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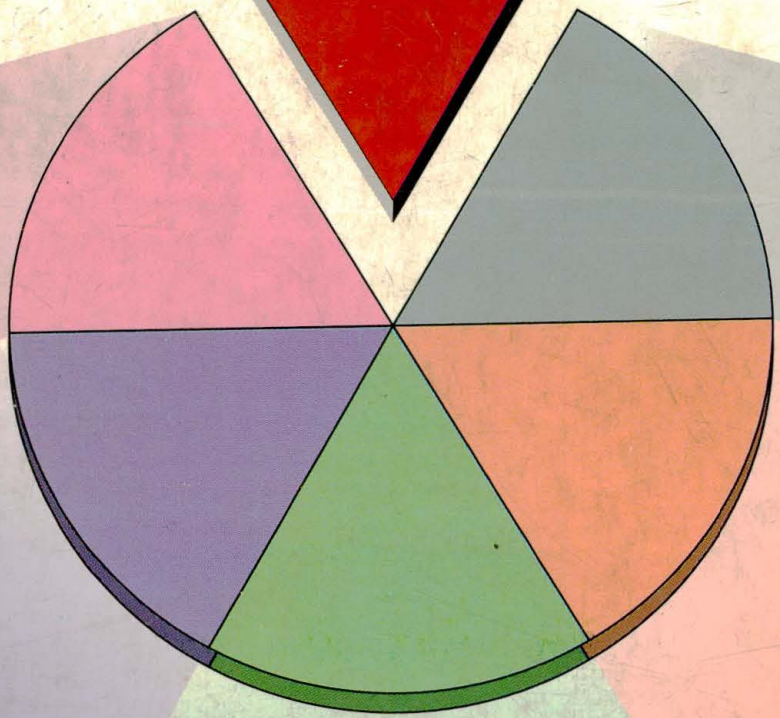
ANNUAL REPORT

1997-98



GOLDEN JUBILEE YEAR OF INDIA'S INDEPENDENCE 1947-1996

INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
LIBRARY AVENUE, NEW DELHI - 110012

ANNUAL REPORT

1997-98

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

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PREFACE

It is a matter of great pleasure for me in presenting the Annual Report 1997-98, for the Indian Agricultural Statistics Research Institute (IASRI) in this Golden Jubilee Year of Independence of India. The report depicts a panorama of research activities and achievements of the Institute in the disciplines of Agricultural Statistics and Computer Applications in Agriculture.

Indian Agricultural Statistics Research Institute is a premier Institute for promoting and conducting research and training in Agricultural Statistics and Computer Application in Agriculture. The Institute, as in the past, continued its service in research, teaching and training activities through its various Divisions during the year. I hope that the scientific fraternity of National Agricultural Research System (NARS) will find the information presented in this publication quite informative and useful. Valuable suggestions and comments for improvement in subsequent volumes of the reports are most welcome.

I wish to express my sincere appreciation to the Heads of Divisions, Scientists, Officers and other staff members of the Institute for their sincere and whole hearted support and co-operation in carrying out the functions and activities of the Institute and for providing requisite material for compilation of this report.

I take this opportunity to put on record my appreciation for the sincere efforts put in by Dr HVL Bathla, Principal Scientist & Head, Research Coordination and Management Unit, Sh PP Singh, Technical Officer and Sh J Srinivasan, Technical Assistant (T-4) for compiling and editing of the report and for bringing out this report in time. Thanks are also due to Sh OP Singh, Technical Assistant (T-4) for his assistance. I express my thanks to Sh Mahesh Chander, Stenographer and Smt Rajni Gupta, Clerk for type-setting the manuscript on computer.

S D SHARMA
Director (A)

CONTENTS

EXECUTIVE SUMMARY

Indian Agricultural Statistics Research Institute (IASRI) established in 1959 was mainly responsible for promoting and conducting research and education/training in Agricultural Statistics. With the advances in information technology the institute has adapted itself to the current needs of agricultural research. In the changed scenario, the mandate of the Institute is, to undertake basic, applied and adaptive research in agricultural statistics, to assist in the development and strengthening of National Agricultural Statistics System, to conduct post graduate and in-service training courses in Agricultural Statistics and Computer Applications, to provide consultancy services, to act as a repository of information on agricultural statistics, to develop the Institute as an Advanced Centre of Excellence in education and training in Agricultural Statistics and Computer Applications and to undertake sponsored research and training of national and international organisations in these disciplines.

A number of research projects are undertaken in the different divisions of the Institute namely Sample Survey Methodology, Design of Experiments, Bio-Statistics and Statistical Genetics, Forecasting Techniques, Statistical Economics and Computer Applications. During the year under report, there were 41 ongoing research projects, covering the main thrust areas, like poultry meat production, inland fish catch estimation, production and area estimation, assessment and evaluation studies, small area estimation, methodological studies in complex surveys, remote sensing technology applications, development of databases, cropping system research, information system for agricultural and animal experiments, experimental designs for agricultural, animal, agro-forestry and fishery research, statistical studies in animal and plant genetics, modelling for biological phenomena, studies in population biology, forecasting techniques in agricultural system, technological change and its diffusion in agriculture, resource use efficiency in agriculture and modelling for demand. In some of these studies, Institute is collaborating with various Institutes and also user organisations. The Research Coordination and Management Unit (RCMU), apart from coordination and management work, brought out 'IASRI News', 'Monitoring Progress Report' and Annual Report of the Institute.

Sampling methodologies for estimation of total poultry meat production, fish catch from Chilka lake, area under wastelands and average milk yield per day per animal for small areas as well as those of total milk production from cows/buffaloes in each season were developed. Bootstrap technique was applied for studying statistical properties of genetic parameters. A study undertaken for comparing genetic groups of crossbred goats for growth studies based on multiple traits explained more variability in goats as compared to the component traits. The non-linear statistical model was fitted to a number of data sets for aphid population growth. The residual analysis carried out on some of these data sets indicated heterogeneity of error variances. In the study on projection matrices, the nature of the proportionality factor was examined and it was found that this factor is highly variable and not constant as reported in earlier studies. A study on developing yield forecast model on agro-climatic zone basis taken up for rice and wheat revealed that models using agricultural inputs and weather were suitable for both the crops. Methodology has been developed to study the effect of weather on response of a crop to long-term fertiliser application. The methodology of analysis of stochastic frontier production function has been developed which is capable

of providing estimates of individual farm level technical efficiency. In another study the cost of production of eggs in Ambala district of Haryana State has been studied.

Agricultural experiments involving split application of nitrogenous fertilizers have been viewed as mixture experiment and alternate method of analysis of data so generated, have been suggested. A catalogue of binary equi-replicated non-proper variance balanced designs, obtainable though Partially Balanced Incomplete Block designs with two associate classes, has been prepared. The data received from long-term fertilizer experiments, conducted under AICRP during the year, were analysed for crops and pooled over the years using appropriate statistical techniques. A number of softwares have been developed by the Institute during the period under report.

The Institute continues conducting degree courses leading to M.Sc. and Ph.D. degree in Agricultural Statistics and M.Sc. in Computer application in collaboration with Post Graduate School of Indian Agricultural Research Institute (IARI) which has the status of a deemed University. Institute organises a regular training programme entitled, "Senior Certificate Course in Agricultural Statistics and Computing". A training course on 'Modern Sampling Techniques' was organised for the senior level officers from Central Statistical Organisation. Another training course on 'Advances in Data Analysis' was organised under Centre of Advanced Studies in Computer Applications and Agricultural Statistics. A number of training courses on Computer Networking, Use of Computers in office work, Use of Computers in agricultural research, Network management and introduction to GENSTAT, introduction to SAS and M.S. Office, etc. were organised at the Institute during the year under report. International training programmes on 'Financial management in agricultural development', 'Human resources development' and 'Computer applications and maintenance' were organised for Nigerian Govt. officers.

The scientists of the Institute participated in number of workshops, seminars, summer Institutes related to the disciplines of agricultural statistics and computer applications. A number of research papers highlighting the results achieved in various studies were published by the scientists of the Institute. Consultancy was given to different organisations. The meetings of Research Advisory Committee, Management Committee and Staff Research Council were held and decisions taken were implemented. The approval on the recommendations of the QRT has also been received from the Council for compliance. The Institute has also started research consultancy work and training programmes etc. for the purpose of resource generation.

INTRODUCTION

Brief History

The Institute made a modest beginning in 1930 as a small Statistical Section, in the then Imperial Council of Agricultural Research, to assist the State Departments of Agriculture and Animal Husbandry in planning their experiments, analysis of experimental data, interpretation of results as also rendering advice on the formulation of the technical programmes and examining the progress reports of the schemes funded by the Council. The activities of the Section increased rapidly with the appointment of Dr PV Sukhatme as Statistician to the Council in 1940 and research was initiated for developing objective and reliable methods for collecting yield statistics of principal food crops. The efficiency and practicability of these methods were demonstrated in different states for estimating yield by crop cutting experiments. The recognition which this method attained was such that in the course of a few years, the method was extended practically to the entire country, to cover all principal food and non-food crops. Research in sampling theory and training of field and statistical staff were the activities initiated in this period resulting in the re-organization of the Statistical Section into a Statistical Branch with permanent footing in 1945 accompanied by appropriate expansion in its strength. The designation of Statistician was changed to Statistical Advisor. The Statistical Branch soon acquired international recognition as a centre for research and training in the field of Agricultural Statistics. In 1949 it was named as Statistical Wing of the ICAR. During 1952 on the recommendations of two FAO experts Dr Frank Yates and Dr DJ Finney, who visited the Council on the invitation of the Government of India, activities of the Statistical Branch were further expanded and diversified. In August, 1955, it moved to its present campus. Subsequently, in recognition of its important role as a training and research institution, the Statistical Wing was re-designated as the Institute of Agricultural Research Statistics (IARS) on 2nd of July 1959. It is to commemorate this important event, that the Annual Day of the Institute is celebrated on this day every year. An important landmark in the development of the Institute was the installation of an IBM 1620 Model-II Electronic Computer in 1964. Another major landmark for the Institute was the signing of a Memorandum of Understanding with Indian Agricultural Research Institute (IARI), New Delhi in 1964, consequent to which new courses leading to M.Sc. and Ph.D. degrees in Agricultural Statistics were started in collaboration with IARI in October, 1964. In April, 1970, the Institute was declared as a full-fledged Institute in the ICAR system and is, since then, headed by a Director. Since 1st January, 1978, the name of the Institute was changed to Indian Agricultural Statistics Research Institute (IASRI) emphasizing the role of 'Agricultural Statistics' as a full fledged discipline by itself.

Since the activities of the Institute expanded manifold, a new three-storeyed Computer Centre building was constructed in the campus of the Institute in 1976. A third generation computer Burroughs B-4700 system was installed in March,1977. A large number of computer programmes for specific problems as also general purpose application software were developed. The Burroughs B-4700 system was replaced in 1991 by a Super Mini COSMOS-486 LAN Server which was subsequently replaced by a PENTIUM-90

LAN Server, a more powerful system having state-of-art technology. Computer laboratories equipped with Pentium, 486, 386 PC/AT's, dumb terminals and printers, etc. have been set up in each of the six divisions as well as in Research Coordination and Management Unit of the Institute. User friendly software packages like operating system (MS DOS Ver. 6.2 and MS Windows 95), Word Perfect 6.0, E-mail Services, SPSS, SAS, Image Processing Software, Harvard Graphics, LOTUS, dBASE IV, SCO-UNIX, ORACLE, MS-Office Suite and a few others have also been made available. Besides this, every section of the Institute has been equipped with PC AT's and printers. Two projects have been initiated, one for developing data-bases in the field of bio-technology as applicable to Animal Sciences Research, and the other for developing a computer communication Network linking all ICAR Institutes and SAUs. In the former, a Selective Dissemination of Information Service (SDI) is available on bibliographic references from VETCD, BEASTCD and AGRICOLA databases.

In order to remove and rectify deficiencies in the existing documentation services dealing with agriculture, the Food and Agriculture Organisation of the United Nations initiated a series of studies in 1971, to establish the Information System for Agricultural Sciences and Technology (AGRIS). After preliminary trials, the System started functioning in 1975. As on 1st November, 1977, there were 82 input centres and 77 liaison offices all over the world, which contribute to the System. Our country is the third largest (next to USA and Japan) among the National input centres, in respect of number of inputs added to the System every month. The Institute provided selective information services to scientists in the ICAR Institutes and Agricultural Universities on references to documents relating to areas of their specific interest till 1989.

From October, 1983 to March, 1992 the Institute also functioned as a Centre of Advanced Studies in Agricultural Statistics and Computer Applications under the aegis of the United Nations Development Programme (UNDP). This programme aimed at developing a Centre of Excellence with adequate infrastructure and facilities to undertake advanced training programmes and to carry out research on various aspects of agricultural statistics and computer application. Under this programme, thirteen distinguished statisticians and computer experts from abroad (19 visits; over 21.5 man months) visited the Institute for a period of four to eight weeks with a view to interacting with the scientists of the Institute, give seminars/lectures and suggest improvements in the research programme of the Institute. Seventeen scientists from this Institute had received training (covering 80 man months) abroad, in different areas of research, extending over periods of 5-6 months each. In addition, a new course leading to M.Sc. degree in Computer Application in Agriculture was initiated from the session 1985-86 which was subsequently changed into M. Sc. (CA) from the session 1993-94.

In view of growing demand from various quarters, the Institute revived the Senior Certificate Course in 'Agricultural Statistics and Computing' in 1997 with change in the course curriculum keeping in view the demand of well trained manpower in Agricultural Statistics.

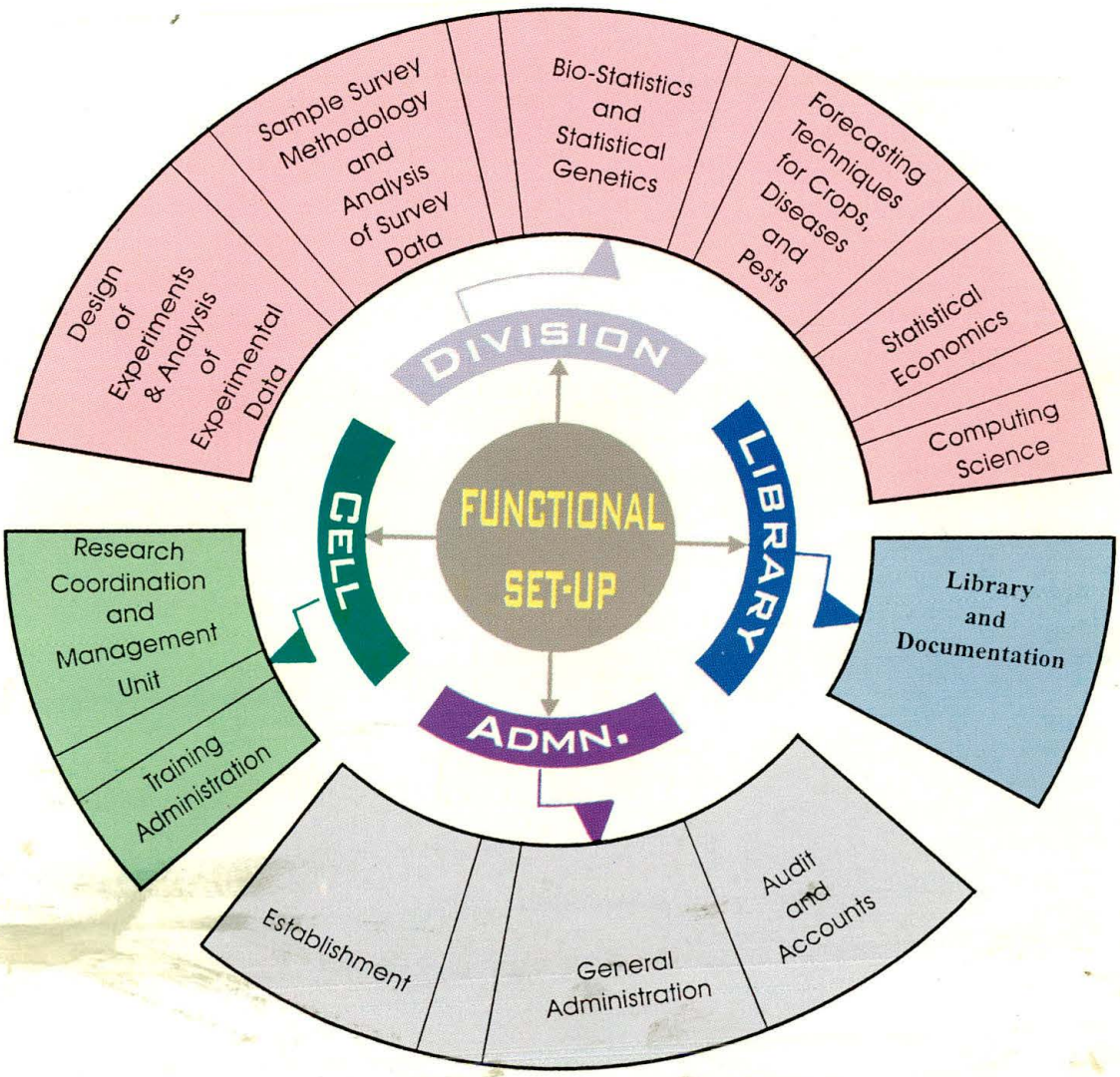
The Institute has achieved international recognition for its high quality research and teaching work in the field of Agricultural Statistics. A number of research workers from the Institute have served as consultants and advisors in Asian, African and Latin American countries. Also, a number of statisticians and students of the Institute are at present occupying high positions in universities and other academic and research institutions of USA, Canada and other countries.

FIG. 1

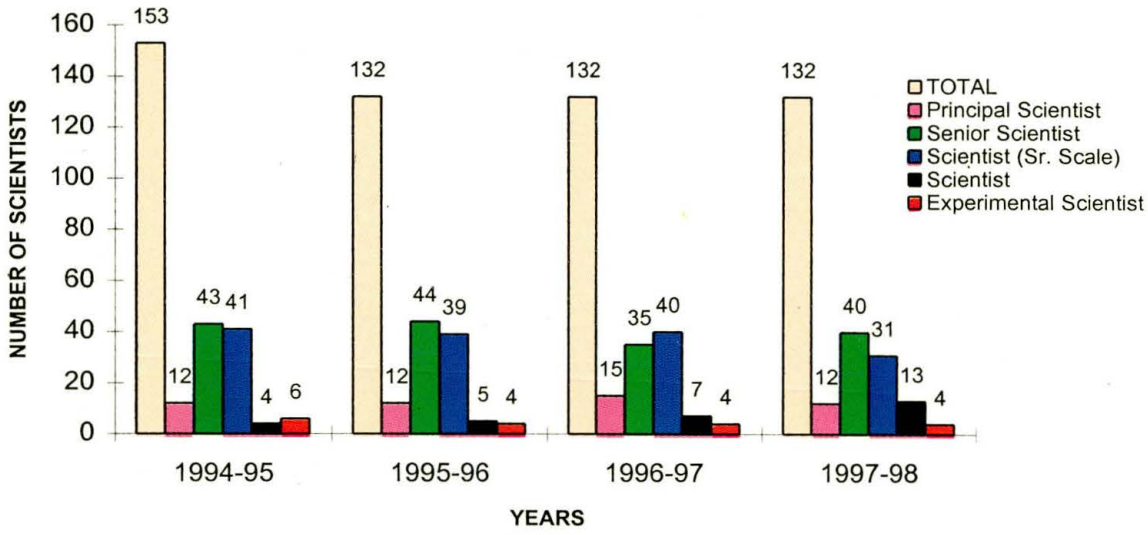
ORGANISATIONAL CHART

OF

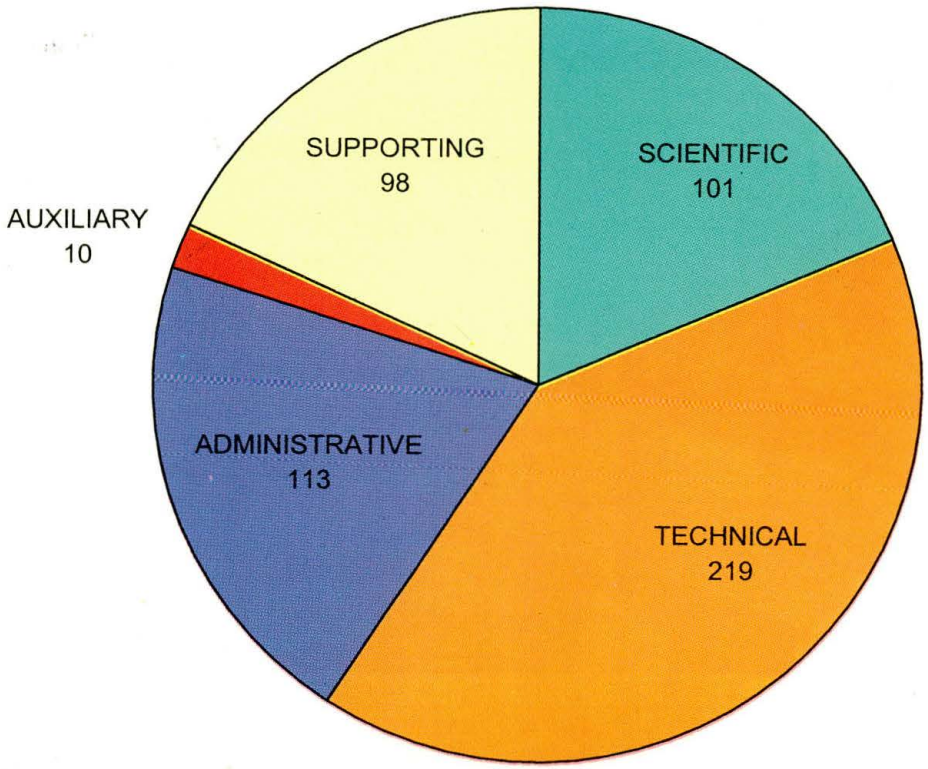
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE



SCIENTIFIC STRENGTH (SANCTIONED AND IN POSITION) FOR THE YEARS 1994-95 TO 1997-98



STAFF STRENGTH IN POSITION AS ON DECEMBER 31, 1997



Heads of the Institute

Dr PV Sukhatme	Sep 1940 -Jul 1951
Dr VG Panse	Aug 1951-Mar 1966
Dr GR Seth	Apr 1966-Oct 1969
Dr Daroga Singh	Nov 1969-May 1971
Dr MN Das (A)	Jun 1971- Oct 1973
Dr Daroga Singh	Nov 1973-Sep 1981
Dr Prem Narain	Oct 1981- Feb 1992
Dr SK Raheja (A)	Feb 1992 -Nov 1992
Dr RK Pandey (A)	Dec 1992 -May 1994
Dr PN Bhat (A)	Jun 1994 - Aug 1994
Dr OP Kathuria	Aug 1994 -May 1995
Dr RK Pandey (A)	Jun 1995 - Jan 1996
Prof Bal BPS Goel	Jan 1996 - Oct 1997
Dr SD Sharma (A)	Oct 1997 - onwards

Dr SD Sharma

Mandate

The mandate of the Indian Agricultural Statistics Research Institute (IASRI) is to promote and conduct research, education and training in agricultural statistics and computer application in agriculture. To achieve these objectives, the IASRI has the following functions:

- To undertake basic, applied and adaptive research leading to new developments in Agricultural Statistics and related fields for bridging gaps in the application of Statistical Techniques to the problems of Agricultural Research.
- To assist in the development and strengthening of National Agricultural Statistics System.
- To conduct post-graduate and in-service training courses in Agricultural Statistics and Computer Applications in Agriculture.
- To provide advisory/consultancy services to agricultural scientists, planners, policy makers and others on their statistical and computing requirements.
- To act as a repository of information on Agricultural Statistics for research and dissemination of such information.
- To develop the Institute as an Advanced Centre of Excellence for education and training in Agricultural Statistics and Computer Applications.
- To liaise with ICAR Institutes, SAUs and State Agricultural/ Animal Husbandry/ Veterinary Sciences departments etc. and undertaking sponsored research & training for national and international organisations.

