ANNUAL REPORT
1985

ICAR

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1985

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

Compiled and Prepared

By

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P.P. SINGH

Cover page
By
A. R. Paul Sr. Artist-I

PREFACE

I have pleasure in presenting this Annual Report of the Indian Agricultural Statistics Research Institute, Delhi for the year 1985. Efforts have been made to cover, as far as possible, all the aspects of the functions and the research activities of the Institute during the year under report.

I hope this report would prove useful to research Workers in the field of agricultural statistics and other users. Comments and suggestions offered for improvement in the presentation of subsequent volumes of the annual reports of the Institute would be welcome and appreciated.

I take this opportunity to place on record my sincere thanks to the officers and staff of the Institute, who extended full co-operation in preparing and supplying the material required for this report.

I am also thankful to Sh. Som Dutt and Sh. K.G. Dewale for their help in compilation of the material and Sh. Kanwar Pal Singh, Smt. Rajni Gupta and Smt. Harsh Kapoor for typing of the Annual Report.

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PREM NARAIN
Director
INDIAN AGRICULTURAL STATISTICS
RESEARCH INSTITUTE
NEW DELHI-110012

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1. Introduction

The Indian Agricultural Statistics Research Institute is a premier Institute for promoting and conducting research and training in Agricultural Statistics in the country for improving the planning and evaluation of agricural research and development. To achieve this objectives, the following functions are carried out :

(i) To conduct research in experimental designs, sampling methods, bio-statistics and statistical genetics ;

(ii) To conduct post-graduate courses leading to M.Sc. and Ph.D. degrees in Agricultural Statistics and M.Sc. in Computer Application in Agriculture.

(iii) To provide advisory service to agricultural scientists/workers from various agricultural organisations in India and abroad.

(iv) To develop computer software for Agricultural Research.

(v) To conduct inservice training courses in Agricultural Statistics and computer applications; and

(vi) To provide consultancy service in data processing.

The Institute has achieved international recognition for its high quality of 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 in various countries.

It was in year 1930 that, in pursuance of the recommendations of the Royal Commission of Agriculture, the Institute made a modest beginning as a Statistical Section of the Indian council of Agricultural Research (ICAR), the then Imperial Council of Agricultural Research. It was then manned by only one statistician and a limited staff. Initially, the principal function of the statistician was to assist the agricultural officers in the various provinces of the country in planning experiments, analysing the data and interpreting the results. In 1933, he was also made responsible for scrutiny of the technical programmes and progress reports of the research schemes of the Council.

The activities of the Statistical Section entered a new phase towards the end of 1943 when at the instance of the Government of India, research was initiated to develop objective and reliable methods for collecting yield statistics of

principal food crops. The Statistical Section developed the objective method of crop estimation technique based on random sampling which, in a course of few years, was extended to almost entire country for estimation of agricultural products.

The Statistical branch was reorganised in 1945 into two separate units, each under the charge of a Statistician; dealing with Statistical applications to research in agriculture and in animal husbandry and was headed by Statistical Adviser to the Council. Also, the Council instituted regular post graduate training courses for professional statisticians wishing to specialise in Agricultural Statistics and for research workers in the field of agriculture and animal husbandry who were desirous of acquiring knowledge of simple statistical methods required most often for use in their work. Although research and teaching was integrated, a small training unit consisting of whole time professor, assistant professors and demonstrators, was eventually constituted for organising the various courses of study. The statistical branch soon acquired International recognition as a training and research Institution in the field of agricultural statistics and was made responsible for training foreign students and organising internal seminars for the Food and Agriculture Organisation of the United Nations.

Valuable contributions were made by the statistical branch to the problem of improvement of crop acreage and production statistics. Sampling techniques were developed for securing objective and reliable estimates of marine fish catch and of livestock numbers. By the end of 1952, the crop-cutting surveys for the estimation of production of the principal food crops were extended to almost whole of the country. In January, 1953 according to a decision of the Government of India, the work of large scale sample seurveys on food crops and a few other surveys was transferred from the ICAR to National Sample Survey Organisation.

In September, 1952 the services of two F.A.O. experts, Dr. Frank Yates, Chief Statistician, Rothamsted Experimental Station, Harpenden (U.K.) and Prof. D.J. Finney of Oxford University (U.K.) were assigned to the Government of India to advise and assist the ICAR in reviewing its research training activities. As a result of their recommendations the activities of the 'Statistical Branch' were expanded in many directions and in August, 1955, it moved to its present campus at Pusa in the neighbourhood of the Indian Agricultural Research Institute for closer collaboration with that Institute and was called 'Statistical Wing' of the ICAR. The campus provided adequate space not only for office accommodation for the technical and the ministerial staff but also for facilities of a library, reading room, class room for the training classes, an auditorium and a hostel with the usual amenities for the students, admitted to the various courses of study. Also, in recognition of its important role as a training and research Institution, the 'Statistical Wing' was re-designated

by the Government of India as the Institute of Agricultural Research Statistics (IARS) in June, 1959. A mechanical data processing unit was also then added to the Institute.

On the completion of construction of a new four-storeyed building in the campus of the Institute in 1964, the mechanical data processing unit was shifted to its ground floor and was expanded with the installation of an I.B.M. 1620 Model-II. Electronic computer and other related equipments, while the first, the second and the third floors of the New building provided additional suitable office space for expanding technical and ministerial staff of the Institute and better accommodation for the Cooperative Canteen of the Institute on the first floor and the space for cultural and other activities of Recreation and Welfare Club of the Institute on the third floor. All these facilities enabled the Institute to discharge its functions more efficiently. In October, 1964, new courses leading to M.Sc. and Ph.D. degrees in Agricultural Statistics were started in collaboration with the Indian Agricultural Research Institute (IARI), New Delhi which is a deemed University.

The Institute was declared a fulfledged Institute under the administrative control of ICAR with effect from Ist April, 1970 and is since then headed by a Director.

Since the activities of the Institute expanded manifold, a new three storeyed building was constructed in the Campus of the Institute in 1976. The Computer Centre with its additional equipments shifted to its ground floor. The Library was expanded and shifted to its spacious second floor. A new Auditorium and a big exhibition room were also provided in this new building on ground floor and first floor respectively. The first floor also provided additional space for the expanding technical and scientific staff.

Looking into the growing demand of computer use, on recommendations of the Department of Electronics, Government of India, a third generation computer B-4700 system was installed in the new computer centre building. The new system was inaugurated by Shri B. D. Jatti, the then acting President of India on 11th March, 1977.

Since Ist January, 1978 the name of the Institute has been changed to Indian Agricultural Statistics Research Institute (IASRI) by the ICAR.

In order to cover the deficiencies in the existing documentation services that deal with agricultural, the Food and Agriculture Organisation (FAO) of the United Nations (UN) 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 Ist November, 1977 there were 82 input centres and 77 liason offices all over the world, which contribute to the system. The Input Centre of India is the Agricultural Research Information Centre located at the Indian Agricultural Statistics Research Institute (IASRI), New Delhi.

Our country is the third (next to USA and Japan) among the national input centres, from the point of number of of inputs added to the system every month. The Indian Agricultural Statistics Research Institute (IASRI), New Delhi has started a selective Dissemination of Information Service to help the Scientist in ICAR Institutes and Agricultural Universities to obtain references to documents relating to areas of their specific interest.

The United Nations under its development programmes (Project No. IND/83/020) has recognised this Institute as a centre of advanced studies in Agricultural statistics and computer Applications. The project became operative from Ist October, 1983 for a period of 7 years and its aims at developing a centre of excellence with adequate infrastructure and facilities to undertake advanced training programmes and carry out research in various aspects of Agricultural statistics and computer applications. Under this project a new course leading to M. Sc. degree in computer applications in Agricultural has started at this Institute from September 1985 in collaboration with Indian Agricultural Research Institute (IARI), New Delhi.

1.1 Organisational Structure of the Institute :

In pursuance of the the recommendations of the quinquennial Review Team, the Research and Tehnical work of the Institute is now organised into following six Divisions and four cells :

Divisions :

1. Design of Experiments and Analysis of Experimental Data,
2. Sample Survey Methodology and Analysis of Survey Data,
3. Statistical Economics,
4. Forecasting Techniques for Crops, Diseases and Pests,
5. Bio-statistics and Statistical Genetics, and
6. Computing Sciences.

Cells :

1. U.N.D.P. Cell
2. Director Cell
3. Monitoring Celi
4. Training Administration Cell

The number of Class I Officers in position as on 31st December, 1985 was 131 (including one Scientist (S-3) on deputation). List of these officers is given as on Appendix-I. On the research and training side, the Director was assisted by one Jt. Director, 9 Sr. Scientists (S-4), 24 Sr. Scientists (S-3), 52 Scientists (S-2), 41 Scientists (S-1), one M.T.O. (T-6), one Field Officer, (T-7) one field Officer (T-6) and one Librarian (T-7), and on the administration side, by a Chief Administrative Officer, One Sr. Administrative Officer, and one Accounts Officer. A list of sanctioned and filled up posts is shown in Appendix-II.

1.2 Management Committee of the Institute :

The main purpose of constituting Management Committee for the Research

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Institutes under the administrative control of the Indian Council of Agricultural Research (ICAR), is ensure that greater administrative and financial powers delegated to the Research Institutes in the reorganised set up of the Council are exercised to the fullest possible extent. The basic philosphy is that once a programme has been approved that necessary funds allocated by the Governing Body of the Council the Institute should have the necessary authority to execute such programme with as little reference to the Council as possible. The setting up of the Management Committee is also expected to broad-base the decision making process and ensure efficient implementation of the approved research programmes.

Besides, assisting the Director of the Institute in the discharge of his functions, the management Committee particularly concentrates the attention on the research and other programmes of the Institute and ensure their implementation both in terms of physical targets and time schedules. For this purpose the Committee will examine the progress of the programmes periodically, pinpoint bottlenecks, if any and suggest suitable remidial measures. A meeting of the Management Committee was held on 28.2.1985.

1.3 Staff Research Council :

The Staff Research Council (SRC) was constituted in 1970. The main objetives of the SRC are to scrutinise the research programmes of the Institute to decide on priorities and watch the progress of various research projects with a view to remove bottlenecks, if any, in their effective implementation. The technical programmes and progress of research problems in Statistical involving inter-diciplinary collaboration are also discussed in the S.R.C. It also considers the results of the Statistical research which are worthy of being passed on the research workers in various disciplines of agricultural and animal sciences.

During the period under report the Staff Research Council met two occasions. The first meeting was convened on the 30th and 31st May 1985 for discussing the objectives, technical/scientific utility and technical programmes of the new research projects for the year 1985. The second meeting was organised on the 18th, 19th, 20th, 25th September and 1st October 1985 for discussing the progress of the existing research projects of the Institute. On both the occasions the meeting were convened under the Chairmanship of Prof. Prem Narain, Director.

1.4 Divisional Research Committees:

Divisional Research Committee mettings are held every month under the Chairmanship of the respective Head of Division to discuss about the technical programmes, statistical methodology adopted, progress of work and bottlenecks, if any, in implementation of the various research projects, etc. and to follow up action in the decision taken therein.

During the year under report, several monthly meetings of the six division, viz. (i) Design of Experiments and Analysis of Experimental Data; (ii)

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Sample Survey Methodology and Analysis of Survey Data; (iii) Statistical Economics; (iv) Forecasting Techniques for Crops, Diseases and Pests; (v) Biostatistics and Statistical Genetics and (vi) Computing Sciences were held under the Chairmanship of the Heads of respective Divisions. In the meeting. the points mentioned above were discussed alongwith the problems faced by the Scientists/ Technical staff in execution of the projects, administrative problems and allocation of any other work of ad-hoc nature assigned by the Director. The Director of the Institute also participated in some of these meetings. He gave some valuable suggestions on the technical aspects of their various research projects for the improvement of their research work and also helped them in removing their difficulties.

1.5 Hostel

Student's Annual Day Function was celebrated on 15th Oct., 1985 at 5.30 P.M. on the premises of the Institute and was presided over by Dr. A.M. Michael, Director, IARI, New Delhi. A nice cultural programme was organised after the prize distribution function.

A general body meeting was held on 15th Nov., 1985 under the chairmanship of Dr. A.K. Nigam, Warden of the hostels. It was well attended by almost all the hostel inmates. A new executive committee was formed for the session 1985-86. The Warden appreciated the team work rendered by the outgoing executive committee and welcomed by the newly elected executive committee.

On 26th of Nov., 1985 a get-together of the students with Dr. D.J. Finney was held in the common room of Sukhatume Hostel. A memento was presented to Dr. D.J. Finney on this occassion by a senior student Sh. P.R. reenath on behalf of the students. Dr. D.J. Finney, Prof. Prem Narain, Director and Dr. A.K. Nigam, Warden addressed the students.

1.6 Library

Library System:

The Library Sytem continued to provide Library Information and Documentation Services to the scientific, technical and student community of the Institute.

Resource Building:

As a result of closer links established with the scientists, students and research organisations, the library has acquired latest books, journals, reports and reprints etc. relating to Institute's interests. The library acquired *500* books, *175* reports, *17* reprints and got bound more than *300* sets of journals. Besides this app. *200* Indian and Foreign periodicals subscribed. More than 100 news letters, bulletins etc, were received on complimentary basis.

Library Usage:

The library was kept open on all working days between 9.30 A.M. to 6-30 P.M. The number of library users has also considerably increased. During the year app. *27000* readers including outside bonafide research scholars visited the library for consultation purposes.

Inter-library-loan facility:

As a part of resource sharing the library borrowed and lent out publications to other libraries on I.L.L.

Reprographic Facility:

Reprographic service was provided to scientists and staff free of cost. The service was also provided to students and outside bonafide research scholars and research Institute on very nominal charges. The unit has made and supplied *70,000* pages in terms of scientific articles, reports, etc.

Documentation service:

Library brought out following bulletins during the year under report.

1. New addition to the library (Reports).
2. New addition to the Library (Books).

Off Prints and reports:

The library has procured extra reprints of *13* articles written by the scientists of the Institute and published in scientific journals. These reprints are meant for free distribution on the requisition from the scientists in the similar field in India and abroad. As a continuous process, the library has procured *175* important reports from different organisations and strengthened qrey literature.

Maintenance:

The library got bound *550* journals, books and other scientific reports, etc, for better preservation of publications.

Management:

The internal administration and organisation, etc. of the Library System is looked after by the Senior Librarian (T-7) who is a member of Head's meeting and Sr. Officers meeting. There is a Library Committee also which meets periodically for recommendation and finalisation of proposals regarding purchase of books/ periodicals etc. It recommends for better management also. During the year under report the Library Committee worked as under:

1. Dr. S.S. Pillai   Chairman
2. Sh. P.N. Bhargava   Member
3. Dr. R.K. Pandey   ,,
4. Dr. J.P. Jain   ,,
5. Dr. O.P. Kathuria   ,,
6. Dr. A.K. Nigam   ,,
7. Dr. K.G. Aneja   ,,
8. Sh. S.N. Mathur   ,,
9. Sh. L.K. Garg   ,,
10. Sh. S.S. Srivastava   Convenor

The Library Committee met four times for finalising different proposals with regard to the purchase of books and subscription of periodicals and other items.

1.7 Exhibition Room :

There is an Exhibition Room in the premises of the Institute where all the results of all the important projects undertaken by the Institute, are presented in the form of graphs and charts. Moreover, important publications by the officers and members of the staff of the Institute are displayed there. The exhibition Room enables a

1.8 Fellowship, Contingent grant and T.A. paid to the students for the period
January to December, 1985

S. No.	Name of the course	No. of Students	F/ship P.M.	Contingent P/annum	Amount of F/ship	Cont. grant	T.A.	Total Amount
1.	M. Sc. I Year	7	Rs. 400/- enhance to Rs. 800/- w.e.f. 1.12.85	Rs. 1000/- enhance to Rs. 2000/- w.e.f. 1.12.85	Rs. 1,16,719—95+4, 101—09+943—75=1,21,764—79			
2.	M. Sc. II Year	12	—do—	—do—	1,33,030—60+36,785—53+ —			=1,69,816—13
3.	Ph.D. I Year	7	Rs. 600/- enhance to Rs. 1000/- w.e.f. 1.12.85	Rs. 3000/- enhance to Rs. 5000/- w.e.f. 1.12.85	90,393—45+1,266—25+204—00		=	91,863—70
4.	Ph.D. II Year	6	—do—	—do—	98,093—25+23,177—47+—			=1,21,270—72
5.	Ph.D. III Year	4	Rs. 700/- enhance to Rs. 1200/- w.e.f. 1.12.85	—do—	55,821—30+19,364—16+ —		=	75,185—46¾
6.	Ph.D. IV Year	1	—do—	—do—	6,720+05,271—26+144—00		=	12,135—26
							Grand Total	Rs. 5,92,036—06

(Rupees Five lakh Ninety Two Thousand Thirty Six and Paise Six only)]

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visitor to the Institute to get at one place a comprehensive picture of the important research activities of the Institute.

The research project's annual reports were updated with the latest reports available. Likewise the charts and graphs displayed were revised in the light of latest data available.

1.9 Research Collaboration with other Research Institutes, Agricultural Universities and other Research Organisations at National level :

1. The project, 'Pilot studies on pre-harvest forecasting of crop yield Groundnut, Jowar' and Apple, were undertaken in research collaboration with :

 (i) Directorate of Agriculture, Gujarat.

 (ii) Department of Agriculture, Pune, Maharashtra (Jowar),

 (iii) Directorate of Horticulture, Himachal Pradesh.

2. The Institute continued the research collaboration with the Agronomy, Soil Science and Agricultural Chemistry Division of IARI, New Delhi, Agricultural Universities and State Departments of Agriculture in Planning of experiments, collection of data, statistical analysis, summarisation of data and reporting of results under the All India co-ordinated Agronomic Research Project (AICARP of ICAR.

3. The project "Agricultural Field Experiments Information System" was undertaken in research collaboration with the State Departments of Agriculture, Agricultural Universities, Institutes under ICAR and various Agricultural Research Organisations in the country.

4. The project 'Pilot sample survey for estimation of catch of inland Fish', in the region of W. Bengal and Orissa was undertaken in Research collaboration with Central Inland Fisheries Research Institute (CIFRI) Barrackpore (W.B.).

5. Number of research projects like Sample Survey for Methodological investigation into HYVP, etc. were undertaken/continued in collaboration and co-operation with the Department of Agriculture, Bureau of Economics and Statistics and Statistical Department of different states.

1.10. Participation in Scientific Committees, Panels, etc. :

(a) The names of officers of the Institute and the Scientific Associations, Committees, Panels, etc., mentioned against their names of whom they were the members during the year under report are given below :

Name of Officer	Name of Scientific Association, Committee, etc.
Prof. Prem Narain	(i) Indian Science Congress Association, Calcutta

Prof. Prem Narain

(i) Indian Science Congress Association, Calcutta

(ii) Indian Society of Agricultural Statistics (Also Secretary General and Vice-President of the Society as well as Chairman of Editorial Board of its Journal).

(iii) Indian Society of Genetics and Plant Breeding (Fellow). (Also member of the Editorial Board).

(iv) General Council of the University of Edinburgh (U.K.).

(v) Post-Graduate Faculty of P.G. School, IARI, New Delhi

(vi) Vice-President, Indian Society of Agricultural Science (Also its life member).

(vii) Computer Society of India.

(viii) Fellow of the Royal Statistical Society, Britain

(ix) Fellow of National Academy of Sciences, India.

(x) Member of the General Body of the Jan Tinbergen Institute of Development Planning, Rohtak for three years (as well as Vice-President for one year 1.4.85 to 31.3.86).

(xi) International Statistical Institute, Netherlands

(xii) Bernoulli Society for Mathematical Statistics and Probability, Netherlands.

(xiii) The New York Academy of Sciences, U.S.A.

(ziv) Indian Society of Human Genetics.

(xv) Member, Editorial Board of the Journal of Energy from Biomass and Recycling, India House Development.

(xvi) Chairman, the first and second meetings of sub-working group for the discipline of Animal Husbandry Statistics for undertaking in depth studies for formulation of suitable proposals for the VII Five Year Plan of the Ministry of Agriculture, New Delhi.

(xvii) Scientific Advisory Committee of the Institute for Research in Medical Statistics, New Delhi.

(xviii) Technical Evaluation committee for evaluation of the design and methodology on collection of catch statistics of fish from different inland water resources, monitor in of progress of work and suggestions on improvement off

sampling system for central sector scheme on Development of inland Fisheries Statistics for implementation.

