । १९७०-७१ और १९७१-७२ में लगभग दो-तिहाई जिलों में श्रौसत पैदावार २५ कु०/हे० या उससे भी अधिक थी । १९७२-७३ और १९७३-७४ में ऐसे जिलों का अनुपात तेजी से अवनति पर अर्थात् १८ से ८ प्रतिशत तक था । फिर भी पिछले दो वर्षों में इस अनुपात में प्रशंसनीय उन्नति हुई अर्थात् प्रत्येक वर्ष में लगभग २५ प्रतिशत । १९७०-७१ एवं १९७१-७२ में गेहूँ की उन्नत

किरमों की पैदावार लगभग ७५ प्रतिशत जिलों में देशी किरमों की अपेक्षा ५० प्रतिशत या उससे भी अधिक थी। पिछले चार वर्षों में ऐसे जिलों का अनुपात ४६ एवं ५३ प्रतिशत के बीच था।

उर्वरकों का प्रयोग

बावल (खरीफ)

पहले चार वर्षों में किसानों द्वारा अपनाई गई नाइट्रोजन की औसत मात्रा का सभी स्थानों पर विवरण एक समान था इसमें लगभग ८० प्रतिशत जिलों में नाइट्रोजन की मात्रा ५० से १०० कि०/हे० थी। फिर भी १९७४-७५ में यह मात्रा ३७ प्रतिशत तक गिर गई परंतु शगले ही वर्ष फिर ७५ प्रतिशत तक बढ़ गई। उन जिलों का संगत अनुपात जिनमें फासफोरस की मात्रा माता अर्थात् २०-४० कि०/हे० थी, वर्ष परिवर्तन के साथ बढ़ गया। पीटाखा के मामले में कोई भी विशेष प्रवृत्ति नहीं थी। फिर भी अधिकता जिलों में (८०-१०० प्रतिशत) से २०-४० कि०/हे० की दर से प्रयोग की सुचना मिली।

गन्ने :

प्रत्येक वर्ष में अधिकता जिलों में (८७-९६%) में ५०-१०० कि०/हे० नाइट्रोजन के प्रयोग की सुचना मिली। १९७१-७२ में जिन जिलों में ७५-१०० कि०/हे० की उच्च मात्रा प्रयोग की गई, का अनुपात पहले वर्ष में २२ प्रतिशत से आगे बढ़े ३६ प्रतिशत तक बढ़ गया लेकिन आगे दो वर्षों में प्रत्येक वर्ष में एक निश्चित अनुपात लगभग २६ प्रतिशत तक फिर गिर गया। फिर भी बाद के दो वर्षों में यह अनुपात फिर ४२ प्रतिशत तक बढ़ गया। लगभग सभी जिलों में फासफोरस की मात्रा २०-४० कि०/हे० तक प्रयोग की सुचना मिली। फिर भी फासफोरस की ४०-६० कि०/हे० मात्रा प्रयोग करने वाले जिलों का अनुपात पहले चार वर्षों की अपेक्षा अतिम वर्ष में ४२-६० प्रतिशत से २६ प्रतिशत तक नेजी से गिरा। इस प्रकार की प्रवृत्ति पीटाखा के मामले में लगभग सभी जिलों में देखी गयी।

यद्यः यह देखा गया कि १९७४-७५ में N, P और K की उच्च मात्रा प्रयोग करने वाले जिलों के अनुपात में गिरावट आई। इसका अंशतः कारण १९७४ में उर्वरकों के दामों में वृद्धि के होने के फलस्वरूप है। आगामी वर्ष १९७५-७६ में दामों में फिर कमी आ जाने से यह अनुपात फिर बढ़ गया था।

उन्नत किस्मों के अर्न्तगत क्षेत्र :

चावल (खरीफ)

चावल उत्पादक कुल क्षेत्र में उन्नत किस्मों के अर्न्तगत क्षेत्र के ऊपर किये गये अध्ययन से पता चला कि उन्नत किस्म के चावल के उत्पादन क्षेत्र १९७०-७१ में जिलों का अनुपात २५ प्रतिशत से बढ़कर १९७५-७६ में ७५ प्रतिशत तक हो गया ।

गेहूँ :

उन्नत किस्म के गेहूँ को उगाने वाले जिलों के अनुपात में प्रत्येक वर्ष में उदररोत्तर वृद्धि हुई । पहले दो वर्षों में उन्नत किस्म के गेहूँ उगाने वाले ४० प्रतिशत जिलों में ५० प्रतिशत क्षेत्र उन्नत गेहूँ की किस्म उगाने वाले क्षेत्र के अर्न्तगत था और आगामी दो वर्षों में यह ६० प्रतिशत तक था । यह अनुपात १९७४-७५ एवं १९७५-७६ में क्रमशः ८० और ८७ प्रतिशत तक बढ़ गया ।

[अनुवादक : श्री डी० पी० सिंह]

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