Organisational Set-up

The Institute has the following six Divisions, a Unit and a Cell to undertake research, training, consultancy, documentation and dissemination of scientific output. *(Fig-1).*

Divisions:

- Sample Survey Methodology and Analysis of Survey Data,
- Design of Experiments and Analysis of Experimental Data,
- Forecasting Techniques for Crops, Diseases and Pests,
- Bio-statistics and Statistical Genetics,
- Statistical Economics, and
- Computing Science.

Unit:

- Research Co-ordination and Management

Cell:

- Training Administration

Financial Statement

Budget statement for the year 1997-98

(Rupees in Lakhs)

Code	Head of Account	Budget		Expenditure@	
		Plan	Non-Plan	Plan	Non-Plan
02	Pay and Allowances	7.50	610.00	5.00	601.46
06	OTA	-	0.89	-	0.85
10	Travelling Allowances	3.00	2.80	2.93	1.32
15	**Other Charges***	**90.00**	**15.50**	**79.97**	**12.24**
	i. Assets required ii. Maintenance of buildings etc. (including electric, water and property tax) iii. Other expenditure iv. Office contingencies				
	v. Fellowship	4.50	2.80	4.57	2.11
	vi. Works	32.00	2.51	20.40	2.57
	Grand Total	137.00	634.50	112.87	620.54

* include item (i) to (iv)

Abstract (1997-98)

(Rupees in Lakhs)

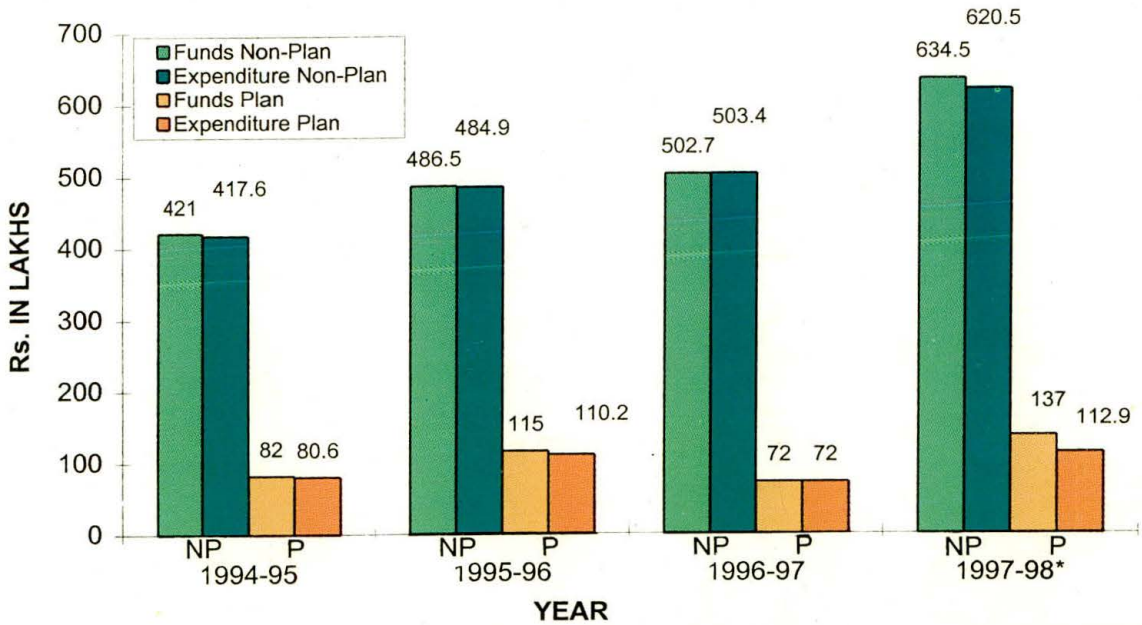
	Budget	Expenditure@
Plan	137.00	112.87
Non-Plan	634.50	620.54
Total	771.50	733.41

@ Expenditure upto 23.03.1998

Staff Position

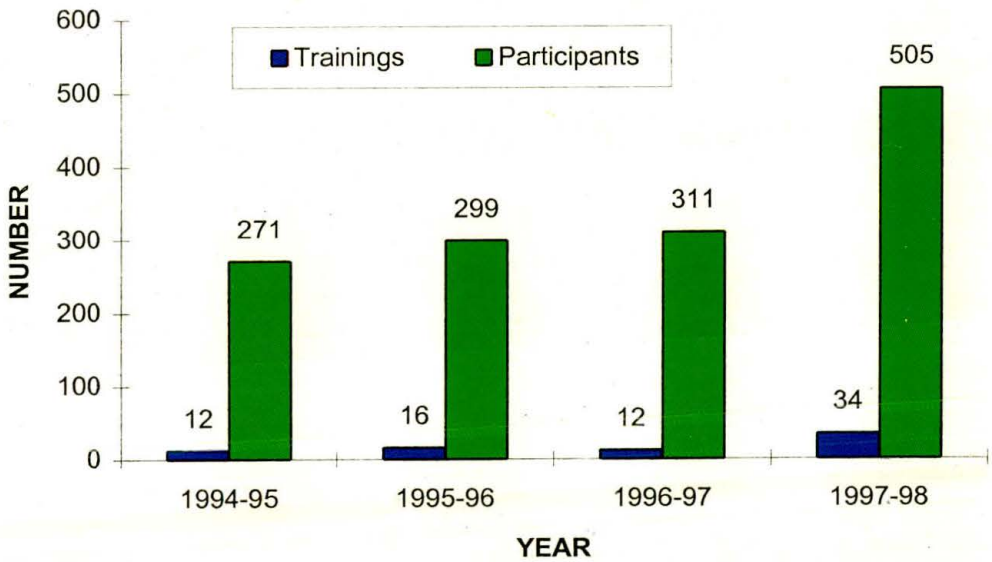
Manpower	No. of posts sanctioned	No. of posts filled
1. Director	1	-
2. Jt. Director	1	1
3. Scientific	130	100
4. Technical	289	219
5. Administrative	124	113
6. Auxiliary	14	10
7. Unclassified	1	-
8. Supporting Staff	98	98
TOTAL	658	541

BUDGET FOR THE YEARS 1994-95 TO 1997-98



* Expenditure as on March 23, 1998

TRAINING COURSES ORGANISED FROM 1994-95 TO 1997-98



RESEARCH ACHIEVEMENTS

DIVISION OF SAMPLE SURVEY METHODOLOGY AND ANALYSIS OF SURVEY DATA

Mandate:	Thrust Areas:
To evolve sample survey techniques for estimation of various parameters of interest relating to crops, livestock, fishery, forestry and allied fields and to develop techniques for analysis of survey data.	-Poultry meat production -Inland fish catch estimation -Production and area estimation -Assessment and evaluation studies -Small area estimation -Methodological studies in complex surveys -Remote sensing technology applications -Development of database

The progress of the projects, thrust-areawise, is given below:

Poultry meat production

1. Pilot sample survey to develop a sampling methodology for estimation of poultry meat production

The objectives of the study are (i) to estimate the poultry meat production through existing integrated sample surveys for estimation of livestock products, (ii) to estimate the poultry meat production through organised farms and (iii) to develop a suitable sampling technique for estimating the poultry meat production integrating the results obtained under (i) and (ii) above.

To estimate the total poultry meat production in a district, a sampling methodology was adopted at two levels. At first level, samples of organized poultry farms of each type and size were selected separately by the method of unistage simple random sampling. Similarly, at second level, sample of villages at first stage and households rearing poultry birds in their backyard at second stage were selected by the method of two stage simple random sampling. Information on some vital characteristics of poultry birds were collected throughout the year at regular intervals. Estimates of poultry meat production were estimated at the levels separately and the total poultry meat production was estimated by integrating the estimates at two levels.

The study revealed that the average covered area and labour requirements were less in case of broilers as compared to layer and parent stocks in all sizes of farms. Mortality rates were slightly more in broiler farms than other farms during all the seasons. The mortality rates were more in all types of farms during summer season. Purchase of one day old chick and sale of table birds were more during winter season in all types of farms. The poultry meat production in the Gurgaon district during the year, through organized farms was estimated to be 2722.75 tonnes and rearing of

poultry birds through backyard of households in the villages was estimated to be 106.83 tonnes. Total poultry meat production in Gurgaon district of Haryana state during the year 1994-95 was estimated to be 2829.58 tonnes

Inland fish catch estimation

2. Sample survey to evolve methodology for estimation of fish catch from rivers and streams of the hilly areas

The objective of the project is to evolve suitable sampling methodology for estimation of fish catch from rivers and streams. The project has been taken up in collaboration with the Department of Fisheries, Himachal Pradesh in three districts namely, Bilaspur, Mandi and Kangra. The sanction of the Government of Himachal Pradesh for taking up the project by involving their field staff has been received and the field work of the project has been started from 1st Nov., 1997. The field work is in progress.

Production and area estimation

3. A Study for estimation of area and production of important vegetable crops on the basis of partial harvest

The objectives of the study are (i) to develop a suitable theoretical framework for sampling from two dimensional population spread over space and time with particular reference to vegetable crops, (ii) to apply and test the theory on secondary data collected under earlier vegetable surveys at IASRI in order to develop a suitable methodology for estimating the production of vegetable crops based on partial harvests and (iii) to estimate the total production of important vegetable crops and their yield rates on the basis of partial harvest.

In view of multiple pickings of vegetable crops, the observations on selected fields for estimation of production of vegetable crops is spread over time. The project study was planned in two phases. In the first phase of the study, the methodological aspects of the problem for estimation on the basis of first phase study were tackled. The problem was attacked in a general perspective for sampling from two dimensional populations where, in one of the dimensions, selection of sampling units were considered while in the other dimension, sampling was spread over time in which the selected units were observed. An approach for a variety of sampling designs associated with sampling over time was developed using the varying probability sampling methods. This method was tested on secondary data in which different duration of time intervals on which data was to be collected and also the periodicity for the systematic sampling interval were tackled. It was found that a span of 7 days with a gap of 14 days was a suitable plan for observing partial harvest data for different vegetable crops.

On the basis of theory developed, the primary data was collected from rural areas of Delhi for the crops Tomato, Lady's finger, Brinjal, Karela (bitter gourd), Loki (bottle gourd) & Tori (sponge gourd). The yield data on crop cuttings was collected systematically for 7 days after a gap of 14 days in each season. Some of the results are as follows. The efficiency of the suggested procedure as well as for double sampling were worked out. It was found that the gain due to double sampling are quite small as compared to the suggested procedure. The percentage reduction in cost due to proposed procedure as well as double sampling was also estimated. It was found that the suggested procedure involves lesser cost. For better efficiency of the procedure ρ_b and $\bar{\rho}$, between and within components of intraclass correlation coefficients, should be negative. It was found

that for all vegetables these two values are negative.

The theoretical framework will lead to suitable methodology for estimating the production of crops and commodities with multiple observations. The methodology will provide estimates on the basis of partial harvest data.

4. Pilot sample survey for estimating the area and yield rates of ginger and potato in hilly areas

The objective of the project is to develop sampling methodology for estimating the area and yield rates of ginger and potato.

The design adopted in the project is stratified multi-stage random sampling. The villages and cultivators growing ginger/potato form the first and second stage sampling units respectively. For crop cutting experiments, fields growing ginger/potato and sub-plots within selected fields, form the third and fourth stage of sampling units respectively. For area estimation, the design used is two stage while for yield estimation surveys, it is multi-stage. A total of 60 villages and 480 cultivators were selected for area estimation enquiry. Crop cutting experiments were conducted in 120 sub-plots selected from the above 60 villages.

The survey on potato was completed during summer season while the field work for ginger is in progress. The methodology for analysis of data is being finalised.

Assessment and evaluation studies

5. Studies on feed intake by bovines through stall feeding and grazing

The main objective of the project is to estimate the intake of herbage by bovines through grazing as well as through stall feeding in different seasons. The field work was carried out in Dharmpuri district of Tamil Nadu. The productivity of bovines was studied with reference to feeding. The sampling design followed was stratified two-stage random sampling with tehsils as strata, villages as first stage units and households as second stage units. For estimation of intake of herbage 10 one metre^2 cuts before grazing as well as after grazing were taken.

On an average the intake of a cattle through stall feeding was worked out to be 3 Kg. green fodder, 6 Kg. dry fodder, about 1 Kg. concentrates and 6.3 Kg. herbage through grazing. The corresponding per day intake of a buffalo was estimated to be 3 Kg., 7 Kg., 3.3 Kg. and 8 Kg. respectively. Seasonwise , it was seen that green fodder and herbage through grazing was scanty in summer and highest during rainy season.

6. Estimation of flow and changes in dynamic population

The objectives of the project are (i) to estimate the structural changes in the population due to cross-movements of units in various classes between two occasions under general developmental phenomenon; (ii) to estimate the structural changes in the population due to various causal factors, (iii) to estimate the parameter for characteristic of interest in respect of a stationary population and structural changes occurring in that population and (iv) to estimate the changes in the parameter for the characteristic on account of the structural changes occurring in the population due to cross-movements of units in various classes between two occasions.

The structural changes in the population due to cross movements of unit in various classes over the two occasions under general developmental phenomenon would be theoretically estimated in the first objective in terms of number of units in the population. In the second objective, the structural changes in

the population due to cross movements of units in various classes over the two occasions would be estimated under various causal factors in terms of units in the population. Population parameters (Mean $\bar{y}$ or total $N\bar{y}$) for a characteristic (Y) of interest on the first and second occasions and for the structural changes occurring in the population would be estimated in the third objective. In the parameter for the characteristic for the structural changes over the two occasions would be obtained. The estimators for the above mentioned parameters in respect of various classes of the population would also be obtained. Minimum Variance Linear Unbiased Estimators (MVLUE's) of all the parameters would be developed by making use of the projective geometry approach and Transition Probability Matrix approach.

The estimators for total, average and changes in the parameters over the two occasions have been theoretically developed when structural changes are occurring in the population over the period. These estimators have been developed separately for the two classes of the population and for the population as a whole. Development of the estimators for the structural changes occurring in terms of number of units in dynamic population due to cross-movement of units in two classes over the two occasions using the approach by Transition Probability Matrix is in progress.

Theoretical development of the estimators under the present study would lead the estimation of the flow of units in various classes in a dynamic population in order to assess the social and economic development of various classes of the population and of the population as a whole engaged in the agriculture sector, industry sector, etc. due to general developmental phenomenon and various economic development programmes initiated or to be initiated by the Government and other agencies having such concern.

7. To study the effect of various input components on the yield of important vegetable crops.

The objectives of the project are (i) to study the functional relationship between the yield of important vegetable crops and various input components and (ii) to study the response of changing levels of different inputs on the yield of vegetable crops.

Cost of cultivation studies are an important source of detailed data on various inputs for any crop. The comprehensive schemes on cost of cultivation of various crops currently in progress in the country is an important source of such information. However, it does not cover vegetable crops. Vegetable crops are short duration and labour intensive. It is obvious that various inputs used in cultivation of vegetable crops have some contribution towards yield. The present study has been planned to study the functional relationship of various inputs affecting yield of important vegetable crops. To study these objectives, it is proposed to fit some linear and non-linear functions. These functions are general linear function, square root function and functions obtained by double log and semi-log transformations. Estimates of short-run elasticity will be worked out to study the response of changing levels of these inputs on the yield.

The data of all 8 selected vegetable crops have been scrutinised. The data have also been transformed in log and square root values to fit the different transformations as required. Linear function, square root function, log and semi-log functions are being fitted to the data pertaining to all the selected vegetable crops under study. The statistical analysis accordingly was in progress.

Small area estimation

8. Small area estimation of milk production

This project was taken up with the following objectives: (i) to identify the symptomatic variables for stratification; (ii) to obtain small area estimates by synthetic method of estimation; and (iii) to obtain direct estimates for small areas by usual method and to compare it with the results obtained in (ii) above.

Small area techniques i.e. synthetic, model based synthetic, direct , etc. were utilised to arrive at small area (district) estimation of milk production.

Reliable estimates of milk production at small area (district) were obtained by adopting different methods for cows/buffaloes /season wise for Haryana state, for the period 1993-94.

Methodological studies in complex surveys

9. Estimation of regression coefficients from sample survey data

The objectives of the project are (i) to study the performance of alternative estimates of regression coefficients for survey data, (ii) to examine the problem of multi-collinearity in the context of survey data and (iii) to estimate the regression coefficients when the variables are in errors.

The problem of estimation of finite population regression coefficient has been examined when the variables were subject to measurement error. For this purpose a simple measurement error model was considered. Kish and Frankel's estimator was found to be biased. Two different unbiased estimators were developed. An empirical study based on simulated data revealed that the unbiased estimators score over the Kish and Frankel's estimator in terms of mean square error.

Software for comparison of alternative estimators of regression coefficients like ordinary least squares (OLS), maximum likelihood estimators (MLE) and their π-weighted analogues had been developed. Methodology for estimation of finite population regression coefficient has been developed when the variables are in errors. This methodology had been tested on simulated data. Some preliminary results have been obtained on estimators of regression coefficients in the presence of multi-collinearity in the context of survey data.

The utility of different estimators of regression coefficients from sample survey data when the variable are in error for prediction purpose and for estimation of population mean will be examined.

10. An analysis of yield gap for buffaloes milk

The objectives of the project are (i) to identify the factors for the gap, (ii) to estimate the contribution of each factor to the gap and (iii) comparison of the different procedures through simulated data.

The study is based on the secondary data collected under the project entitled "Development of a suitable methodology to study the effect of housing conditions and other related factors on milk production under village conditions". The survey was conducted in Gurgaon district of Haryana state. The sampling design adopted was stratified two-stage sampling. For meeting the requirements of the objectives, the approaches followed are i) Path co-efficient analysis (Causal modelling), ii) The

multiple regression analysis and iii) The Principal component analysis.

The analysis of data reveals that the contribution of original feeds (i.e. green, dry and concentrate) towards milk yield using path co-efficient analysis is 52.19%. The analysis by multiple regression technique reveals that 45.82% of variation is explained by different factors affecting the milk yield. The analysis by Principal component technique reveals that the variations explained are 67.1% and 70.5% by two different equations.

11. A study of variance estimation in complex surveys

The objectives of the project are (i) to examine the effect of sampling designs on variance estimators of complex surveys, (ii) to examine the relative performance of different variance estimators in complex surveys for non-linear statistics and (iii) attempt to modify above estimators for reducing higher order biases in complex surveys.

The methodology is based on the simulated data following multivariate normal, beta, gamma and uniform distributions. Select the different samples of various sample sizes by using 8 different sampling designs to compare the performance of four methods: (i) Balanced Repeated Replication, (ii) Jackknife Repeated Replication, (iii) Generalized Repeated Partial Sample scheme, and (iv) Taylor series linearization method for various estimators for estimating the population parameters viz mean, ratio, regression co-efficients and coefficient of correlation alongwith the estimate of their variances.

It is observed that GRPS and JRR are better methods for estimating the variances. These methods are flexible with respect to design and are consistent and efficient than BRR and Taylor series linearization method for estimation of variance. As far as the biases of the estimators of population parameters are concerned the BRR is appearing as the best amongst all the four.

Remote sensing technology applications

12. Use of remote sensing technology in crop yield estimation surveys

The main objectives of the project are i) to test the methodology of stratification based on satellite data in crop yield estimation surveys. ii) to obtain improved estimator of crop yield from crop yield estimation surveys using post-stratification based on spectral data, and iii) to examine the usefulness of spectral data under study for stratification in crop yield estimation surveys for subsequent year.

The satellite data in the form of vegetation indices has been utilized for stratification of crop area in homogeneous crop condition areas like high growth, average growth, poor growth etc. Crop yield data based on crop cutting experiments has been used to develop post-stratified estimator of crop yield.

The satellite data and also the crop yield data based on crop cutting experiments for wheat crop for district Sultanpur has been collected and data analysis was in progress.

Based on the findings of an earlier project and this project, a more comprehensive project aimed at developing suitable methodology for crop acreage estimation, crop yield estimation and crop yield forecasting using satellite data alongwith survey data has been taken up which is being funded through the ICAR A.P. Cess Fund.

13. Use of remote sensing satellite data in crop surveys - (Under ICAR A.P. Cess Fund)

The objectives of the project are (i) to develop sampling design (involving planning of the surveys and method of estimation) for

estimation of crop acreage & crop yield and crop yield modelling based on the combined use of satellite data (IRS) and ground survey data on crop yield obtained from crop cutting experiments. (ii) to evaluate the efficiency of the proposed sampling design based on a simulation study and (iii) to develop suitable crop yield models using multi-date spectral data.

The satellite data in the form of vegetation indices and ground survey data based on crop cutting experiments will be used. The crop cutting sites will be identified with the help of a Global Positioning System (GPS). Suitable sampling design for acreage and yield estimation will be developed and crop yield forecasting model based on satellite data will be developed.

A well equipped remote sensing laboratory equipped with Hardware consisting of one Pentium Server, two pentium Nodes, an A0 Size Digitizers and a GPS and Software consisting of Windows NT, Digital Image Processing Software ER-MAPPER and a GIS Software PC ARC/INFO has been established which has started functioning. Further analysis of data is in progress.

Based on the findings of the project, a nation-wide operational plan for crop acreage, crop yield and crop yield forecasting will be developed.

Development of database

14. Development of data base relating to basic and current agricultural and allied statistics over time and space.

The objectives of the project are (i) to develop and establish an agricultural data base for the country, (ii) to develop appropriate software for storage and retrieval of data, and (iii) to develop appropriate software for using primary statistical tools for analysis of data.

For development of database, following variables for which data for agricultural and allied statistics were taken as i) area, production and yield of total foodgrains, major cereal-wise, pulse-wise etc., ii) area, production and yield of fruits and vegetables, spices, oilseeds etc., iii) information and production and consumption of fertilizers - straight, mixed and complex, iv) information of area irrigated - gross, net, by source (net) and cropping intensity, v) information of production of milk, eggs, wool and meat, vi) information on live-stock numbers under various categories/classifications, and vii) information on land use statistics. In this study it is aimed to provide a prototype data base on the basis of readily available information on all India basis with flexibility to incorporate future data availability on smaller area level.

The development of software in respect of storage and retrieval of data have been completed. The software for analysis of data by applying primary statistical tools have been developed.

DIVISION OF DESIGN OF EXPERIMENT AND ANALYSIS OF EXPERIMENTAL DATA

Mandate :	Thrust Areas:
To develop statistical designs and methodologies for analysis of data relating to field and laboratory experimentation in agriculture and animal sciences.	- Cropping system research - Information system for agricultural and animal experiments - Experimental designs for agricultural, animal, agroforestry and fisheries research

The progress of the projects, thrust-areawise, is given below:

Cropping system research

1. Planning, Designing and analysis of on-farm research experiments planned under Project Directorate of Cropping System Research

Under AICARP (CSR) on-farm research trials were laid out in 32 NARP zones during 1995-96. Five different types of experiments viz. (i) Crop intensification under irrigated/rainfed conditions (2a), (ii) Intercropping under irrigated/rainfed conditions (2b), (iii) Performance of crop varieties and their nutrient requirements under irrigated/rainfed conditions (3a), (iv) Integrated nutrient management under irrigated/rainfed conditions (3b), (v) Component technology based on regional constraints (3c), were planned at different centres on various crops. The data of about 2844 experiments were received during 1996-97 and are under preparation and validation. The experiments conducted during 1995-96 were analysed and results were sent to different officers incharge of NARP Zone Centers for incorporation in their annual report.

2. Planning, Designing and analysis of experiments planned on stations under the Project Directorate of Cropping System Research

Objectives of the project are:

i. To identify the suitable statistical designs for conduct of experiments according to the technical programme formulated in the annual workshop of the project,
ii. To develop suitable method of analysis for the identified designs.
iii. To statistically analyse the data of experiments conducted at 37 cropping system research centres

Complex experiments at cropping system research centres were conducted in RBD, split plot, strip plot, Factorial RBD, split- split plot and 3^2x2 partially confounded design. Data were analysed accordingly.