(xix) Sub-committee for consideration of adhoc research project entitled survey of animal drought power in various agro-climatic zones of the country.

(xx) Socio-economic features and current husbandry practices.

(xxi) Committee of Direction for the Bureau of Animal and Genetics Resources and the Institute of animal Genetics for formulation of detailed programme.

Dr. S.S. Pillai

(i) Computer Society of India.

(ii) Standing Committee for 'Controlling of computers for software export' set up by the Deptt. of Electronics, Govt. of India.

(iii) Committee set up by the Deptt. of Electronics for selection of a suitable computer for the Central Mine Planning and Design Institute, Ranchi.

(iv) Committee for selection of computer for Central Marine Fisheries Research Institute, Cochin.

(v) Committee set up by the Indian National Scientific Documentation Centre for installation of a computer for INSDOC.

(vi) Committee set up for selection of a computer and staff for the Council for Advancement of Rural Technology, Delhi.

(vii) Chairman of the DPC for the IASRI.

(viii) Committee set up by the Indian Council of Medical Research for development of medical information system for the ICMR.

Dr. S.K. Raheja

(i) Indian Society of Agricultural Statistics, New Delhi.

(ii) Indian Society of Agricultural Sciences, New Delhi.

(iii) P.G. Faculty of the P.G. School, IARI, New Delhi.

(iv) Expert Committee for evaluation of ICAR Lab-to-Land Programme (Phase I and II).

(v) High Level coordination committee on agricultural statistics.

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	(vi) Sub-group for planning of survey for estimation of yield of irrigated and un-irrigated crops in command areas, Ministry of Irrigation, New Delhi.
	(vii) Sub-group for planning of survey for estimation of fruits and vegetables in the state of West Bengal.
	(viii) Chairman, Telephones Committee and IWSU Committe of IASRI.
	(ix) President, Sports Committee, ICAR (Stat, Wing) Co-operative stores Ltd., and Recreation and Welfare Club of IASRI.
Dr. R.K. Pandey	(i) Indian Society of Agricultural Economics, Bombay.
	(ii) Indian Economic Association, Bombay.
	(iii) Member, Indian Academy of Social Sciences, Allahabad.
Sh. P.N. Bhargava	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Scientific Panel for Agronomy and Soil Sciences.
Dr. Aloke Dey	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) International Statistical, Instt., Netherlands.
	(iii) Editorial Board, Journal of Indian Society of Agricultural Statistics.
Dr. O.P. Kathuria	(i) Indian Society of Agricultural Sciences.
	(ii) International Association of Survey Statisticians.
	(iii) Indian Society of Agricultural Statistics.
Dr. H.P. Singh	(i) Scientific Panel for Animal Health and Diseases.
	(ii) Indian Society of Agricultural Statistics, New Delhi.
Sh. S.N. Mathur	(i) Computer Society of India (Institutional Member).
	(ii) Society of Information Sciences.
Sh. U.G. Nadkarni	(i) P.G. Faculty of the P.G. School, IARI, New Delhi.
	(ii) Agricultural Research Communication Centre.
	(iii) Sampling Methods Sectional Committee T.D.N.-33.
Dr. J.P. Jain	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) P.G. Faculty of the P.G. School. IARI, New Delhi.
Dr. K.G. Aneja	(i) P.G. Faculty of the P.G. School, IARI, New Delhi.
	(ii) Indian Society of Agricultural Statistics, New Delhi.

Dr. J.S. Maini	(i) Indian Society of Agricultural Statistics.
	(ii) Indian Society of Agricultural Sciences.
Sh. R.K. Khosla	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) International Association of Survey Statisticians, Paris (France).
	(iii) Scientific Panel for "Post Harvest Technology".
Sh. V.S. Rustogi	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) P.G. Faculty of the P.G. School, IARI, New Delhi.
Sh. P.N. Soni	(i) Scientific Panel for Microbiology.
Miss C.R. Leelavathi	(i) Scientific Panel for 'Agricultural Engineering'.
Dr. Bhagat Singh	(i) Board of Studies, Division of Agricultural Economics, IARI, New Delhi.
Sh. G.S. Bassi	(i) NAARM, ALUMUNI, Hyderabad (A.P.).
Sh. V.N. Iyer	(i) Scientific Panel for "Agricultural Engineering".
Dr. H.V.L. Bathla	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Scientific Panel for Fisheries.
Sh. K.B. Singh	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) NAARM, Hyderabad (A P.).
Sh. Satya Pal	(i) NAARM, Hyderabad (A.P.).
Sh. G.N. Bahuguna	(i) Scientific Panel for "Entomology and Nematology".
Sh. S.C. Rai	(i) EC 3.10.1 and 10.3 of Indian Standards Institutions.
	(ii) Staff Research Council of IASRI (Secy.).
	(iii) Indian Society of Agricultural Statistics, New Delhi.
	(iv) Food Sampling Committee of Indian Standards Institution.
	(v) Sub-Committee EC 3 : 10 of Indian Standards Institution for Control for preparation of Handbook of Quality Control.
	(vi) Joint Staff Council of IASRI.
Sh. J.C. Malhotra	(i) Indian Society of Animal Genetics and Breeding.
	(ii) Indian Society of Agricultural Statistics, New Delhi.
	(iii) Scientific Panel for Animal Breeding.

Sh. B.C. Sexena	(i) I.C.A.R. Scientific Panel for Home Science.
Dr. Randhir Singh	(i) Boards of Studies, IASRI, New Delhi.
	(ii) Indian Society of Agricultural Statistics, New Delhi.
	(iii) P.G. Faculty of the P.G. School, IARI, New Delhi.
	(iv) President, Seminar Association, IASRI, New Delhi.
Dr. P.C. Mehrotra	(i) Indian Society of Agricultural Statistics.
	(ii) Indian Society of Agricultural Sciences.
Dr. R.C. Jain	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) P.G. Faculty of the P.G. School, IARI, New Delhi.
Shri Jagmohan Singh	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Indian Society of Agricultural Sciences, New Delhi.
Shri T.B. Jain	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Indian Society of Agricultural Economics, Bombay.
	(iii) NAARM, Alumuni, Hyderabad.
Shri S.N. Arya	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Agricultural Research Communication Centre.
Sh. S.P. Verma	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) NAARM Alumuni, Hyderabad (A.P.)
Sh. P.S. Rana	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Indian Academy of Mathematics, Indore.
	(iii) Indian Society of Theory, Probability and Applications.
Sh. S.D. Wahi	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Agricultural Research Communication Centre, Sadar, Karnal.
Sh. Lal Chand	(i) ICAR Scientific Panel for Plant Breeding.
Sh. K.C. Bhatnagar	(i) Indian Society of Agricultural Statistics, New Delhi.
Sh. J.K. Kapoor	(i) Scientific Panel for Soil Science.
Sh. Basant Lal	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Scientific Panel for Horticulture and Eloriculture.
Sh. P.K. Malhotra	(i) Scientific Panel for 'Plant Breeding'.
	(ii) Indian Society of Agricultural Statistics.

Dr. G.C. Chawla   (i) Indian Society of Agricultural Statistics.

                      (ii) NAARM Alumuni, Hyderabad (A.P.)

Sh. M.S. Batra   (i) Indian Society of Agricultural Statistics.

                      (ii) Indian Society of Agricultural Sciences.

Sh. Chandrahas   (i) Scientific Panel for Plant Pathology.

The following officers were also members of Indian Society of Agricultural Statistics, New Delhi.

Dr. A.K. Nigam, Dr. A K. Banerjee, Sh. R. Gopalan, Dr. A.K. Srivastava, Dr. Shivtar Singh, Sh. P.P. Rao, Mrs. Ranjana Agarwal, Sh. L.K. Garg, Sh. D.L. Ahuja, Sh. H.B. Choudhary, Sh. S.N. Bajpai, Dr. J.S. Maini, Sh. R.S. Khatri, Sh. Anand Prakash and Sh. D.C. Mathur.

(b) The Director was the ex-officio member of the following Scientific Committees, Panels. Working Groups, etc., during the year.

(i) Direction Committee (Computer Science and Numerical Analysis) IASRI, New Delhi.

(ii) Advisory Board on Training Courses, IASRI, New Delhi (As Chairman).

(iii) Academic Council, IARI, New Delhi.

(iv) Committee on Improvement of Agricultural Statistics, National Sample Surveys Organisation, New Delhi.

(v) Sampling Methods Sectional Committee, TDC-33 for preparation of Standard of Statistical Quality Control of the Indian Standards Institution, New Delhi.

(vi) Committee on Improvement of Agricultual Statistics, Dte. of Economics and Statistics, New Delhi.

(vii) Faculty of Mathematics, University of Delhi.

viii) Central Technical Committee on Agricultural Census (1980-81) of the Ministry of Agriculture, Govt. of India, New Delhi.

(ix) National Advisory Board on Statistics (NABS), Govt. of India C.S.O., New Delhi.

(x) Advisory Commission of the Governing Council of Indian Society of Human Cenetics, Bombay.

(xi) Council of the Centre for Mathematics Sciences, Trivandrum.

(xii) Committee of experts to evaluate the proposal submitted by Economics and Marketing Research Department of Projects and Development India Ltd.

(xiii) Re-constituted Regional Committee No. 4 consisting of Sub-humid Sutlej-Gnaga Alluvial plans comprising of States of Punjab, Delhi, U.P. Plains and Bihar.

(xiv) AFDC-57/P2 on behalf of the sampling Methods for food Production Agricultural Inputs Sec-

tional Committee of the Indian Standards Institutions, New Delhi (as Chairman).

(xv) Management Committee, IASRI, New Delhi (as Chairman).

1.11 Appointments, Promotions, Transfers, Retirements and Resignation, etc.

Appointments:

1. Dr. Karmeshu appointed as Scientist (S-3) w.e.f. 29.3.1985 (A.N.)

2. Sh. Narender Kumar appointed as Superintendent w.e.f. 30.5. 1985.

3. Sh. S.K. Maithani appointed as Suberintendent (A&A) on deputation w.e.f. 17.6.1985 (F.N.)

4. Dr. (Smt.) Ranjana Agarwal has been appointed as Scientist (S-3) and joined duty at I.A.S.R.I. on 9.8.1985 (F.N.)

5. The appointment has been made of Sh. S.N. Malhotra, Inspector (Executive) in the office of the CISF to the temporary post of Security Officer in the pay scale of Rs. 650-1200 w.e.f. 26th August, 1985 on the foreign service.

Promotions:

1. Sh. R.L. Rustogi, Scientist (S-1) has been promoted in (S-2) grade w.e.f. 1.1.1983.

2. Sh. J.K. Kapoor, Scientist (S-1) has been promoted in (S-2) grade w.e.f. 1.1.1983.

3. Consequent upon the appointment of Sh. S.D. Sharma, A.F.O. to the post of Field Officer in grade (T-6) of category III in the pay scale of Rs. 700/- to 1300/-. He has joined his duty at IASRI H.Q. w.e.f. 4.2.1985 (F.N.) vide O.O. No. 30 (207)/78-Admn. II dated 15th March, 1985.

4. Sh. B.K. Mehta appointed as Asstt. Admn. Officer w.e.f. 28.3.1985. (F.N.)

5. Sh. Bhagat Singh, Scientist (S-1) has been promoted to the post of Scientist (S-2) w.e.f. 1.1.1984.

6. Dr. Randhir Singh, Scientist (S-2) has been promoted to the post of Scientist (S-3) w.e.f. 19.4.85.

7. The following Technical Personnel have been given the merit promotion w.e.f. the dates as mentioned against each:

   1. Sh. B. Ramkrishnan, (T-4) to (T-5) 1.7.1984
   Tech. Asstt. Rs. 650-1200

   2. Sh. Maharaj Swaroop, (T-4) to (T-5) 1.7.1985
   Tech. Asstt. Rs. 650-1200

   3. Sh. Amlendu Sinha, (T-4) to (T-5)1.7.1985
   Tech. Asstt. Rs. 650-1200

   4. Sh. Praveen Kumar Saxena, (T-II-3) to (T-4) 1.1.1985
   Tech. Asstt. (Lib.) Rs. 550-900

Transfer:

1. Sh. B.L. Jhangira, Accounts Officer has joined duty at IASRI

w.e.f. 17.1.85 on transfer from NRCG, Junagarh.

2. Sh. K.C. Bhatnagar, Scientist (S-1) has joined duty at I.A.S.R.I. w.e.f, 1.3.85 on transfer from NDRI, Karnal.

3. Sh. R.C. Goyal, Scientist (S-1) has joined duty at IASRI on 9.4.85 (F.N) on transfer from CARI, Izatnagar.

4. Dr. V.K. Sharma formerly Scientist (S-2) at IARI, New Delhi has joined duty as Scientist (S-3) at IASRI w.e.f. 19.4.85 (FN).

5. Dr. U.N. Dixit formerly Scientist (S-1) at IARI, New Delhi has joined as (S-2) at IASRI w.e.f. 23.4.85.

6. Consequent upon his appointment as Scientist 'S' in C.A.R.I., Izatnagar (U.P.), Sh. Ram Gopal, Technical Assistant (Stat.) T-4 has been relieved of his duties with effect from 30.4.85 (F.N.) vide office order No. 39 (65),77-Admn. II dated 30th April, 1985.

7. Sh. Ravindra Srivastava, Scientist (S-1) has joined duty at IASRI w.e.f. 3.6.85 (F.N.) on transfer from ICAR Headquarter.

8. Sh. Thakur Dass, Sr. A.O. has joined duty at IASRI w.e.f. 5.7.15 (F.N.) on transfer from IARI, New Delhi.

9. Sh. Chanan Lal, C.A.O. has been transferred to IARI and relieved at IASRI w.e.f. 5.7.85.

10. Sh. S.K. Batra, Sr. Stenographer on deputation was relieved at IASRI on 19.7.85 (F.N.)

11. Sh. S.P. Bhardwaj, Scientist (S-1) has joined duty at IASRI on 7.8.85 (F.N.) on transfer from ILRI, Ranchi.

12. Sh. M.S. Narang, Scientist (S-1) has joined duty at IASRI on 13.8.85 (F.N.) on transfer from IVRI Izatnagar (U.P.).

13 Sh. Ant Ram, Scientist (S-1) has joined at IASRI on 28.8.85 (A.N.) on transfer from ICAR Headquarter.

Retirement:

1. Shri B.K. Mehta, Asstt. Admn. Officer has been retired from IASRI services on the afternoon of 30.9.85.

1.12 Representation of Scheduled Castes/ Scheduled Tribes in Services at the Institute.

The position of posts held by the SC/ ST candidates during the year under report is indicated in Appendix-II.

1.13 Joint Council :

Election of Joint Council was held on 24.12.85.

1.14 Grievance Cell

The grievance cell of this Institute has been reconstituted for a period of 3 years w.e.f. 17th June, 1985 *vide* Office Order No. 17 (1)/85-Admn. II dated 17th June, 1985.

1.15 Staff Amenities

(a) Recreation and Welfare Club :

The IASRI Recreation and Welfare Club was set up in 1965 with the following main objectives :

   i) To provide facilities for indoor and outdoor games.
   ii) To create good reading habits and to develop literary tests.
   iii) To promote social and friendly relations among the members.
   iv) To look after the general welfare of the members.

Keeping these in view, the club provides facilities to its members, a number of indoor and outdoor games like Table-Tennis, Carrom, Chess, Playing Cards, Badminton, etc.

To improve the standard of games, every year tournaments are organised in various items of games and sports.

The members of the Executive Committee for the year 1985-86 consisted of the following :—

Dr. S.K. Raheja	President
Dr. O.P. Kathuria	Vice-President
Sh. S.L. Dua	Vice-President
Sh. S.K. Sharma	Secretary
Sh. Satya Pal	Joint-Secretary
Sh. G.M. Pathak	Sports-Secretary
Sh. Mohan Lal	Treasurer
Dr. U.N. Dixit	Literary Secretary
Sh. A.P. Singh	Cultural Secretary
Sh. V.P.N. Singh	Member
Sh. Asha Ram	Member
Sh. K.B. Sharma	Member

Sh. S.C. Panwar	Member
Sh. S.K. Upadhayaya	Member

(b) Benevolent Fund :

In order to provide relief in time to the families of the employees of this Institute, who die in harness and are left in an indignent condition, Benevolent Fund was constituted. The fund is fed by the contribution from members of the Fund and donation received from the Institute's employees and students.

   (i) On the occasion of Benevolent Fund day on 31.10.85 an Amount of Rs. 175/- were collected from the Officers/Staff of I.A.S.R.I
   (i) A meeting of the Benevolent Fund was held on 6.11.85.
   (iii) A sum of Rs. 15/- has been received from Sh.S.L. Dua, Asstt. Admn. Officer on account of unspent balance left after the Farewell of Sh. D. Nath.

(c) IASRI Employees Cooperative Thrift and Credit Society Ltd.

The society which is registered with the Registrar Cooperative Societies, Delhi Administration, Delhi, Regd. No. 495 (u) continued with its activities in usual manner. The society had been helping its members by advancing loans as was being done during the past years. The total membership of the society increased to 469 on 31.12.1985. The last General Body Meeting was held on 5th Nov., 1985 in which the accounts for the year 1984-85 were presented and passed Ammendments in the by-laws raising the loan amount from 5000/- to

Rs. 7500/- and number of instalments from 30 to 45 were discussed and passed by the G.B. and thereafter sent to the Registrar, Cooperative Societies for approval. The election for the new Managing Committee was held on 8th Nov., 1985 and the following were elected.

1. Sh. Ram Kumar — President
2. Sh. Satya Pal — Vice-President
3. Sh. M.L Choudhary — Hony. Secretary
4. Sh. Naresh Chand — Hony. Treasurer
5. Sh. V.P.N. Singh — Member
6. Sh. Ashok Kumar — ,,
7. Sh. Panna Lal Gupta — ,,
8. Sh. P.P. Singh — ,,
9. Sh. D.K. Sharma — ,,
10. Sh. Vishnu Hari Gupta — ,,
11. Sh. Maqsood Khan — ,,

The new managememt committee took charge of the society on 1st Dec., 1985.

During the accounting year 1984-85, the society advanced Rs. 8,89,090 as loan to the members. The source of funds of the society are share money, compulsory deposits, and fixed deposits from the members of the society.

The member welfare scheme introduced in the year 1979 is continuing and looking after the welfare of its members. Its funds amounted to Rs. 1900/- on 30.6.85. There was a proposal to allocate Rs. 2000/- to this fund out of the profit for the year 1984-85 which was approved by G.B. It was also decided that each member would contribute Rs. 4/- per year towards this fund.

1.16 Honours/Awards Won, etc. :

(i) Prof. Prem Narain was nominated on the Technical Advisory Committee on Training of Statistical Personnel set up by the Deptt. of Statistics, Ministry of Planning, Govt. of India for a period of two years.

(ii) He was nominated on the Technical Advisory Committee of the Indian Statistical Institute, Calcutta for Applied Statistics, Surveys and Computing Division for two years.

(iii) He was nominated on the High Powered Committee to go into the various suggestions received for making modifications in the Crop Insurance Scheme introduced w.e.f. Kharif 1985 Season and also to review all the related aspects of the Scheme, constituted by the Govt. of India, Ministry of Agriculture and Rural Development, New Delhi.

(iv) He was nominated on the Committee of Experts to examine the present methodology of estimation of production, consumption, stock, etc. in respect of cotton and look into causes of discripancies between the trade and official estimates of cotton production, constituted by the Govt. of India, Ministry of Agriculture

and Rural Development, New Delhi. Comprehensive Programme on 'Science and Technology Indicators for Development' being evolved by Commonwealth Science Council.

(v) Prof. Narain was also nominated on the Expert Group constituted by C.S.I.R. in connection with the

1.17 Attending training, study tour, meetings and to deliver lectures etc. by the scientists during Jan.-Dec., 1985.

Prof. Prem Narain, Director

(i) Attended the Function to commemorate the Anniversary of the Inauguration of the Golden Jubilee of the Indian National Science Academy, New Delhi on 16th January, 1985.

(ii) Delivered a special lecture entitled 'Diffusion Processes in Population Genetics' on 4th Jan., 1985 in the Section on Statistics during the 72 Session of the Indian Science Congress Association held at Lucknow University, Lucknow,

(iii) Attended as Secretary-General, the first meeting of the Executive Council of the Federation of Indian Societies of Agricultural Sciences and Technology held at IASRI on Feb., 25, 1985. Dr. B.P. Pal, President of the Federation, chaired the meeting.

(iv) Chaired Sessions on 'Micro-level planning and food and agriculture' during the Working Conference on 'Computer for advance of [rural society' on 11th March, 1985 at Akbar Hotel, organised by the Computers Society of India on the eve of their Annual Convention.

(v) Chaired a Session on Submitted papers related to scientific applications during the 20th Annual Convention-1985 of the Computer Society of India held at New Delhi on 15th March, 1985.

(vi) Attended the 30th Meeting of the Governing Council of NSSO, New Delhi on 2nd March, 1985 in connection with the discussion on 'Development of Methodology on the expectation of Crop yield based on the stage of Crop Growth'.

(vii) Attended meeting of the M. Phil Committee in Mathematical Statistics, Department of Mathematical Statistics, University of Delhi, Delhi on 17th April, 1985.

(viii) Delivered 'Prof. R.S. Verma memorial Lecture' entitled "Population dynamics of gene substitution in molecular evolution" in the programme 'A Date with Mathematicians-1985' organized by the Mathematical Association of India (Delhi Chapter) on 13th April, 1985 at the Physics Lecture Theatre University of Delhi.

(ix) Attended Twelfth meeting of the Project Working Committee of the UNDP/ICAR assisted Projects on Postgraduate agricultural Education and Research for the establishment of Centre for Advanced Studies (Project No. IND/83/020) at ICAR, New Delhi on 16th April, 1985.

(x) Attended as Secretary-General, meeting of the Working Group of the Federation of Indian Societies of Agricultural Sciences and Technology at IASRI, New Delhi on 30th April, 1985.

(xi) Chaired the Sub-Committee meeting constituted by ICAR to consider, prepare and developed the VII Five Year Plan proposals of the Council in the discipline of Agricultural Statistics, held at Krishi Bhavan, New Delhi on 14th May, 1985.

(xii) Attended, as Vice-President, the Executive Council cum-Editorial Board/the Annual General Meeting/Extra-ordinary General Meeting of the Indian Society of Agricultural Science held at Krishi Bhavan, New Delhi on 3th May, 1985.

(xiii) Attended first meeting of the Technical Committee for revision of based period for All-India Index Numbers of Agricultural Production at Directorate of Economics and Statistics, Krishi Bhavan, New Delhi on 11.7.1985.

(xiv) Attended meeting of the M. Phil Committee in Mathematical statistics in the Department of Mathematical Statistics of the University of Delhi, Delhi held on 14.8.1985.

(xv) Attended Academic Council Meeting of the IARI on 31.8.1985.

(xvi) वैज्ञानिक तथा तकनीकी शब्दावली आयोग शिक्षा तथा संस्कृति मंत्रालय नई दिल्ली द्वारा आयोजित 10.9.85 को कृषि सांख्यिकी विषय नाभिका की बैठक में अध्यक्ष के रुप में भाग लिया ।

xvi) Attended meeting of the High Powered Committee of the Crop Insurance Scheme of the Ministry of Agriculture and Rural Development, Govt of India at New Delhi on 3rd October, 1985.

(xvii) Attended the Academic Council Meeting of IARI on 25th November, 1985.

(xviii) Attended the first meeting of the Experts Group for commonwealth science council project: 'Science and Technology Indicators for Development' held at NISTADS, New Delhi on 26th November, 1985.

(xix) Attended the Inaugural Ceremony of the Installation of Computer System at ICAR Headquarters on 4.12.85. The system is also linked with the main Frame Computer System B-4700 of IASRI, New Delhi.

(xx) Attended the UNDP Task Force Committee Meeting held on November 21, 1985 at IASRI which has been set up for studying the future computing needs augmenting the computer hardware available, finding out the software requirements, estimating the number of micros required in the context of the availability of the resources like communications, data transmission computer networking, etc. available in the Country to have a consolidated networking of computer in ICAR institutes and Agricultural Universities.

(xxi) As Director, he looked after the Administration of the Institute as well as coordinated the entire research, training and computer activities of the Institute.

(xxii) As Sub-Project Coordinator of the FAO/UNDP Project 'Centre of Advanced Studies in Agricultural Statistics and Computer Applications', he organised the activities of the Project which aims at developing a Centre of excellence with adequate infrastructure and facilities to undertake advanced training programme and carry out research in various aspects of agricultural statistics and computer applications.

(xxiii) As Head of the Division of Bio-statistics and Statistical Genetics, he coordinated, organised as well as guided the research activities of the Division. The scientists/technical staff were guided in preparation of the Annual/final reports of the research projects from time to time as well

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as on their presentation in Staff Research Council and in preparing the various reports of the research projects. Suitable guidance was also given in the preparation of Research Project Files to the various scientists.

(xxiv) As overall Supervisor, he organised the ICAR Agricultural Research Service Competitive Examination for Delhi Centre from February 20-23, 1985 conducted by ASRB.

(xxv) He attended the 72nd Session of the Indian Science Congress Association held at Lucknow University, Lucknow from January 3-7, 1985.

(xxvi) He had discussion with Sh. K.N. Ardhanareeswaran, Joint Secretary, Ministry of Agriculture, Govt. of India and Dr. S. Rajagopalan, Jt. Director (Statistics), Deptt. of Statististics, Madras on the conduct of crop cutting experiment to meet the needs of Crop Insurance Scheme in Tamil Nadu, at Krishi Bhavan, New Delhi on Feb. 14, 1985.

(xxvii) He had discussions with Sh. S. Chandra, Dy. Commissioner (Narcotics), Madhya Pradesh Unit, Neemuch regarding feasibility of Crop Insurance for Poppy crop, at IASRI on Feb. 15, 1985.

(xxviii) He had discussions with Sh. R.V. Madhav Rao, Managing Director, General Insurance Corporation of India, Bombay and Sh. A.C. Sen, Joint Secy., (Insurance), Ministry of Agriculture, New Delhi regarding various aspects of crop insurance, at IASRI on Feb. 18, 1985.

(xxix) He gave necessary guidance to Dr. O.P.S. Senegar, the Principal Investigator of the PL-480 Goat Project, who visited the Institute on 25.2.85 to discuss about the Institute collaboration in taking up the analysis of the data collected under the project. It was agreed that the data will however be analysed at the Institute.

(xxx) He attended the National Workshop on Crop Insurance at Vigyan Bhavan, New Delhi on 1st May, 1985 organised by the Ministry of Agriculture, Govt. of India.

(xxxi) He had discussions with Dr. Shymal Mathai, Scientist of the Lead Protein Research Unit, ISI, Calcutta who visited the Institute on 6th June, 1985 regarding possible collaboration in the project.

(xxxii) He participated in the one-day National Conference on Crop Insurance held on 17th July, 1985 at New Delhi under the chairmanship of Secretary (A&C), Ministry of Agriculture and Rural Development, Govt. of India. While speaking on the statistical aspects of the Crop Insurance, emphasized the need for sound data base and stressed that in future the seasonal average yield of a crop, required for calculating the threshold yield, premium and indeminity table should be based on adequate number of crop cutting experiments. The number of experiments could be more than 10 at block level. This point was well taken by the Chairman.

(xxxiii) He attended the meeting of the ICAR Scientific Panel on Economics, Statistics and Marketing held at Krishi Bhavan, New Delhi on 18th July, 1985.

(xxxiv) He attended the meeting of the Technical Advisory Committee for Applied Statistics, Surveys and Computing Division of the Indian Statistical Institute, Calcutta on 25th July, 1985.

(xxxv) He attended as Chairman the Fourth Meeting of the Sampling Methods for Food Products and Agricultural Inputs Sectional Committee (AFDC-57) of the Indian Standards Institution, New Delhi held on 26th August, 1985 at Mohan Nagar, Ghaziabad.

(xxxvi) He attended the National Symposium on Agricultural Education and Research in India at IARI, New Delhi from Oct. 28-30, 1985 organised by the Agricultural Society of India, Calcutta and presented a paper entitled 'Identification of Research Priorities in Agriculture' on 30th October, 1985 at Session-IV.

(xxxvii) He attended the ICAR Scientific Panel for Economics Statistics and Marketing at Krishi Bhavan, New Delhi on 9th December, 1985.

(xxxviii) He attended the 39th Annual Conference of the Indian Society of Agricultural Statistics held at Punjabrao Krishi Vidyapeeth, Akola from 28th to 30th December, 1985 and participated in the deliberation of various sessions.

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Dr. S.S. Pillai, Jt. Director	(i) Delivered a lecture on 'Computers role in Agricultural Development' at the Annual Day Function of the Computer Society of India held at Hotel Taj Palace, New Delhi on 14th Dec., 85.
	(ii) Delivered a lecture on 'Security of Computer Installation and Establishment' on 30th Nov., 1985. During one day Seminar on Computer data security held by computer society of India at Taj Palace Hotel, New Delhi.
	(iii) Delivered a lecture on 'Computerisation of employment exchange functions' on 17.12.85 to the participants of the integrated Training Course for employment Officers held in the Central Institute for Research and Training in Employment Services, Pusa, of the Ministry of Labour, Government of India.
	(iv) Delivered a lecture on 'Computers in Administration' to the Participants of the 8-computer centre management and data communication course held by the Directorate of Police Computers on 10th September, 1985.
Dr. R.K. Pandey, Sr. Scientist	(i) Attended a meeting of technological committee for revision of base period for All-India Index Members of agricultural production in the Dte. of Economics and Statistics, Ministry of Agriculture and Rural Development, New Delhi on 11th July, 1985.
	(ii) Attended the inaugural function of the FAO-ICAR Workshop of AGROVOC THESSRUS for South Asia held at IASRI, New Delhi on 29th July, 1985.
Dr. S.K. Raheja, Senior Scientist (S-4)	Deputed as a Visiting Research Scholar to the International School for Agricultural and Resource Development, Colorado State University, Fort Collins,Collins, Colorado-80523. U.S.A. for about 4 months w.e.f. 14th October, 1985 to participate in the research and teaching programme of ISARD.
Sh. P.N. Bhargava, Scientist (S-3)	(i) Attended Regional Group Meeting to prepare Project Plans for an Integrated Production on Cropping Systems at selected locations in India held at Hyderabad and Delhi on 20th, 21st and 23rd March, 1985 respectively.
	(ii) Attended the Group discussion on 'Soil testing Plant Analysis and Fertilizer Evaluation organised by Indian Potash Research Institute in Nov., 1985.

Dr. K.C. Raut, Sr. Scientist	(i) Attended as a Member, the meeting of the Board of the studies of IASRI on 14th and 25th February, 1985.
	(ii) Attended as a member, the meeting of Management Committee of IASRI on 28th Feb., 1985.
Dr. A.K, Nigam, Scientist (S-3)	Delivered two lectures at the Statistics Department,B.H.U. in Jan., 1985.
Dr. K.G. Aneja, Scientist (S-3)	Gave a talk to the participating ICAR Institutes' Statisticians on 29th Jan. 1985 on the work of the Division of Forecasting Techniques.
Sh. S.N. Mathur, Scientist (S-3)	Delivered a lecture on 15th batch of ISS probationers on, "Data Processing and use of Computer in Agriculture Research" on 6th Feb., 1985.
Dr. A.K. Srivastava, Scientist (S-3)	Delivered a lecture on, "Elementary sampling technique II" in Crop Insurance Training organised by Ministry of Agriculture at IASRI on 8th January, 1985.
Sh. S.C. Rai, Scientist (S-3)	(i) Attended meeting of the Advisory Committee of UNDP Project held on 17th January, 1985 at IASRI, New Delhi.
	(ii) Attended the meeting of Evaluation Mission of UNDP Project No. IND/83/020 held at IASRI on the 4th April, 1985.
	(iii) Conducted the meeting of Staff Research Council of the Institute as its Secretary on the 30th and 31st May, 1985 at IASRI, New Delhi.
	(iv) Attended the meeting of AFDC 57 at Indian Standards Institution, Manak Bhavan, New Delhi on 26th August, 1985.
	(v) Attended Second meeting of Advisory Committee of UNDP Project held on the 29th October, 1985 at IASRI, New Delhi.
	(vi) Attended first meeting of Task Force of Computer Applications held at IASRI, New Delhi on the 21st November, 1985.
Sh. J.C. Malhotra, Scientist (S-2)	Delivered lecture on, Progeny Testing Programme-its importance and background.
Dr. Shivtar Singh, Scientist (S-2)	(i) Delivered the following lectures to the participants attending the Second Crop Insurance training Course held at Newzealand guest house, Aarey Milk Colony, Goregaon (East) Bombay from February, 18-23, 1985.

(i) Estimation of crop yields through sample survey on 18.2.85.

(ii) Determination of premium rates on 19.2.85.

(ii) Delivered a lecture on, "Cost of production of milk" to C.S.O. trainees on 6th May, 1985 at IASRI, New Delhi-12.

Dr. P.C. Mehrotra, Scientist (S-3)	(i) Delivered a lecture on activities of the Division of 'Sample Survey Methodology and Analysis of Survey Data" in respect of field crops to trainees of Junior Certificate Course of CSO opting agricultural statistics as a special subject in the context of specialized training in the selected subject of their training at IASRI, New Delhi.

(ii) Attended high level coordination committee's 8th Meeting on Agricultural Statistics, H.P. held at Shimla on 3rd October, 1985.

(iii) Attended Committee of Experts on Crop Estimates in respect of cotton at Krishi Bhavan, New Delhi on 10th October, 1985.

(iv) Attended first meeting of technical group set up to identify the causes of discrepancies observed in demand and supply of raw jute, etc. — divergence in official and trade estimates held and Krishi Bhavan, New Delhi on 10th Dec., 1985.

(v) Delivered a lecture on the Methodology adopted in the planning and execution of research projects on field crops in the division of SSM&ASD to a representative Sh. G.N. Amahia, lecturer, University of Ibadan, Nigeria.

Dr. (Mrs.) Ranjana Agrawal, Scientist (S-3)	(i) Gave lecture to C.S.O. trainees on forecasting crop yield using weather variables on 8.5.85 at IASRI, New Delhi.

(ii) Delivered lectures on statistical research on pre-harvest methodology to CSO trainees on 28th October, 1985 and 11th November, 1985.

Dr. G. Sadasivan, Scientist (S-2)	Delivered a lecture on "Some order effect models for paired comparisons" on 15th April, 1985 at the Statistics Deptt. of Punjab University.

Sh. S.P. Doshi Scientist (S-2)	(i) Attended a short duration full time course on "Data Processing and File Systems" conducted by I.I.T., Hauz Khas, New Delhi from 14th May to 31st May, 1985.

	(ii)	Attended a short duration full time course on 'Data Base Systems' conducted by I.I.T., New Delhi from 3rd Dec. to 21st Dec., 1985.
Sh. O.P. Dutta, Scientist (S-2)		Attended a short term full time course on 'COMPILER-CONTRUCTION" from 14th May to 31st May, 1985 held at I.I.T., Delhi, Deptt. of Computer Sciences and Engineering.
Sh. Ram Kumar Scientist (S-2)	(i)	Attended a short term full time course on 'Computer Organisation and Architecture' from 14th May to 31st May, 1985 at I.I.T., Hauz Khas, New Delhi.
	(ii)	Attended a short term full time course on 'Systems Analysis and Design' held at I.I.T., New Delhi from 3rd Dec., 1985 to 21st Dec., 1985.
Sh. Mahesh Kumar, Scientist (S-2)		Attended a short term full time course on "Microprocessor system and applications" at I.I.T., New Delhi from 3rd Dec., 1985 to 21st Dec., 1985.
Sh. I.C. Sethi, Scientist (S-2)		Attended a course entitled 'Theory of Computation' organised by the Deptt. of Computer Science and Engineering conducted by I.I.T., Delhi under its continuing Education Programme during 3rd to 21st Dec., 1985.
Sh. N.K. Ohri Scientist (S-2)		Delivered three lecture on statistical methods in the XXVII (27th) short (Refresher) course Training in Soil Testing for social chemists incharge of Soil Testing Laboratories held at the Division of Soil Science and Agricultural Chemistry IARI on Ist, 3rd and 4th October, 1985.
Sh. B.H. Singh Scientists (S-1)	(i)	Gave lecture to trainees from C.S.O. regarding forecasting of crops using biometrical characters on 8th May, 1985 at IASRI, New Delhi.
	(ii)	Delivered a lecture to M.Ss. (Stat.) students of Karnataka University on 21.11.85.
Sh. K.C. Gupta Scientist (S-1)		Attended a short term full time course on "Programme Methodology and Data Structures" from 14th May to 31st May, 1985 at I.I.T., Hauz Khas, New Delhi.
Sh. G.N. Bahugua Scientist (S-1)		Gave lecture on "Crop losses due to pests and diseases" to J.C.C. trainee of C.S.O., New Delhi and ISEC Trainee (ISI), New Delhi on 8.5.85 at IASRI, New Delhi.

1.18. Other Information

Prof. Prem Narain, was unanimously elected Member of the General Body of the Jan Tinbergen Institute of Development Planning, Rohtak for a period of three years from 1st April, 1985 to 31st March, 1988.

He was elected as Vice-President of the Jan Tinbergen Institute of Development Planning, Rohtak for a period of one year from 1.4.85 to 31.3.86.

He was nominated on the Technical Advisory Committee on Training of Statistical personnel set up by the Departmont of Statistics, Ministry of Planning, Govt. of India for a period of the years.

He was nominated on the Technical Advisory Committee of the Indian Statistical Institute, Calcutta for Applied Statistics, Survey and Computing Division for two years.

He has been co-opted as a member of the Faculty of Mathematics, University of Delhi for a period of three years w.e.f. 29th March, 85.

Biography of Prof. Prem Narain published by the Business Press Private Limited, Bombay, in their publication 'WHO's WHO IN INDIA-1985'.

He presided over the meeting of Sampling methods for Food Products and Agricultural Inputs Sectional Committee, AFDC 57 ; and Panel on the Method of Sampling for Pesticide Residues Analysis, AFDC 57/p-4 on the 26th August, 1985 at Indian Standards Institution, Draft Indian Standard on Method of Sampling for the Determination of Pesticide Residues Part-I—Agricultural and Food Commodities was finalized in the meeting. A number of Indian Standards were also approved to be widely circulated and some of them were recommended for revision. The meeting was attended by large number of delegates deputed from various organisations.

He has been nominated member on the High Powered Committee to go into the various suggestions received for making modifications in the Crop Insurance Scheme introduced w. e. f. Kharif 1985 season and also to review all the related aspects of the Scheme, constituted by the Ministry of Agriculture and Rural Development, Govt. of India, New Delhi.

He was nominated as Member of the Committee of Experts to examine the present methodology of Estimation of production, consumption, stock, etc., in respect of cotton and look into causes of discrepancies between the trade and official estimates of cotton production, constituted by the Ministry of Agriculture and Rural Development, Govt. of India, New Delhi.

The following two Books were reviewed by Prof. Prem Narain, Director of the Institute. The title, authorships and name of the publication and particulars of the Journal at which those were published are given below.

(i) Book review of Statistics in Britain (1865-1930). The social Construction of Scientific Knowledge by Donald A. Macken-

zie, University of Edinburgh, U.K. Edinburgh University Press, 22, George Square, Edinburgh, 1981, pp. i-vii, 1-304, published in *Jour, Ind. Soc. Ag. Statistics, Vol xxxvii, No. 2, 1985, pp. 212-217.*

(ii) Book review of Statistical procedures for Agricultural Research by Kwanchai A. Gomez and Arture A. Gomez. A Wiley-Interscience Publication, John. Wiley & Sons, New York, 1984, 680 pages, published in *Sankhya, The Indian Journal of Statistics, Calcutta series B, Vol. 47, Pt. 2, August, 1985, pp. 296-299.*

He was nominated on the Expert Group constituted by C S I R in connection with the Comprehensive Programme on 'Science and Technology Indicators for Development' being evolved by Commonwealth Science Council.

Dr. Narain also published a book entitled 'Training Programme in Food and Agricultural Statistics for Developing Countries', FAO, Rome pp—1-89.

Dr. S.S. Pillai, Jt. Director organised the XX annual Convocation of the Computer Society of India held in Hotel Ashok and Hotel Samrat, New Delhi in the capacity as Chairman of the Programme Committee. The convention was held during 13 to 16th March, 1985 and was attended by 1680 delegates from India and Abroad. An exhibition of latest computers was held during the convention by about 18 exhibitors. The theme of the convention was "Computers for Advance-

ment of Rural Society". 94 papers were presented in various sessions. Panel discussions and special lectures were other attractions of the convention.