(i) Biologically more productive, economically more profitable and environmentally more compatible, need based cropping systems were identified for different agro-ecosystems. (ii) Trials on integrated nutrient management in cereal-cereal cropping systems at several locations have indicated that 25-50% nitrogen need of a system can be met

through organic sources such as FYM/farm residue/green manuring. (iii) A marked response to 25 kg S/ha in rice and 10 kg Zinc/ha in soybean was recorded at Maruteru in rice-rice system and at Sehore in soybean-wheat system. Zinc sulphate was found to be superior than other sources of zinc.

From 1997-98, some more efficient designs like BIBD and Balanced confounded ($4x2^2$) were introduced. In addition to season-wise analysis of experiments according to the design adopted, pooling of concluded experiments and long-term experiments will be taken up.

3. Planning, designing and analysis of data relating to experiments conducted under AICARP on long term fertilizer experiments

The objectives of the project is given below:

To plan and design Long Term Fertilizer Experiments, to try alternative approaches for statistical analysis of data and to coordinate the work relating to statistical requirement of the project and also to provide necessary information to the P.C. (LTFE) and ICAR.

At each site for each year the analysis of variance of crop yield to examine the effects of block and treatment structures in relation to total variability together with contrasts of interest between levels of treatments were estimated . The data were combined over years to estimate the effects of years, blocks within years and treatments, and the treatment effects were subdivided according to contrasts of interest in interaction with the year effects. Regression models were fitted to the yield and available soil nutrients over time to examine the treatment performance pattern. The data of superimposed treatments obtained consequent to the midcourse bifurcation of plots was analysed using the nested two - way design to facilitate comparison amongst the superimposed treatments over the residual effects of the original long term treatments

The remaining data for 1994-95 (about 600 schedules) and about 400 schedules for the year 1995-96 involving 10-15 characters data from various centres were received. These were transferred on floppy after thorough scrutiny and checking for various gap/abnormalities. The data were analysed for individual years and were also pooled over years. Also the data of midcourse bifurcated plots through nested two-way design were analysed for Ludhiana and Pantnagar centres. Statistical results were made available to PC(LTFE) and the Scientist incharge of co-operating centres. These results were tabulated in the form of final summary tables to be incorporated in the final report of the project

The remaining data for the year 1995-96 would be received and analysed. The preparation of project report embodying the results upto 1995-96 would be undertaken in collaboration with the P.C.(LTFE). This report then would be presented in the annual workshop of the project to be held at IISS Bhopal during the year 1998.

Information system for agricultural and animal experiments

4. Agricultural experiments information system for Animal Sciences

The objectives of the project are to collect, compile and put in an approved format, the experimental data of large number of experiments conducted at various Animal husbandry Research Station of ICAR/SAUs all over the country.

During 1997, work on the preparation of format of presentation of results and Index for about 375 experiments was completed and their coding and corrections are under processing. Two computer programs in FORTRAN were also developed. The work of

collection of data, format, index, storage etc. will continue and more information will be added in the data base prepared.

5. Agricultural field experiments information system

The objective of the project are to maintain at a central place the results and other ancillary information in respect of Agricultural Experiments conducted at different research stations in the country. It envisages the creation of computer based data bank of Agricultural field experiments conducted from the year 1978 onwards. It would assist the research workers in (i) efficient planning of their research (ii) avoiding duplication in effort, and (iii) making available the results of past research.

A total of 1470 experiments were collected from all the regional staff posted at different regional centres. Experimental data received upto June, 1997 for Maharashtra was validated. The experimental data received upto December 1995 for the states of Assam, Orissa, Bihar, Gujarat, Madhya Pradesh, U.P. and Karnataka were validated. The development of user friendly software for storage and retrieval was under taken.

Experimental designs for agricultural, animal, agroforestry and fisheries research

6. Cataloguing and construction of variance balanced block designs - computer algorithms for construction

The objectives of the project are (i) to review the available literature on the method of construction of variance balanced block designs, (ii) to prepare a catalogue of available variance balanced block designs and their efficiency factor, (iii) to make an attempt to fill the gaps by giving some new method of construction, and (iv) to give computer algorithms/programme to generate variance balanced block design.

Construction aspect of binary proper variance balanced block designs have been completed. The catalogue of non-proper variance balanced block designs have also been prepared. The computer algorithms for construction of binary non-proper variance balanced block designs is in progress.

7. Study of designs for two or more sets of treatments applied at different periods of experimentation

The objectives of the project are (i) to study the characterization, properties of the designs for the multi-stage experiments on the same experimental material with different non-interacting sets of treatments in one-way and two-way elimination of heterogeneity setting, (ii) to construct designs under (i) and to study their efficiency, (iii) to study the optimality aspect of designs under (i) and (ii) above, and (iv) to prepare a catalogue of available designs and those obtained under objectives (ii) and (iii) above.

The optimality aspects of block designs for two non- interacting sets of treatments applied in succession to the same experimental material and construction has been studied. Conditions have been obtained for the block design to be universally optimal. Some methods of construction of optimal designs have been given.

8. Construction of efficient designs for asymmetrical factorial experiments

The objectives of the project are (i) to study the possible association between the combination of levels of factors of symmetrical factorial experiments of type 2^n ,3^n and levels of factors of asymmetry, and (ii) to suggest most suitable association above for different number of levels of factor of asymmetry.

Further work on the project for studying the levels of main effects and interaction of 3^n series alongwith the efficiency of the design will be carried out.

10. Study of heterogeneity of error variances in Agricultural Field experiments

In the field experiments the error (experimental) can be considered to be, to a large extent, the expression of soil heterogeneity. The other uncontrollable factors also contribute to it. Certain treatments such as spacing, dates of sowing, method of sowing, size of seeds variety etc. are also likely to influence the error to different degrees, thus homocedastic models can not be taken for granted for the field experiments A study of the error variances therefore will be useful to both Statisticians and Research Scholars engaged in designing and conduct of experiments and analysis of their data. This enables proper choice of design for experiments alongwith suitable method of analysis of the data.

BIO-STATISTICS AND STATISTICAL GENETICS

Mandate:	Thrust Area:
To conduct basic & applied statistical research in the fields of Biostatistics and Statistical Genetics	- Statistical studies in animal and plant genetics - Modelling for biological phenomena - Studies in population biology

The progress of the projects, thrust-areawise, is given below:

Statistical studies in animal and plant genetics

1. Application of bootstrap techniques for studying statistical properties of genetic parameters

The project aims:(i) to examine different procedures for assessing the accuracy of genetic parameters, heritability and genetic correlation, (ii) to study the sampling distribution of estimates of genetic parameters, and (iii) to obtain the optimum number of bootstrap replications for getting the satisfactory estimates of sampling variance and confidence intervals.

A large number of bootstrap samples were drawn by different methods. The samples so drawn were analysed to obtain the estimates of heritability and the distribution of heritability estimates was tested for normality. The bootstrap estimates of genetic correlation by half-sib analysis approach along with other statistics was obtained for different combination of population parameters. In almost all the cases the distribution of statistics was found to be non-normal. The confidence intervals based on percentiles and bias corrected confidence intervals were obtained and were compared with the normal confidence intervals. The study of genetic correlation by parent-offspring method was also started and was in progress.

2. Statistical modelling for comparing genetic groups of crossbred goat for growth studies based on multiple traits

The objectives of the project are (i) to develop growth performance index by combining several body measurement traits, (ii) to cluster various genetic groups into homogeneous clusters by different clustering procedures and to develop some suitable criterion to compare the efficiency of these procedures, (iii) to study the combining ability for individual growth traits and for growth performance index, and (iv) to estimate the genetic parameters such as heritability, phenotypic and genetic correlation, etc. for component traits as well as for the index.

Records on body weight and body measurement traits were adjusted for effects like season, period, parity order, etc. and these adjusted records were utilized to develop a linear discriminant function of the type

$$Y = \sum_{i=1}^{n} b_i x_i$$

where x_i's are the component traits and b_i (i=1,2...,n), a column vector, are so chosen as to maximize the variation 'Between genetic groups' relative to 'Within genetic groups' for the composite character.

For comparing genetic groups of crossbred goats for growth studied based on multiple traits, the growth performance index based on body weight, pin-shoulder length, growth velocity and growth rate of one month of age of animals explains more variability in goats as compared to the component traits. The results also indicate that the growth performance score of the genetic group Jamunapari is maximum followed by Jamunapari X Beetal, Beetal and Barbari X Jamunapari, where as it is lowest is respect of the genetic groups Barbari X Black Bengal and Black Bengal on the basis of Composite character/growth performance index. It is further noticed from the studies on general & specific combing ability analysis that in pure bred, general and specific combining ability and maternal effects are found highly significant in respect of the component traits as well as composite character except for the trait growth rate where general combining ability effect is significant at 5 percent level of significance. On the other hand, heterosis and reciprocal effects were not found significant only in cases of pin shoulder length at one month age and the index/composite character.

3. A study to compare the performance of different methods of estimating repeatability and to assess their stability by bootstrap techniques

The main objectives of the project are: (i) to estimate the repeatability by four different methods for important traits of some breeds of indigenous cows, (ii) to estimate the variance of repeatability of milk yield by the usual four methods and also by the new technique called bootstrap, and (iii) to compare the efficiencies of different procedures and to estimate the relative-variance by bootstrap to assess the stability of the estimate of variance.

The breeding data for three indigenous breeds of dairy cows viz. Haryana, Red Sindhi and Sahiwal from military farms at Agra, Bangalore and Meerut were utilized pertaining to the period 1955 to 1978. From the scrutinized data, non-genetic effects were eliminated by Least Square technique and the adjustment of latter records were carried out using Sander's (1927) methods. The adjusted records for four different production traits were utilised for estimating the parameters and the adjusted records of trait milk yield were used for variance estimation by different methods and also by the new technique called Bootstrapping. Efficiencies of different procedures would be judged using the relative variance ($CV^2(T)$) where T stands for the estimate of variance by bootstrap.

The data for three breeds of cow, brought in required format, were subjected to Sander's correction through a computer program for the character lactation yield. Under ANOVA technique, the corrected data was utilised for statistical analysis and under PCA technique, both the corrected and the uncorrected data forms were used for statistical analysis. In order to carry out the statistical analysis five computer programs were written, tested and put to use in addition to the available packages. Roughly 90% of the statistical analysis was over. The estimation of their variances by bootstrap technique was also taken up and five more new programs were written and this work remained in progress. Three chapters of the project report were also drafted. The results would be available as soon as all the analysis would be over.

Modelling for biological phenomena

4. Study of contagious distributions and dynamical models for aphid population growth

Aphids are recognised as serious pests of cereals, oilseeds, pulses and vegetable crops. One objective of the project is to study various contagious distributions with a view to better understanding of the phenomenon of their spatial spread. Another objective is to develop

appropriate dynamical population growth models to describe the underlying dynamics of an aphid population.

The techniques of solving differential equations, fitting of nonlinear statistical models are employed. The nonlinear statistical model was fitted to a number of data sets for aphid population growth. The 'residual analysis' carried out on some of these data sets indicated heterogeneity of error variances. For such cases, optimal transformations of data from the Box-Cox family of transformations were obtained. Subsequently, the model was fitted to the transformed data satisfactorily. The aspect of auto correlated errors in the models will be explored. After that the resultant model needs to be fitted to data.

Studies in population biology

5. Investigations on the properties of projection matrices in population biology

The project aims:(i) to study the properties of the projection matrix with special reference to stable population structure, (ii) to arrive at a stable population structure using the findings of the first objective, and (iii) to study the behaviour of projection matrices and their limit properties when the matrix elements are non-stationary over time and stochastic in nature.

Several population structures were considered to study the nature of proportionality factor which establishes a relationship between the total herd strength and the product of the t-th power of the eigen-value and the corresponding eigen-vector of the projection matrix at time t. To study the effect of stochasticity on the elements of the projection matrix, one of the elements of the matrix was assumed to be a random variable. In studies on projection matrices, the nature of the proportionality factor was examined and it was found that this factor is highly variable and not a constant as reported in earlier studies. Further the stochastic nature of the matrix elements was considered and the intrinsic rate of change in the total population has been obtained in three ways first by computing the average of the growth rates of population sizes, secondly the growth rate of average population size and these two have been compared with the natural logarithm of eigen-value of the average matrix. The growth rate obtained by second method gives an upper bound to the rate of growth obtained by other methods.

DIVISION OF FORECASTING TECHNIQUES FOR CROPS, DISEASES & PESTS

Mandate:	Thrust Areas:
To develop statistical models for obtaining pre-harvest forecast of crop production on the basis of biometrical characters, weather parameters and agricultural inputs and also to develop forecast models for incidence and intensity of pests and diseases.	- Forecasting techniques in Agricultural Systems.

The progress of the projects, thrust-areawise, is given below:

Forecasting techniques in Agricultural Systems.

1. A study of behaviour of crop response to long term fertilizer application with reference to weather.

The project aimed to study the effect of weather on response of a crop to long-term fertilizer application. Investigations revealed that most of the variation in response of rainfed Sorghum as well as irrigated wheat crop, over a period of 13 years, was due to the variation in weather. Response of wheat crop to fertilizer treatments without P_2O_5 had a diminishing trend over years. Hence, it was an essential nutrient for the medium black soil of Parbhani district (Maharashtra). Optimum dose of nitrogen was 80 kg/ha. Fertilizer dose $N_{80}P_{80}K_{40}$ should be recommended to farmers for both the crops as its responses were higher in favourable as well as unfavourable weather years. Characteristics of favourable and unfavourable years were also identified for Sorghum and wheat crops. The project report has been published.

2. Yield forecast on weather variables and agricultural inputs on agroclimatic zone basis.

The study aimed at developing forecast model using weather variables and agricultural inputs on agro-climatic zone basis. Earlier, district based studies were carried out at IASRI. The models developed, though provided reliable yield forecast, require a long series of data of 25-30 years which are not available for most of the locations. Therefore, it was thought to pool data of various districts within the agroclimatic zone so that a long series is obtained in a relatively shorter period. The models were developed using data of various districts within the agroclimatic zone introducing some parameters which could take care of variation between districts within the zone. The study has been taken up for rice and wheat in East and West zone of Madhya Pradesh respectively.

Models were developed using weather variables alone and weather variables along with agricultural inputs. Analysis was carried out using deviations of data from district averages. Agricultural inputs, year, previous year's yield and 2-5 years moving averages of yield were used to take care of district effect within the zone.

Results indicated that models using agricultural inputs and weather were suitable for both the crops. Reliable forecasts can be obtained using these models when the crops are 11-12 weeks old, i.e. two months before harvest. Study also revealed that the models work well, even if data on some years are missing or data of some districts within the zone are missing. The data requirement reduced to 10 to 15 years per district for agroclimatic zone model as against 25 to 30 years for district based models. It is proposed to extend the study to State level forecast.

3. Non-linear statistical models for pre-harvest forecasting of inland fish production from ponds.

The study aimed to develop suitable non-linear model for pre-harvest forecasting of inland fish production. The study has been conducted for three species, viz, Rohu, Mrigal and Common Carp. Study revealed that logistic model can be used to forecast fish weight three months before harvest for indigenous species i.e Rohu and Mrigal species. For exotic species i.e Common Carp the forecast can be provided three months before the harvest by using Gompertz Model. The project report has been published.

4. Study to develop model for assessing the effect of flood on yield of crops.

The study has been taken up with the objective to develop model for reliable assessment of flood effects on major kharif and rabi crops in Faizabad and Ballia districts of U.P. The study was based on secondary data already collected under the project entitled, 'Pilot sample survey to study the impact of flood on agricultural production in a region of Uttar Pradesh', carried out by IASRI, New Delhi.

As the impact of flood on yield depends on the stage of the crop at the time of flood occurrence, the flood parameters at different growth stages of the crop were considered separately. Models were developed using various flood parameters i.e. flood frequency during the crop season, depth and duration of flood at different stages of crop growth as such and also through derived variables of these parameters. Models were developed for paddy, arhar, sugarcane and wheat for various tehsils in the selected two districts and also for different scenarios based on texture and topography of the soil.

The models were found to be successful for providing reliable assessment of yield losses due to flood as the losses worked out using the models were very close to the losses observed directly based on yields of affected and unaffected fields.

5. Use of discriminant function of weather parameter for developing forecast model on rice crop.

The objectives of the project are: (i) to categorise the year into three groups on the basis of weather parameters, (ii) to develop yield forecast model using the discriminant score of weather parameters and the input variables, and (iii) to examine the validity of forecast model.

The methodology consisted of (i) Development of weather scores. The weather scores based on discriminant analysis are to be obtained on the basis of weather variables so as to maximise the ratio of mean squares of between and within groups. (ii) Testing of significance of centroids : The test statistics proposed by Bartlett (1947) is used to test the significance of discriminant functions based on the null hypothesis that group centroids are all equal. (iii) Classificatory analysis : The classificatory procedure for classifying the individual crop year into three groups involve the computation of distances between each individual observation from each group centroid in discriminant function. (iv) Development of

forecast model : A linear multiple regression model is to be developed using weather score, input variables and trend.

Weather data have been classified into three groups on the basis of adjusted rice yield. Variance and co-variance matrices among the weather variables have been obtained for each of the three groups and their testing has been done for deciding about the type of discriminant functions to be tried. Analysis has shown that quadratic type of discriminant function will be more appropriate. Further analysis is in progress.

6. Pilot study for developing Bayesian probability forecast model based on farmers' appraisal data on wheat crop.

The study was conducted with two objectives, viz. (i) to develop the Bayesian probability model for forecasting the wheat crop yield. (ii) to enlist the factors affecting the crop yield based on farmers' appraisal.

The methodology consisted of conducting a survey in Muzaffarnagar district following a stratified multistage random sampling design. Taking tehsils as stratum, villages as first stage units and farmer experts as the second stage units, a random sample of 90 experts was selected. The expert opinion data are collected in a number of rounds by interviewing the selected experts regarding their assessments about the likely crop production and chances of occurrences. In the first round the requisite informations are collected for establishing an approximate distribution of crop yield. After summarising the responses in various yield classes, each expert is asked in round 2 to estimate the chances in favour of getting yield in various classes. From these responses average prior probabilities are computed. At harvest, wheat yield data was obtained by enquiring the selected farmers. Actual harvest yield and farmers' appraisal data on yield are to be taken into account to obtain the posterior probabilities. Then Bayes probability forecast model is to be developed to forecast wheat yield.

The selection of villages and selection of expert farmers has been completed for all the four tehsils in Muzaffarnagar district of U.P. The schedules to be used in the collection of field data have been finalised. The work of collection of data for the year 1996-97 is over. The collected data have been scrutinised and the discrepancies observed were rectified. Further collection of data for the year 1997-98 is in progress. The supervision of field work is being carried out by the Project leader and the associates. Analysis of collected data is in progress.

7 Forecasting sugar production and demand in India.

It is a collaborative scheme in collaboration with IISR, Lucknow with the objective to develop suitable methodology for forecasting of sugar production and demand. In this scheme, IASRI is responsible for planning, training of field staff and analysis and interpretation of data. Detailed technical programme for the scheme has been finalised. A handbook of instructions for field workers for collection of data was prepared. A group meeting was organised at IISR during September, 1997.

8. Development of Forewarning System for Aphids, Myzus Persicae(Sulzer) on Potato.

It is a collaborative project with NCIPM, Pusa Campus, New Delhi, for development of fore-warning technique to identify aphid free and low period and area for seed production.

Aphid population and weather data for 18 years from AICPIP coordinating centre, Pantnagar were taken to study the behaviour of aphid population with weather factors. The preliminary studies relating to aphid

population revealed that mean (s.d.) ranged from 24.0 (30.06) to 317.6 (458.2), the rate of change from 7 to 130 in different years and the correlation coefficient with the aphid population of the previous week was of the order of 0.82, which was highly significant.

To identify the factors that account for the variability in aphid population in a week and to study their relationships with aphid population, multiple regression model was fitted to the data of I week of December to IV week of January. The model fitted to the data pertaining to II week of January was best with highly significant $R^2 = 0.78$. Both the partial regression coefficients of aphid population (current week) on maximum temperature (current week) and the aphid population (previous week) were highly significant. In case of the models fitted to the II, III & IV week of December and III week of January, though the per cent variation explained was highly significant but it was in the range of 41 to 48 only.

For further improvement, non-linear models were also studied. Since the data were collected over the years, the time series error was to be removed either from the data or it is to be modelled suitably. Therefore, the time series error had been taken care of while modelling and different order of autoregressive week-wise models were fitted. The non-linear models fitted was Sinusoidal - model. It was revealed that the value of coefficient of determination i.e. R^2 for different models ranged from 0.83 to 0.97 which implies that the models were fitted well to the data. It was found that the predicted values (aphid population) calculated from the models were quite close to the observed ones. The weather records of the previous years can be used for prediction of aphid population for a particular week through these models.

To develop models using Group Method of Data Handling and Validation of various models already fitted/ to be fitted will be taken up.

DIVISION OF STATISTICAL ECONOMICS

Mandate:	Thrust Areas:
To develop appropriate Stochastic Models and Methods for Quantification of Economic Phenomena related to agriculture	- Technological change and its diffusion in agriculture - Resource use efficiency in agriculture - Modelling for Demand

The progress of the projects, thrust-areawise, is given below:

Technological change and its diffusion in agriculture

1. Estimation of Farm Level Technical Efficiency and Its Related Parameters Under Error Decomposition Methodology of stochastic Frontier Model in the Production of Wheat.

The objectives of the project are (i) to examine production elasticity of various inputs, (ii) to estimate the related parameters of technical efficiency, namely, variances of one-sided error term and symmetric error term and ratio of standard error of one-sided error term to symmetric error term, (iii) to identify discrepancy parameter for finding discrepancies between observed output, actual and maximal output (frontier), and (iv) to measure mean technical efficiency of individual farms.

For estimating technical efficiency and its related parameters, stochastic frontier model for reflecting the farmers' production scenario has been considered. The stochastic frontier model introduced in literature postulates that the error term is composed of two independent error components as $\varepsilon = V-U$ where $V \sim N(0, \sigma^2)$ is a two sided error term symmetrically distributed and captures the effects of random shocks outside the firm's control, observation and measurement error in independent variables, and usual statistical 'noise' generally found in an empirical relationship. The normal error term(V) representing the pure randomness makes the production frontier stochastic and, therefore, allows the frontier to vary across or over time for the same firm The other independent error component (U) is a non-negative term representing technical efficiency. The economic interpretation of the one-sided error term (U) follows that each farm production must be either on or below the production frontier.

During the year methodology associated with the recent advances in estimating frontier production function for examining production scenario, using farm level data for Punjab and Haryana states for wheat was obtained from the Cost of Cultivation Scheme of Directorate of Economics and Statistics. In order to obtain the point estimators of mean and mode relating to half-normal distribution of a random variable (one-sided error term) truncated at zero, the behavioural patterns of related parameters of technical inefficiency have been theoretically examined for analysis under the framework of stochastic frontier model.

2. Economic Study of Micro-Irrigation System on Farmers' Fields

The objectives of the project are (i) to study the impact of micro-irrigation on crop production/productivity, saving of resources, income and employment, (ii) to estimate the credit needs for adoption of micro-irrigation technology, and (iii) to examine the effects of subsidy on adoption of micro-irrigation technology and to explore the potential of the micro-irrigation technology, constraints in its adoption and promotional measures to be adopted in future.

Multi-stage stratified random sampling technique was used to select sample from the study area i.e. Mahendergarh and Gurgaon districts of Haryana state. Data is being collected from 135 cultivators using drip and sprinkler irrigation systems in these two districts. Key cluster sampling was used to select cultivators using traditional methods of irrigation on their farms for the same crops. Data collection work is in progress.