He was nominated by the Computer Society of India to be the Chairman of the Programme Committee for the 20th Annual Convention of the Computer Society of India, which was held during 13-16 March, 1985 in New Delhi. A record number of 1635 computer professionals attended this Convention. The Convention included a number of paper presentation session, poster sessions, invited speakers on seven different topics Cultural programmes, tutorials and an exhibition of latest computer manufacturers both in the country and abroad were also organised. As programme Committee Chairman, Dr. Pillai was in-charge of organising the Convention in hotel Ashok, New Delhi. Prof. Prem Narain, Director of the Institute was Chairman of one of the sessions in which the problems relating to application of computers in Statistics was discussed.

Dr. S.K. Raheja, Sr. Seientist, as a member of the evaluation committee of ICAR, LLP, visited the states of Tamil Nadu, Karnataka and Kerala and assessed the impact of LLP on the socio-economic status of adopted families.

He was a member of Evaluation Committee of ICAR Lab to Land Programme visited zone IV Comprising the States of U.P. and Bihar during 1st to 10th April, 1985.

Dr. R.K. Pandey, Sr. Scientist, visited Haryana Agriculture University twice for implementation of the Project entitled "Economic Study of New Farm Technology with special Reference to yield Gaps and Associated Factors".

He acted as an expert in the Workshop on promotion of Employment Opportunities in Agriculture organised by the Institute of Applied Manpower Research, New Delhi on 18th June, 1985.

He was deputed by the ICAR to attend the workshop-cum-Monitoring tour on socio-economic research in farming system research to international Rice Research Institute, Manila, Phillipines from 16th to 28th September, 1985.

Dr. K. C. Raut, Sr. Scientist nominated as a member of the Joint Staff Council of IASRI and attended the meeting in April, 1985.

Dr. Randhir Singh, Scientist (S-3) visited F.R.I., Dehradun from June 19-21, 1985 to discuss the possibility of organising students Field Project and to have Jt. Project on problems relating to estimation of Timber and other by products.

Sh. S.N. Mathur, Scientist (S-3), attended a Training Course on "Programming in PASCAL" at Computer Maintenance Corporation Ltd., New Delhi from 18-29 March, 1985.

Sh. P.N. Bhargava, Sr. Scientist attended and presented a paper for discussion on Quality of data for ECF in the review committee on ECF.

Sh. P.C. Mehrotra, Scientist (S-3), guided one ISS probationer, Sh. Preet Singh of Batch-XV on the project work entitled, "An emperical study on post stratification in two-stage sampling". The project work was of 7 weeks duration from 12.8.85 to 30.9.85. The synopsis and project report on the above title was completed and finalized under his guidance & supervision.

Dr. J P. Jain, Sr. Scientist had series of group discussion with UNDP expert Prof Graham Kalton on advance topics in Sample Survey Methodology from Dec. 4-21, 1985.

Dr. A.K. Srivastava, Scientist (S-3) returned from a five months training in Sample Survey at University of Michigan, Ann Arbor USA on 28th Nov., 1985.

Dr. A.K. Banerjee, Scientist (S-3) visited Parsadepur, (Rai-Bareilli) for arranging programme of crop-cutting experiments to be conducted by IASRI for the evaluation trials conducted by IARI.

Sh. P.P. Rao, Scientist (S-2) taken the students of PSCC and SCC to the experimental fields of IARI to acquaint them with field experiments and various designs adopted.

Sh. B.C. Saxena, Scientist (S-2) attended meeting with Prof. Graham Kalton, UNDP Expert on 18-20th Dec., 1985.

Dr. R.C. Jain, Scientist (S-2) returned from USA on 24.12.85 after completing fellowship training on Crop Forecasting under UNDP project on Agricultural

Education and Research for Accelearated Agricultural Development at Texas A & M University, Texas, USA from 29.6.85 to 24.12.85.

Dr. K.K. Tyagi, Scientist (S-2) attended the meeting of ICAR interstudents Institute Sports Organizing Committee at IVRI, Izatnagar as representative of the Institute on 6th Dec., 1985.

He made various arrangements for the participation of Institute's Sport Contingent in the V ICAR Zone-III Sports Meet organised by NDRI, Karnal from 3rd to 5th October, 1985. Participating in the above sports meet as Vice-captain of Institute's Table Tennis Team and Captain of Badminton Team and won the Winners position for the Institute in Table-Tennis (Team events).

He was nominated as Secretary of the Seminar Association.

The following Scientists of the Institute attended the Intensive Course on Computer Aided Statistics Analysis organised by the National Centre for Software Development and Computing Techniques of the TIFR, Bombay from 11.2.85 to 15.2.85.

1. Dr. O.P. Kathuria, Sr. Scientist

2. Sh. S.N. Mathur, Scientist (S-3)

3. Dr. A.K, Banerjee, Scientist (S-3)

The following Scientist attended the training programme 'All India Advanced Institute in Sample Survey and Inference conducted by the Department of Statistics, University of Rajasthan from 1st October, 1985 to 11th Nov., 1985.

1. Sh. Anand Prakash, Scientist (S-2)

2. Sh. R.S. Khatri, Scientist (S-1)

3. Sh. Satya Pal, Scientist (S-1)

2. Design of Experiments and Analysis of Experimental Data

The work on Design of Experiments and Analysis of Experimental Data was continued during the year under report as per programme laid down. The progress of work in respect of various items of research included in the programme is summarised below. The name of the concerned Project leader and his associate (S) are given in brackets at the end of the description of each project.

2.1 Planning, designing and analysis of experiments planned under AICARP at cropping systems research centres and on cultivators' fields.

The objectives of the Project are (i) to identify the suitable statistical designs for the conduct of experiments according to the technical programme formulated each year in the annual workshop of the project, (ii) to develop the suitable statistical method of analysis for the identified designs and the sampling plan adopted for the conduct of experiments on cultivators' fields, (iii) to statistically analyse the data of about 600 complex experiments at 43 CSR centres and about 10,000 experiments on cultivators' fields in 49 selected districts in a year, and (iv) to develop the model proformae for the collection of data and the instructions manual for laying out the trials at cropping systems research centres and on cultivators' fields.

During the year 1985, the analysis of data relating to the expts. planned during 1984-85 at cropping systems research centres and on cultivators' fields in different districts spread over the country was completed. Partly, the data for the expts. planned during kharif 1985-86 was received and their preliminary scrutiny as well as listing/checking was also taken up.

During the period January-March, 1986, the scrutiny and the analysis of the experimental data planned during kharif 1985-86 would be continued and the results in respect of the expts. planned at cropping systems research centres and on cultivators' fields during 1984-85 would be finalised.

(P.N. Bhargava, P.N. Soni, H.C. Jain, B.L. Choudhary, P.K. Batra and (Rajinder Kaur)

2.2 Statistical assessment of changes in area and food production due to availability of water in the command area of Malaprabha-Ghataprabha river valley project in Karnataka, Krishna river valley project in Maharashtra and Pochampad river valley project in Andhra Pradesh.

The objective of the project is to study the changes in cropping pattern

adopted, increase in area under irrigation, average yield of different crops, agricultural practices adopted by farmers due to availability of irrigation in the command area and to find out the reasons for non-fulfilment of agronomic targets.

The report pertaining to the command area of Sreeramsagar (Pochampad) was finalised in the light of the comments of external referee. A joint report on the three commands was also prepared.

(C.R. Leelavathi and S.C. Mehta)

2.3 Planning, designing and statistical analysis of data relating to expts. conducted under All India Coordinated Research Project on Long Term Fert. Expts.

The objectives of the project are (i) to plan and design long term fertilizer experiments, (ii) to try alternative approaches for statistical analysis of data on Long Term Fert. Expts. and (iii) to coordinate the work of the project on national level, and also to provide necessary information to the Project Coordinator (LTFE).

Appropriate proformae for recording data of various characters were developed and necessary coding instructions prepared and communicated to all the 11 cooperating centres. Comprehensive training to the scientists and staff at various cooperating centres were imparted. The data for the year 1983-84 in respect of various characters were critically examined and appropriately analysed and results summarised and incorporated in the Annual Report of the All India Coordinated Research Project on Long Term Fertilizer Expts. The

results were discussed in a group meeting organised at IASRI from 18-19 December, 1985.

(P.N. Soni, M.R. Vats, D.K. Sehgal and D.K. Mehta)

2.4 A statistical study for characterisation of drought in relation to crop.

The objective of the project is to quantify drought threshold values in relation to a crop and to obtain the chances of occurrance of drought.

Rainfall and crop yields data for Ahmednagar and Bijapur was collected and analysed. Correlations between rainfall and yield was highest for groundnut crop and lowest for cotton crop. Threshold values were obtained from graphs (minimum rainfalls and yields). Threshold values for 1 week, 2 weeks and so on upto 16 weeks were obtained for all the three crops. Fitting of a quadratic function of these values and the length of interval was in progress.

(Asha Saksena, P.N. Bhargava and S.C. Mehta)

2.5 Statistical evaluation of agronomic factors in relation to homogeneity of error variances in groups of expts. on Jowar crop.

The objective of the project is to find out suitable plots and blocks favourable for homogeneity of error variances in groups of experiments in Jowar crop under different soil types etc.

An empirical study of 150 groups of experiments on Jowar crop indicated that

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there is more than 60% chance of getting homogeneity of error variances within a group of experiments if the block size adopted in clay soils does not exceed 350 sq. m. However if the number of treatments tried does not exceed 6 times the maximum limit of block size could be 450 sq. m. and the chances of getting homogeneity of error variances in such a case is about 75%.

(P.P. Rao and S.C. Rai)

2.6 Yardstick of additional production from the use of crop improvement measures.

The objectives of the project are (i) to prepare yardsticks of additional production and to work out benefit cost ratios using different response functions from the use of fertilizer and irrigation and (ii) to study the feasibility of developing composite yardsticks from experimental data.

(V.N. Iyer and Onkar Swarup)

2.7 National Index of Animal Experiment

The objectives of the Project are to record on uniform lines the research results of all experiments on animals conducted at various research stations in the country during the past and publish periodically the same in the form of compendia volumes for the benefit of research workers and planners.

2.7 (a) *Southern and Eastern Research Stations* : Data on large number of expts. conducted at college of Veterinary Science and Animal

Husbandry 'APAU' Rajendranagar (Hyderabad) were compiled, analysed and published the compendium. Most of the experiments belong to completely randomised Design (CRD). Another compendium pertaining to animal and poultry nutrition experiments conducted at Ranchi Veterinary College, Ranchi (Bihar) was in progress.

(G.C. Chawla and A. Dey)

2.7 (b) National Index of Animal Experiments Vol. IV, Part-I, pertaining to animal experiments conducted at Gujarat Agricultural University, Anand during 74-81. Compendia Vol. was completed. National Index of Animal Experiments Vol. IV, Part-II, pertaining animal experiments conducted during 1965-81 at Central Arid Zone Research Institute, Jodhpur, compendia Vol. was in progress. The compendium 'National Index of Animal Experiments, Vol. IV, Part-III, pertaining to Animal Experiments conducted at four important research centres of Maharashtra state viz. (i) Mahatama Phule Krishi Vishwa Vidyalaya, Rahuri, (ii) Marathwada Agricultural University, Parbhani, (iii) Punjab Rao Krishi Vidya Peeth, Akola and (iv) Bombay Veterinary College, Bombay during 1965-81 was under preparation.

(S.N. Bajpai and A. Dey)

2.8 Statistical assessment of cropping sequences in different agro-climatic regions of the country.

The objectives of the Project are to (i) comparison of the performance of different cropping sequences in terms of economic values/energy equivalents/agronomic productivity, (ii) to setting up of confidence intervals for crop (s)/sequences for different agro-climatic regions and (iii) examination of the consistency in performance of crop (s)/sequences over years.

Since the initiation of the project from July, 1985, the cropping sequence experiments conducted during the six years period (1978-79 to 1983-84) at about 20 cropping systems research centres in different agro-climatic regions of the the country for which replication-wise yield and other ancillary data were available, were identified and compilation started. The prices of various produce in different sequences at different agronomic research centres were collected. Further data collection and compilation was in progress.

(K.C. Bhatnagar, G.L. Khurana and C.R. Leelavathi)

2.9 Overview of designs adopted in animal nutrition experimentation in India with recommendation for use of new design in appropriate situations.

The objectives of the Project are (i) to evolve suitable technique for evaluating statistically the annual nutrition experiments on similar lines as have already been done to agricultural field experiments, (ii) to find out short coming in laying out animal nutrition experiments and (iii) to recommend suitable designs appropriate to different situations.

Detailed study was made of structural richness of 623 statistically designed nutritional experiments conducted at 18 important research stations of the country. In structural richness appropriatness of design adopted, appropriateness of treatments and their levels in context of the object of experiment and percentage loss of information due to faulty planning was examined. Latest literature about designs developed recently for animal experimentations was consulted. On the principal laid down by D.R. Cox in her book 'Planning of Experiments'. 1960, norms were decided for number of replications, permissible experimental error, number of treatment levels and distance between the levels so as to get maximum points in response curve/ surface wherever the need be. The report was nearly in completion.

(S.N. Bajpai, A.K.Nigam and D.K.Bhatia)

2.10 Statistical Studies on nitrogen economy through organic sources

The objectives of the Project are (i) to study the direct and residual effects of nitrogenous fertilizers applied alone or in combination with organic sources like FYM, Azolla and Rhizobium culture in crop sequences and to determine the extent to which nitrogen could be substituted through these sources and (ii) to study the comparative performance of slow release nitrogenous fertilizers and urea in rice based cropping systems.

The project was started since 1.7.85. upto Dec., 85, collection of data of various experiments covering various aspects of nitrogen economy was over. Scrutiny and coding in respect of some expts. would be over by next three months.

(Rajinder Kaur, A.K. Bhatia, Madan Mohan and P.N. Soni)

2.11 Studies on designs for animal experiments.

The objectives of the projects are (i) to review the existing literature and examine the feasibility of existing designs for animal nutrition and animal physiology experiments, (ii) to identify the situations where existing designs are inadequate and to construct new designs, (iii) to suggest optimal designs for small number of units and (iv) to prepare a catalogue of designs suitable for animal nutrition/animal physiology experiments.

The project started in October, 1985. Preliminary review of literature and experimental situations was in progress.

(K.S. Krishnan, R.K. Ghai, M.P. Saksena, P.R. Yeri and D.K. Mehta)

2.12 Main-effect orthogonal plans-construction and tabulation.

The objectives of the project are (i) to review comprehensively the existing literature, (ii) to construct more designs and give a unified method of construction and (iii) to prepare an upto date catalogue of the plans.

The project work was over. The report was being finalised. Several new plans have been abtained. In fact plans of the type n. $2n^{(m-1)} / / mn$ and $4^{t-1} 2^p$ $/ / nt$, where $p = t (n+2) - t^2 - 2$ and m, n and t, are, Hadamard number have been constructed. The method of construction involve several products like kronecker, Schur and new product of Hadamard matrices. A catalogue of orthogonal main-effect plans had also been prepared.

(V.K. Gupta, A. Dey and A.K. Nigam)

2.13 Agricultural field experiments information system.

The objectives of the project are (i) to collection of data of all the agricultural field experiments, excluding purely varietal trials, conducted at the various research stations and institutes at the country, (ii) to transferrence of data to and storage in magnetic tapes at a central place (IASRI), (iii) to dissemination of experimental information through publications such as Annual Directories, summaries of results of suitable groups of experiments and (iv) Developing arrangements for retrieval and supply of selected experimental data to research institutions and in special cases to individual scientists.

The scrutiny of experimental data received was undertaken and the coded data was being transferred on punch cards. The loading of data on tapes in respect of the experiments reported during 1983 was completed and in respect of experiments reported during 1984 was in progress.

The printing of 'Annual Index of Agricultural Field Experiments' Vol. X (in respect of experiments reported to

IASRI during 1981) was taken up and completed. The material in respect of the subsequent, Vol. XI (in respect of experiments conducted during 1972-77 and reported to IASRI during 1982 and 1983) was processed.

The editing of the material to be included in the reports on summarised results of cotton experiments conducted in the country during 1966-77 was completed while that for groundnut experiments was in progress. Preparation of similar report on sugarcane was in progress.

(K.S. Krishnan.R.K. Ghai, M.P. Saksena, P.R. Yeri, and D.K. Mehta)

2.14 Methodological studies and critical analysis of data relating to repeated experiments with some common treatments.

The objectives of the project are (i) to examine the applicability of the available methods of combined analysis of experiments when at least some treatments not necessarilly all the treatments, are common to all the experiments, (ii) to examines the applicability of the available methods in the literature for combined analysis of experiments when some treatments are common to some experiments only and not necessarily to all the experiments, (iii) to develop some new methods of analysis of a series of experiments covering the situations (a) and (b) above.

Experimental Data had been extracted from the National Index of Agricultural Field Experiments Scheme pertaining to Paddy Crop of Andhra Pradesh State subsequent to years 1966 onwards. Suitable groups of series of experiments having some common treatments were grouped. A preliminary review of the literature was in progress.

(J.K. Kapoor and V.K. Gupta)

3. Forecasting Techniques for Crops, Diseases and Pests

The progress of work under various research projects of the Division of Forecasting Techniques for Crops, Diseases and Pests is briefly described below with the names of the concerned Project leader and his associate (s) given in brackets at the end of the description of each project.

3.1 Pilot studies on pre-harvest forecasting of the yield of crops on the basis of observations on biometrical characters-- Groundnut, Apple and Sugarcane

The objective of the projects is to develop a suitable statistical methodology for obtaining pre-harvest estimates of yield on the basis of biometrical characters, agricultural inputs and rainfall.

3.1.1 Groundnut — Rajkot District (Gujarat) : – Data on biometrical characters, namely, number of plants, number of branches, length of main axis, number of flowers, number of pegs and number of pegs at various stages of crop growth, weather variable (rainfall) from different rainguage stations in the district and agricultural inputs such as fertilizers and manures applied in the selected plots were analysed. Data collected during Rabi 1985 were tabulated. Data schedules for the second round of survey for kharif 1985 season

had been received. During January to March, 1986, final tables of the results for kharif 1984 would be prepared and draft of the report would be taken up. Data schedules for Rabi 1985 would be scrutinised and tabulated.

(S.R. Bapat, B.H. Singh and R.C. Jain)

3.1.2 Apple—Shimla District (H.P.) :— The data collected during the first round (1984) of the survey were scrutinised, coded and got transferred on computer cards. The correlation analysis between apple yield, various biometrical characters and inputs were taken up. Further analysis would be continued,

The data collected during the second round (1985) of the survey would be coded and scrutinised for getting transferred on Computer cards.

(Chandrahas, K.G. Aneja and Prem Narain)

3.1.3 Sugarcane — Kolhapur District Maharashtra) : – The report summaries the results of the surveys on pre-harvest forecasting of yield of sugarcane conducted in Kolhapur district of Maharashtra during 1977-78 to 1979-80.

A stratified multi-stage random sampling design was applied for collection of

data on biometrical characters and yield. The results of the study show that there existed positive and significant correlation between yield and different biometrical characters at almost all period of crop growth in all the years. Four linear models were tried taking yield as dependent character in original scale and biometrical characters as independent characters in original, logarithmic, square-root and reciprocal scales. Liner model was found to be superior. It was observed that plant population, plant height and plant girth are significant characters to be needed to forecast the sugarcane yield after 7 months of plantation.

(S.R. Bapat, Chandrahas and B.H. Singh)

3.2 Pilot sample survey for estimating the incidence of pests and diseases and their consequent loss in high yielding varieties of paddy crop in South Arcot district of Tamil Nadu

The objective of the project is to develop methodology for estimating the level of incidence of pests and diseases, their consequent crop loss and avoidable loss.

Estimates of the level of incidence of pests and diseases and their standard errors were obtained during the year under report for 3 seasons viz. *Navarai* 1978, *Samba* 1978 and *Navarai* 1979. Part of the preliminary processing of data for estimating the crop loss due to pests and diseases for *Navarai* 1978 season was also done. In the next three months i.e. Jan. to March, 1986 the analysis for *Navarai* season 1978 would be completed and

preliminary processing of data for estimating crop loss due to pests and diseases for *Samba* 1978 season would also be done.