Resource use efficiency in agriculture

3. A Study on Production Efficiency and Resource Use in Poultry Production

The objectives of the project are (i) to study the pattern of poultry production, level of investment and capital requirement in poultry enterprises, (ii) to study the pattern of resource use and its efficiency in poultry production, (iii) to examine the profitability of poultry enterprise, and (iv) to study the constraints faced by poultry producers.

The project is based on the primary data collected by the Department of Animal Husbandry, Government of Haryana on the selected poultry farms in Ambala district. The project work involves the estimation of production functions and productivity equations. Linear programming technique is also being used for studying resource allocation.

The analysis indicated that the number of egg layer birds at the farms vary over three seasons. In case of small and medium farms the number is reduced significantly in rainy season. However, in case of large farms, season has no impact on the number of birds because the number of birds remains more or less the same in the three seasons. The productivity of birds shows no set pattern on the three categories of farms and over different seasons. The average bird productivity fluctuates around 0.65 eggs per day.

Modelling for Demand

4. Study of demand for agricultural products and its implication for food security in India

The objectives of the project are (i) to study the consumption pattern of foodgrains in rural and urban areas, (ii) to estimate the demand functions and Engel elasticity for these items, (iii) to study the demand for these products among poorer section of population, (iv) to predict demand for foodgrains for the year 2015, and (v) to study the implications of consumption pattern of poor section of population for food security.

The project was initiated in August 1997. The work during the year has been related to the review of literature and construction of demand models for agricultural products. The project is based on secondary data and expenditure on foodgrains by various groups of consumers have been collected from the NSS reports. The collection of data is in progress.

The future work will be confined to the analysis of demand for foodgrains. Thus during the next year data on various variables relating to expenditure and income will be collected and demand and Engel curves will be estimated.

DIVISION OF COMPUTING SCIENCE

Mandate:	Thrust Areas:
- To develop computer software to the requirements of agriculture research - To develop databases and information systems for agricultural research - To conduct post-graduate teaching and ad-hoc training courses in Computer Applications - To provide advisory and consultancy services in data processing - To provide computer services in the Institute.	- Development of Application software for use in agricultural research - Development of databases and information system for National Agricultural Research System.

The thrust-areawise progress is given below:

Software Development

- Computer Package SPBD Ver.1.0 (Statistical Package on Balanced Designs)
- Agricultural Research Data Information System (**ARDIS**) Ver. 1.0. It is a computer based information system that gives easy and fast access to agricultural research data contained in the IASRI's Agricultural Research Data Book.
- Database software for Scientists/ Technical Personal Information on Computer knowledge of the staff of IASRI.
- Database software of Technical Personnel to provide Information about the activities in which they are associated.
- National Information System for Agricultural Education to provide information about State Agricultural Universities and Deemed Universities of ICAR is being developed.

Data Entry

180 jobs were received during the period and 1,62,687 records were created.

Divisional Computing Facilities Utilisation

A. The following facilities were procured and extended to the scientists/technical and other staff of the Institute.

i. GIST: The access to General Information System Terminal of the NIC has been made available to all the IASRI personnel.

ii. INTERNET: With the installation of 64 KU Band VSAT and connecting it to SUN SOLARIS Server, the access to Internet has become available to all the IASRI personnel. This facility has also been extended to all the computing labs. The Unix users have character based browser "LYNX". Besides, some labs including that of National Centre for Agricultural Economics & Policy Research (NCAP) were given graphics based Internet facility. With these facilities the users including students are now making maximum use of Internet facility through both character based browser "LYNX" and graphics based browser "INTERNET EXPLORER"

iii. ELECTRONIC MAIL: Keeping pace with the changing Technology, Simple Mail Transfer Protocol (SMTP) e-mail facility through VSAT was started, discontinuing the old ***ren mail*** facility. The users are able to send and receive e-mail instantly from any part of world. With this the e-mail address stands changed, from " **@iasri.ren.nic.in**" to "**@iasri.delhi.nic.in**".

iv. PINE software for sending and receiving e-mail: A user friendly software PINE was provided to all Unix clients. For users who are using Windows platform, a user friendly e-mail software "OUTLOOK EXPRESS" was installed. Such users are able to receive and send e-mail by their desktop using POP mechanism. *This facility has been made available for NCAP, located in the campus of IASRI.*

v. CD-ROM: An external CD-ROM reader was procured and made available to the scientists.

vi. COLOUR-PRINTER: One colour printer was procured and made available to the scientists.

vii. STRENGTHENING: All other Divisions including RCMU of the Institute have been provided with additional number of PENTIUM and 486 PCAT's, Laser and Dot Matrix printers, printer sharers and UPS systems. The Centre of Advance Studies in Computer Application and Agricultural Statistics has been further strengthened with 2 more PENTIUM PC/AT's. All the Administrative sections including the Hindi section have been provided with computers and printers.

B. UTILISATION OF LABS: A total of 49,556 hours of computing time was utilized by 13,039 users.

Selective Dissemination of Information Services

Under the Selective Dissemination of Information Services, research workers from NARS are provided information from Bibliographic Databases like AGRICOLA, VETCD, BEASTCD and Biotechnology abstracts are provided. 70 requests were received in the Bioinformatics Centre and a total of 46,627 abstracts were provided to the research workers in the NARS.

Advisory/ Consultancy services

- Computerisation and data analysis of ARS/NET/SRF examination -1997 for Agricultural Service Recruitment Board (ASRB).

- Computerisation and data analysis of F&AO and AOs examination -1997 for ASRB.

LIBRARY AND DOCUMENTATION SERVICES

Library and Information Services play an important role in serving the Institute's scientific, technical and student community as a Centre for Scientific Literature and Information related to the Institute's mandate. The Library System of the IASRI is one of the resourceful centres in the country, specialised in Agricultural Statistics and Computer Application and allied fields. The library system of the Institute provides documentation and information services to in house scientists, students and researchers as well as users from ICAR Institutes and Agricultural Universities.

Library Information Services

As a part of automation activities the library has created database of books available in the library. The database has been created using CDS/ISIS software package under SCO Unix Operating System. The users can therefore retrieve desired book Information through LAN at the IASRI. Further creation of other databases are in progress.

The reprographic section of the Library is meeting up, day to day requirements of postgraduate students, research scholars and faculty members efficiently.

To keep abreast with latest development in their field a fortnightly ``Current Contents Service" is provided to Institute's Scientists.

Brief Statistics

1)	No. of Books added	:	114
2)	No of Bound Journals added	:	197
3)	No. of Reports added	:	176
4)	No. of Indian & Foreign Journals subscribed	:	105
5)	No. of Publication issued from the Library	:	19500
6)	No. of Publications consulted within the Library	:	23300
7)	No. of Publications borrowed or lent out on ILL	:	55
8)	No. of readers who visited the Library	:	14500
9)	No. of Issues of Current Contents brought out	:	16
10)	No. of pages of scientific & technical nature reprographed	:	23,768
11)	No. of reprints issued to users	:	23
12)	No. of Indian Newsletter received on complimentary basis	:	95

TECHNOLOGY ASSESSED AND TRANSFERRED

- A sampling methodology was developed to estimate the total poultry meat production through organised poultry farms and backyards of household rearing poultry birds in the villages at district level.

- The study of sampling methodology for estimation of fish catch from Chilka lake indicated the feasibility of estimating the fish catch with a reasonable degree of precision by using ratio method of estimation taking the information on fish catch for the previous year as an auxiliary variate. It has also shown the feasibility of reducing the sample size by taking a further sample of landing centres. This will reduce the cost of the survey.

- The methodology developed in the project "Pilot sample survey for estimating the area under wasteland" will enable the State Governments to estimate the wasteland area in different districts with high precision and to find out alternate uses of wasteland and the extent to which it can be reclaimed. This will indirectly increase the production of foodgrains in the country.

- Estimates of average milk yield per day per animal for small areas as well as those of total milk production from cows/buffaloes in each season were obtained by different methods such as synthetic estimation and model-based synthetic estimation etc. An empirical comparison of the results showed that model-based synthetic method outweighs other methods. It will be of immense use to the various Departments of Animal Husbandry and thus making satisfactory planning at grass-root level. Also it will save in cost, as the sample size in this case is very small.

- A Statistical Package for Balance Incomplete Block Designs (SPBD release 1.0) has been developed. This package selects, generates and gives a randomized layout of a Balanced Incomplete Block (BIB) Design. This package also gives the analysis of variance with both treatments adjusted and blocks adjusted sum of squares, adjusted treatment means, variance of the estimated contrasts and the contrast sum of squares, etc.

- A catalogue of binary equi-replicated non-proper variance balanced designs obtainable through Partially Balanced Incomplete Block Designs with two associate classes has also been prepared. A new method of construction of non-proper variance balanced block designs has also be given.

- Agricultural experiments involving split application of nitrogenous fertilizer have been viewed as mixture experiment and alternate method of analysis of data so generated has been suggested. The method is demonstrated through the analysis of experiments on Paddy crop involving 2 to 4 splits of fertilizer. The results have generally revealed that the amount of fertilizer applied at later stages of crop growth have given more response than the amount of fertilizer applied in earlier crop growth stages.

- The data received from long term fertilizer experiments conducted under AICRP during the year were analysed for individual crops and pooled over the years using appropriate statistical techniques. The statistical analysis of data of mid course bifurcated plots through nested two-way design received from Ludhiana, Pantnagar and Bhubaneswar centres

revealed that increasing the level of N from the present 50% to 100% of the recommended level gave significantly increased yields for all the crops. Reduction of fertiliser P by 50% from recommended dose did not have any adverse effect on the yields. The statistical results also confirmed that Zn deficiency occurred at higher level of nutrient application at Ludhiana and Pantnagar soil could be arrested by timely zinc replenishment.

- Bootstrap techniques for studying statistical properties of genetic parameters was applied to generate the data for 50 sires and 10 daughters per sire from the population with low (0.1), moderate (0.5) and high (0.7) heritability. The large number of bootstrap samples were drawn by different methods. The samples so drawn were analysed to obtain the estimates of heritability and the distribution of heritability estimates was tested for normality after every 200 samples and it was found that it was non-normal in 50% of cases. The bootstrap estimates of heritability, variance and 10% & 5% confidence intervals of parameter were obtained. The bias in the bootstrap estimates varied from -0.03 to -0.07 and was always negative. The bias in the bootstrap estimates of heritability increased with increase in the value of population heritability. The usual estimate of standard error of heritability is always found lower than the corresponding bootstrap estimates. The length of the percentile confidence interval and normal confidence limits are almost similar but their limits are found to be different due to skewed distribution of heritability estimates. As the bias was negligible in bootstrap estimates, there was not much reduction in length of the bias corrected percentile intervals.

- For comparing genetic groups of crossbred goats for growth studies based on multiple traits, the growth performance index based on body weight, pin-shoulder length, growth velocity and growth rate at one month age of animals explains more variability in goats as compared to the component traits. The results also indicate that the growth performance score of the genetic group Jamunapari is maximum followed by Jamunapari X Beetal, Beetal and Barbari X Jamunapari, where as it is lowest in respect of the genetic groups Barbari X Black Bengal and Black Bengal on the basis of Composite Character/growth performance index. It is further noticed from the studies on general & specific combining ability analysis that in pure bred, general and specific combining ability and maternal effects are found highly significant in respect of the component traits as well as composite character except for the trait growth rate where general combining ability effect is significant at 5 percent level of significance. On the other hand, heterosis and reciprocal effects were not found significant for these traits. Specific combining ability effect has been found significant only in cases of pin shoulder length at one month age and the index/composite character.

- The nonlinear statistical model was fitted to a number of data sets for aphid population growth. The 'residual analysis' carried out on some of these data sets indicated heterogeneity of error variances. For such cases, optimal transformations of data from the Box-Cox family of transformations were obtained. Subsequently, the model was fitted to the transformed data satisfactorily.

- In studies on projection matrices, the nature of the proportionality factor was examined and it was found that this factor is highly variable and not constant as reported in earlier studies. Further the stochastic nature of the matrix elements was

considered and the intrinsic rate of change in the total population has been obtained in three ways first by computing the average of the growth rates of population sizes, secondly the growth rate of average population size and these two have been compared with the natural logarithm of eigen value of the average matrix. The growth rate obtained by second method gives an upper bound to the rate of growth obtained by other methods.

- A study on developing yield forecast model on agroclimatic zone basis taken up for rice and wheat in one zone each of East and West Madhya Pradesh respectively revealed that models using agricultural inputs and weather were suitable for both the crops. Reliable forecasts can be obtained using these models when the crops are 11-12 weeks old, i.e. two months before harvest. Study also revealed that the models work well, even if data on some years are missing or data of some districts within the zone are missing. The data requirement reduced to 10 to 15 years per district for agroclimatic zones models as against 25 to 30 years for district based models. The study will be useful for obtaining reliable pre-harvest yield forecasts for larger area.

- Methodology was developed to study the effect of weather on response of a crop to long-term fertilizer application. Investigations revealed that most of the variation in response of rainfed Sorghum as well as irrigated wheat crop, over a period of 13 years, were due to the variation in weather. Response of wheat crop to fertilizer treatments without P_2O_5 had a diminishing trend over years. Hence, it was an essential nutrient for the medium black soil of Parbhani district (Maharashtra). Optimum dose of nitrogen was 80 kg/ha. Fertilizer dose $N_{80}P_{80}K_{40}$ should be recommended to farmers for both the crops as its responses were higher in favourable as well as unfavourable weather years. Characteristics of favourable and unfavourable years were also identified for Sorghum and wheat crops.

- The methodology of analysis of stochastic frontier production function has been developed which is capable of providing estimates of individual farm level technical efficiency. Suitability of the application of corrected ordinary least squares estimation procedure under the framework of frontier production function is being examined.

- In another study the cost of production of eggs in Ambala district of Haryana State has been studied using farm level data for the year 1991-92. The cost of production ranged between Rs.0.65 to Rs.0.77 per egg. This was marginally higher in winter season. Moreover, the cost of production for egg remains the same on the small, medium and large producing units and there is hardly any economy of scale visible in the production process.

- Agricultural Research Data Information System (ARDIS), Database software for Scientists/Technical Personal Information and Database software of technical personal were developed.

EDUCATION AND TRAINING

Degree Courses

The Institute continued to conduct the following degree courses in collaboration with Post Graduate School of Indian Agricultural Research Institute (IARI) which has the status of a Deemed University:

i) Ph.D. (Agricultural Statistics)
ii) M.Sc. (Agricultural Statistics)
iii) M.Sc. (Computer Application)

Both, Ph.D. and M.Sc. students are required to do courses not only in Mathematics and Agricultural Statistics but also in Agricultural Sciences like Genetics, Agronomy, Agricultural Economics, etc. All courses in Mathematics, Statistics and Computer Applications, etc. are offered at this Institute while the courses in Agricultural Sciences are offered at the I.A.R.I.

The eligibility qualification for admission to Master's degree in Agricultural Statistics is a Bachelor's degree in Agriculture / Horticulture / Forestry / Agroforestry / Veterinary Sciences / Fisheries Sciences / Sericulture / Agricultural Marketing or B.Sc. (10+2+3 system). For admission to Master's degree in Computer Application, the eligibility qualification is a Bachelor's degree in Agriculture / Computer Science / Agricultural Engineering / Veterinary Science OR B.Sc. Horticulture / Forestry or B.Sc. (10+2+3 system) OR Science with Hons. with Mathematics / Statistics / Physics.

Further for admission to Ph.D. degree in Agricultural Statistics the eligibility qualification is a Master's degree in Agricultural Statistics or Statistics or Mathematical Statistics or Bio-Statistics of IVRI or Professional Statisticians' Certificate Course (PSCC) from IASRI

Number of students admitted / Completed various courses during 1997 - 98 is as follows:

i) Ph.D. (Agricultural Statistics)

Four students completed Ph.D. (Agricultural Statistics) and six students were admitted during the academic year.

ii) M.Sc. (Agricultural Statistics)

Three students completed M.Sc. (Agricultural Statistics) and five students were admitted during the academic year.

iii) M.Sc. (Computer Application)

Three students completed M.Sc. (Computer Application) and three students were admitted during the academic year.

Training Programmes in Agricultural Statistics

Regular Training Programmes

- **Senior Certificate Course in Agricultural Statistics & Computing.**

The Senior Certificate Course in Agricultural Statistics and Computing is being organised for the benefit of research workers in Agriculture and other related fields engaged in handling statistical data collection, processing, interpretation and employed in Research Institutes of the Council, State Agricultural Universities and State Government Departments of Agriculture, Animal Husbandry and Fisheries etc.

The main objective of the course is to impart training in latest statistical techniques as well as use of computers and software packages. The course is offered by the Institute during July to April. The course which is in progress is being attended by 8 participants. The topics covered include: Statistical Methods, Statistical Economics and official Agricultural Statistics, Introduction to computer systems, Database Management and Software packages, Design of Experiments and Statistical Genetics, Sampling Techniques and their Applications.

Ad-hoc Training Programmes

A training programme on 'Advances in Data Analysis' (10 Feb. - 7 March, 1997) was organised under Centre of Advanced Studies in computer applications and agricultural statistics. Dr. R.C. Jain. acted as Course Director. The objectives of the training programme were to provide exposure to the advancements taking place in the field of data analysis and upgrading the professional capabilities of the participants in research and teaching.

A training course on "Modern Sampling Techniques" was organised at the Institute during 13-17 Oct., 1997 for senior level officers from Central Statistical Organisation. Dr. AK Srivastava and Dr. HVL Bathla acted as Course Director & Co-Course Director respectively for the training course. The participants were exposed to recent developments in the field of sample surveys like: model based estimation, small area estimation techniques, analysis of survey data, sampling from imperfect frames, qualitative aspects of data collection and analysis and use of remotely sensed data in surveys. The thrust of the programme was on applications of these emerging areas in collection and analysis of survey data. The participants were also given exposure to the survey data analysis package PCCARP developed by the IOWA state university, USA.

A specialized training programme in Agricultural Statistics was organised for 14 participants of International Statistical Education Centre (ISEC) on Oct.22, 1997. Thirteen trainees of Junior Certificate Course on Dec. 30, 1997 sponsored by Central Statistical Organization, New Delhi were exposed to research and training activities in Crop yield estimation and forecasting at IASRI.

Training programmes for M.Sc. Ph.D. students of various State Agricultural Universities like University of Agricultural Sciences, Bangalore, Tamil Nadu Agricultural University, Tiruchirapalli and Panjab University, Chandigarh were also organised during the year.

Research Fellowships

During 1997-98, 19 M.Sc. and 13 Ph.D. students received research fellowships, 5 M.Sc. students received fellowship at the rate of Rs.1600/- p.m. each besides Rs.3000/- per annum as contingent grant. 14 M.Sc. students received fellowship at the rate of Rs.1800/- p.m. each besides Rs.3000/- per annum as contingent grant. Out of 13 Ph.D. students 10 received fellowship at the rate of Rs.2200/- p.m. in I, II year and 3 received fellowship at the rate of Rs.2800/- p.m. in III and IV years in addition to Rs.5000/- per annum as contingent grant.

Faculty members of P.G.School, IARI in Agricultural Statistics

1. Dr.Prajneshu, Principal Scientist
2. Dr.A.K.Srivastava, Principal Scientist
3. Dr.R.C.Jain, Principal Scientist
4. Dr.H.V.L.Bathla, Principal Scientist
5. Dr.Randhir Singh, Principal Scientist
6. Dr.B.S.Sharma, Principal Scientist
7. Dr.V.K.Sharma, Principal Scientist

8. Dr.(Mrs.) Ranjana Agrawal, Principal Scientist
9. Dr.V.T.Prabhakaran, Principal Scientist
10. Dr.V.K.Gupta, National Fellow
11. Dr.B.C.Saxena, Senior Scientist
12. Dr.D.P.Handa, Senior Scientist
13. Dr.V.K.Bhatia, Senior Scientist
14. Dr.G.C.Chawla, Senior Scientist
15. Mrs.Asha Saxena, Senior Scientist
16. Dr.D.L.Ahuja, Senior Scientist
17. Dr.U.C.Sud, Senior Scientist
18. Dr.Chandrahas, Senior Scientist
19. Sh.S.D.Wahi, Senior Scientist
20. Dr.K.K.Tyagi, Senior Scientist
21. Dr.P.K.Batra, Senior Scientist
22. Dr.P.S.Rana, Senior Scientist
23. Dr.R.Srivastava, Senior Scientist
24. Dr.A.K.Vasisht, Senior Scientist(Ag.Econ.)
25. Dr.Jagbir Singh, Senior Scientist
26. Dr.M.S.Narang, Scientist (Sr.Scale)
27. Dr.Aloke Lahiri, Scientist (Sr.Scale)
28. Dr.V.P.N.Singh, Scientist
29. Dr.Anil Rai, Scientist
30. Dr. (Mrs.) Seema Jaggi, Scientist
31. Dr.Rajender Parsad, Scientist

Faculty members of P.G. School, IARI in Computer Application

1. Dr.S.D.Sharma, Director (Acting)
2. Sh.S.N.Mathur, Principal Scientist
3. Dr.P.K.Malhotra, Principal Scientist
4. Dr.I.C.Sethi, Senior Scientist
5. Sh.Mahesh Kumar, Senior Scientist
6. Dr. R.C.Goyal, Senior Scientist
7. Dr.V.K.Mahajan, Senior Scientist
8. Sh.Harnam Singh Sikarwar, Scientist.