(K.G. Aneja and G.N. Bahuguna)

3.3 Yield forecast model based on biometrical characters and agricultural inputs for jowar, sugarcane and tobacco.

The objective of the project is to develop forecast model on the basis of growth indices of biometrical characters and by using principal components for biometrical characters.

3.3.1 *Jowar* :- In this project the data already collected under the project on pre-harvest forecasting of Jowar yield in Sangli district (Maharashtra) were utilised.

Model using growth indices and agricultural inputs were developed for hybrid jowar. Results indicated that inclusion of agricultural inputs improved the model based on growth indices of biometrical characters alone. In general, coefficient of determinations increased by more than 10% by inclusion of agricultural inputs. Model using data on biometrical characters of first three periods along with inputs explained 72% variation in yield and as such can be recommended for yield forecast. Using this model forecast of yield can be obtained at milk stage of the crop i.e. one month before harvest for a crop of $3\frac{1}{2}$ months duration. However, in local jowar effects of agricultural inputs were found to be negligible.

Further analysis of the data would be continued during January to March, 1986.

(R.C. Jain and Ranjana Agrawal)

3.3.2 Sugarcane :- In this project data already collected under the project on pre-harvest forecasting of yield of sugarcane in Meerut district (U.P.) were utilised.

Analysis had been carried out to develop model laking growth indices of biometrical characters. Models based on volume were also tried. Analysis revealed that model developed based on growth indices was at par with the model using variables as such. Also using volume in place of number of canes and height did not improve the model.

Further analysis of the data would be continued during January to March, 1986.

(R.C. Jain and Ranjana Agrawal)

3.3.3 Tobacco :– In this project the data already collected by the Institute under the project on 'Pilot studies on pre-harvest forecasting on tobacco yield in Prakasam district (A.P.) 'during 1976-79 were utilised.

Correlation studies were carried out to identify biometrical characters having profound influence on tobacco yield. Regression forecast models were fitted using principal components of biometrical characters and inputs. These models were tried growth and more than one crop growth stages together. Results would be tabulated.

(Chandrahas, K.G. Aneja and B.H. Singh)

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4. Sample Survey Methodology and Analysis of Survey Data

The work of Sample Survey Methodology and Analysis of Survey Data was continued during the year under report as per programme laid down. The progress of work in respect of the various research projects included in the programme is described below in brief and the name of project leader and his associate(s) are given in brackets at the end of the description of each project.

4.1 Pilot sample survey for estimation of inland fishery resources and catch in a region of West Bengal.

The main objectives of the survey are (i) to evolve a suitable sampling methodology for estimation of (a) inland water resources and (b) total catch of inland fish and (ii) to study the prevailing practices of pisci-culture.

A pilot sample survey was conducted in 24-Paraganas district of West Bengal state. The survey was undertaken jointly by the Indian Agricultural Statistics Research Institute, New Delhi and the Cent ral Inland Fisheries Research Institute, Barrackpore. The field work of the survey was conducted by field staff of the Central Inland Fisheries Research Institute while the responsibility of statistical analysis of data and preparation of report, etc, primarily rested with the Indian

Agricultural Statistics Research Institute The sampling design followed in the survey consisted of two stage cluster sampling, clusters of villages and ponds within villages constituted the first and second stage units respectively. A sample of 10 clusters of 4 villages each was selected from the district. The ponds and tanks in each of the selected villages were completely enumerated for estimating the area under them.

The study revealed that only about 33 per cent of the ponds were used mainly for fish cultivation while about 60 percent were used mainly for other purposes alongwith the fish cultivation. Only about 3.3 percent of the ponds were not used for fish cultivation at all. Among the ponds used for fish cultivation 33 percent were parennial and 30 percent were seasonal in nature. Silting and weed infestation were not reported to be the major problems of water units. 68 per cent of ponds were not reported to have any problem of silting while 76 and 77 per cent of ponds had no problem of submerged weeds or floating weeds respectively. Various reasons were cited by the ponds owners for non-utilisation of ponds for fish cultivation. Among them the major causes reported were multiple ownership,

the poaching and wilful destruction and lack of capital, etc. 38 per cent of water units yielded fish throughout the year while 50 per cent of them yielded fish during summer months only. In 99 per cent of the ponds ordinary pisciculture technique was adopted. 71 percent of the water units were used for stocking purpose, while 27.6 percent of ponds were used as nursery cum stocking ponds. In about 72 per cent of ponds fish seed was obtained locally while in the remaining ponds fish seed was obtained from other sources.

One of the main objectives of the study being to evolve a suitable sampling methodology for estimation of inland fishery resources, alternative estimators were tried using cluster sampling and ratio method of estimation for estimating the area under water units. The efficiencies of these estimators were compared in obtaining more precise estimate of the area under water units. The catch of fish was estimated both on the basis of per pond as well as per hectare. Ratio method of estimation was also tried to improve the precision of estimators with number of ponds as the auxilliary variate. It was seen that in case of cluster sampling, the fish catch per pond per year was estimated to be 246.01 kg. with 25.33 percent standard error, whereas, in case of ratio estimate the fish catch per pond per year was obtained as 200.31 kg. with 21.17 per cent standard error. Similarly, the catch of fish when estimated on per hectare basis was worked out to be 1360 kg with 16.16 percent standard error. Another esti-

mator was built up as the ratio of total catch to the area of 100 sample ponds. In this case the estimate of fish catch was 1125 kg. per hectare per year with 19.85 percent standard error.

(O.P. Kathuria, H.V.L. Bathla and S.K. Raheja) IASRI; New Delhi

(K.K. Ghosh and P.M. Mitra) CIFRI, Barrackpore

4.2. Pilot sample survey for estimation of cost of cultivation of oilseeds and pulses.

The objectives of the project are (i) to evolve suitable sampling procedure for estimation of various components of cost of production of some important oilseeds and pulses and (ii) to work out an index of cost of cultivation of these crops from year to year taking into account the fluctuations in the cost of various inputs.

Data collection for kharif season was completed. Rabi season data collection work was in progress.

(A.K. Banerjee, D.L. Ahuja, O.P. Kathuria and S.K. Raheja)

4.3 Pilot sample survey on cost of production of Banana/Mango and its marketing practices in Surat and Valsad districts of Gujarat State.

The objectives of the project are (i) to obtain suitable estimates of cost of production of banana/mango based on a suitable sampling design and (ii) to study the prevailing marketing practices of the fruit in the region of study,

The report had been drafted and was being modified in the light of comments received from the referees.

(M.S. Batra and O.P. Kathuria)

4.4 A study of variability of various compouents of cost of cultivation of vegetables at different stages of sampling and determination of sampling sizes at given levels of precision.

The objective of the project was to study the variability of various components of cost of cultivation of vegetable crops at different stages of sampling like villages, cultivators field, etc. and determination of sample sizes for given level of precision.

It is observed from this study that variability at second stage units (SSU's) was higher compared to Primary Stage units (PSU's) to the extent that estimate of between variance component is sometimes negative. Hence it is recommended that in future surveys on cost of cultivation studies of vegetable crops, this concept should be kept in mind when selection of sampling units is made and sample size at second stage units should be increased.

(Satya Pal and A.K. Srivastava)

4.5 Pilot sample survey to study the impact of flood on agricultural production in a region of U.P.

The objectives of the project are (i) to investigate a sampling procedure for assessing the losses caused by flood in agriculture production including livestock and (ii) to study the impact of floods in crops and livestock in the subsequent season.

Tabulation and processing of data for statistical analysis was continued during 1985.

(O.P. Kathuria, A.K. Banerjee and Jagmohan Singh)

4.6 Pilot sample survey for developing a sampling methodology for estimation of livestock products on the basis of data collected as a part of the normal work of field agency of A.H. Deptt of states, district Trichur.

The objectives of the project are (i) to evolve a suitable sampling technique for estimation of livestock products utilising the normal field agency of stockmen/ stock assistants in the animal husbandary departments in the States and (ii) to obtain estimates of annual production of major livestock products for the districts to be covered with a reasonable precision.

Field work was in progress.

(R.S. Khatri, J.S. Maini and K.B. Singh)

4.7 A study of variability and trends of yield rates of high yielding varieties of rice during IV and Vth five Year Plan periods.

The objectives of the Project are (i) to study the variability and trends of yield rates and the associated practices for high yielding varieties of rice during IVth and Vth Five Year Plans and (ii) to

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study the distribution of field rates over different holding size classes.

Preparation of computor programmes for analysis of data, and final summary tables was in progress.

(P.C. Mehrotra, V.S. Rustogi, S.K. Raheja and Satya Pal)

4.8 Pilot sample survey for developing sampling methodology for assessment of impact of National Demonstration Trial on Crop yield.

The objective of the project is to develop a sampling methodology to study the impact of N.D.T. on crop profitability, labour employment potential and marginal productivity of various agricultural inputs.

Analysis of data for the year 1981-82 and 1982-83 was almost completed. Analysis of data for the year 1983-84 and report writing was in progress.

(M.G. Mittal)

4.9 Sample survey for cost of cultivation, agronomic practices, area and yield rates of potatoes.

The objectives of the project are (i) to estimate the cost of cultivation of important varieties of potatoes, (ii) to estimate the area and yield rates of different varieties of potatoes and (iii) to study the extent of adoption of improved practices under cultivator's conditions.

The analysis of data and tabulation of results in respect of cost of cultivation enquiry had been completed. The final tables had been sent to CPRI. Analysis of data pertaining to area and agronomic enquiry was in progress.

(S.S. Gupta, S.K. Raheja, A.K. Srivastava)
IASRI

(P.S. Dahiya and V.P. Malhotra)
CPRI

4.10 A study of variability of yield rates and acreage under HYV Cotton.

The objectives of the project are (i) to study the variability yield rates and area of HYV cotton from year to year for different holding size groups and (ii) to determine the relationship between important inputs and the output.

The yield data had been analysed while the analysis for other items etc. was under progress.

(V.S. Rustogi, P.C. Mehrotra and S.K. Raheja)

4.11 Pilot sample survey for studying the relative merits of the data obtained by actual weighment and those through enquiry for estimation of milk production. Pulwame (J&K.)

The objectives of the project are to study the relative merits of the data obtained by actual weighment and those through enquiry for estimation of milk production and (ii) to obtain the estimates of annual milk production at district level with a reasonable precision.

Field work was in progress.

(K.B. Singh, J.S. Maini and R.S. Khatri)

4.12 A study of yield trends of wheat in India during last three decades.

The objectives of the project are (i)

to study the variability and trends of yield rates of wheat during the pre-plan period, plan-period before the introduction of high yielding varieties of wheat and plan period after the introduction of HYV of wheat and build up forecasting models, (ii) to study the variability and trends of yield rates and associated practices for HYV of wheat in the 4th and 5th Plan period and (iii) to study the distribution of yield rates over different holding size classes.

Taking data for annual wheat production for the period 1946-83 for the country as a whole and for the period 1911-83 for some important wheat growing regions, time-series analysis using moving average model of order 2, the forecast estimates of All India Wheat Production for the year 1984-85 was obtained at 46.97 million tonnes. This is fairly in agreement with actual wheat production of 45.0 million tonnes.

(D.L. Ahuja, A. Dey, A.K. Banerjee and S.K. Raheja)

4.13 Use of imperfect frames in census and surveys.

The objectives of the project are to (i) develop sampling procedure from imperfect frames in Agriculture and household surveys when (a) frame is incompleted, (b) frame contains duplicate units and (c) auxiliary information is incompleted and (ii) to examine the relative performance of procedure.

Literature was examined. Some procedure had been developed for dealing with various imperfections. After examining these procedure more critically, their relative performance would be examined empirically.

(Randhir Singh)

4.14 Pilot sample survey to evolve an appropriate methodology for estimation of lac production (i) U.P. (ii) Maharashtra.

The main objective of the project is to develop a suitable sampling methodology for estimating the production of lac and important lac growing areas with reasonable degree of precision.

The data for all the three seasons had been received and analysed. Final tables for inclusion in the report were being prepared. The field work at Bhandra district of Maharashtra state was started.

(D.C. Mathur, O.P. Kathuria, A.K. Srivastava and S.C. Sethi)

4.15 Pilot sample survey for estimation of area of grazing land and its utilization—Tamil Nadu.

The objectives of the project are (i) to evolve a sampling technique for estimation of area of grazing land, (ii) yield of harbage and (iii) Botanical classification and analysis of harbage samples.

The field work of the survey was in progress.

(Anand Prakash, J.S. Maini and B.C. Saxena)

4.16 Pilot sample survey for study of cost of production of Chikoo and its marketing practices in Valsad district (Gujarat).

The objectives of the project are (i) to obtain reliable estimates of cost of production of Chikoo based on a suitable sampling design and (ii) to ⌐study the prevailing marketing practices of the fruit in the region of study.

Tabulation of basic data was completed. Data on inputed costs were now being tabulated and the same was likely to be completed by March end.

(M.S. Batra and O.P. Kathuria)

4.17 A study of employment and income of small farmers and landless labourers.

The objectives of the project are (i) to investigate sampling methodology for estimating Employment and Income, (ii) to study the extent of employment opportunities in the field of Agriculture and (iii) to estimate the income of people belonging to this section.

Data collection was completed in both the districts. Coding of data and tabulation work was in progress.

(Randhir Singh and A.K. Srivastava).

4.18 Some investigations of the use of two dimensional varying probability sampling schemes in Agriculture, Animal Hubandry and Forestry.

The objective of the project is to check up the effectiveness of some methodo-

logies in sampling with probability proportional to size by selecting data form Agriculture, Animal Husbandry and Forestry.

Some data has been extracted from secondary sources, to check up the models developed for suitability for application in certain particular situations was proposed.

(G. Sadasivan and K.R. Rajagopalachar)

4.19 Statistical summarization of results on yield rates, area and extent of adoption of improved practices for HYV of millets (Maize, jowar, bajra) during IV and V five year Plan Period.

The objectives of the project are (i) to bring out comparative information on yield rates, area and adoption of improved practices for HYV of millets for different holding size classes during the IV and V Plan periods, (ii) to study the relative performance of important varieties and factors limiting their large scale cultivation and (iii) to examine the trend of area, average yield and rates of application of fertilizer in and between two plan periods and overall as well.

As the project is based on secondary data (1971-80) of, 'Sample Surveys for Methodological Investigations into High yielding Varieties Programme'. Finalisation of computer programmes, analysis of data and preparation of summary tables for inclusion in the project were satisfactorily progressing.

(G.S. Bassi, P.C. Mehrotra and
S.K. Raheja)

4.20 Pilot sample survey for estimation of production of hides and skins in Chingleput and North Arcot districts of Tamil Nadu and Surat district of Gujarat state.

The objectives of the project are (i) to evolve suitable sampling technique for estimation of production of hides and skins, (ii) to study the practices like flaying on slaughtered and falled animals, curing of hides and skins and their disposal and (iii) to study the socio-economic status of the householders handling hides and skins.

The field work pertaining to summer and winter season was over and that for the rainy season, it was in progress in Tamil Nadu state. The field work in Surat district for winter season was in progress.

(J.S. Maini, K.B. Singh and R.S. Khatri)

4.21 Sample survey for study of constraints in transfer of new agricultural technology under field conditions.

The objectives of the project are (i) to develop suitable sampling methodology for studying the effect of new agricultural technology including high yielding/improved varieties, fertilisers, plant protection chemicals and cultural and management practices for increasing productivity of land, (ii) to determine the extent to which the potential of high yielding/improved varieties has been achieved under field conditions and (iii) to identify and investigate constraints and limiting factors in the transfer of new agricultural technology to cultivators fields.

Scrutiny of filled in data schedules was in progress.

(S.K. Raheja, P.C. Mehrotra, V.S. Rustogi, S.S. Gupta, N.K. Ohri, G.S. Bassi and R.C. Gola)

4.22 Pilot survey to develop statistical models for production and culling pattern in poultry, Delhi.

The objectives of the project are (i) to estimate month-wise/season-wise, age specific vital characterstics affecting the growth and structure of the poultry population, (ii) to estimate production of broilers in terms of number and weight, (iii) to develope appropriate models characterising the production and culling pattern and (iv) to determine the optimum number of size of farms to meet the specific demand.

The field work was in progress

(K.P.S. Nirman, J.P. Jain and Balbir Singh)

4.23 Pilot studies for estimation of birth and death rates in ovines (Tamil Nadu).

The objectives of the project are to develop a suitable methodology for estimating specific fertility and mortality rates in stationary flocks of ovines according to breed, sex and age. These involve three aspects viz, (i) formulation of concepts, definitions and questionnaires, (ii) specification of sampling design and (iii) development of estimation procedures.

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The field work was in progress. During the period January to March, 1986 scrutiny and coding of schedules would be completed and major part of the data would be transferred to punch cards. Writing of computer programs required for analysis would be in progress.

(U.G. Nadkarni, S.N. Arya and Balbir Singh)

4.24 Statistical investigations on economics of pig production

The objectives of the project are (i) to evolve a suitable methodology for evaluating the commercial aspects of rearing pigs to an assigned stage of growth under field conditions and (ii) to estimate component-wise costs of raising and rearing of pigs.

The field survey work in the project was completed. The data collected under detailed enquiry survey would be analysed to evaluate component-wise costs of maintenance of different categories of pigs.

(T.B. Jain and U.G. Nadkarni)

4.25 Studies on comparative performance of fixed farming involving crops, livestock, poultry and fish, Cuttack (Orissa)

The objectives of the project are (i) to determine design and response parameters for studying the comparative performance in terms of production, investment, return, etc. of different systems of farming singly or in combination and (ii) to compare the different systems of farming in respect of labour intensification.

A sample of 288 households spread over 36 villages were selected for collection of primary data. The field work pertaining to the detailed enquiry which commenced from 31.1.85 was continued. Schedules were received at IASRI in parts and were scrutinised coding and punching of data were in progress.

During the period Jan. to March, 1986, the collection of primary data would be completed. Statistical analysis of data was in progress.

(Shivtar Singh, K.C. Raut, R.L. Rustogi and H.O. Agarwal)

4.26 A comparative study of some methods for estimating mortality rates in bovines.

The objective of the project is to compare estimates of mortality rates obtained by different methods with a view to judging their relative merits. Estimation of mortality rates for the various sex-category groups of cattle and buffaloes were obtained from the age distribution over broad age groups. Some of the final tables and corresponding write-up were prepared.

During the period Jan. to March, 1986 age-specific mortality rates would be estimated by one more method and the results would be incorporated in the draft report.

(S.N. Arya and U.G. Nadkarni)

4.27 Pilot survey to study the performance of crossbred cattle under village conditions, Palampur area (H.P.)

The objectives of the project were

(i) to evolve a technique for evaluating the performance of cross-bred and local cattle under village conditions in respect of some economically important production traits and (ii) to study the constraints of adoption of crossbreeding if any.

The report had been finalised and salient results are as follows :—

The average age at first calving was estimated to be 48.7±2.6 months for crossbred cows and 64.0±1.2 months for non-descripts.

Crossbreds were found to have longer lactation lengths and shorter dry periods than non-descript cows. The average lactation length and dry period of crossbred cows were 452±8 days and 103±5 days. The corresponding figures for non-descript cows were 384±5 days and 240±9 days.

The average lactation yield of a crossbred cows was 1330±50 Kg. as compared to 457±15 Kg. for a non-descript cow. It was further seen that 36.5% of the crossbred cows had their lactation yield less than 1000 kg, 21.2% between 1000 to 1400 kg. and 27.5% between 1400 to 2000 kg. and 14.9 percent more than 2000 kg. On the other hand about 95% of non-descript cows had their lactation yield between 300 to 1000 kg. and only 5 percent yielded between 1000 to 1400 kg. It was further seen that about 94% of the lactation yield was realised upto 360 days in the case of crossbred and more than 97% in the case of non-descript cows, indicating that cows in the area may not be miled more than a year. Moreover it was worked out that if the lactation, it crossbred be terminated after 10th month of its calving, it would yield on an average one more lactation in its life span.

The correlation between various production traits revealed that cows with higher age at first calving tended to have longer lactation, longer calving period and lower lactation yield. It indicates higher age at first calving is not desirable.

The death rate among crossbreds was less than that among non-descripts. The mortality rate in male youngstock was more than that in their female counterparts for both crossbred and non-descript calves. Mortality for milch stock was 5.7% in crossbreds as against 10.6% for non-descripts. The proportion of deaths among youngstock was more in lower age groups than in higher age groups. Majority of calves died before completion of their dam's lactation.

The study on constraints analysis was made through causal modelling and production function approaches. The results based on path analysis showed that feed intake in terms of DCP had a high direct effect (0.341) on lactation yield and its indirect effect was 0.316 via DNN and 0.012 via feeding practices. The feed intake in terms of DNN had also higher direct effect (0.362) on lactation yield and its indirect contribution through DCP and feeding practices was 0.299 and 0.008 respectively. Housing conditions had a direct positive effect (0.213) on lactation yield. Feeding practices and stall area did not contribute to lactation yield. Similar findings were

found when the data were analysed following production function methodology.

(Shivtar Singh, K.C. Raut and J.P. Jain)

4.28 Pilot study for developing a suitable methodology for estimation of cost of cultivation of fodder crops, Jalandhar

The objective of the project is to evolve a suitable methodology for estimation of cost of cultivation and yield rates of fodder crops.

The report was under finalisation.

(K.P.S. Nirman, Shivtar Singh and H.O. Agarwal)

4.29 Construction of life tables for bovines.

The objectives of the project are (i) to construct life tables for different breeds and sexes of cattle and buffaloes, (ii) to carry out comparative statistical studies of these life tables, and (iii) to work out premium rates for cattle insurance.

The observed expectation of life of cattle and buffaloes was maximum in ages covering upto 3 years and it decreased gradually with advancing age. In case of cattle the life expectancy was in general highest for Kankrej breed in Gujarat and the least for Sahiwal breed in Punjab while in buffaloes, it was highest for Surti bread also in Gujarat and least for Nili breed in Punjab. The life expectancy of cattle and buffaloes was generally found more in areas covered under the Intensive cattle Development Programme (I.C.D.P.) as compared to non-ICDP areas.

The age-specific premium rates for cattle and buffaloe insurance were calculated for some breeds. The premium rates based on actual mortality upto 3 years of age were in general higher as compared to those charged by General Insurance Corporation (G.I.C.). In the higher age groups it was more than those of G.I.C. in 40 percent of the cases.

(T.B. Jain and U.G. Nadkarni)

4.30 Optimum ration for animal production through linear programming techniques.

The objective of the project is to estimate least cost balanced rations through linear programming techniques for three species of livestock and for poultry in two phases (i) poultry and pigs (ii) bovines and ovines.

Using the constraints for the requirements of TDN, DCP, Dry matter, Energy Calcium Phosphates and total quantity of feeds and with different types of green fodder, dry-fodder and concentrates, least cost combination of feeds for a balanced ration for bovines of East and West Zones were obtained. Similarly data were run for ovines to get the optimum ration, separately for three feed zones into which the regions having ovines were divided. Incorporating all the available results on bovines, ovines pigs and poultry report was prepared and was under review of the referees.

(U.G. Nadkarni, L.B.S. Somayazulu and S.C. Agarwal)

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4.31 Development of a suitable statistical methodology for estimating extent of labour utilisation in livestock and poultry keeping in rural area, Meerut (U.P.)

The objectives of the project are to work out estimates for each species based on (i) mean of the first-stage unit means (ii) mean of first-stage unit totals, (iii) estimated labour coefficients (labour input per animal) with a view to judge their relative merits and to determine norms for efficient utilization of labour.

The field work was in progress.

(S.P. Verma and J.P. Jain)

4.32 Study of distribution of age specific mortality and fertility rates in bovines.

The objective of the project is to study the distributional aspects of age-specific mortality and fertility rates of bovines obtained for different sizes of samples.

Programmes had been developed for formulation of distributions and calcula-

tions of moments and other characteristics. Bounds for the distribution had been calculated and curves drawn to compare between groups and over increasing sample sizes. Work was in progress.

(L.B.S. Somayazulu, S.N. Arya and

S.C. Agarwal)

4.33 Development of a suitable methodology to study the effect of housing conditions and other related factors in milk production under village conditions.

The objectives of the project are (i) to identify the various housing conditions and other related factors influencing milk production, (ii) to quantify their inter-relationships and their effects on milk production, and (iii) to develop a composite index of factors identified as important.

Tabulation work was in progress.

(V.T. Prabhakaran and Bhagwan Dass)

5. Statistical Economics

The progress of work in respect of each of the various research projects included in the programme is described below in brief and the name of the concerned project leader and his associate (s) are given in brackets at the end of the description of each project.

5.1 Study of cost functions for milk production in rural area, West Bengal.

The objectives of the project are (i) to examine the suitability of different types of functions and various problems involved in their estimation with respect to milk production, (ii) to estimate the cost functions and (iii) to derive supply functions for milk in rural area in West Bengal.

Methodological issues pertaining to estimation of milk production functions and cost functions were being examined. Analysis of data was in progress.

(R.K. Pandey, Sushila Kaul and Ashok Kumar)

5. 2 Economic Analysis of acreage response for tur crop in India.

The objectives of the project are (i) to study the trend in acreage, production and productivity of arhar crop in impor-

tant pulse growing states, (ii) to study the effect of prices on acreage adjustment behaviour and (iii) to investigate the overall causes hindering arhar production.

The data had been analysed and the project report was under preparation.

(Shanti Sarup)

5.3 A study on Institutional credit in Agriculture.

The objectives of the project are (i) to examine the farm credit structure in India, (ii) to study the causes of concentration of bank advances of farm sector in the selected states and (iii) to investigate the impact of institutional credit on productivity of foodgrains.

The secondary data collected from different sources would be analysed. The Ginni concentration ratios of bank advances in different stages would be calculated by hand calculations. The lorenz curves representing the distribution of bank advances according to the Gross Cropped Area in different states for different years would also be prepared.

(Ashok Kumar, R.K. Pandey and Sushila Kaul)

5.4 Economic study of New Farm Technology with Special Reference to yield gap and associated factors in selected operational research project areas (i) ORP on dryland agriculture, Ranchi, (ii) ORP on Pulse Production Mohindergarh, Haryana, (iii) ORP on Crop Production, Bhilwara, Rajasthan and (iv) ORP on Indo-UK Dry farming project, Indore, M.P.

The objectives of the project are (i) to examine the new technology and its yield potential for different crops, (ii) to estimate the extent of gap in yields under farmer's environment and (iii) to identify the socio-economic and other constraints responsible for gap between the potential yield and actual yield achieved at farm level.

Data collection work was in progress in all the four centres.

(R.K. Pandey, Bhagat Singh, Shanti Sarup, H.B. Choudhary and B.L. Kaul)

6. Computing Science

The division of Computing Science continued to extend the EDP facilities to research scholars/scientists from various Institutes under ICAR and Agri. Universities and colleges.

The B-4700 computer system was utilized during two shifts from 8 A.M. to 8 P.M. on all working days. About 11,660 production jobs and 2025 testing jobs were processed on B-4700 system. (This does not include the testing and production jobs run through inter-active-terminals). The interactive terminals and graphics terminal are being used extensively by the staff and students for the purposes of program developed and drawing charts, diagrams, etc.

Programming and data processing assistance was provided to 141 Ph. D., 114 M.Sc. students and 43 other research workers. A few new computer programs were developed and a number of existing programs were up-dated to meet the computing requirements of the users.

The selective dissemination of information from AGRIS Data-base was continued.

The scientists of the division were associated in conducting Data-processing and computer programming courses for the students of P.G. School, IARI. A full time two year M.Sc. course in Computer programming and related topics in collaboration with IARI was started during the year 1985

Mechanical Tabulation Unit of this division undertook jobs of data punching on cards. About 7.60 lakhs cards were punched and about 25 sorting jobs were completed during the year.

The division has proposed to conduct three types of short duration courses on computer programming and data processing during the year 1986, of these three courses, the first course will be of 2-3 days for top-management personnel from Institutes of ICAR, the second course of about 7-10 days duration for middle order personnel and the third course of about 2-4 weeks duration for scientists and research workers.

Research Project

The following research project was undertaken by the Scientists of the division during the year under report.

Computer Software for Quadratic Programming Techniques

The objectives of the project are (i) to make available computer programs for solving problems of Quadratic Programming and (ii) to prepare user's manual for these programs.

Programs had been developed and tested with a sample data. The work of writing the report was in progress.

(Ram Kumar and M.L. Choudhary)

7. Biostatistics and Statistical Genetics

The work of the Division of Biostatistics and Statistical Genetics was continued during the year under report as per the programme laid down. The progress of work in respect of each of the research project included in the programme is described below in brief and the name of the concerned project leader and his associate(s) are given in brackets at the end of the description of each project.

7.1 Estimation of genetic variability in crop plants

The objectives of the project are (i) estimation of relative contribution of genetic and environmental variations to the total variation in crop plants and (ii) to develop statistical technique for estimating these variations. Methods of linear regression and analysis of variance were being applied for the analysis.

The report was under finalisation.
(P.S. Rana, L.K. Garg and P.N. Bhargava)

7.2 'Use of discriminant function for comparing different breeding programme with sheep".

The objectives of the project are (i) to develop a sound technique for comparing the performance of different grades of sheep in terms of economic characters under the condition when the variance – covariance matrices of the populations to be compared are unequal, (ii) to obtain the discriminatory power and probabilities of misclassifications of the functions developed, (iii) to compare the performance of the functions developed with Fisher's linear discriminant function and (iv) the clubbing of different grades of sheep into fewer number of homogeneous clusters.

After testing the equality of variance-covariance matrices pair-wise for all possible pairs of grades under study, the Fisher's linear discriminant function as well as Best linear function (using minimax procedure) given by Anderson and Bahadur (1976) were obtained. The corresponding D^2-values as well as probabilities of misclassifications were also worked out for all the functions. The results of both these data sets indicated that the Best linear function performs slightly better than Fisher's linear function in majority of cases when the variance-covariance matrices of the populations under comparison are unequal. The data analysis and tabulation work of the project was completed and final report was being finalised.

(S.D. Wahi, Prem Narain and L.K. Garg).

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7.3 Direct and maternal additive and heterotic effects in crossbred dairy cattle.

The objectives of the project are (i) to evaluate the genetic components e.g. direct and maternal additive breed effects and heterotic effects in dairy cattle and to study the parameters that allow prediction of the performance of crosses that have not actually been tested by using multiple regression method of estimation, (ii) to estimate the heterotic effect based on fitting the biometrical genetic models to means of different grades in terms of additive, dominance and epistatic gene effects by an alternative approach to that of multiple regression technique when the performance of one or both the parents is not known and (iv) to compare the estimates of heterosis obtained by above two methods of estimation.

Analysis of data was in progress.

(R.K. Jain, L.K. Garg and S.D. Wahi)

7.4 Statistical study of dynamical models for fishery growth and harvesting.

The objectives of the project are (i) to critically examine the existing models in fish population growth and fishery harvesting, (ii) to develop more realistic nonlinear dynamical stochastic growth models for single and multispecies fish populations and (iii) to investigate various harvesting policies with a view to providing a firm theoretical basis for sustained yield.

Work was in progress.

(Prajneshu and Karmeshu)

7.5 Statistical Analysis of cross-breeding data at Military Dairy Farms.

The objectives of the project are (i) to study the problems associated with adjustment of data by least sequares technique, (ii) to study the suitability of various grades of crossbred cattle for life time traits and to study the genetic divergence among the crossbred grades and (iii) to study genotype x environment interaction.

The data for the period 1958 to 1978 on the crossbred cows of military farms, Meerut, Allahabad, Bareilly, Kanpur and Agra were prepared for the statistical analysis after inserting the exact grade codes in the records of individual cows. Working out the various life time traits new files were created and loaded in magnetic tape for further statistical analysis. The computer programmes required for the statistical analysis of the data were also prepared.

(B.S. Sharma and Prem Narain)

7.6 Investigations on statistical methods for comparing genetic groups based on multiple traits in Dairy animals.

The objectives of the project are (i) to investigate into the statistical techniques for developing lactation performance indices applicable to cross-bred cattle and graded buffaloes based on multiple traits utilizing repeated lactation records of animals, (ii) to estimate genetic parameters like heritability, genetic correlation etc. of each individual character as well as of the lactation performance indices for purebred cattle and buffaloes, (iii) to develop statistical techniques for comparing genetic groups based on production and reproduction

traits in dairy animals and to examine the feasibility of adopting lactation performance indices for determining optimum level of exotic inheritance in crossbred cattle and (iv) to develop methodology for estimating generalized heritability.

The adjusted records of repeated lactations of several animals on three characters (lactation yield, lactation length and dry period) were used to fit a linear discriminant function so as to maximise the variation between animals relative to within animals which leads to a determinantal equation.

$$/ T - \lambda B / = 0$$

Where T and B are matrix of sum of squares and sum of products for total and between animals respectively. The lowest root was taken for estimating the coefficients of the function to be choosen as lactation performance index.

The breeding data of crossbred cattle maintained at military farm Meerut for the period 1955-78 were scrutinized and senders lactation correlation factors upto 6th lactation for several production and reproduction traits were worked out. The data was adjusted to the first lactation basis by using these correlation factors. With these adjusted records the determinantal equation $/ T - \lambda B / = 0$ were solved to get the values of λ. With the lowest value the lactation performance indices (Y) based on three characters viz. lactation yield, lactation length and dry period were developed for each genetic group. To study grade differences, the method of least squares analysis was employed, for each individual character

as well as for the compounded character 'Y'.

(Lal Chand and Prem Narain)

7.7 Growth studies on crossbred cows available at various military farms in the country

The objectives of the project are (i) to study influence of genetic groups, farms, periods of birth on body weights of crossbred females at different ages, (ii) body weight changes in crossbreds in relation to level of exotic inheritance, (iii) growth curves in respect of crossbred cows upto three years of age, (iv) growth rate and its relationship with weight and age at first calving and first lactation milk yield and (v) estimates of genetic parameters of various stages of growth.

To study how the body weigth varies among crossbreds as the level of exotic inheritance changes, the body weights adjusted for farm and period effects were plotted taking level of exotic inheritance viz. Friesian blood in terms of 1/8th proportion as the independent variate. The graphs showed different trends for weights at different ages. The orthogonal polynomials of appropriate degree were fitted for birth weight, body weights at 6, 12, 18, 24, 30 and 36 months respectively. The crossbreds at the ages of 12, 18, 24 and 30 months attained maximum weight when their level of exotic inheritance was around 50 per cent at showed at declining trend with the increase in exotic blood. In case of body weight at 6 months, the weight increased upto 5/8th level and showed a declining trend thereafter. No definite trend was

observed in case of body weight at 36 months.

(J.C. Malhotra, Prem Narain, J.P. Jain and P.K. Malhotra)

7.8 Statistical studies in relation to crop insurance.

The objectives of the project are (i) to critically examine and analyse premium and indemnity tables for different crops under crop insurance progromme of the General Insurance of India (GIC) as modified from time to time, (ii) to develop suitable statistical methodology for estimating premium and indemnity rates based on appropriate distribution of crop yield over time and space using data on crop cutting experiments, (iii) to investigate into the modification needed to take account of technological changes in yield overtime as notice through linear of curvilinear trends, and (iv) to study the feasibility of adopting homogenous area approach for insuring individual crops as compared to groups of major crops grown in the given area.

The data received from different states where the comprehensive crop insurance scheme is being implemented by G.I.C. for Kharif 1985 were scrutinised, coded and transferred to punch cards. The crops covered are Paddy, Jowar, Bajra, Maize and Groundnut.

(J N. Garg, Prem Narain, Shivtar Singh and Mahesh Kumar)

7.9 Some aspect of yield-survival relationship in dairy cattle

The objective of the project was to study some aspects of relationship bet-ween the retention of a cow in the herd and its milk production characteristics in the first lactation.

To study the probability of survival to different lactations and its relationship with the yield characteristics, the statistical analysis broadly included (i) estimation of survival functions, (ii) comparison of survivor functions, (iii) estimation of relative culling rates, (iv) fitting of logistic model, (v) relationship between progeny test and proportion surviving and (vi) estimation of genetic and phenotypic correlation between probability of survival at two successive lactations.

The culling patterns of different crossbreds were studied with the help of two survival functions viz. survivorship and Hazord function using the data from Military Dairy Farms. From these two function as well as their median, it is concluded that the crossbreds 3/8th and 7/8th are respectively the best and worst adaptive at the farms. The probability of survival of two categories of animals were also tested statistically. The relative culling rates of 3/8th crossbreds in comparison to other categories of animals were seen to be less than one, which implied that the culling for these animals were not that intense. It is further observed by fitting of logistic model that first lactation milk yield effect significantly the culling of the animals in the first few initial culling processes at the phenotypic level. Similar type of results were also obtained from the relationship studies at the genetic level. The heritability of survival to different orders at lactation as well as the genetic correlations bet-

ween proportion surviving at two lactations were also worked out. It was concluded that there were some common genes with similar actions which govern the culling policies at the initial few lactations.

The project report had also been finalised.

(V.K. Bhatia, Prem Narain and
P.K. Malhotra)

7.10 Statistical investigations in sensory evaluation of Agricultural Products.

The objectives of the project are (i) development of methodologies for analysis of sensory data obtained in different situations and (ii) relative efficiencies of the methodologies developed as compared with the existing parametric and non-parametic procedures.

Sensory evalution is assuming increasing importance in our day to day life. Generally the experiments for taste-testing or other sensory evaluation are conducted in paired of trial designs where observations are recorded mostly in ordinal scale. Appropriate statistical methodologies for analysing such experiments are extremely essential and investigations on these aspects have been made in the project and two models one for paired comparisons and the other for triad comparisons have been developed.

Since the sensory evaluation involves the use of human subjects, the sensitivity and reproducibility of the analytical tool greatly influence the direction and validity of the results. Environment and equipments used in sensory testing also influence the results. It is, therefore, essential that more emphasis must be placed on controlling physical and phychological influences in sensory evaluation. It is important and also necessary to test agreement of the judgement for a judge over different replications and also between various judges. In sensory evaluation, selected judges should be consistent in their judgement. A model for judging the consistency of the selected judges and their judgements had been developed in the project.

(S.C. Rai and V.K. Bhatia)

7.11 Selection indices for economic merit in poultry.

The objectives of the project are (i) to study in economic terms the profit accruing at the poultry farm due to adoption of selection index for rate of lay based on Osbornes procedure for six generations, (ii) to develop selection indices including restricted selection indices for economic merits involving production and adaptability traits in poultry for eggs and (iii) to study the efficiencies of various selection indices developed in terms of expected genetic gains.

The report was under finalisation.

(P.K. Malhotra and Prem Narain)

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8. Other Units, Cells and their Activities

8.1. Director Cell

The functions and activities of the cell are (i) to collect the requisite material from the different Divisions of the Institute and prepare the Annual Reports, Statistical Newsletters, Quarterly Progress Reports, Fortnightly Reports, etc., for various purposes, (ii) to convene meetings of the Head of Divisions, Senior Officers of the Institute and other technical committees of the Institute from time to time, where policy decisions regarding scientific/technical matters, etc., are taken ; to prepare the minutes of such meetings and to take necessary follow up action, (iii) to organise Annual Conferences of Agricultural Research Statisticians and to prepare and distribute the proceedings thereof ; to take follow up action on the recommendations made therein and (iv) to dispose of such other work as may be assigned by the Director from time to time.

During the year under report, the Cell collected the requisite material from the various Divisions as well as from administration of the Institute, which also required scrutiny, editing, etc., and prepared and consolidated materials in respect of this Institute for the following reports/publications, etc. brought out by this cell.

(i) The Annual Report of the institute for the year 1984.

(ii) The Quarterly Progress Reports of the Institute falling due during 1985

(iii) IASRI Statistical Newsletters, Vol. X, No. -, 1984 and Vol. XI Nos. 1-3, 1985

(iv) Organised Senior Statisticians Meeting held at IASRI, New Delhi from 28th to 30th January, 1985.

In addition to the compilation and preparation of the above publications, reports, etc. the scientific material in respect of the Institute was also collected and supplied in the appropriate format to such organisations/agencies as given below in brief for their publications for onward transmissions to the respective co-ordinators for National/International Research Programmes,

(a) To ICAR :

(i) For the General Body Meeting of the ICAR Society.

(ii) For DARE report (1985) to be placed in the budget of the Parliament.

(iii) Regarding a schedule of Meetings/Conferences/Seminars, etc. during 1985.

(iv) Regarding 'Publication of Research Highlights and Annual Report' of ICAR for the year 1985.

(v) Regarding Indo-French protocol for cooperation in the field of Agricultural and Rural Development.

(vi) Regarding 'ICAR by 2000 AD'.

(vii) Regarding 'Comments in the recommendations made in the workshop on 'Management of ICAR Institute'.