Training Programmes in Computer Application

A. National Training Programmes

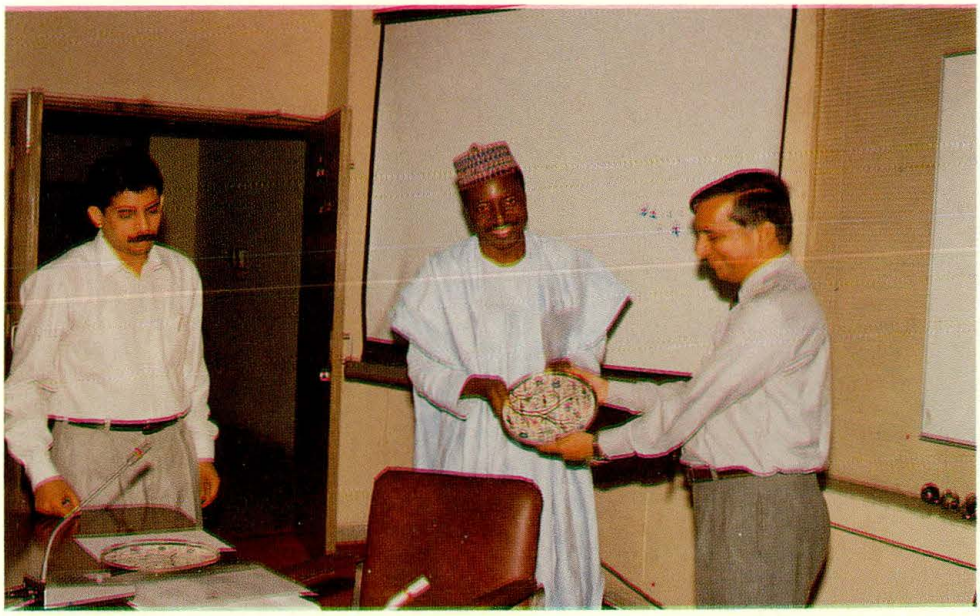
Sl. No.	Title	Course Contents	Course Coordinator/ Co-coordinator	Period	Participants	No. of parti-cipants
1.	Training Programme on 'Network Management and Information Processing in Agriculture' under Centre of Advanced Studies.	Computer Network and Management, Internet, Novell Netware, ARIS , E-Mail, Introduction to MS-OFFICE and MS WORD, EXCEL, POWERPOINT AND ACCESS, Data processing through statistical packages, Storage and retrieval of information and	Dr. R.C.Goyal	13.1.97 to 1.2.97	Scientists of ICAR Institutes and State Agr. Universities	20
2.	Training program for ICAR(Hqrs.) staff on 'Use of Computers in Office Work'	Basics of computers, MS DOS 6.2, Word Perfect 6.0 and Introduction to Windows.	Dr. S.D.Sharma	27.1.97 to 1.2.97	Tech. and Admn. Staff of ICAR	13
3.	Training program for IASRI staff on 'Use of Computers in Office Work'	Basics of Computers, MS Windows 3.1 and MS WORD	Dr. S.D.Sharma	3.2.97 to 7.2.97	Tech. and Admn. Staff of IASRI	16
4.	Training program for ICAR(Hqrs.) staff on 'Use of Computers in Office Work'	Basics of Computers, MS DOS 6.2, Word Perfect 6.0 and Introduction to Windows.	Dr. S.D.Sharma	10.3.97 to 15.3.97	Tech. and Admn. Staff of ICAR	12

5.	Training program for IASRI staff on 'Use of computers in Office Work'	Windows 95 and SPSS System	Dr. S.D.Sharma	20.3.97 to 5.4.97	Scientists and Tech. Officers of IASRI	20
6.	IX Adhoc training program for ICAR (Hqrs.) staff on 'Use of Computers in Office Work'	Basics of Computers, MS-DOS 6.2, Word Perfect 6.0 and Introduction to Windows.	Dr. S.D.Sharma	31.3.97 to 5.4.97	ICAR(Hqrs.) Tech. & Admn. staff	17
7.	XXXV Adhoc Training Program on 'Use of Computers in Agricultural Research'	MS- DOS, MS Windows 95 , MS-Word, MS-PowerPoint, MS- Excel and MS- Access, Statistical packages SPSS and SPAR1, Introduction to Net working and E-mail	Sh. Mahesh Kumar	21.4.97 to 3.5.97	Scientists and Technical Officers of various ICAR institutes	18
8.	X Adhoc Training Program for ICAR (Hqrs.) staff on'Use of Computers in Office Work'	Basics of Computers, MS-DOS 6.2, Word Perfect 6.0 and Introduction to Windows.	Dr. S.D.Sharma	28.4.97 to 3.5.97	ICAR (Hqrs.) Tech. & Admn. staff	15
9.	XI Adhoc Training Program for ICAR (Hqrs.) staff on 'Use of Computers in Office Work'	Basics of Computers, MS-DOS 6.2, Word Perfect 6.0 and Introduction to Windows.	Sh. Mahesh Kumar	12.5.97 to 17.5.97	ICAR (Hqrs.) Tech. & Admn. staff	10
10.	Summer School on 'Network Management and Informatics'	Computers Network Management, Internet, Novell Netware, ARIS and E-mail etc. , Windows 95, MS-Word, MS-PowerPoint, MS-Excel, MS-Access, Introduction to UNIX operating system, C and C++ Programming languages, Data Processing through Statistical packages SPSS, SAS, GENSTAT and SPAR1, Storage and Retrieval of Information systems like ARFIS and PIS of ICAR and Agricultural Field Experiment Information system and Hardware/Software Management System.	Dr. S.D.Sharma	26.5.97 to 24.6.97	ICAR Institutes State Agricultural Universities	30
11.	Training for IASRI staff on 'Introduction to GENSTAT'	GENSTAT package	Sh SN Mathur	16.7.97 to 17.7.97	IASRI staff	19

12.	XXXVI Adhoc Training Program on 'Use of Computers in Agricultural Research'	MS-DOS, MS-WINDOWS 95, MS-WORD, MS-PowerPoint, MS-EXCEL and MS-ACCESS, Statistical packages SPSS and SPAR1, Introduction to NETWORKING and E-MAIL.	Sh. Mahesh Kumar	21.7.97 to 3.8.97	Scientists and Technical Officers of various ICAR institutes	20
13.	Training for IASRI staff on 'Introduction to SAS'	SAS package	Dr. V.K. Mahajan	21.7.97 to 23.7.97	IASRI staff	20
14.	Training for IASRI staff on 'Introduction to SAS'	SAS package	Dr. V.K. Mahajan	24.7.97 to 27.7.97	IASRI staff	20
15.	Training for IASRI Admn. Staff on 'Use of Computers in Office work'	MS-WINDOWS 95 and MS- WORD	Dr. S.D.Sharma	4.8.97 to 8.8.97	IASRI Admn. Staff	20
16.	Training for IASRI Staff on 'Introduction to MS-Office'	MS-WINDOWS 95, MS- WORD, MS-EXCEL, MS-PowerPoint and MS-ACCESS.	Dr. S.D.Sharma	28.8.97 to 3.9.97	IASRI Staff	20
17.	Training for IASRI Staff on 'Introduction to MS-Office'	MS-WINDOWS 95, MS- WORD, MS-EXCEL, MS-PowerPoint and MS-ACCESS.	Dr. S.D.Sharma	5.9.97 to 11.9.97	IASRI Staff	20
18.	Short Term Training Course on 'Introduction to Statistical packages'	MS-WINDOWS 95, Statistical packages SPSS, GENSTAT and SPAR1.	Sh. Mahesh Kumar	15.9.97 to 20.9.97	Scientists of various ICAR Institutes and Agricultural Universities	17
19.	Short Term Training Course on 'Introduction to MS-OFFICE'	MS-WINDOWS 95, MS- WORD, MS-EXCEL, MS-PowerPoint and MS-ACCESS.	Sh. Mahesh Kumar	22.9.97 to 27.9.97	Technical and Administrative staff of ICAR Institutes and Agricultural Universities	22
20.	XXXVII Adhoc Training Programme on 'Use of Computers in Agricultural Research'	MS- DOS, MS WINDOWS 95 MS-WORD, MS-PowerPoint, MS-EXCEL and MS-ACCESS, Statistical packages SPSS and SPAR1, Introduction to NETWORKING and E-MAIL.	Dr. V.K. Mahajan	13.10.97 to 25.10.97	Scientists and Technical Officers of various ICAR Institutes	25
21.	ICAR Staff (Education Division), Krishi Anusandhan Bhawan, on 'Introduction to MS Office and Page Maker'	Windows 95, MS Word, Page Maker, Excel, PowerPoint and E-mail.	Dr. V.K. Mahajan	1.12.97 to 18.12.97	ICAR Staff (Education Division), Krishi Anusandhan Bhawan,	20

B. International Training Programmes

Sl. No.	Title	Course Contents	Course Coordinator/Co-coordinator	Period	Parti-cipants	No. of parti-cipants
1.	Training in Financial Management in Agricultural Development	MS DOS 6.22, Windows 3.11, Windows 95, Word Star 6.0, Word Perfect for Windows, MS WORD for Windows, LOTUS 1-2-3, dBase IV and MIS, CPM * PERT, Decision support system and Financial Accounting Package of ICAR-ARFIS etc.	Dr. S.D. Sharma	19.1.97 to 5.2.97	Nigerian Government Officials	1
2.	Training in Human Resource Development	MS DOS 6.22, Windows 3.11, Windows 95, Word Star 6.0, Word Perfect for Windows, MS WORD for Windows, LOTUS 1-2-3, dBase IV and MIS, CPM * PERT, Decision support system and Financial Accounting Package of ICAR-ARFIS etc.	Dr. S.D. Sharma	19.1.97 to 5.2.97	Nigerian Government Officials	1
3.	International Training Course for Nigerian Government Officials on 'Advance Course on Computer Application. and Maintenance'	Introduction to Human Resource Development, Management Information System, HRD Information System, Introduction to Computers and Computing, Introduction to MS-DOS and Windows-95, Microsoft Office, Internet and Internet Tools, Knowledge Base Systems, Advances in Information Technology, Information and Database packages of ICAR and IASRI (ARFIS, ARPIS, FMS, ARDIS, Payroll and GPF packages, Cost Accounting, AEIS) Program Scheduling PERT/CPM, Networking and E-mail, Computer Centre Management and Cost Accounting. Computer Hardware Maintenance and Testing, Computer Hardware/Software Procurement.	Dr. P.K.Malhotra/ Sh. Ravi Kumar Badge	29-9-97 to 27-10-97	Nigerian Government Officials	1



Director presenting a memento to a Nigerian participant of an International Course

Inauguration of training course on `Modern Sampling Techniques'

Valedictory function of training programme on 'Use of Computers in Agricultural Research'

Institute Joint Staff Council Meeting in progress

4.	International Training Course for Nigerian Government Officials on 'Management of Training and Dev. with Computer Application.'	Introduction to Human Resource Development, Management Information System, HRD Information System, Introduction to Computers and Computing, Introduction to MS-DOS and Windows-95, Microsoft Office, Internet and Internet Tools, Knowledge Base Systems, Advances in Information Technology, Information and Database packages of ICAR and IASRI (ARFIS, ARPIS, FMS, ARDIS, Payroll and GPF packages, Cost Accounting, AEIS) Program Scheduling PERT/CPM, Networking and E-mail, Use of Remote Sensing Technology, Use of Geographical Information System in Agriculture, Computer Centre Management and Cost Accounting.	Dr. P.K.Malhotra/ Sh. Ravi Kumar Badge	29-9-97 to 27-10-97	Nigerian Government Officials	1
5.	International Training Course for Nigerian Government Officials on 'Comp. App. in Human Resource Development'	-- do --	Dr. P.K.Malhotra/ Sh. Ravi Kumar Badge	29-9-97 to 27-10-97	Nigerian Government Officials	1

C. Training Programmes/Seminar Organised at the Institute by other Organisations:

Sl. No.	Training Type	Organised by	Period	No. of participants
1.	I ARIS Training	HCL	31-07-97 to 08-08-97	22
2.	II ARIS Training	HCL	11-08-97 to 20-08-97	6
3.	III ARIS Training	HCL	28-08-97 to 05-09-97	17
4.	IV ARIS Training	HCL	06-09-97 to 12-09-97	7
5.	V ARIS Training	HCL	15-09-97 to 23-09-97	14
6.	VI ARIS Training	HCL	24-09-97 to 01-10-97	7
7.	Computerised ICAR Project Management	World Bank	20-10-97 to 24-10-97	16
8.	Seminar on Integrated Database Management for Research and Planning		03-11-97 to 07-11-97	17

AWARDS AND RECOGNITIONS

The following awards were given to the scientists of the Institute by the Indian Society of Agricultural Statistics (ISAS) during its 51st Annual Conference held at Saurashtra University, Rajkot (Gujarat)

PV SUKHATME MEMORIAL GOLD MEDAL

Sr.No.	Name of the Scientist	Selected for
1.	Dr AK Srivastava	Contributions made in the field of Agricultural Statistics

ISAS YOUNG SCIENTISTS AWARD - 1996

Sr.No.	Name of the Scientist	Title of the Paper
1.	Dr Tauqueer Ahmad	A resampling technique for complex survey data

BEST PAPER AWARD

Sr. No.	Name of Scientist	Title of the paper	Field of Research	Year
1.	Dr RC Goyal Dr Randhir Singh	Estimation of crop yield using post-stratification based on satellite data, XLVI, Aug., 1994	Sampling	1993-94
2.	Sh SD Wahi	Estimators of repeatability for perennial crops, XLVI, Aug., 1994	Statistical Genetics	-do-
3.	Sh Lal Chand	Generalised Heritability and its estimation, XLVI, Dec., 1994	Statistical Genetics	-do-
4.	Dr VK Bhatia	On use of bootstrapping for estimation of confidence interval of heritability, XLVIII, Aug., 1996	Statistical Genetics	1995-96
5.	Dr Rajender Parsad Dr RC Jain	Yield forecast using curvilinear study of yield and biometrical characters, XLVII, Dec., 1995	Applied Statistics	-do-

LINKAGES AND COLLABORATIONS IN INDIA AND ABROAD INCLUDING EXTERNALLY FUNDED PROJECTS

Inter-institutional research programmes were undertaken by the Institute in collaboration with other institutions as given below.

S. No.	Title	Collaborative Agency	Start	Completion
1.	Sample survey to evolve methodology for estimation of fish catch from rivers and streams especially of the hilly areas.	Department of Fisheries, Himachal Pradesh	Nov, 1997	Dec, 1999
2.	Pilot sample survey for estimating the area and yield rates of ginger and potato in hilly areas.	Directorate of Economics & Statistics, Meghalaya, Shillong.	Jan, 1997	Jan, 1999
3.	Use of remote sensing technology in crop yield estimation surveys.	IIRS, Dehradun	Apr, 1995	Jun, 1998
4.	Planning, designing and statistical analysis of data relating to experiments conducted under AICRP on Long Term Fertilizer Experiment.	PC (LTFE) and State Agricultural Universities.	Jul, 1985	Continuing
5.	Planning, designing and analysis of experiments planned on stations under the PDCSR.	Directorate of Cropping System Research, Modipuram, Meerut.	Apr, 1986	Continuing
6.	Planning, designing and analysis of on farm research experiments planned under the PDCSR.	Directorate of Cropping System Research, Modipuram, Meerut.	Apr, 1986	Continuing
7.	Forecasting sugar production and demand in India.	I.I.S.R., Lucknow	Apr, 1996	Mar, 1999
8.	Non-linear statistical models for pre-harvest forecasting of inland fish production from ponds.	P.A.U., Ludhiana	May, 1995	Apr, 1997
9.	Development of Forewarning System for Aphids, Myzus persicae (Sulzer) on Potato.	N.C.I.P.M., New Delhi.	May, 1996	Apr, 1999.
10.	Study of production efficiency and resource use in poultry production	Deptt. of Animal Husbandry Statistics, Govt. of Haryana, Chandigarh	Jul, 1995	Jun, 1998
11.	Economic study of micro irrigation system on farmers' fields	IARI, New Delhi	Apr, 1996	Mar, 1999

RESEARCH COORDINATION AND MANAGEMENT UNIT

Research Coordination and Management Unit (RCMU) was strengthened with the merger of the erstwhile Director's Coordination Unit of the Institute. The Unit is responsible for documentation and dissemination of scientific output of the Institute through IASRI News and Annual Report etc. It also organises National Conferences of Agricultural Research Statisticians once in three years and conducts meetings of Heads of Divisions and Principal Scientists of the Institute from time to time. The Unit also assists the QRT and is responsible for correspondence with ICAR, ICAR Institutes, SAUs and other organisations in India and abroad. The other functions of the unit are: to examine the new Research Project proposals before these are considered by the SRC in respect of importance of problems, its design and final requirements; to monitor the progress of on-going research projects and to bring out half yearly monitoring progress reports; to prepare Annual Action Plan, Activity Milestone, EFC Memo, to maintain the Research Project Files and also their submission to ARIC (ICAR). The Unit also provides help in Art, Photography & Reprographic Services. The following activities were undertaken by the Unit during the year under report:

Publications:

- Vision 2020 IASRI Perspective Plan
  by HVL Bathla, PP Singh and J. Srinivasan
- Annual Report of the Institute for the year 1996-97
  by HVL Bathla, PP Singh, Maharaj Swaroop, Som Dutt, J. Srinivasan and OP Singh
- IASRI News, Vol. 1, No. 2, Oct 96-Mar, 1997
  by HVL Bathla, PP Singh, J. Srinivasan and OP Singh
- IASRI News, Vol. 2, No. 1, Apr-Jun, 1997
  by HVL Bathla, PP Singh, Maharaj Swaroop, Som Dutt, J. Srinivasan and OP Singh
- IASRI News, Vol. 2, No. 2, Jul-Sep. 1997
  by HVL Bathla, PP Singh, Maharaj Swaroop, Som Dutt, J. Srinivasan and OP Singh
- Monitoring Progress Report Mar-Sep, 1997
  by HVL Bathla, Mohan Lal, Anil Kumar, Anil Garg and Ram Shay
- Proceedings of Staff Research Council Meetings held on Aug 26-27, 1997

Communication of Research Material to:

ICAR

- Material for inclusion in the DARE-ICAR Annual Report 1996-97
- Material for Director General's presentation at the Sixty Eighth Annual General Meeting of ICAR Society along with 10

slides highlighting the major achievements / breakthroughs during 1996

- Information on studies conducted by IASRI for submission to Minister of Agriculture
- List of scientists who can act as referees of the Indian Journal of Agricultural Sciences
- Proposal to the Secretary (A&C), Ministry of Agriculture regarding impact evaluation studies of various development programmes from time to time
- Information on meetings of IMC, RAC and SRC of the Institute
- Information regarding the proceedings of 36th Meeting of the Management Committee of the Institute
- Material for publication of handbook of ICAR Institutes
- Comments on QRT recommendations of the Institute
- Information regarding resource generated at IASRI during the current financial year
- Realisation of revenue receipts target fixed by DG
- Proposal of UNDP Project on National Food Security
- Material for Annual Action Plan of ICAR/DARE (1997-98)
- Programme of conferences/seminars, symposia, workshops, meetings etc. in Agriculture proposed to be held during July-December, 1997 and Jan.-June, 1998 by the Institute
- Paper on 'Research Highlights and Future Strategies - Indian Agricultural Statistics Research Institute' for the special issue of Indian Farming"
- Paper on 'Agricultural Statistics and Computer Application in Agriculture - Past, Present and Future Orientation' for the publication "Fifty Years of Agricultural Research in India" to be brought out by the Council
- List of ARS and NET disciplines and qualifications for their examinations alongwith justification about need for introducing computer science as a discipline in ARS.
- Lok Sabha unstarred question regarding expenditure incurred on agricultural research and development
- Information pertaining to Project Coordinators of the Institute
- List of experts in agricultural statistics/Computer Applications
- Information on all the plan schemes in the IX plan document
- Revised EFC Memo for the IX plan
- Research Project Files (RPFs) for ARIC
- Report on the progress made in the matter or problems encountered and any other related issues for implementing the Rules and Guidelines regarding Training, Consultancy, Contract Research and Contract Service in ICAR System for High Powered Advisory Committee
- Action taken report on the recommendations of the Directors' meeting held on Oct 14-15, 1996 and agenda items proposed for the Directors' meeting held on May 5-6, 1997
- Action taken report on the proceedings of the Staff Research Council Meeting held on Mar 13-14, 1996 and presentation of QRT report by the Chairman, QRT

Information supplied to ICAR Institutes

- Training charges for the scientific staff of AFRI, Jodhpur in the areas of experimental/sampling design etc.

Information supplied to other organisations in India

- Schedule of training courses being organised during 1997-98
- Filled-in proformae on Intra-Mural current research projects taken by the scientists of various divisions
- Information on categorisation of the Institute to Indian Council of Medical Research (ICMR), New Delhi

Correspondence with foreign organisations

- Material sent to Director, SAIC regarding information on directory of Agricultural related Training Programmes (short & long) in SAARC countries
- Information on compilation of Union catalogue of Ph.D. thesis accepted, 1994 onwards in Agricultural Universities of SAARC countries
- Directory of Agricultural related training programme (short and Long) in SAARC countries
- Material for the 10th Edition of the Directory for International Research Centres to GALE Research, Michigan, USA

Meetings organised

- Four meetings of Heads of Divisions of the Institute were organised on Jan 28, Apr 15, Sep 9 and Dec 19, 1997
- A meeting of all the Scientists of the Institute with Deputy Director General (Engg.) was organised on Feb 18, 1997
- A meeting of Heads of the Divisions with five members of Vietnamese delegation was organised on Oct 24, 1997
- A meeting of Heads of Divisions with four members of Russian Delegation was organised on Nov. 25, 1997
- Meetings of Staff Research Council of the Institute were organised during Aug 26-27, 1997

In addition to above the following items were undertaken by the Unit.

i. Preparation of the proceedings of the all the HDs/PS meetings

ii. Preparation of Non-plan revised estimates for 1997-98 and budget estimation for 1998-99

iii. Preparation of the draft Souvenir of the Golden Jubilee Celebration of the Independence of India

iv. Circulated information about training programmes/research activities received from various organisations from time to time among the HDs and Principal Scientists of the Institute

v. Sent the following publications to various organisations in India and abroad:

   a) IASRI Annual Report 1996-97
   b) IASRI NEWS
   c) VISION 2020 IASRI Perspective Plan
   d) Monitoring Progress Report ending Mar 31, 1997 and Sep 30, 1997 prepared and distributed

Art, Photography and Reprography

Assisted the scientists in preparing diagrams, charts, histograms and maps for research publications and also visual display of research findings in the exhibition room. It also assisted in transcribing the lectures write-ups on transparencies.

Photographic jobs including exposing, processing and printing of about 250 photographs taken on various important occasions of important research and extension activities of the Institute and some slides were prepared. In addition, enlargement of good number of photographs was also done.

The charts and graphs were up-dated in the light of recent research findings for display in the exhibition room. A number of new charts were also added to the existing ones depicting current research findings. Photographs taken at the special occasions were also displayed. Latest publications were also added.

On Gestetner Copy Printer 5327 machine installed at the unit lab about three lakh pages for three thousand jobs were multicopied and supplied to 200 users of the Institute.

GENERAL/MISCELLANEOUS

LIST OF PUBLICATIONS

Papers Published

1. Batra, P.K., Sreenath P.R. and Prasad R. (1997). Robustness of block designs against interchange of treatments. *Journal of Indian Society of Agril. Statistics* 50(2); 156-167.

2. Chand, L., Wahi, S.D. and Bhatia, V.K. (1996). Relationship among different genetic groups for growth traits in goats. *Indian J.Dairy Sci.*49,(8):511-516.

3. Dhandapani, A., Gupta, VK and Nigam, AK (1996). Variance estimation using proportional frequency plans. *Journal of Indian Society of. Agricultural. Statistics,* XLIX, 267-276

4. Goel, Bal BPS and Bathla, HVL (1997). Research highlights and future strategies: Indian Agricultural Statistics Research Institute, *Indian Farming,* 47(5): 80-85

5. Goel, Bal BPS and Bathla, HVL (1997). Investing in food security: Role of agricultural statistics, *Indian Farming,* 47(7): 57-60

6. Gupta, V.K., Ramana, D.V.V. and Agarwal, S.K. (1997). Weighted A-optimal row column designs for making treatment-control and treatment-treatment comparison. *J.Combinatorics Information and System Sciences* (Special issue)

7. Jaggi, S., Parsad, R. & Gupta, V.K. (1997). General efficiency balanced block design with nequal block sizes for comparing two disjoint sets of treatments. *Journal of Indian Society of Agril. Statistics* 50(1); 37-46.

8. Jain, R.C. and Ramasubramanian, V. (1997). Forecasting of crop yields using second order Markov chains. *JISAS, Vol. L(3).*

9. Jain, R.C. and Agrawal, Ranjana (1997). Statistical models for forecasting yields in crop plants.*Invited paper for special issue of MAEER's MIT Journal on challenges in Plant Science and Agriculture by 2000 A.D.*

10. Kaur, Rajinder & Sikarwar, H.S. (1997). A Statistical study to evaluate the Relative performance of different sources of phosphorus in a rice-rice cropping system; *Annals of agricultural research,* Vol. 18(3): 285-289.

11. Prajneshu and Venugopalan, R.(1997). Statistical modelling for describing fish production in *India. Ind.J.Ani.Sci.,* 67, 452-56.

12. Pandey, R.K., Sarup Shanti and Mahajan V.K. (1997). Analysis of Supply and Job Opportunity of Scientific Manpower in Agriculture. *Manpower Journal*, vol. 33(1):78-86.

13. Pandey, R.K. and Ashok Kumar (1997). Implications of Structural changes in Economic Policy for Agriculture in R.P.Singh (ed) *New Economic Policy and Perspective to Rural Development NIRD*, Hyderabad, pp.201-209.

14. Parsad, Rajendra, Gupta V.K. and Singh V.P.N. (1996). Trace optimal designs with unequal block sizes for comparing two disjoing sets for treatments. *Sankhya*, B, Vol. 58(3), 414-426.

15. Rao, C.H. and Satya Pal (1997). Economic efficiency of Nitrogen and phosphorous fertilization in rainfed green gram (moong) in Telenguna region of A.P. *Journal of Indian Society of Agricultural Sciences*, vol.18(1): 99-101

16. Rao, C.H., and Pal Satya (1997). Economic efficiency of nitrogen and phosphorus fertilization in rainfed green gram in Telangana region of Andhra Pradesh. *Annals of Agricultural Research*, Vol.18; March, 97.

17. Saksena, Asha and Bhatia, Ajit Kaur (1997). Effect of Weather on response of sorgham to long term fertilizer application through cluster analysis. *Indian Journal of Agricultural sciences.* Vol. 67(5): 184-188.

18. Sharma, V.K. (1997). Spatial and temporal patterns of adoption of high yielding varieties of wheat and paddy in India. *Agril. Econ. Res. Rev.*, 10(1); 24-36.

19. Sharma, V.K. and Haque T. (1996). Perspective of technological change in Indian Agricultural - A case of HYV technology. *Agril. Situation in India,* Dec. (1996) 639-644.

20. Sharma, V.K. and Jha G.K. (1997). Pattern of adoption of high yielding varieties of Maize in different states, *Annals Agril. Res.* 18(1); 92-98.

21. Singh, Jagbir and Kathuria, OP. (1997). Estimation of parameteric functions in repeat surveys. *Journal of Indian Society of Agricultural Statistics.* 50(1): 18-28.

22. Srivastava, R., Parsad, R. and Gupta, V.K. (1996). Robustness of block designs for making test treatments - Control comparisons against a missing observation. *Sankhya B,* Vol. 58(3), 407-413.

23. Venugopalan, R. and Prajneshu (1997). Von Bertalanffy growth model with autocorrelated errors. *Ind. J. Fisheries* 44, 63-67.

Research Project Reports Published

1. Agricultural Research Data Book, 1996 (1997)
   by AK Srivastava, PC Mehrotra, KK Tyagi, RS Khatri, Jagbir Singh, RM Sood, JP Goyal, SC Agarwal and BN Chakraborty.

2. A-optimality of block designs for comparing two disjoint set of treatments (1997)
   by Seema Jaggi & V.K. Gupta.

3. A study of behaviour of crop response to long-term fertilizer application with reference to weather (1997)
   by Asha Saksena, Ajit Kaur Bhatia and Harnam Singh Sikarwar.

4. Composite forecast of sugarcane yield (1997)
   by S.C. Mehta and Chandrahas.

5. Estimation of Economic Gains from Technological Advance in rice cultivation (1997)
   by Ashok Kumar and R.K.Pandey.

6. Index of Animal Experiments (Vol.No.1) (1997)
   by GC Chawla,., PR Sreenath,., DD Arora, and BJ Gahlot

7. Non linear statistical models for pre-harvest forecasting of inland fish production from ponds (1997)
   by S.S.Walia, R.C. Jain & R.S. Sehdev.

Other Publications

1. Vision 2020 IASRI Perspective Plan
   by HVL Bathla, PP Singh and J. Srinivasan

2. Annual Report 1996-97
   by HVL Bathla, PP Singh, Maharaj Swaroop, Som Dutt, J. Srinivasan and OP Singh

3. IASRI News, Vol. 1, No. 2, Oct 96-Mar, 1997
   by HVL Bathla, PP Singh, J. Srinivasan and OP Singh

4. IASRI News, Vol. 2, No. 1, Apr-Jun, 1997
   by HVL Bathla, PP Singh, Maharaj Swaroop, Som Dutt, J. Srinivasan and OP Singh

5. IASRI News, Vol. 2, No. 2, Jul-Sep. 1997
   by HVL Bathla, PP Singh, Maharaj Swaroop, Som Dutt, J. Srinivasan and OP Singh

6. Monitoring Progress Report Mar-Sep, 1997
   by HVL Bathla, Mohan Lal, Anil Kumar, Anil Garg and Ram Shay

7. Proceedings of Staff Research Council Meetings held on Aug 26-27, 1997

Dissertations Approved

Ph.D. (Agricultural Statistics)

1. ATMAKURI, RAMAKRISHNA RAO - ***Some contribution to improved estimation of genetic parameters***

The information on different genetic parameters, heritability, repeatability and genetic correlation is a prerequisite to the planning of breeding programmes for animal and plant improvement. An important aspect of these programmes is "selection". It is the only genetically determined variation which can be utilised for effecting permanent improvement in the production characteristics of a population. A quantitative measure of genetic variability is provided by the parameter - heritability coefficient. As heritability is estimated from a function of variance components of the analysis of variance of half-sib, full-sib families or from multilocation trials conducted on several varieties over years, a robust estimation procedure by using bootstrapping technique is devised. Simulation techniques are applied for the generation of master samples, based on half-sib, full-sib and multilocation varietal trial models, for various levels of population heritability parameters. From master samples, bootstrap samples are generated by using computer programme in 'C' and the variance of different mean squares, taking into account their distributional properties, have been used for estimating the different variance components and hence narrow - sense heritability in the case of half-sibs and full-sibs and broad-sense heritability in the case of multilocation varietal trials. An appropriate confidence interval for the full-sib correlation measure of heritability by a moment approximation to the distribution of a linear combination of between sire and between dam mean squares, warranted in such situation, suffers from the fact that the distribution is not determined uniquely and moreover the confidence limits become less reliable when the computations are based on small amount of data. A procedure has also been devised for obtaining reliable confidence limits for the full-sib correlation estimate of heritability.

(Guide:Dr.V.T.Prabhakaran)

2. BHAR, LAL MOHAN - *Outliers in experimental designs*

The collection of statistical methods that have come to be associated with the term 'regression' is certainly valued and widely used. An annoying and often sizable gap remains between the necessary idealized theoretical basis for the methods and their routine application in practice. It is well known, for example, that inferences based on ordinary least squares regression can be strongly influenced by only a few cases (outliers) in the data, and the fitted model may reflect unusual features of those cases.

A large number of tests and procedures have been developed for outliers detection. Out of them Cook-statistic is most important since apart from identifying an outlier it helps to assess the degree of influence an outlying observation may have on the parameter estimates. However, robust techniques and diagnostic procedures, developed for identifying outliers are applicable to full rank models only. And as a consequence they can not be applied to experimental designs because of deficiency in rank of its design matrix. The present investigation aimed at initiating a comprehensive study on outliers in design of experiments.

Some important statistics for testing outliers in the field of designed experiments have been appropriately developed under the mean shift model i.e. the model where the expected value of the outlying observation has been assumed to be shifted from the expected value of the other observations. And this study has been extended to variance -inflation model, where the variance of the outlier has been assumed to be inflated from variance of other observations. These statistics have been developed under the general model of experimental designs, keeping in view that the interest of the experimenter is in the estimation of some functions of parameters (say treatment effects). For better interpretation of these sta istics and to acquire more insight about the consequences the presence of outliers, some specific designs have been considered for special study. Special emphasis is also given to a single outlier case. The newly developed statistics have been illustrated with data obtained from an experiment using partially balanced incomplete block design.

A different kind of study, the robustness against the presence of outliers has also been considered for the present investigation. A completely new robustness criterion has been proposed. Since the proposed criterion is based on the Cook - statistic, the outlying observation has no effect on the estimation of treatment contrasts in designs identified as robust. A number of designs for both one - way and two - way elimination of heterogeneity which are robust against the presence of a single outlier are identified.

(Guide:Dr.V.K.Gupta)

3. DWIVEDI, S.K. - *Computer aided search for optimal designs*

Present thesis deals with optimality aspects in three areas of design of experiments (i) computer aided construction of block designs, (ii) minimally connected designs, and (iii) saturated main effect plans. An algorithm to search for optimal block designs has been developed using the concept of exchange and interchange procedures. Simulation technique has been used for searching the optimal block designs. Chatterjee and Mukherjee (1993) have obtained D-optimal saturated main effect plans for three factors out of which first factor is at two levels. D-optimal saturated main effect plans for three factors when the first factor is at three levels have been obtained. Balasubramanian and Dey (1996) have given row-column design with two rows which is D-optimal. It has been shown through computer

search technique that the design is also A- and E- optimal in a given class. A row-column design has been obtained by keeping minimal number of experimental units when the number of rows are three.

(Guide : Dr. RC Jain)

4. JAYASANKAR, J - *Bootstrap method for studying the distributional properties of estimates of heritability*

Estimation of heritability, an important genetic parameter, is incomplete without the measures of the precision of the estimate. Though some measure of precision are available in the literature they are plagued by the shortcomings, like difficulty in getting an exact value under unbalanced data situations and over dependence on the assumptions of normality. This study targets the better estimation of the precision measures of heritability estimates by using a computer intensive resampling method called "Bootstrap" on the simulated datasets. The Bootstrap algorithm is modified to suit both the balanced and unbalanced sib and parent offspring data. Apart from estimating the bias, variance and confidence interval of the estimator, the probability of getting inadmissible estimates of heritability was also arrived at using the Bootstrap technique. The variance of the precision estimates is also measured by applying resampling tool Jackknife after Bootstrap. In that process a look on the role placed by influential random effects is also cast. The results indicated the overall superiority of the strictly non-parametric Bootstrap over most of the well established analytic measures. The inflation caused in the variance and confidence length by increasing degree of unbalancedness is recorded. The effect of unbalancedness on the skewness and shape of the sampling distribution of different estimates is observed to be significant. Among the various Bootstrap measures it was found that the variance estimators performed better in most of the situations by means of the standard error comparisons.

(Guide: Dr.V.K.Bhatia)

5. PAUL, AMRIT KUMAR - *On some aspects of estimation of genetic parameters for stayability in dairy cattle*

The aptitude of the animal to stay healthy and productive in the herd has been given various names and is directly associated with the longevity / survival / retention status of it. The most common name assigned to this is stayability. The knowledge as well as the genetics of this is very crucial for the success of the future breeding programme for genetic improvement. To achieve this, the study is taken up in two parts. Firstly dealing with the various measures of stayability and secondly related to estimation of heritability of stayabililty adjusted for production and reproductive traits. Different methods of analysis of stayability and different measures along with various relationships of stayability with other characteristics are examined. A procedure based on path coefficient approach for estimation of heritability of herd life by accounting adjustment for more than one character, i.e. production and other economic traits, is developed. The methodology developed has been studied for both the situations whether characters are themselves related or not. The formulae for estimation of heritability of herd life have been derived and extended for several related and unrelated economic traits. Further, different methods such as binomial approach, angular transformation, Dempster Lerner and beta - binomial model approach are taken into account for estimation of heritability of stayability which is considered as a threshold character. From the results based on path co-efficient approach, it has been concluded that while the adjustment will have its impact on the estimation of heritability of stayability but it also depends on number of other things together, i.e. magnitude of genotypic and

phenotypic correlation, sign of correlation and heritability of the characters. From the results of Beta - binomial approach it is concluded that family size and block size have an important role in the estimation of heritabillity of stayability. The unbalancedness may induce inconsistence in the results. The procedure based on real data, Beta-binomial and Dempster-Lerner shows encouraging results whereas procedure based on family mean exhibits very unreliable estimates of heritability. Among the methods which are relatively good, the Beta-binomial is by and large a good procedure of estimation of stayability for different situations of parametric values of heritability and points of truncation.

(Guide : Dr.V.K.Bhatia)

M.Sc.(Agricultural Statistics)

1. AMRENDER KUMAR - *Estimation of crop yield at block level using farmer's technique*

The crop cutting approach is used for the estimating the crop yield at district level. The yield of chosen crop is estimated by the farmer's estimate from a large sample of field while from a sub sample of the field the yield is estimated physically by the method of crop cutting experiments.

For the estimation of crop yield at block level, the crop cut method becomes very time consuming as well as costly affair. The alternative method in which the yield for a block level is obtained by considering the design as simple random sampling and utilising the double sampling technique, the regression estimate is obtained for the yield at block level, using farmer's estimate as auxiliary information. Considering the cost function, sample size for auxiliary variable and efficiency are obtained.

(Guide: Dr. A.K. Srivastava)

2. MOHAMMED, WASI ALAM - *Time series statistical analysis for modelling lac production in India*

This dissertations deals with the development of an adequate and parsimonious model for forecasting India's lac production through univariate Box-Jenkins technique. This technique is based on solid foundation of classical probability theory unlike traditional univariate time series technique. This technique involves three iterative stages for selection of a parsimonious model. Among these three stages, the first is the identification stage, which guide in, how to select two or more models as candidate models on the basis of computed values of ACF and PACF. At the estimation stage, the coefficients of the models selected at identification stage are estimated and checked for its adequacy. At the final stage (diagnostic checking stage) on the basis of computed values of goodness of fit statistics one most adequate model, ARIMA (0,1,2) model has been selected for forecasting India's lac production.

(Guide: Shri S.D. Wahi)

3. SANJEEV KUMAR - *On prediction of varietal performance under heterogeneous variance structure*

The estimation of yield of genotypes in different environments play an important role in the study of Genotype-Environment (GE) interaction and stability analysis of genotypes. Thus, in this dissertation BLUP (Best Linear Unbiased Prediction) has been introduced for predicting yield in multilocation yield trials, because it has better accuracy in predicting yield, and works under the mixed model. Here environments are considered as fixed effects and genotypes and GE interactions as random. Emphasis has been given that most of the real data-sets do not confirm the homogeneity of error mean squares (ESM) which is a major assumption of conventional BLUP. To overcome this

limitation of conventional BLUP regarding the heterogeneity of EMS a modification in BLUP has been compared with the conventional BLUP under different levels of EMS. It has been found that the accuracy of modified BLUP is far better than the conventional BLUP in predicting yield of genotypes in multilocation yield trials.

(Guide: Dr. P.S. Rana)

M.Sc. (Computer Application)

1. HIMANSHU -*Computerized paper setting and evaluation system with a case study in computer application*

Computerised Examination Paper Setting and Evaluation is an attempt to automate the work of question paper setting on-computer examination and evaluation of answers. The system is user-friendly and provides Graphics interface for its operation. The system also provides facility for creating new question bank, updating the question bank by adding subject/topic. The system has been designed using object-oriented development methodology and implemented using Microsoft Visual C++

(Guide: Sh. Mahesh Kumar)

2. LAKSHMINARYANAN SHYAMAL - ***A cluster analysis package for one - dimensional gel-electrophoregram data***

Electrophoresis is a powerful technique used to study the composition of biomolecules such as isozymes, protein and nucleic acids. The presence or absence of particular isozymes are genetically determined and hence they can be used as attributes in the study of variation. Cluster analysis is a useful aid in summarising and exploratory data analysis of such variations.

The package, GELCLUST, which has been developed, allows for visual editing of band and lane patterns that are obtained from electrophoregrams (either manually or through other software) and applies hierarchical agglomerative clustering to produce dendograms. The similarity of lanes can be based on either Jaccard or Sorensen (=Nei and Li) indices and transformed to distance measures by one of three transformations. The distance matrices may also be viewed. To this distance matrix, one may apply single linkage, complete linkage, unweighted centroid, weighted centroid, weighted average, UPGMA or Ward's (minimum sum of squares) clustering procedures. The results are saved into a cluster information file and also as a dendogram plot. The package includes on-line help and documentation. This package has been developed using Microsoft Visual C++ and involves the use of object-oriented design and programming under the Windows-95 platform.

(Guide:Sh.S.N.Mathur)

3. SANJEEV KUMAR - ***Some image processing applications for remote sensing***

Remote sensing has made rapid advances since its inception a few decades ago and has established itself as a powerful tool in providing information in many resource areas. Availability of data with very high ground resolution is opening up new application areas hitherto unknown. Therefore, the User friendly image processing software for remote sensing is developed to generate images using IRS (Indian Remote Sensing) Satellite image data (Multi-special scanner data) and it enhances the image to improve the visual interpretation and identification of objects in the senses. The software does not require any special hardware like image processing card. The basic requirement of the software is a PC with Windows95 operating system and colour monitor. The software is designed using

Object-oriented design methodology and implemented through Microsoft Visual C++ Ver.4.0

The software allows for the following operations on remote-sensing image data.

Make False Colour Composite Image.

View image of individual band data.

View Histogram of image data.

Enhance image by applying contrast stretching (linear or special contrast stretch).

Edge detection and enhancement.

Calculates vegetation indices (Simple ratio vegetation index and Normalized difference vegetation index).

Classify image (Unsupervised).

Zoom image.

(Guide: Sh. Mahesh Kumar)

LIST OF APPROVED ON-GOING PROJECTS

No.	Project title	Project leader and associates
1.	Pilot sample survey to develop a sampling methodology for estimation of poultry meat production.	Mahender Singh
2.	Sample survey to evolve methodology for estimation of fish catch from rivers or streams specially of the hilly areas	HVL Bathla KK Kher AK Gupta
3.	Study for estimation of area and production of important vegetable crops on the basis of partial harvest	AK Srivastava DL Ahuja DC Mathur K Chug
4.	Pilot sample survey for estimating the area and yield rates of ginger and potato in hilly areas.	SS Gupta MS Narang RC Gola
5.	Studies on feed intake by bovines through stall feeding and grazing	BC Saxena KK Tyagi
6.	Estimation of flow and changes in dynamic population	Jagbir Singh
7.	To study the effect of various input components on the yield of important vegetable crops	AK Gupta
8.	Small area estimation of milk production	DK Bhatia SN Arya HC Gupta
9.	Estimation of regression coefficients from sample survey data.	UC Sud Anil Rai IC Sethi VPN Singh
10.	An analysis of yield gap for buffaloes milk	Satya Pal RM Sood T Rai
11.	A study of variance estimation in complex surveys	VPN Singh Anil Rai VK Jain

No.	Project title	Project leader and associates
12.	Use of remote sensing technology in crop yield estimation surveys	Randhir Singh RC Goyal
13.	Use of remote sensing satellite data in crop surveys (AP Cess funded project)	Randhir Singh RC Goyal
14.	Development of database relating to basic and current agricultural and allied statistics over time and space.	NK Ohri Bal BPS Goel (upto Oct, 1997) MS Narang
15.	Planning, designing and analysis of on farm research experiments planned under Project Directorate of Cropping System Reserarch (PDCSR)	P.K. Batra N.K. Sharma, Mahesh Kumar
16.	Planning, designing and analysis of experiments planned at research stations under the project Directorate for cropping system research.	Rajinder Kaur Ajit Kaur
17.	Planning, designing, statistical analysis of data relating to experiments conducted under AICRP on long term fertilizer experiments	M.R. Vats D.K. Sehgal, D.K. Mehta
18.	Agricultural Experiments Information System for Animal Sciences	G.C. Chawla
19.	Agricultural Field Experiments Information System for Crop Sciences	P.K. Batra O.P. Khanduri, D.C. Pant
20.	Cataloguing and construction of variance balanced block design computer algorithm for construction	Rajendra Parsad V.K. Gupta, O.P. Khanduri
21.	Studies of design for two or more sets of treatments applied at different period of experimentation	Seema Jaggi R. Srivastava V.K. Gupta
22.	Construction of efficient designs for asymmetrical factorial experiments.	D.P. Handa P.R. Sreenath
23.	Study of heterogeneity of error variances in agricultural field experiments.	Rajendra Kumar P.R. Sreenath

No.	Project title	Project leader and associates
24.	Application of bootstrap techniques for studying statistical properties of genetic parameters	SDWahi VK Bhatia Lal Chand
25.	Statistical Modelling for comparing genetic groups of crossbred goat for growth studies based on multiple traits.	Lal Chand SD Wahi VK Bhatia
26.	A study to compare the performance of different methods of estimating repeatability and to assess their stability by bootstrap techniques	SP Verma RK Jain
27.	Study of contagious distributions and dynamical models for aphid population growth	Prajneshu
28.	Investigations on the properties of projection matrices in population biology	PS Rana Indra Singh
29.	A study of behaviour of crop response to long term fertilizer application with reference to weather	Asha Saksena, Ajit Kaur Bhatia, H. Singh Sikarwar
30.	Yield forecast based on weather variables and agricultural inputs on agro-climatic zone basis	Ranjana Agrawal RC Jain SC Mehta
31.	Non-linear statistical models for pre- harvest forecasting of inland fish production from ponds	SS Walia RC Jain RS Sehdev (PAU, Ludhiana)
32.	Study to develop models for assessing the effects of floods on yield of crops	Jagmohan Singh BH Singh Ranjana Agrawal
33.	Use of discriminant function of weather parameter for developing forecast model of rice crop.	T. Rai Chandrahas
34.	Pilot study for developing Bayesian probability forecast model based on farmers' appraisal data on wheat crop.	Chandrahas T Rai Onkar Swarup

No.	Project title	Project leader and associates
35.	Forecasting sugar production and demand in India.	Bengali Baboo (IISR, Lucknow) Ranjana Agrawal RC Jain
36.	Development of forewarning system for Aphids, Myzus persicae (Sulzer) on Potato	RC Jain, SC Mehta, LM Bhar
37.	Estimation of farm level technical efficiency and its related parameters under error decomposition methodology of stochastic frontier model in the production of wheat.	S.S. Kutaula R.K.Pandey
38.	Economic Study of Micro-irrigation Systems on Farmers' Fields.	Ashok Kumar U.N. Dixit Ant Ram Ashwani Kumar (IARI) Manoj Kumar (IARI)
39.	Study of Production Efficiency and Resource use in Poultry Production	S.P. Bhardwaj V.K. Mahajan R.K. Pandey
40.	Study of Demand for Agricultural Products and its implications for Food security in India.	R.K. Pandey

CONSULTANCY, PATENTS, COMMERCIALISATION OF TECHNOLOGY

ADVISORY/CONSULTANCY SERVICES PROVIDED

Sl. No.	Nature of advisory/ consultancy service	Given to whom
1.	A study on equines in the household economy of the poor	1. Director, N.R.C.E., Hissar
2.	Methodology to estimate area and production of coconut and Arcanut	2. Director, Directorate of Eco. and Stat., Govt. of Tamil Nadu
3.	Methodology for estimation of area and production of fruits and vegetables	3. Joint Director (Stat), Board of Revenue for Rajasthan, Ajmer
4.	Methodology for conducting crop cutting experiments on Horticultural and Cash crops.	4. Director, Directorate of Eco. and Stat., Meghalalya, Shillong.
5.	Dissertation on "Developing and appropriate software to study the basic tools of statistics"	5. Himanshu Barthwal, student (Post Graduate Diploma in Computer Application) from Pusa Polytechnic, New Delhi.
6.	Methodology for estimation of area of production of fruits, vegetables and minor crops.	6. Field Officer and Field Supervisors of the Deptt. of Horticulture, Govt. of Punjab at Chandigarh and Amritsar.
7.	Methodology for estimation of area and production of fruits and vegetables.	7. Statistical Officer of the Deptt. of Board of Revenue for Rajasthan. 8. Director, Directorate of Eco. & Stat., Meghalaya, Shillong.
8.	Computerisation and data analysis of ARS/NET/SRF examination - 1997.	9. Agricultural Services Recruitment Board , ICAR, New Delhi
9.	Computerisation and data analysis of F&AO and AOs examination - 1997	10. -do-

Sl. No.	Nature of advisory/ consultancy service	Given to whom
10.	Consultancy in Agricultural Research Data Analysis	11. Sh. D. Behra, Ph.D. Student, IARI, New Delhi. 12. Sh. Iqbal Singh, M.Sc. Student, S.K.Univ.of Agril.Sci.& Technology, Vegetable Research Station, Ponichak, Jammu. 13. Sh. Maharani Din, Research/Training Organizer Krishi Vigyan Kendra, Shri Bhagat Bhakti Ashram, Rampura , Rewari-123 401. 14. Dr. T.S. Verma, Principal Scientist(Veg.) & Head, IARI Regional Station, Katrain, (Kullu Valley), HP- 175129. 15. Sh. Rajesh Kumar Jain, Ph.D. Student, Meerut University. 16. Sh. Prabir Ranjan Paul, Ph.D. Student, Meerut University. 17. Sh. Praveen Kumar, M.Sc. Student, Meerut University. 18. Sh.Bateshwar Kumar, M.Sc. Student, Meerut University. 19. Sh. Ram Kumar Raghav, M.Sc. Student, Meerut University. 20. Sh. Bajender Kumar Tyagi , M.Sc. Student, Meerut University.