(b) C.S.O., New Delhi :

(i) Regarding publication of 'Statistical System in India-1984'.

(ii) For International Technical Corporation in Statistics.

(ili) For 36th Annual Report on Sample Survey of Current interest in India and 22nd report in the ESCAP region-1984.

(iv) For inclusion in the issue of 'Statistical Newsletter,' a quarterly publication.

(c) Department of Science and Technology :

(i) Regarding National Survey for collecting of data on resources devoted to Research and Development activities in the country.

(ii) Regarding schedule and meeting/conference/seminar etc. during 1985.

(d) Institute of Applied Manpower :
Regarding assessment of Agricultural Institute of Applied Manpower Research.

(e) United Nations Development Programme :
Regarding TCDC/INRES Inquiry Service of UNDP.

The cell also offered the comments on the research papers, bulletin research project reports, etc., as desired by the Director.

Monthly meetings of the Heads of the Divisions, Senior Officers of the Institute as well as other meetings of the technical committee of the Institute were also convened by the Cell. Twenty such meetings were held during the year under report. Proceedings of all those meeting were prepared, circulated and follow-up action taken.

In addition to the above, other miscellaneous items of scientific and technical work assigned by the Director during the year under report were also attended to.

8.2 Field Unit :

The field unit of the Institute is comprised of Three Field Officers (T-8, T-7 and T-6) Two Field Inspectors, Six Field Supervisors and Thirty Field Investigators The collection of field data of the schemes sponsored by the Institute either through its own staff or through the adhoc staff of the concerned State Departments Institutes has been one of the important activities of the field unit. The objective of employing its own field staff in different field surveys is to collect reliable data through intesive supervision of the field work of the surveys by the field officers and other supervisory staff in collaboration with the concerned project

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leaders of the Institute so as to evolve a suitable methodology for collection of reliable data and making different types of estimates viz., area under different crops, yield rates, birth and death rates in bovines, cost of production of agricultural and animal husbandry products, etc. The feasibility of data collection with maximum precision is also studied by the Institute by employing its own field staff in different pilot studies.

(a) Field Training :

During the year under report, the field training was imparted to the field and supervisory staff of the schemes mentioned below in the collection of data, convassing of different schedules and planning and organisations of field work of the surveys at the places shown against them in collaboration with the concrned project leaders :—

(i) Pilot studies for developing statistical methodology for assessing the losses due to diseases and pests in bovines.

(ii) Sample survey for study of constraints in transfer of new agricultural technology under field conditions-Lucknow (U.P.) Dibrugarh (Assam), Chandigarh, Ernakulam (Kerala), Velore and North Arcot (Tamil Nadu).

(iii) Economic study of new farm technology with special reference to yield gaps and associated factors-Bhilwara (Rajasthan), Mohindergarh district (Haryana).

(iv) Pilot sample survey to develop methodology for estimating

production of livestock products by utilising departmental staff-Kerala.

(v) Pilot sample surey for estimating the production of hides and skin-Tamil Nadu, Surat district (Gujarat).

(vi) Pilot sample survey to develop methodology for estimating the area under grazing land-Tamil Nadu.

(vii) Studies on comparative performance of mixed farming involving crops, livestock poultry and fish, Orissa-Cuttack (Orissa).

(viii) Pilot sample survey for studying the relative merits of the data obtained by actual weightment and through enquiry for estimation of milk production-Palewame (J&K).

(ix) Pilot sample survey to evolve an appropriate methodology for estimation of lac production-Dudhi Tehsil of Mirzapur district (U.P.).

(x) Economic study of New Farm Technology with special reference to yield rate and constraints-BHU, Ranchi, Bihar.

(xi) Pilot sample survey for estimating the resources and catch of Inland Fish-Cuttack.

(xii) Development of statistical methodology for estimating the extent of labour utilisation in livestoke and poultry keeping in rural areas Meerut (U.P.)-IASRI, New Delhi, Village Laliana and Nagla Sherkhan of Meerut.

(xiii) Studies for developing statistical methodology for assessing losses due to diseases and pests in bvones-Veterinary Public Health and Epidemiology Department, H.A.U., Hissar.

(xiv) All India Co-ordinated Agronomic Research Project-Baroda (Gujarat).

(xv) Pilot studies on pre-harvest forecasting of groundnut yield in Rajkot district-Rajkot.

(xvi) Pilot sample survey for developing suitable sampling methodology for estimation of cost of cultivation Oilseeds and pests-Navgaon, Alwar (Rajasthan) and Jabalpur (M.P.).

(xvii) Planning, designing and statistical analysis of data relating to the experiments conducted under All India Co-ordinated Research Project on Long Term Fertilizer Experiments—Hyderabad (A.P.), Ludhiana (Punjab), Palampur (H. P.), Barrackpore (W. B.), Ranchi (Bihar), Bhubaneshwar (Orissa).

(xvii) Statistical analysis and planning of experiments for agronomic research—Kanpur (U.P.).

(xix) National Index of Animal Experiments—New Delhi.

(xx) Pilot survey to develop statistical models for production and culling pattern in poultry—Jalundhar.

(xxi) Pilot sample survey to evolve a sampling methodology for esti-

mating the inland fishery resources and catch in a region of Orissa—Orissa.

(xxii) Statistical modeling for production and culling pattern in poultry—Delhi.

(b) *Field work/Inspection/Supervision*

During the year under report, the field survey work of the following projects was carried out by field unit through its own staff concerned. Project leaders, State Departments and ICAR Institutes at the places/areas mentioned against them. The inspection, supervision of the same was also undertaken :—

(i) Pilot sample survey to develop methodology for estimating production of livestock products by utilising departmental staff—Kerala.

(ii) Pilot sample survey for estimating the production of hides and skins—Tamil Nadu.

(iii) Pilot sample survey to develop methodology for estimating the areas under grazing land—Tamil Nadu.

(iv) Pilot sample survey ,to evolve and appropriate methodology for estimation for lac production—Dudhi Tehsil of Mirzapur district (U.P.)

(v) Statistical investigations on economics of pig production—Ranchi (Bihar).

(vi) Pilot sample survey for estimating the energy utilization for different levels of adoption of modern technology in agriculture-Meerut (U.P.)—

(vii) Development of Statistical Methodology for estimating the extent of labour utilisation in livestock and in poulty keeping in rural areas of Meerut (U.P.) Villages Rithani (Meerut Tehsil), Jiwana (Baghpat Teh.) Nagla order (Sardhana Teh.) Jangethi, Jahangirpur, Daryapur villages district (Meerut).

(viii) Studies on comparative performance of mixed farming involving crop, livestock, poultry and fish-Cuttack (Orissa).

(ix) Pilot sample survey for studying the relative merits of the data obtained by actual weighment and those through enquiry for estimation of Milk product-Pulwame.

(x) Economic study of New Farm Technology with special reference to yield gap and associated factors-Ranchi (Bihar) and Bhilwara (Raj.), Indore (M.P.), HAU, Hissar Regional Research Station at Bawal, Mohindergarh district (Harayana).

(xi) Pilot sample survey to evolve a sampling methodology for estimation of inland fishery resources and catch on a region of Orissa—Cuttack district (Orissa).

(xii) Pilot studies for developing statistical methodology for assessing the losses due to diseases and pests in bovines HAU, Hissar.

xiii) Planning, designing and statistical analysis of data relating to the expts. conducted under All India Co-ordinated Research Project on Long Term Fertiliser Experiments—Ludhiana.

(xiv) Pilot sample survey to evolve an appropriate methodology for estimation of lac production—Gondia Tehsil of Bhandra district (Maharastra).

(xv) Pilot studies on pre-harvest forecasting of groundnut crop of the basis of data on biometrical characters, weather variables and agricultural inputs in Rajkot district, Gujrat.

8.3 Monitoring Cell

The monitoring cell was set up at IASRI to review the physical and financial achievements in the implementation of the Plan Schemes in November, 1979. The composition of Monitoring Cell being Jt. Director (Trg. and Res.) as chairman and Jt. Director (CS&NA), all Heads of the Division and Cells, CAO and Accounts Officer as members with Sh. S.D. Bal as the Convenor.

The functions and activities of the Monitoring Cell are to collect the information from the Heads of the Divisions, Administration, Scheme Section, etc., regarding the implemention of the various projects in-terms of the targets laid down. The progress of the projects is being

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reviewed for each quarter (3 months). Budget Estimates for the VII Plan period were prepared for the E.F.C. Memo. of the Institute and for the Co-ordinated Scheme for Primary Data Collection involving Adhoc Field Staff. Draft of E.F.C. Memos for the VII Plan were prepared and sent to the Council after Director's approval. To monitor the progress of various on-going research projects in the Institute, a summary of progress of all the on-going Research Project was prepared and distributed to the concerned scientists. The Research Project Files (RPF) pertaining to the various Divisions of the Institutes were sent to Agril. Res. Information Centre (ARIC), ICAR, New Delhi. The information regarding the VI Plan Co-ordinated Scheme on Primary Data Collection involving Adhoc Field Staff for 32 centres was compiled and sent to ICAR.

The Institute was assigned by the Council an important role for advising about the man-power requirements of statistics discipline of all the ICAR institutes. Consequently the information received from the various ICAR Institutes in response to the D.G.'s D.O. No. 1-10/ DDG (AS)/85 dated the 28th June, 1985 was compiled. It was presented by the Director in the Director's Conference held in Oct., 1985 for detailed discussion as desired by D.G.

Three meetings were convended on 3.1.85, 18.1.85 and 24.1.85 under the chairmanship of the Director to re-organise the activities of the Institute into six divisions as recommended by the Quinquenial Review Team (Q.R.T.) and approved by the Council.

A meeting was convened with the DDG (AS) and ADG (ES&M), ICAR representing the Council and the Director with the Heads of Divisions of IASRI representing the Institute to review the manpower requirements and research programmes of the Institutes.

A number of meetings were convened with the Heads of the Divisions regarding finalisation of the VII Plan proposals and progress of the on-going research projects of the Institute and for the Co-ordinated Scheme on primary data collection involving adhoc field staff.

8.4 UNDP Cell :

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

The following foreign consultants visited the Institute during 1985 :—

Consultant	Field of Consultancy	Period of visit
1. Dr. James H. Matis Texas A and M University College Station (U.S.A)	Crop Forecasting	8.7.1985 to 1.8.1985
2. Prof. D.J. Finney	Key-consultant	30.9.1985 to 28.11.1985
3. Dr. Graham Kalton University of Michigan, Ann Arbor (U.S.A.)	Sample Survey	01.12.1985 to 21.12.1985
4. Prof. H.A. David Iowa State University, Ames, (U.S.A.)	Curriculum Development and Training Methods	02.12.1985 to 30.12.1985

(1) The reports of Dr. James H. Matis and Dr. Graham Kalton have received and the action is being taken as per their recommendations.

(2) Four scientists of the Institute were deputed to receive training in different fields of Agricultural Statistics. The names of Scientists and the training institutions alongwith the field and period of training are given below :

Scientists	Field	Training Centre	Period
1. Dr. A.K. Srivastava	Sample Survey	University of Michigan, Ann Arbor, U.S.A.	5 months
2. Dr. R. C. Jain	Crop Fore-casting	Texas A and M University, College Station, U.S A.	6 months
3. Dr. V.K. Bhatia	Curriculum Development and Training Methods	Iowa State University, Ames, U.S.A.	5 months
4 Dr. Chandrahas	Statistical Ecology	North Carolina State University at Raleigh, U.S.A.	5 months

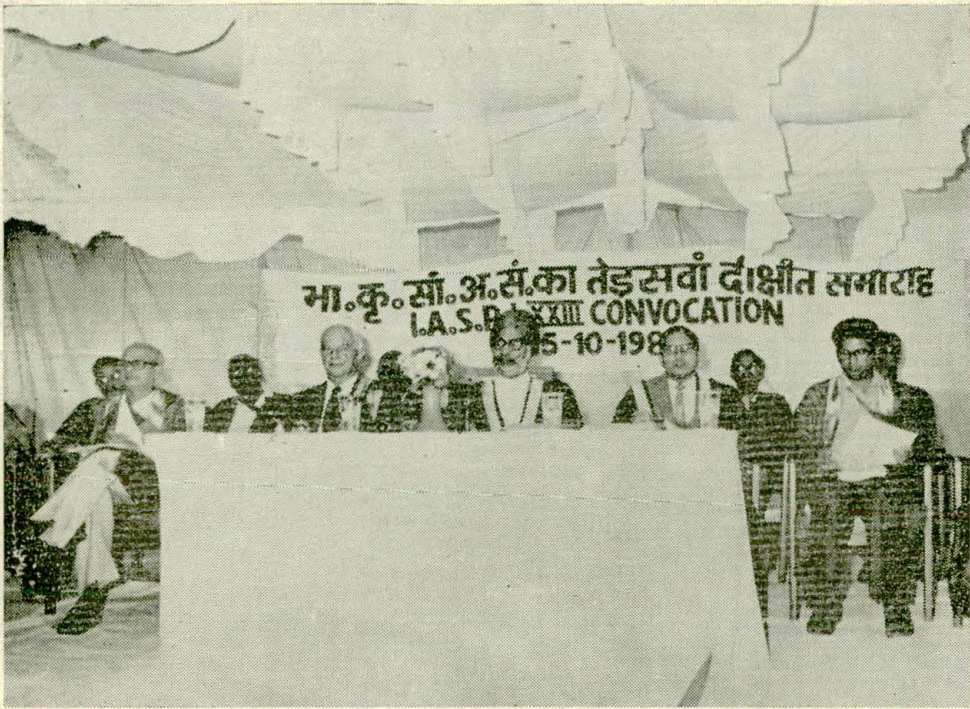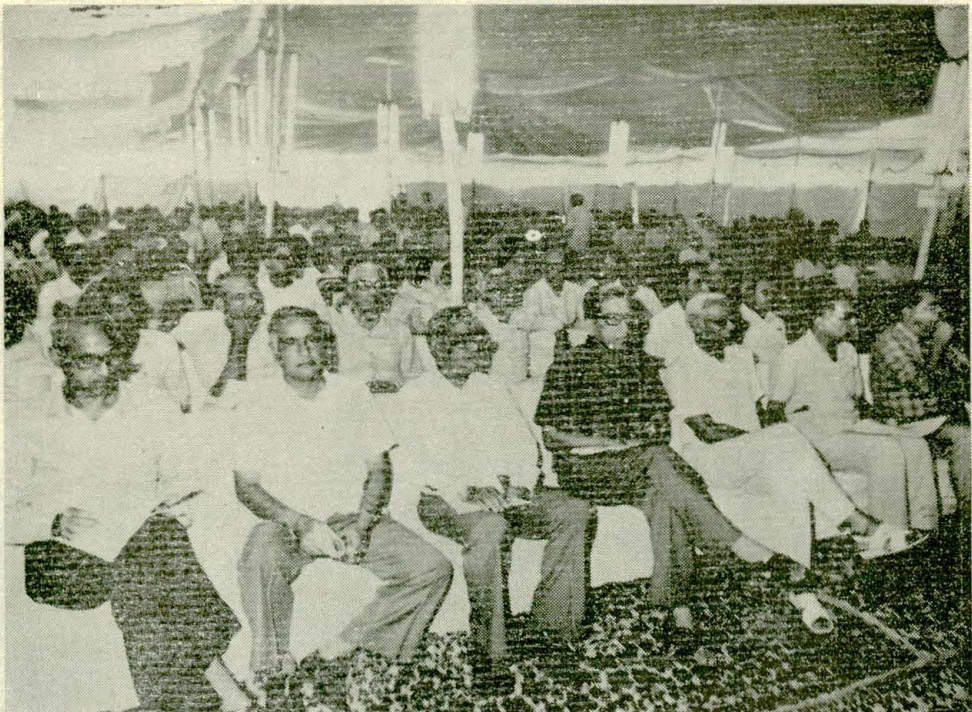Dr. N.S. Randhawa, Director General (ICAR)
Delivering the Convocation Address.

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

A Veiw of the Dias at the Convocation.

A view of the participants at the Convocation

(3) 10 Computer Terminals and 1 Graphic terminal have been obtained under UNDP Sub-Project and they are put in operation in the Computer Centre of the Institute.

(4) A course leading to M. Sc. degree in Computer Applications in Agriculture has started from September 18, 1985.

(5) The Evaluation Mission of UNDP/FAO/UNESCO/GOI visited this Institute for evaluating the progress of UNDP Project on the 4th April, 1985. They were acquainted with the up-to-date progress of the project.

(6) The Twelfth Meeting of the Project Working Committee was held on the 26th April, 1985 at I.C.A.R. under the Chairmanship of Director-General, ICAR.

(7) Requisition for procurement of 5 IBM Pcs Micro-Computers were sent to the Project-Director for onward transmission to the UNDP/FAO.

(8) The meetings of the Advisory Committee were held on the 17th Jan., 1985 and 29th October, 1985. Prof. D. J. Finney the Key-Consultant of the Sub-Project attended the meeting on the 29th October, 1985.

(9) The first meeting of the Task Force in Computer Applications was held on the 21st November, 1985 under the chairmanship of Prof. Prem Narain.

(10) A UNDP Cell has been formed in the Institute under the charge of Shri S.C. Rai, Senior Scientist. Two Technical Assistants, one stenographer and one junior clerk have been placed in the UNDP Cell to look after the work of UNDP Project at this Institute.

8.5 Training Administration Cell

National Workshop on teaching/training of Agricultural Statistics and Computer Applications in Agriculture was held at IASRI, New Delhi on 19th November, and 20th November, 1985 attended by the participants of ICAR Institutions/Agricultural Universities where Post Graduate training programme are being offered in Agricultural Statistics/Computer Applications. Besides, offering two degree courses, M. Sc. and Ph.D. in Agricultural Statistics in collaboration with IARI, New Delhi, the training administration cell coordinates four training courses namely Senior Certificate Course, Professional statisticians Certificates Course, Diploma in Agricultural Statistics and Diploma in Advanced Computer Programming. During 1985, 15 students of the Institute successfully completed the degree courses of which *11* were from M.Sc. and *4* were from Ph.D. The XXIII convocation of the training courses of Institute was held on 15th Oct., 85 which was presided over by Prof. Prem Narain, Director, IASRI, Dr. N.S. Randhawa, Director General, ICAR, New Delhi was the Chief Guest, who gave the convocation

address. A progress report was presented by Prof. Prem Narain, Director, IASRI. The report on training activities was given by Dr. A.K. Nigam, Head, Training Administration Cell. As a part of convocation programme an elocution contest was organised on 11th Oct.., 1985 in which students of various courses of the Institute participated. The topic for the elocution was 'Computers in Agriculture'. The session was chaired by Prof. D.J. Finney, Key Consultant UNDP Project at IASRI. At this convocation 16 candidates (SCC-8, PSCC-3, Diploma in Advanced Computer Programming-3, Diploma in Agricultural Statistics-2) were awarded certificates.

For the academic session 1985-86, a degree course in M.Sc. (Computer Applications in Agriculture) has been started in collaboration with IARI, New Delhi.

For the aforesaid session 17 students were admitted to various courses ((4 to M.Sc. (Ag. Stat.), 3 to M.Sc. (Computer Application in agriculture), 10 to Ph.D. (Ag. Stat.)).