RAC, MANAGEMENT COMMITTEE, SRC, QRT ETC. MEETINGS WITH SIGNIFICANT DECISION

Research Advisory Committee

The Second meeting of the RAC of IASRI was held on 18th August, 1997. The Chairman Prof. Y.K. Alagh, Union Minister of State for Power and Science and Technology (Independent Charge) could not attend the meeting. As suggested by him, Dr. MN Das, the seniormost member of the FAC chaired the meeting. Dr DL Ahuja, Senior Scientist is the Member Secretary.

Some of the important decisions taken on which the Institute has to take action are as follows:

1. Formulation of an AP Cess Fund project on Methodology for estimation of livestock products, F & V, tree crops etc.

2. Project Formulation should precede consultation with users orgnaisations.

3. The Institute is to formulate models in Agriculture to capture post GATT economic Scenario.

4. Studies on `Yardsticks'

Management Committee

The Director of the Institute, who is incharge of the overall management of the Institute, is assisted in the discharge of his functions by the Management Committee of the Institute (constituted by the Council) by providing a broad-based platform for decision making process by periodically examining the progress of the Institute activities and by recommending suitable remedial measures for bottlenecks, if any. The 36th & 37th meetings of the Management Committee were held on May 26 & Oct 06, 1997 respectively under the Chairmanship of Prof. Bal B.P.S. Goel, Director.

The Management Committee examined the progress of utilization of fund for 1997-98. It recommended for provision of additional fund both under Plan and Non-Plan at RE stage due to inadequacy of provision in sanctioned BE. It also prioritised and approved items for utilisation of budget and also approved redeployment of vacant posts to meet the requirement under priority area by change of qualification within same technical category without any additional financial involvement. The Management Committee also approved the course content for S.C.C. Course, constitution of Grievance Committee of IASRI besides other routine approval to the agenda items within its purview.

Staff Research Council

The Staff Research Council (SRC) of the Institute is an important forum to guide the scientists in the formulation of new research projects and to review the progress of on-going research projects periodically. It also, monitors the follow up action on the recommendations of the Quinquennial Review Team (QRT) in respect of technical programmes of the Institute.

Meetings of the SRC were held under the Chairmanship of Prof Bal BPS Goel, Director of the Institute during Aug 26-27, 1997 for consideration of one new research project proposal and to review of progress of 41 on-going research projects. Dr HVL Bathla, Principal Scientist & Head (RCM) is the Member-Secretary of the SRC.

Quinquennial Review Team

During the year under report Quinquennial Review Team (QRT) submitted its report on IASRI for the period 1987-1995. On the basis of recommendations made by QRT the approval of the Council has been received for compliance . The important recommendations are as below:

1. The existing post of Joint Director (JD), Computing Science will be made a general post of JD who would not only look after computing science but also research and other activities of the IASRI.

2. Eventually, IASRI will have only four Divisions, viz.

    i. Division of Sample Survey & Forecasting Techniques
    ii. Division of Design of Experiments
    iii. Division of Bio-Statistics
    iv. Division of Computer Applications

By looking to the present incumbents of HOD's of the existing 6 Divisions and their period of retirement such a scheme is possible after 1999. While advertising for HOD's posts in future, this has to be kept in view. The two Divisions which would be phased out are Division of Forecasting Technique and Division of Statistical Economics. IASRI may retain 3 scientists in the discipline of Agricultural Economics to be placed in other Division for the study of economic aspects of the various projects. The rest of the agricultural economists can be transferred to other ICAR Institutes.

3. Since teaching of fundamentals of agricultural sciences is taught in the M.Sc. courses in agricultural statistics for students from non-agricultural streams, there is no need to test at the admission stage any non-agricultural student in agriculture. IASRI can take up this issue with IARI and settle it.

4. Since NARS required qualified and trained professionals in computer applications in agricultural sciences, M.Sc. degree in computer applications should be continued in IASRI. However, steps will have to be taken to recruit qualified staff, provide advanced training to existing staff and up-date the curriculum on the lines of MCA as approved by the All India Council of Technical Education (AICTE).

5. IASRI should revive training courses leading to junior and senior certificates of degree to meet the renewed demands by state departments.

6. The name of the Division of Design of Experiments and Analysis of Experimental Data should be changed to Design of Experiments. The name of the Division of Sample Survey Methodology and Analysis of Survey Data should be changed to Division of Sample Survey. In view of the structural change suggested under point 2 above eventually the Division of Sample Survey would be changed to Division of Sample Survey and Forecasting Techniques. The Division of Statistical Economics may continue with the same name till it is phased out as suggested under point 2. The name of the Division of Computer Science should be changed to Division of Computer Applications.

7. IASRI should take up only a small number of projects (not exceeding say 6 at any point of time) of national importance. A few areas in which such projects can be taken up are crop forecasts, small area estimation and remote sensing, yield forecast during growth, development of data base for agricultural experiments, genetics and

Research Advisory Committee Meeting of the Institute in progress

Management Committee Meeting of the Institute in progress

Scientist presenting progress of the project in SRC Meeting

Meeting of the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics

bio-statistics and agricultural planning model. All project proposals should go through a process of anonymous external review before being put up to the SRC.

8. Training of Scientific, administrative and financial staff in new trends and methodologies should be an on-going and continuous activity.

9. IASRI, in general, even in the existing disciplines, faces an acute shortage of well trained statisticians in the middle level. The Institute should try to recruit not only at the Principal Scientist level but also at the middle level (i.e. Senior Scientist level). The Institute badly needs strengthening the personnel in certain basic and new areas like statistical inference, multivariate analysis, stochastic processes, optimization techniques, time series analysis, statistical genetics, statistical computing and information technology. ICAR will provide all support to strengthen IASRI staff by new blood at all levels particularly in the cutting edge areas of statistical science/research.

10. IASRI should work in close collaboration not only with other ICAR institutions, Agricultural Universities and Central and State Departments of Agriculture, but also with Universities and other scientific organisations involved in agriculture Statistics, Computer Applications, Remote Sensing and other related areas.

11. IASRI should assure greater responsibility in monitoring and standardizing teaching of agricultural statistics in Agricultural Universities. IASRI in consultation with DDG(Edn.) can undertake this activity.

12. Provision of adequate budget be made for visiting scientists scheme. This, in conjunction with other resources, will facilitate strengthening human resource and research capacity of IASRI. Adequate budget may be provided under this activity during IX Plan.

13. A separate travel office and protocol section be opened subject to the condition that IASRI will establish this with its own resources.

14. Maintenance of staff cars, guest houses and hostels is very poor and needs priority attention.

15. Transport (vehicle) facility is very poor and old vehicles need immediate replacement.

16. Scientist should be encouraged to publish their research findings in statistical journals of repute.

17. Research and Publication system needs to be strengthened and re-organised. There should be a Research and Publication Committee (RPC) to do this job and the existing monitoring and co-ordinating cells may have to be wind up.

18. The library should subscribe more to journals in statistical and computing science.

PARTICIPATION OF SCIENTISTS IN CONFERENCES, MEETINGS, WORKSHOPS, SYMPOSIA ETC. IN INDIA AND ABROAD

INSTITUTE'S PARTICIPATION IN CONFERENCES, WORKSHOPS, SYMPOSIA ETC.

Sr. No.	Name of the Scientist	Programme	Venue	Period
1.	2.	3.	4.	5.
1.	Prof BBPS Goel Dr HVL Bathla Dr BC Saxena Dr KK Tyagi Dr Jagbir Singh Dr Anil Rai Dr RC Jain Dr GC Chawla	84th Session of Indian Science Congress	Delhi University, Delhi	Jan 03-08
2.	Prof BBPS Goel Dr AK Srivastava	Symposium on 'Statistics as an interface in indisciplinary research methodology and data analysis'	ISI, Calcutta	Feb 07-08
3.	Prof BBPS Goel	Second Annual Conference of Indian Society of Information Theory and Application	CCS Haryana Agri-cultural University, Hissar	Feb 07-09
4.	Prof BBPS Goel	The conference on 'TROPNET, 97'	Meteorological Society, Bangalore	Feb 10-14
5.	Prof BBPS Goel	National seminar on 'Survey Sampling Design of Experiments and Statistical Inference'	Sardar Patel University, Vallabh Vidya Nagar, Gujarat	Feb 20-22
6.	Prof BBPS Goel Dr AK Srivastava	Conference and exhibition on 'Strategy for development of full potential of Phytomedicines for employment Generation Export and Health for all'	Pragati Maidan, New Delhi	Feb 21-22

1.	2.	3.	4.	5.
7.	Prof BBPS Goel Dr Anil Rai	National Conference on Global Positioning System	IIT Kanpur	Feb 21-23
8.	Dr Aloke Lahiri	All India Conference of Statisticians	JVG College, Baraut (Meerut)	Mar 08-09
9.	Dr PK Malhotra Dr VK Mahajan	Workshop on Computer in Agricultural Production & Management	CINADCO, Israel	Mar 12- Apr 09
10.	Prof BBPS Goel	UNESCO regional workshop on Internationally developed data analysis and management software package organised by DSIR/NISSAT/ NISTADS	CSIR, New Delhi	Mar 17-21
11.	Prof BBPS Goel	Seminar on 'Modern Technologies and Rural Development'	Sir Chhotu Ram Rural Technical Institute Delhi	Mar 27-29
12.	Prof BBPS Goel Sh. RS Khatri	XXVIII Conference on 'Dairy Industry' jointly organised by Indian Dairy Association and Karnataka Maha Federation	IIS, Bangalore	Apr 27-29
13.	Dr. VK Bhatia	Training work shop on administrative vigilance	CERPA, New Delhi	Jun 4-6
14.	Dr AK Srivastava	Workshop on improvement of skills of Technical Personnel	Krishi Bhawan, New Delhi	Jun 05-06
15.	Prof BBPS Goel Dr Randhir Singh	National Workshop on Improvements of Agricultural Statistics organised by DES, Min. of Agriculture	Krishi Bhawan, New Delhi	Jun 05-06
16.	Prof BBPS Goel	The workshop on India's Socio-economic research priorities in Agriculture organised by Australian Centre for International Agricultural	New Delhi	Jul 03
17.	Dr PK Malhotra	Seminar on Information and Security organised by NIIT	New Delhi	Jul 15-16

1.	2.	3.	4.	5.
18.	Dr AK Srivastava	National Workshop on Livestock Census	Krishi Bhawan, New Delhi	Jul 16
19.	Prof BBPS Goel Dr HVL Bathla Dr RK Pandey	Workshop on `Institutionalising agricultural research priority setting, monitoring and evaluation in NARS'	IARI, New Delhi	Jul 21-23
20.	Prof BBPS Goel	Workshop on `Commercialisation of Indigenous Technologies'	IIT, Delhi	Aug 22-23
21.	Dr HVL Bathla	Technological Appreciation seminar on the Intellectual Property Rights	IIT, Delhi	Sep 13
22.	Dr RK Pandey Dr MS Narang Dr SP Bhardwaj	V Annual Conference on 'Agriculture-Industry Interface in the changing Economic environment organised by Agricultural Economics Research Association (India) New Delhi	NCAP and IASRI, New Delhi	Sep 16-17
23.	Dr V.K. Mahajan Dr RC Goyal Sh OP Khanduri Sh VH Gupta	In-country working seminar on Integrated Database Management for Planning and Research	IASRI, New Delhi	Nov 03-07
24.	Dr RK Pandey	Workshop on teaching Natural Resource Economics in India Universities organised by Indian National Resource Economics and Management Foundation, Anand	NCAP, New Delhi	Nov 11
25.	Dr Ravi Kumar Badge	National Symposium for citriculture	NRCC, Nagpur	Nov 17-19
26.	Dr VK Gupta	Workshop on 'Research level exposition on optimal designs with reference to growth curve model and random coefficient regression model'	ISI, Calcutta	Nov 28-29

1.	2.	3.	4.	5.
27.	Dr SD Sharma Dr AK Srivastava Dr HVL Bathla Dr RK Pandey Dr VK Sharma Dr (Mrs.) Ranjana Agrawal Dr KK Tyagi Sh RS Khatri Dr VK Bhatia Sh Satya Pal Sh RM Sood Sh.K Chugh Dr Anil Rai Dr Tauqueer Ahmad Mrs Rajinder Kaur Dr Aloke Lahiri Sh T. Rai	51st Annual Conference of Indian Society of Agrl. Stat.	Saurashtra University, Rajkot	Dec 06-08
28.	Dr SD Sharma	ISNAR/ICAR Workshop on Information Technology Policy for Agriculture Research	NAARM., Hyderabad and New Delhi	Dec 08-11 and Dec 13-17
29.	Dr VK Gupta Dr L.M. Bhar Dr Seema Jaggi	International conference on Recent Advances in Statistics and Probability.	I.S.I., Calcutta	Dec.29-Jan 1, 1998

INSTITUTE'S PARTICIPATION IN MEETINGS

- The second meeting of the 'Technical Committee set up under the Plan Scheme for Estimation of Marketable Surplus and Post-harvest losses of foodgrains' of the Directorate of Marketing and Inspection, Govt of India, Nagpur held at Krishi Bhavan, New Delhi on Jan 27, 1997.

- The meeting of the Expert Group to review the methodology of building crop forecast/advance estimates of the Ministry of Agriculture, Deptt. of Agriculture & Cooperation, Krishi Bhavan, New Delhi held at IASRI on Feb 03, 1997.

- The meeting of Project Screening Committee on Agriculture Economics, Statistics and Marketing at Krishi Bhavan, New Delhi on Mar 10, 1997.

- Discussions with the Director, National Centre for Agricultural Economics and Policy Research, New Delhi and Project Director, PDCSR, Meerut on the possibility of a research project on socio-economic issues for the cropping system experiments held at IASRI on Mar 22, 1997.

- The meeting for "Market Research - to assess agro-input consumption, crop production and finance mobilization by different categories of farmer" organized by Rallis India at New Delhi on Apr 26 and Jun 9, 1997.

- The meeting of the Institute Joint Staff Council (IJSC) was held on Apr 28, 1997 under the Chairmanship of Prof. Bal B.P.S. Goel, Director.

- Third meeting of the Expert Committee on Small Area Statistics of Deptt. of Statistics, Ministry of Planning & Programme Implementation, Govt. of India at New Delhi on Apr 28, 1997.

- The 36th meeting of the Management Committee of the Institute was held on May 26, 1997 under the Chairmanship of Prof. Bal B.P.S. Goel, Director.

- Meeting of the ICAR Directors at New Delhi on May 5-6, 1997.

- Meeting of the ICAR Scientific Panel on Agricultural Engineering and IX Plan Activities at New Delhi on May 8-9, 1997.

- Meetings, at Forest Research Institute (ICFRE), Dehradun for reviewing their research projects to advise on statistical analysis and research design during Jun 4-7, 1997.

- Meeting of the "Technical Committee for Estimation of Marketable Surplus and Post-Harvest Losses of Foodgrains" of the Directorate of Marketing & Inspection, Govt. of India held at Nirman Bhavan, New Delhi on Jun 16, 1997.

- Meeting of the Technical Committee of Direction for Improvement of Animal Husbandry and Dairying Statistics of the Department of animal Husbandry & Dairying, Ministry of Agriculture, Govt. of India, New Delhi, held on Jul 7-8, 1997.

- Meeting of the Technical Committee for estimation of marketable surplus and post harvest losses of foodgrain on Jul 16, 1997 held at Nirman Bhavan, New Delhi.

- The Inaugural Function of the FAO/WIEWS Technical meeting at National Bureau of Plant Genetic Resources, New Delhi on Jul 28, 1997.

- The meeting of the Executive Council of the Indian Society of Agricultural Statistics was held at New Delhi on Aug 21 and Oct 15, 1997.

- The meeting of the Cadre Review Committee of ICAR for Group-A administrative posts was held on Sep 04, 1997 under the chairmanship of Dr. Kirti Singh, Member, ASRB.

- Group meeting on sugar production in India held at IISR, Lucknow on Sept 06, 1997

- The meeting of the Task Force to examine and workout the modalities of implementing a proposal of 'Forecasting Agricultural output using Space Agrometerology and Land Based Observations', a (FASAL) Project of

DES, Deptt. of Agril. and Cooperation, Ministry of Agriculture, Government of India held at New Delhi on Sep 22, 1997

- Meeting of SEARC Technical Committee on Agriculture held at New Delhi on Oct 13, 1997

- Meeting with Sh. JNL Srivastava, Addl. Secretary, Ministry of Agriculture, Deptt. of Agri. & Co-operation., Krishi Bhawan regarding a project on Forecasting Agricultural Production in the context of FASAL Project held at New Delhi on Oct 15, 1997

- Meeting of Executive Council of Indian Society of Agricultural Statistics held at New Delhi on Oct 15, 1997

- Task Force meeting on 'Forecasting Agricultural output using Space Agrometerology and Land Based Observations (FASAL) Project of DES, Deptt. of Agril. and Cooperation held at Space Application Centre, Ahmedabad on Oct 17, 1997

- Meeting of High Level Coordination Committee for Haryana, Deptt. of Agriculture held at Chandigarh on Oct 20, 1997

- Meeting of ADG's/PDs of the Crop Science Division of the ICAR on Varietal evaluation trials/statistical analysis etc. chaired by Dr. Mangala Rai, DDG (CS) held at New Delhi on Oct 23, 1997

- Meeting on National Agricultural Technological Project (NATP) held at Krishi Bhawan, New Delhi on Oct 28 & Nov 10, 1997

- Fourth Steering Committee meeting on 'Post Harvest Losses' held under the chairmanship of Sh. Balbir Singh, Joint Secretary, Ministry of Food and Consumer Affairs at New Delhi on Nov 18, 1997

- Meeting on CABI data base compendium for Crop Protection launch ceremony held at New Delhi on Nov 18, 1997

- Meeting of ICAR Scientific Panel on Agricultural Engineering held at IASRI, New Delhi on Nov 24, 1997

- Meeting of Standing Technical Committee on Crop Forecasting and Improvement of Agricultural Statistics of DES, Ministry of Agriculture held at New Delhi on Dec 23, 1997

- Meeting with Prof. MN Das on the development of Yardsticks of production held at IASRI, New Delhi on Dec 26, 1997

WORKSHOPS, SEMINARS, SUMMER INSTITUTES, FARMERS' DAY ETC. ORGANISED AT THE INSTITUTE

Summer School on "Network Management and Informatics"

A summer school aimed at upgrading the skills of the faculty members/Research scientists of the National Agricultural Research System was organized at the Institute from May 26 to Jun 24, 1997. Dr SD Sharma was the Director of the School. It was inaugurated by Prof. Gajendra Singh, DDG(Engg.), ICAR. He emphasized the role of ARIS Network of ICAR and elaborated on the steps being taken by the Council for the training of the scientists and faculty members from NARS and pointed out that one of the immediate goals of ICAR is to establish a nation wide Computer Network under ARIS program. Prof. Singh remarked that keeping in view the importance of the subject, there is a need to organise a winter school of this kind. The school was attended by thirty participants from ICAR Institutes / Project Directorates/ National Research Centres / National Bureaux and the State Agricultural Universities from all over the country.

The participants were introduced to Windows 95, MS-OFFICE suite including, MS-WORD, MS-PowerPoint, MS-Excel and MS-Access. Networking under UNIX, C and C++programming, Novell Netware under DOS, INTERNET, Network Protocols, Standards, Types, Layers, E-mail applications, Statistical Software packages SAS, SPSS, GenStat and SPAR1, Database designing and Application programming, Computer Viruses, Data Protection, HW/SW configuration and maintenance, Crop simulation modelling, IPM databases on INTERNET, ARFIS, Personnel Information System, Remote Sensing application, Agricultural Field Experiments Information System besides other miscellaneous topics.

Prof.S.L. Mehta, DDG(Edn.), ICAR delivered the valedictory address and also distributed certificates to the participants.

The Annual Day

The annual day of the Institute was celebrated on Jul 02, 1997. As a part of these celebrations, the declamation contests separately for the scientists and students were held on Jul 01, 1997. The topic of the contest was "Role of Agricultural Statistics and/or Computers in Environmental Sciences and/ or Biotechnology". In the afternoon session a debate for technical & administrative staff was organised. The topic of the debate was "Automation in Office is Essential for Development". Dr DN Jha, Director, National Centre for Agricultural Economics & Policy Research (NCAP), New Delhi chaired the above sessions.

The main Annual Day Function was held on Jul 02, 1997. The function started with garlanding the photograph of Late Pt. Jawahar Lal Nehru, the first Prime Minister of India by the Chief Guest Prof. Gajendra Singh, DDG(Engg.), ICAR and Dr N Seshagiri, Special Secretary to the Government of India, Planning Commission & Director General, National Informatics Centre (NIC), New Delhi. Prof. Bal BPS Goel, Director of the Institute delivered the Welcome Address. The Seventh Nehru

Memorial Lecture on "Low Cost High-Speed Computer - Communication Network Support for Agricultural Development" was delivered by Dr. Seshagiri. Prof. Gajendra Singh presented a memento to Dr. Seshagri and distributed the prizes to the winners of various events organised by the Institute from time to time and delivered the Presidential Address. He also released the 'Annual Report 1996-97' and 'IASRI News' of the Institute on this occasion. Two other publications of the Institute viz. 'Vision 2020, IASRI' and 'Brochure on International Courses in Agricultural Statistics, Statistical Computing and Food Security' were released by Dr. N. Seshagiri.

Seminars

The result of research projects and field trials undertaken in different aspects of Agricultural Statistics and Computer Applications were presented in the seminars organised regularly in the Institute.

During the period under report 81 seminars were organised. Out of which 42 seminars were delivered by the students of PG School, IARI, 27 by the scientists of the Institute and 12 were delivered by eminent guest speakers. Name(s) and topics of the research seminars delivered by eminent scientists are as follows:

Seminars By Guest Speakers

Sl. No.	Speaker	Topic
1.	Dr Murari Singh, ICARDA, Allepo, Syria	- Critical point of crossover genotype x environment interactions
2.	Dr. ML Tiku, Prof of Statistics, Mc Mastic University, Canada	- Modified Maximum likelihood Estimation and its Usefulness for Robustifying Statistical Procedures'. (3 seminars).
3.	Prof RS Chhikara, University of Houston, Clear Lake, Texas, USA	- Recent Developments in United State Agricultural Labour Surveys.
4.	Dr PK Misra, NIC, New Delhi	- Computer Virus.
5.	Dr HP Sharma, NIC, New Delhi	- Recent Trends in Computer Networking.
6.	Prof. Prichner, Chief Editor, Jr. of Animal Breeding and Genetics, Germany	- Epistrasis 8.1.97
7.	Dr Padam Singh, Chief, Division of Epedemiological and Communicable Diseases, ICMR & Director, IRMS, New Delhi	- Poverty Management - Issues and Implications
8.	Dr Bowen, International Potato Centre, Peru	- Agricultural System Modelling

9.	Dr D Das Purkayastha, Director, Bio-statistical application federal Medical Advisory Service, Cardiology Research Centre, Washington D.C.	- Specific statistical Diagnosis and treatments to investigate the effectiveness of a cardio vascular therapeutic Device/Drug
10.	Prof Dan Voss, Prof of Statistics, Deptt. of Mathematics and Statistics, Wright-State University (WSU), Dayton, Ohio, USA	- Exact confidence intervals in the analysis of saturated & supersaturated factorial designs

Prof Gajendra Singh, releasing the Annual Report of the Institute

Professor N. Seshagiri, releasing the `Vision - 2020 IASRI Perspective Plan'

Vietnamese delegation at the Institute

Russian delegation at the Institute

DISTINGUISHED VISITORS

INDIAN

Prof Gajendra Singh,
DDG(Engg.),
Krishi Bhavan,
New Delhi-110 001

Dr SL Mehta,
DDG (Edn.), ICAR,
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Dr N Seshagiri,
Special Secretary to the Government of India,
Planning Commission &
Director General,
National Informatics Centre (NIC),
New Delhi.

Prof. MN Das,
Ex-Director IASRI,
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Centenary Professor,
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Dr Aloke Dey,
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Dr Padam Singh,
Chief , Division of ECD, ICMR
& Director, IRMS, Medical Enclave,
New Delhi

Dr. GS Ram,
Eco. & Statistical Adviser, Government of India,
Krishi Bhavan,
New Delhi

Dr. MP Yadav,
Director,
National Research Centre on Equines,
Hisar

Dr DN Jha,
Director,
NCAP, New Delhi

Dr PK Misra,
NIC, New Delhi

Dr HP Sharma,
NIC, New Delhi

FOREIGN

Dr D Das Purkayastha,
Director, Bio-statistical application,
Federal Medical Advisory Service,
Cardiology Research Centre,
Washington D.C.

Dr Bowen,
International Potato Centre,
Peru

Prof. Prichner, Chief Editor,
Jr. of Animal Breeding and Genetics,
Germany

Dr. KD Singh,
F.A.O.,
Rome

Prof RS Chikara,
University of Houston,
Clear Lake, Texas
USA

Prof Dan Voss,
Prof of Statistics,
Deptt. of Mathematics and Statistics,
Wright-State University (WSU),
Dayton, Ohio, USA

Dr ML Tiku,
Prof of Statistics
Mc, Mastic University,
Canada

Dr Murari Singh,
ICARDA, Allepo
Syria

Dr Salian Ahmed Ingewa,
Head, Federal Agricultural Coordinating Unit,
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Director,
Doctor of Science in Agriculture,
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Mr Anatoly I. Antonenko,
Chief Engineer of Institute,
The All Union Research Institute of
Electrification of Agriculture,
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PERSONNEL (MANAGERIAL POSITION ONLY)

Sl. No.	Name	Designation	Telephone		E-mail
			Off.	Resi.	
1.	Dr SD Sharma	Director (A)	5741479	7261478 7871772	sdsharma@rocketmail.com sdsharma@iasri.delhi.nic.in
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3.	Dr HVL Bathla	Principal Scientist & Head (RCM)	5781475	7274393	bathla@iasri.delhi.nic.in
4.	Dr. V.K. Sharma	Principal Scientist & HD(DE&AED)	5721952	667734	vksharma@iasri.delhi.nic.in
5.	Dr Prajneshu	Principal Scientist & HD (BS & SG) and Prof (Ag. Stat.)	5788721	7273793	prajneshu@iasri.delhi.nic.in
6.	Dr RC Jain	Principal Scientist & HD (FTCD &P)	5783398	5403349	rcjain@iasri.delhi.nic.in
7.	Dr RK Pandey	Principal Scientist & HD (SE)	5721952	5588079	rkpandey@iasri.delhi.nic.in
8.	Dr. P.K. Malhotra	Principal Scientist & HD(CS)	5781074	2272225	pkm@iasri.delhi.nic.in
9.	Sh. Mahesh Kumar	Sr. Scientist & Prof. (CA)	5721952	5431395	mahesh@iasri.delhi.nic.in
10.	Sh SN Jha	Chief Administrative Officer	5720574	5588079	snj@iasri.delhi.nic.in
11.	Sh VR Srinivasan	F&AO	5739157	9152525 (PP)	vrs@iasri.delhi.nic.in
12.	Sh RS Khatri	Sr.Scientist, Warden & I/c, Guest House	5783398	5572955	rskhatri@iasri.delhi.nic.in
13.	Dr SS Srivastava	Sr Librarian	5719135	2296364 2118989	sss@iasri.delhi.nic.in

ANY OTHER RELEVANT INFORMATION SUCH AS SPECIAL INFRASTRUCTURAL\DEVELOPMENT

Joint Staff Council

The Institute has a Joint Staff Council (JSC) to promote harmonious relations and secure the best means of co-operation between the Council/IASRI as employer and the general body of its employees in matters of common concern for ensuring a high degree of efficiency in the service.

Two meetings of Institute Joint Staff Council were held on Apr 28, 1997 and on Sep 6, 1997 under the Chairmanship of Prof. Bal BPS Goel, Director of the Institute. In this meeting various issues were discussed.

Grievance Committee

The Grievance Committee of the Institute (constituted as per ICAR rules) provides the employees a forum to ventilate their grievances relating to official matters and for taking remedial measures. The Grievance Committee of the Institute was reconstituted with the approval of the Management Committee of the Institute for a period of two years w.e.f. July 07, 1997

The committee consists of:

Sl. No	Official Side	Staff Representative
1.	Dr Prajneshu	Sh Mahender Singh
2.	Sh SN Jha	Sh AP Singh
3.	Sh VR Srinivasan	Sh Mahanand
4.	Sh Dharamvir Singh	Sh Dev Murti Prasad

Cooperative Thrift and Credit Society

The society is registered with the Registrar Cooperative Societies, Delhi Administration, Delhi and continued its activities as in the past years by advancing loans to its members and looking after their welfare. The source of funds of the society and share money, compulsory deposits and fixed deposits from the members of the society. At present the number of members on the roll of the society is 503.

The society is managed by an Executive having one President, one Vice President and nine members, the Secretary and Treasurer of the society are elected by the executive from its nine members.

The executive of the society is

1.	President	Sh Ram Lal
2.	Vice President	Sh AS Tung
3.	Secretary	Sh Nirbhay Pal Singh
4.	Treasurer	Sh Pal Singh
5.	Member	Sh NK Ohri
6.	Member	Sh Sudershan Sharma
7.	Member	Sh Ram Bhool
8.	Member	Smt Usha Jain
9.	Member	Sh Ram Sahay
10.	Member	Sh Mohan Singh
11.	Member	Sh Vijay Kumar
12.	Auditor	Sh Mahesh Kumar

Main achievements of the Society

1. The society advanced Rs.30,35,100/- to the members as loan
2. The society has refunded Rs.3,00,072/- to the members as their 50% CD

3. An amount of Rs.251/- was given as gift to the each members on their retirement from the Institute
4. The financial half of Rs.2,500/- was extended from the members. Welfare fund to the bereaved family of one member
5. The net profit for the financial year 1996-97 was Rs. 1,10,575/-.

Hostel Activities

There are two well furnished hostels viz. Panse Hostel and Sukhatme Hostel to cater to the residential requirements of the trainees and students of M.Sc. and Ph.D. courses at the Institute within its premises. Officers and other trainees to the various other refresher, short-term and adhoc courses organised at the Institute are also provided residential accommodation at the Panse Hostel. Ample facilities exist for the cultural activities and sports for the hostel in-mates. Hostel mess is run by the students on cooperative basis. The general management of the hostels is vested with the Warden, who is assisted by the Prefect and the other students. The main activities included are as follows:

A General Body meeting of IASRI hostel inmates was held under the Chairmanship of Shri RS Khatri, Warden. For smooth functioning of the hostel activities Prefect alongwith other Executive Body members were elected.

On the eve of Institute's Annual Day celebrations, the students sports competition were held during the month of June, 1997. The events included Tennis singles/doubles, TT singles/doubles, indoor games viz. Caroms, Chess as well as field events Short put, Javelin throw, 100m, 200m, 400m races. A musical chair event was also held in which the faculty actively participated. In addition to above, two matches viz. Cricket and Volley ball were also organised between the students and staff.

A study tour of all the students of M.Sc/Ph.D.(Ag. Stat) and M.Sc.(Comp Appln) was organised from Feb 10-14, 1997 to Dr YS Parmar University of Horticulture and Forestry, Solan, HP and Central Potato Research Institute, Kufri, Shimla. This tour was very much informative and beneficial to the students.

Boarding facilities were provided to the participants of the training course on Advances in Data Analysis organised by the Institute under Centre for Advance Studies in Computer Application and Agricultural Statistics during Feb 10-Mar 07, 1997.

In addition to the above, boarding and lodging arrangements were made in Panse Hostel (Guest House) for the participants of various training programmes organised in the Institute during the period under report. Similar arrangements were made for the guests who stayed in guest house from different departments/organisations.

Benevolent Fund

The employees of the Institute have constituted a Benevolent Fund from their own contributions to provide relief to the families of the employees who die in harness and are left in an indigent condition. During the period under report an amount of Rs.20,000/- has been deposited in the FD account with State Bank of India, Rajinder Nagar Branch.

Cooperative Store

The cooperative store, registered with the Registrar, Cooperative Societies, Delhi Administration, Delhi continued to be run for the benefit of the staff members of the Institute, Cold drinks, Coffee, Snacks-provisions and general merchandise etc. were made available at reasonable rates to the staff members of the Institute.

Member's Children Education Welfare Scheme was also introduced by the Managing Committee for the promotion of educational improvement for the children of the members of the cooperative store.

The Total membership of the cooperative store as on 31st December, 1997 was 457.

Recreation and Welfare Club

The Institute has a Recreation and Welfare Club which operates during lunch hours and after office hours from 4.30 P.M. to 6.30 P.M. and provides facilities for indoor and outdoor games, promotes social and friendly relations among the members and general recreation and welfare of its members. The club organised sport tournaments at Institute level for different games/events. All the members of our recreation and welfare club are thankful to Prof Bal BPS Goel, Ex-Director of this Institute and President of our club who took keen interest in all the activities of the club and gave us able guidance in smooth functioning till his retirement in the month of October, 1997. Dr SD Sharma, Director (A), IASRI has kindly acceded to the request of the executive committee to become the President of our club after the retirement of Prof Bal BPS Goel. At present the total strength of its members took at 100.

संस्थान में राजभाषा के बढ़ते चरण

प्रतिवेदनाधीन वर्ष के दौरान संस्थान में राजभाषा हिन्दी के प्रचार - प्रसार में अभूतपूर्व अभिवृद्धि हुई । इस दौरान बड़े ही सुनियोजित रूप से राजभाषा हन्दी के प्रचार और प्रसार की रूपरेखा तैयार की गयी । पत्राचार, धारा 3 (3), हिन्दी प्रकाशनों इत्यादि जैसे महत्त्वपूर्ण क्षेत्रों पर चरणबद्ध तरीके से कार्रवाई की गयी और उन की स्थिति में आशातीत सुधार लाया गया । विनिर्दिष्ट अनुभागों पर विशेष जोर दिया गया और सुनिश्चित किया गया कि इन अनुभागों में समस्त दैनिक काम-काज केवल राजभाषा हिन्दी में हो । वर्ष भर के दौरान प्रशासनिक अनुभागों के दैनिक काम-काज में हिन्दी का प्रयोग आशा से अधिक बढ़ा है । इसी प्रकार संस्थान के विभिन्न अनुभागों में हिन्दी पत्राचार की स्थिति में, वार्षिक कार्यक्रम में निर्धारित लक्ष्यों के अनुसार सुधार लाने के लिये ठोस कदम उठाये गये जिसके परिणामस्वरूप संस्थान में हिन्दी में हुए पत्राचार का प्रतिशत प्रतिवेदनाधिन वर्ष के दौरान लगभग तीस प्रतिशत तक जा पहुंचा जो संस्थान द्वारा वर्ष भर के लिये तय किये गये लक्ष्य के अनुसार ही था ।

इसी प्रकार धारा 3(3) के मामले में भी कई कड़े कदम उठाये गये । इस दिशा में निर्णय लिया गया कि धारा 3(3) के तहत जारी किये जाने वाले कागजातों पर हस्ताक्षर करने वाले अधिकारी की जिम्मेवारी होगी कि वह यह सुनिश्चित करे कि जारी किया जाने वाला कागजात नियमानुसार द्विभाषी रूप में ही जारी किया जा रहा है अथवा नहीं । संस्थान में अब इस दिश में काफी जागरूकता है और इस धारा का उल्लंघन कदाचित न के बराबर है ।

प्रतिवेदनाधीन वर्ष के दौरान संस्थान के प्रकाशनों को समानान्तर रूप से अंग्रेजी के साथ - साथ हिन्दी में भी प्रकाशित करने विचार हुआ जिसके परिणामस्वरूप संस्थान के महत्वपूर्ण दस्तावेज विज़न 2020 अर्थात् संस्थन की भावी योजना का हिन्दी संस्करण भी जारी किया गया । भविष्य की योजना है कि संस्थान के अधिकांश प्रकाशनों को जिन्हें आसानी से हिन्दी एकक के वर्तमान स्टाफ द्वारा हिन्दी में तैयार किया जा सकता है को समानान्तर रूप से हिन्दी में भी प्रकाशित करने के प्रयास किये जायेंगे ।

प्रतिवेदनाधीन वर्ष में संस्थान के अनेक वैज्ञानिकों ने हिन्दी में भी लोकप्रिय शोध लेख लिखे जो देश की विभिन्न पत्र - पत्रिकाओं में प्रकाशित हुए हैं । इस प्रकार हम कह सकते हैं कि संस्थान के वैज्ञानिक अपने विषय से संबंधित हिन्दी साहित्य तैयार करने की दिशा में सजग हैं और बहुमूल्य योगदान कर रहे हैं ।

प्रतिदनाधीन अवधि के दौरान संस्थान के अनेक वैज्ञानिकों ने अपने सेमीनार हिन्दी में भी प्रस्तुत किये ।

संस्थान में हिन्दी दिवस के अवसर पर संस्थान की "भावी योजना" पर एक संगोष्ठी का आयोजन किया गया जिसमें प्रमुख वक्क्ता डा० मंगला राय, उप महानिदेशक (फ०वि०) ने हिन्दी में अत्यन्त ही सुरूचिपूर्ण एवं धारा प्रवाह व्याख्यान दिया । इसके अलावा वैज्ञानिक शोध एवं आध्यात्मिक शोध के समन्व्य पर स्वामी प्रेमानन्द जी महाराज ने भी एक व्याख्यान दिया । इसके अलावा हिन्दी दिवस के अवसर पर संस्थान में हिन्दी पखवाड़े का आयोजन किया गया और इस दौरान अनेक कार्यक्रम आयोजित किये गये जैसे - काव्य पाठ, प्रश्न - मंच प्रतियोगिता, हिन्दी में "डा० दरोगा सिंह स्मारक वैज्ञानिक व्याख्यानमाला", हिन्दी संगोष्ठी इत्यादि । इस प्रकार गया वर्ष राजभाषा के प्रचार प्रसार की दिशा में उपलब्धियों का वर्ष रहा ।

कार्यांग सारांश

भारतीय कृषि सांख्यिकी अनुसंधान संस्थान की स्थापना 1959 में हुई थी और इसके मुख्य उत्तरदायित्तव थे-कृषि सांख्यिकी और संगणक उपयोग में अनुसंधान एवं शिक्षा/प्रशिक्षण प्रदान करना और उसे प्रोत्साहित करना । बदलते हुए परिवेश में इस संस्थान को सौपें गए कार्य - कृषि सांख्यिकी में आरम्भिक/व्यावहारिक और अनुकूल अनुसंधान कार्य करना, राष्ट्रीय कृषि सांख्यिकी कृषि प्रणाली को विकसित करने और सुदृढ़ बनाना, कृषि सांख्यिकी एवं कम्प्यूटर उपयोग में स्नातकोत्तर तथा सेवाकालीन प्रशिक्षण पाठयक्रम आयोजित करना, परामर्श सेवा प्रदान करना और कृषि सांख्यिकी पर सूचना भण्डार मके रूप में कार्य करना । संस्थान को शिक्षा और प्रशिक्षण के क्षेत्र में सर्वोत्कृष्ट अग्रणी केन्द्र के रूप में विकसित करना और राष्ट्रीय एवं अन्तर्राष्ट्रीय संगठनों के प्रायोजित अनुसंधान एवं प्रशिक्षण का कार्य करना ।

संस्थान के भिन्न-भिन्न प्रभागों में अनेक अनुसंधान प्रायोजनाएं चल रही हैं उनमें से कुछ प्रमुख प्रायोजनाएं हैं - प्रतिदर्श सर्वेक्षण प्रद्धति, परीक्षणों के डिजाइन, जैव सांख्यिकी, और सांख्यिकी आनुवंशिकी, पूर्वानुमान तकनीक, सांख्यिकी अर्थशास्त्र एवं कम्प्यूटर उपयोग । प्रतिवेदाधीन वर्ष के दौरान चल रही 41 अनुसंधान परियोजनाओं में जिन विषयों पर प्रमुख जोर दिया गया है वे हैं - मुर्गी पालन, मांस उत्पादन, अन्तर्देशीय मछली उत्पादन के आकलन, उत्पादन एवं क्षेत्र आकलन, मूल्यांकन अध्ययन, लघु क्षेत्र आकलन, जटिल सर्वेक्षणों में प्रतिबद्ध अध्ययन, दूर सवेदी प्रौघोगिकी का उपयोग, आंकड़ों के आधार (डाटा बेस) का विकास, फसल प्रणाली अनुसंधान, कृषि एवं पशु परीक्षणों के लिए सूचना प्रणाली, कृषि, पशु के लिए परीक्षण डिजाइन, कृषि वानिकी और मछली अनुसंधान पशु एवं पौध आनुवंशिकी में अध्ययन, जैविक प्रक्रिया के लिए माडलिंग, जनसंख्या जीव विज्ञान में अध्ययन, कृषि प्रणाली में पूर्वानुमान तकनीक, कृषि में प्रौधोगिक परिवर्तन और इसके विसरण, कृषि में संसाधनों का कुशल उपयोग और मांग के लिए माडलिंग । इनमें कुछ अध्ययन के लिए संस्थान विभिन्न संस्थानों और उपयोगकर्ता संगठनों के साथ सहयोग कर रहा है । अनुसंधान समन्वय एवं प्रबन्ध एकक, समन्वय एवं प्रबंध कार्य के अलावा भा०कृ०सां०अ०सं० समाचार, मानीटरींग रिपोर्ट और संस्थान की वार्षिक रिपोर्ट प्रकाशित करता है ।

मुर्गी के मांस उत्पादन, चिल्का झील से मछली उत्पादन, बंजर भूमि के तहत क्षेत्र और सभी क्षेत्रों में प्रति पशु दुध की औसत उपज का आकलन लगाने के लिए प्रतिचयन पद्धतियों का विकास किया गया । आनुवंशिकी प्राचलों के सांख्यिकीय लक्षणों का अध्ययन करने के लिए बूट-स्ट्रेप तकनीक का प्रयोग किया गया । कम्पोनेण्ट ट्रैटस की तुलना में बकरियों में आई बहु - लक्षणीय भिन्नता के आधार पर बढ़वार अध्ययनों के लिए संकर नस्ल की बकरियों के आनुवंशिक समूहों की तुलना करने के उद्देश्य से भी अध्ययन किए गए । चैंपा की जनसंख्या (एफिड पापूलेशन) जनसंख्या की बढ़वार के लिए अनेक आकड़ों के रूप में अरैखिक सांख्यिकी माडल समायोजित किए गऐ । इन आकड़ों के समूहों पर किए गए अविशष्ट विश्लेषणों रेजिडुअल एनालेसिस से त्रुटि प्रसरणों में विषमांगता देखने मे आई । प्रोजेक्शन मैट्रिक्स पर किए गए अध्ययनों में समान अनुपातिक कारकों की प्रवृति की जांच की गई और पता चला कि यह कारक बहुत ही ज्यादा अदलता -बदलता है और अस्थिर है । चावल और गेहूं के लिए सस्य जलवायवीय क्षेत्रों पर आधारित उपज पूर्वानुमान माडल विकसित करने के लिए किए गए अध्ययनों से ज्ञात होता है कि ऐसे माडलों जिनमें कृषि निवेशों और मौसमों का प्रयोग किया जाता है, दोनों ही फसलों के लिए उपयुक्त

थे । फसल पर दीर्घकालीन उर्वरक उपयोग की प्रतिक्रिया पर मौसमों के प्रभाव का अध्ययन करने के लिए पद्धति का विकास किया गया है । स्टाकैस्टिक फ्रंटियर उत्पादन फलन के विश्लेषण की पद्धति का विकास किया गया है जो फार्म स्तर की तकनीकी कुशलता के आकलन प्रदान करने में सक्षम है । एक दूसरे अध्ययन के अन्तर्गत, हरियाणा राज्य के अम्बाला जिले में अण्ड़ों के उत्पादन की लागत का अध्ययन किया गया ।

कृषि परीक्षण नाइट्रोजन युक्त उर्वरकों के खंडित उपयोग की समीक्षा, मिश्रित परीक्षण के रूप में की गई और इस प्रकार आंकड़ो का विश्लेषण करने के लिए वैकल्पिक विधि सुझाई गई है । दो सहयोगी वर्गो सहित आंशिक रूप से संतुलित अपूर्ण ब्लाक डिजाईनों की सहायता से प्राप्त बायनरी इक्वीरेप्लीकेटिड नॉन प्रोपर वेरिएंस संतुलित डिजाईनों की एक सूची तैयार की गई है । वर्ष भर में अखिल भारतीय समन्वित योजना के तहत किए गए दीर्घ कालीन उर्वरक परीक्षणों से प्राप्त आकड़ों का विश्लेषण किया गया और उन्हें समुचित सांख्यिकी तकनीकों की सहायता से समुहित किया जा रहा है । प्रतिवेदनाधीन वर्ष के दौरान संस्थान द्वारा अनेक सॉफटवेयर विकसित किए गए ।

संस्थान द्वारा पी० जी० स्कूल, भारतीय कृषि अनुसंधान संस्थान, जो एक मानद विश्वविद्यालय है, के सहयोग से कम्प्यूटर उपयोग में स्नातकोत्तर और कृषि सांख्यिकी में एम०एस०सी और पी०एच० डी० के पाठ्यक्रम चलाए जा रहे हैं । संस्थान, कृषि सांख्यिकी और संगणन में वरिष्ठ प्रमाण-पत्र पाठ्यक्रम नामक एक नियमित प्रशिक्षण कार्यक्रम चला रहा है । केन्द्रीय सांख्यिकीय संगठन से आए वरिष्ठ स्तर के अधिकारियों के लिए संस्थान द्वारा आधुनिक प्रतिचयन तकनीकों पर एक प्रशिक्षण पाठयक्रम आयोजित किया गया । कम्प्यूटर उपयोग और साख्यिकी में उच्च अध्ययन केन्द्र के अन्तर्गत आकंड़ों के विश्लेषण में प्रौन्नति पर एक दूसरा प्रशिक्षण पाठयक्रम आयोजित किया गया कम्प्यूटर नेटवर्किंगं के काम में कम्प्यूटरों का उपयोग, कृषि अनुसंधान में कम्प्यूटरों का उपयोग, नेटवर्क प्रबन्ध और जेनस्टेट (GENSTAT) की प्रस्तावना का समावेश सेस (SAS) और एम. एस. आफिस, इत्यादि के परिचय पर प्रतिवेदनाधीन वर्ष के दौरान अनेक पाठयक्रम आयोजित किए गए । नाइजिरिया के सरकारी अधिकारियों के लिए कृषि विकास में वित्तीय प्रबंध मानव संसाधन विकास और कम्प्यूटर उपयोग और रखरखाव पर अन्तर्राष्ट्रीय कार्यक्रम आयोजित किए गए ।

संस्थान के वैज्ञानिकों ने कृषि सांख्यिकी और कम्प्यूटर उपयोग से संबंधित अनेक कार्यशालओं, संगोष्ठियों, और समर-इन्स्टीटयूट में हिस्सा लिया । संस्थान के अनेक वैज्ञानिकों द्वारा अनुसंधानिक उपलब्धियों वाले शोध लेख प्रकाशित किए गए । विभिन्न संगठनों को परामर्श दिया गया । अनुसंधान सलाहकार समिति, प्रबंध समिति और कर्मचारी अनुसंधान परिषद की बैठकें आयोजित की गईं तथा उनमें लिए गए निर्णयों को लागू किया गया । पांच वर्षीय समीक्षा दल की सिफारिशों पर परिषद का अनुमोदन प्राप्त हुआ । संसाधन तैयार करने के उद्देश्य से संस्थान द्वारा अनुसंधान परामर्श कार्य और प्रशिक्षण कार्यक्रम इत्यादि भी शुरू किए गए ।