The four training courses namely Senior Certificate Course, Professional Statisticians Certificate Course, Diploma in Advanced Computer Programming and Diploma in Agricultural Statistics have been discontinued from the session 1985-86 and a new set of short-term refresher courses namely *Refresher courses in Agricultural Statistics, Senior Level Refresher Courses for Statisticians, Refresher Course in Statistics for Agricultural Scientists, Senior Level Refresher Course for Agricultural Scientists and Short-term course on use of computer in agricultural research will start from March, 1986 onwards.*

1. Training Activities

(a) The following ad-hoc training programmes / lectures were arranged : –

Sl. No.	Name of Organisation	Period	Category of Trainees
1.	C.S.O., New Delhi	05.02.85 to 06.02.85	I.S.S. Probationers
2.	C.S.O., New Delhi	22.03.85	J.C.C.S.
3.	C.S.O., New Delhi	06.05.85 to 10.05.85	Specialised training in Agril. Statistics
4.	C.S.O.. New Delhi	01.06.86	M. Stat. students of ISI Calcutta/ New Delhi
5.	C.S.O., New Delhi	04.07.85	Specialised training in data processing
6.	C.S.O., New Delhi	28.10.85	I. S.E.C., Calcutta
7.	C.S.O.. New Delhi	11.11.85	I.S.E.C., Calcutta
8.	Karnatka University	22.11.85	M. Stat. Students
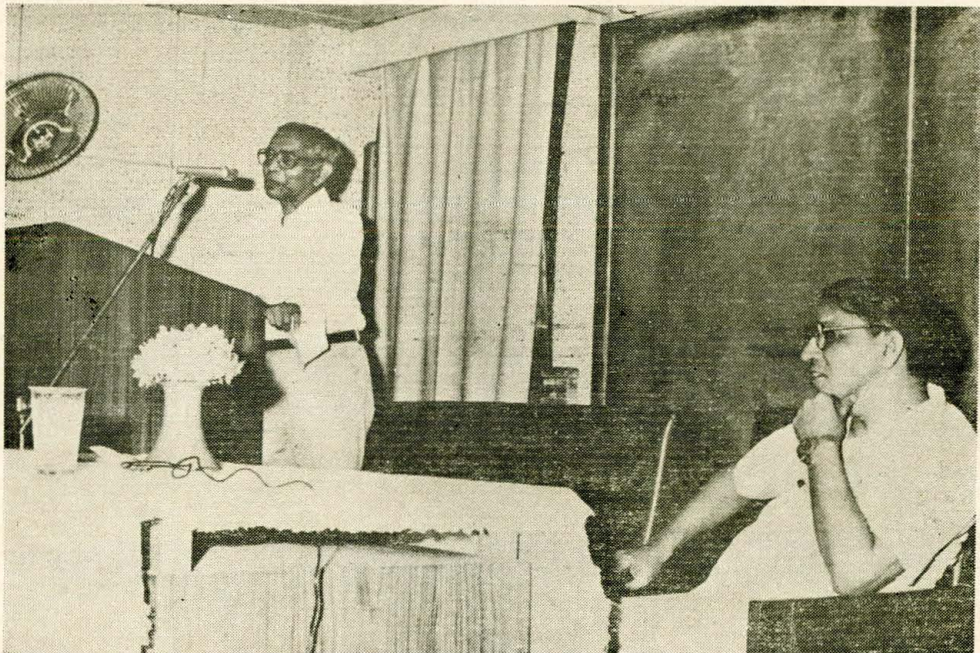
Prof. C.R. Rao Delivering the Seminar Talk
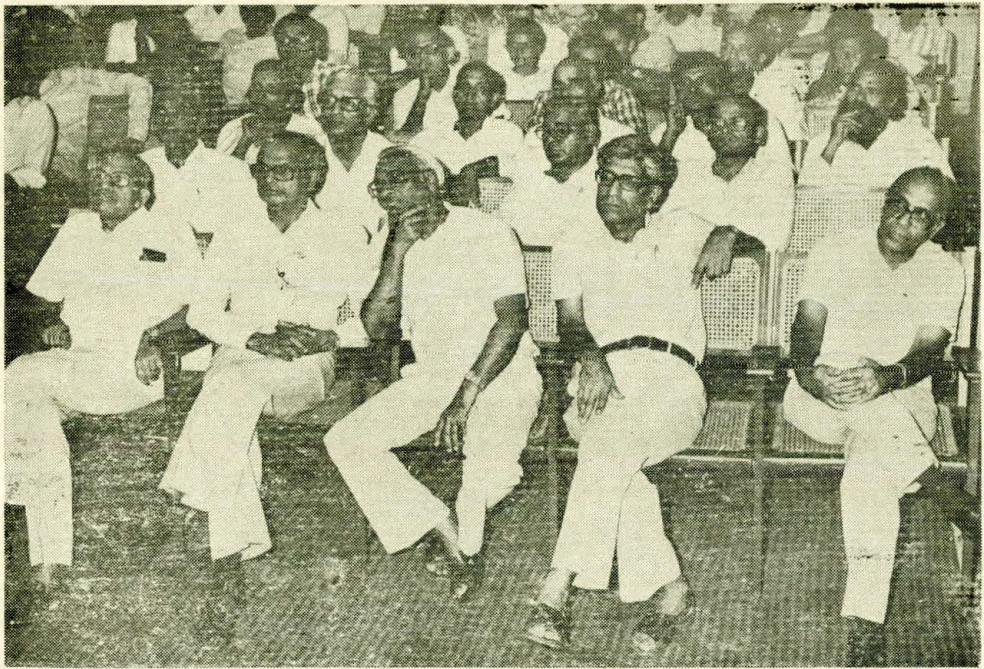
A View of the Participants of the Seminar

(ii) Basic Research in statistics :

For bio-assays some block design with nested blocks were developed.

(iii)   The list of important Seminars delivered by the distinguished visitors during the year under report is as follows :—

(a) Prof. James H. Matis
     Prof. of Statts..
     Deptt. of Statts.,
     Texas A and M University
     College Station,
     TEXAS, U.S.A.

(i) Crop Forecasting-Overview of Markov Chain Model with Applications to Simulated Corn and Surveyed Cotton Data.

(ii) Crop Forecasting : Recent Development in Markov Chain Model Incorporating Rank Regression and Optimal Formulation of States.

(iii) Recent Development in the Statistical Analysis of Physiological Pharmachological data.

(iv) On the use of Stochastic Compartmental Models with Gamma. Retention Time in Pharmachokinetics and Physiological Models.

(b) Dr. S.D. Peddada,
     Asstt. Prof.,
     Central Michigan University,
     Mt. Pleasant,
     MICHIGAN, U.S.A.

On the existence of non-negative MINQUE for variance components in a Linear Model.

(c) Sh. B.K. Sharma,
     IAS (Retd.)
     Ex. Secretary.
     Ministry of Rural Development,
     New Delhi.

National Rural Employment Programme.

(b) Dr. M.N. Das,
     Ex. Director,
     IASRI, New Delhi-12

Computer in Statistics.

(e) Prof. C.R. Rao,
     Pittsburg University,
     U.S.A.

9. Advisory Services

The Institute continued to play its important role of giving technical advice and guidance in regard to problems in agricultural statistics and sampling techniques particularly in the statistical aspects of the projects financed by the ICAR. During the year under report, the research projects submitted by the various Research Institutes, Universities, State Department of Agriculture and Animal Husbandry and other Research organisations as were referred to the Institute by the ICAR were examined critically by the Institute from the Statistical point of view. Also, officers of the Institute attended meetings of the various ICAR Scientific Panels as well as some of the workshops of the All India Co-ordinated projects of the ICAR held during the year and took active part in the discussions on statistical aspects of the Projects.

Technical advice and guidance were also rendered to research workers and students of the various Research Institutes, Universities and other Research Organisations in planning of their experimental investigations and statistical analysis of data as well as in processing of their data at the Computer Centre and Mechanical Data Processing Unit of the Institute.

Some details of technical advice and guidance given by the Institute during the year under report are briefly given below :—

Design of Experiments and analysis of Experimental Data

Guidance was given to Dr. H.P. Singh, Scientist (S-3) of CAZRI, Jodhpur in developing a model for estimating daily soil moisture from rainfall evaporation and soil characterstics data for loamy sand soils of Jodhpur.

Technical guidance was given to Dr. Ajit Gupta, Sr. Scientist (Agronomy) CPRI, Shimla in formulating experimental design on usage of fertiliser inputs under resource constraints.

Sample Survey Methodology and Analysis of Survey Data

(i) Advice was given to Director, Bureau of Statistics and Economics, Orissa, Bhubaneshwar, regarding Planning/Conduct of survey for estimation of Area/ Yield of fruit and vegetables in the State.

(ii) Advice was given to Standing Technical Committee for improvement of crop surveys in West Bengal on planning/conduct of survey for estimation of Area and yield of fruits and vegetables at Calcutta.

(iii) Advice was given to Command Area Development Authority, Ministry of Irrigation on planning of surveys for determining yield rates of irrigated and unirrigated crops in command area.

(iv) Director, N.S.S.O., New Delhi was advised on formulation of project for conducting a survey one or two command areas for developing methodology for estimation of yield of irrigated, an unirrigated crops in command area and block level estimates of crop yields for crop insurance.

(v) Dr. A.C. Sharma, Senior Farm Economist, Punjab Agricultural University, Ludhiana, was advised for finalisation of the sampling methodology on Farm production strategies in the wake of risk conditions in the paddy-wheat belt of the Punjab.

(vi) Technical advice was given to Shri M.S. Kaushik, Ph.D. Scholar, I.I.T., for developing new PPS sampling techniques for the project for development of new methedologies in sampling.

(vii) Guidance was given to Shri Sudarshan Kumar, Deputy Director (Statistics), Directorate of Animal Husbandry, Punjab for conducting a survey on, "Pilot investigations to study the performance characteristics of crossbred cows under village condition" at IASRI, New Delhi.

(viii) Advice was given to Dy. Director (Stat.), Department of Animal Husbandry, Haryana, Chandigarh for data collection, tabulation and analysis for estimation of production of Wool and Meat.

(ix) Advice was given to Jt. Director (AHS), Deptt. of Agriculture and Co-operation, Ministry of Agriculture on the estimation of milk production for the years 1980-81 and 1982-83.

(x) Technical advice was given to the Jt. Director (AHS), Deptt. of Agriculture and Co-operation, Ministry of Agriculture and Rural Development, New Delhi in the estimation of egg production for the period 1980-83.

(xi) Technical advice was given to Dy. Director and Directorate of Animal Husbandry, Kashmir, Srinagar on the planning and conduct of Sample Surveys for estimation of production of milk and egg.

Bio-statistics and Statistical Genetics

(i) Guidance was given to Dr. O.P.S. Senegar, the Principal Investigator of the PL-480 Goat Project, who visited the Institute on 25.2.85 to discuss about the Institute collaboration in taking up the analysis of the data collected under the project. It was agreed that the data will however be analysed at the Institute.

(ii) Guidance was given to National Research Centre on Camel, Bikaner (i) for maintaining the records for various experiments to be conducted at the centre,

(ii) for finalising different types of performae (in consultation with the Director of the centre), and (iii) regarding statistical methods for analysing the already accumulated data on various characters of camel.

(iii) Guidance was given to Dr. N. Natrajan, Head of the Station, Sheep Breeding Farm, Sandynallata (Tamil Nadu) in providing card design for the analysis of data collected under AICRP on sheep.

(iv) Sh. M.A. Pillai, Ph.D. (Entomology) student, College of Agriculture, Annamalai University, Annamalai, Tamil Nadu was given technical guidance in regard 'the use of discriminant function in classification of biotypes in Entomolgy'.

Forecasting Techniques for Crops, Diseases and Pests

Guidance given to Shri Jacob Methew, Scientist (S-3), Central Plantation Crops Research Institute, Kasaragod on the problem of Forecasting Pine-aple yield at different pickings in various months.

Statistical Economics

To Shri Ashwini Kumar Sharma, Ph.D. student, Deptt. of Agril. Economics, HAU, Hissar on his thesis entitled 'Capital Requirements for modernisation of Agriculture'.

10. Papers Presented at Interorganisational Seminars, Work Shops, etc.

During the year under report, papers by the Officers, members of the staff and research students of the Institute were presented in several inter-organisational seminars, workshops, etc. The titles and authorships of the papers presented and the particulars of the seminar, workshops, conferences, etc., at which those were presented are given below :

10.1 The symposium on 'Design of Experiments' at the Indian Science Congress held at Lucknow University, at Lucknow from Jan. 3-7, 1985.

Nigam, A.K. And Gupta, V.K.- Interplay of experimental design and survey sampling (invited paper).

10.2 The XV National Convention organised by Indian Society for Training and Development in Collaboration with Planning Commission on Human Resource Development at New Delhi from January 19-23, 1985.

Singh, Randhir-Some Socioeconomic studies of rural labour.

10.3 Seminar 'Control of non-Sampling errors in relations to methods of data collection', organised by the NSSO, New Delhi held at Jaipur from March, 12-14, 1985.

(i) Singh, Randhir, And Narain, P.—Measurement error in interview based surveys.

(ii) Narain, P., Kathuria O.P., Srivastava, A.K. And Singh, K V.—Some observations on method of data collection in agricultural surveys.

10.4 XX Annual convention of CSI-85 held at Ashok Hotel, New Delhi from March 13-16, 1985.

Doshi, S.P., Gupta, K.C. Mishra, J.P.-Diallel cross techniques in Rural Development.

10.5 National Seminar on, 'Pollution Control and Environmental Management' held at National Environmental Engineering Research Institute, Nagpur from March 17-19, 1985.

Narain, P., Kathuria, O.P. and Bathla, H.V.L.—Status of forestry statistics in environmental management.

10.6 All-India U.G.C. Seminar on Statistical Inference, held at Punjab University, Chandigarh from 14th to 19th April, 1985,

Sadasivan, G. - Some order effect models in paired comparisons.

10.7 Seminar on, 'Dairying in Hilly area, Prospects and Problems' organised by the Indian Dairy Association (North Zone) at Shimla on 7th June, 1985.

Raut, K.C., Singh Shivtar, Jain, J.P. Performance of Cross-bred Vis-a Vis Non-descript cows in a Hilly area of Himachal Pradesh.

10.8 Workshop on Promotion of Employment Opportunities in Agriculture organised by the Institute of Applied Manpower Research, New Delhi on 18th June, 1985.

Pandey, R.K. — Promotion of Employment Opportunities in Agriculture.

10.9 Workshop-cum-Monitoring tour on socio-economic research in farming system research to International Rice Research Institute, Manila, Philipines from 16th to 28th September, 1985.

(i) Pandey, R.K. - Farm Survey Sampling Techniques. (discussant paper)

(ii) Pandey, R.K. - Identifying Farm Resource Constraints to adoption (Graphic whole-Farm Resources). (discussant paper)

10.10 The National Symposium on Agricultural Education and Research in India Organised by the Agricultural Society of India, Calcutta held at IARI, New Delhi from 28th to 30th October, 1985. Session IV — (On 30th October, 1985)

Narain, P. and Khosla R.K. - Identification of Research priorities in Agriculture.

10.11 The VIIth Conference of Central State Statisticians held at Hyderabad (A.P.) from 19th to 23rd Dec., 1985.

(i) Narain, Prem, Kathuria, O.P. and Bathla, H.V.L.- Status of Forestry Statistics in relation to Environment.

(ii) Narain, Prem, Kathuria, O.P. and Kumar Pranesh - Use of remote sensing technique in estimating crop average.

10.12 The 45th Annual Conference of the Indian Society of Agricultural Economics held at Anand (Gujarat) from 27th to 29th Dec., 1985.

Jain, T.B. and Prabhakaran, V.T. - Effect of rural female labour participation in bovine and poultry keeping on their economic status.

10.13 The 68th Annual Conference of Indian Economic Association held at School of Social Sciences, Gujarat University, Ahmedabad from 28th - 30th December, 1985. Pandey, R.K., Dixit, U.N. - Study of inter-relationship between Agriculture Industrial Production.

10.14 The 39th Annual Conference of the Indian Society of Agricultural Statistics held at Punjabrao Krishi Vidyapeeth, Akola (Mahashtra) from 28th to 30th Dec., 1985.

(i) Agarwal, R.C., Narain, Prem. Dey, A. and Banerjee, A.K.—An emperial study in evaluating sampling strategies for estimating the distribution of land holding sizes.

(ii) Arya, S.N. and Nadkarni, U.G.—Estimation of specific withdrawal rates in bovines from survey data.

(iii) Bathla, H.V.L. and Singh, Padam - On probability proportional to size sampling.

(iv) Bhatnagar, K.C. and Khurana, G.L. - Economics of Fertilizer Application from 'On Farm Trials' to Mustard Crop'.

(v) Choudhary, H.B. - Three decades of Agri. in Rajasthan

(vi) Gola, R,C., Mehrota, P. C. and Kathuria, O. P. - On two state successive sampling with partial replacement of units.

(vii) Gupta, S.C. and Mehrotra, P.C - An Analysis of constraints in adoption of HYV rice.

(viii) JAIN, T.B.—On age specific premium rates for cattle and buffalo insurance.

(ix) Jain, T.B. and Bhatia, D.K.—On efficient use of labour in poultry keeping.

(x) Kaistha, A.C. – Acreage response of sugarcane in the state of Tamil Nadu.

(xi) Kathuria, O.P. and Banerjee, A.K. – Yield tends of groundnut in India over the last 3 decades.

(xii) Kathuria, O. P. and Mehrotra, P.C. – On a procedure for estimating productivity at micro-levels using auxiliary information.

(xiii) Khosla, R.K. — Statistical analysis for estimation of crop losses due to Pests and Diseases.

(xiv) Mathur, D. C., Singh, B.H., Sethi, S. C. and Walia, S.S.—Trends in sugar recovery in Uttar Pradesh.

(xv) Nirman, K.P.S. and Agarwal, H.O.—Fodder cultivation—a cost study.

(xvi) Mehrotra, P.C., Rustogi, V.S. and Kathuria. O.P.— A study of variety replacement in paddy crop.

(xvii) Nadkarni, U.G., Somayazulu, L.B.S. and Agarwal, S.C. — Optimum rates for bovines.

(xviii) Narain, Prem. Kathuria, O.P. and Bathla, H.V.L.— Status of forestry statistics

in environment management.

(xix) Rai, S.C.—On slippage Test for ordered observations.

(xx) Rana, P.S. and Bhargava, P. N. — Use of shape variance in uniformity trial data.

(xxi) Saran, S.M.G., Khurana, G.L., Mathur, D.C. and Lahiri, Alok-Efficiency of rock phosphatic fertilizer on paddy in different tracts of Bihar region,

(xxii) Satya Pal, Mehrotra, P.C. and Singh, V.P.N.—A study of fertilizer use on high yielding varieties of rice in different holding size classes.

(xxiii) Sethi, S.C. and Mathur, D.C.—A study on use of human labour for different agricultural operations in the cultivation of vegetable crops in Delhi.

(xxiv) Singh, Shivtar, Raut, K.C. and Jain, J.P.—Constraints impending milk yield of crossbred cows in hilly area.

(xxv) Singh, B.H. and Bapat, S.R. —Studies for obtaining pre-harvest sugarcane yield fore-casts.

(xxvi) Singh, Jagmohan and Gupta, A.K.—A study on use of Insecticides and Pesticides in Vegetable cultivation.

(xxvii) Singh, Jagmonan, Kathuria, O.P. and Banerjee, A.K.— Effect of drainage system on Agricultural Production in flood affected areas.

(xxviii) Singh, Jagmohan, Mehrotra, P.C. and Bhatia, D.K.— A study on additional yield of high yielding varieties of rice over local varilties.

(xxix) Singh, V.P.N. and Mehrotra, P.C. — A study of association between HYV wheat seed source and size of holding

(xxx) Walia, S.S., Singh, B.H., Mathur, D.C. and Sethi, S.C.—Study of growth analysis and trends of area, production and yield of potato in major potato growing states of India.

10.14.1 Symposium on Breeding and other strategies for minimising crop losses due to pests and diseases held on 29th Decembr, 1985 during the Conference.

Narain, P.—Breeding strategy to minimise losses due to diseases and pests.

10.14.2 Symposium on crop insurance organised during the coference held on 30th December, 1985.

Narain, Prem, Singh, Shivtar, Garg, J.N. and Kumar, Mahesh -Statistical aspects of comprehen-sive crop insurance scheme.

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11. Conferences/Seminars/Symposia/ Workshops, etc. Attended by the Scientists

During the year under report, officers of the Institute participated in several inter-organisational seminars, workshops, conferences, etc. The names of the officers (with designation) and the particulars of the seminars, workshops, conferences, etc , in which they participated are given below :—

Date	Name of Conferences/Seminars/ Symposia/Workshop, etc.	Name of the scientists with designation
1	2	3
Jan., 3-7	72nd Session of the Indian Sciences Congress Association held at Lucknow University, Lucknow	Prof. Prem Narain, Director
Jan., 6-8	44th Annual Conference of the Indian Society of Agricultural Economics which was held at Orissa University of Agriculture and technology, Bhubneshwar (Orissa)	Dr. R.K. Pandey, Sr. Scientist
Jan., 14-16	VII Workshop of AICRP on buffalo breeding held at N.D.R.I., Karnal (Haryana)	Sh. P. S. Rana, Scientist (S-2)
Jan., 19-23	XV National Convention organised by Indian Society for Training and Development in Collaboration with Planning Commission on Human Resource Development at New Delhi.	Dr. Randhir Singh, Scientist (S-3)
Jan., 28-30	Sr. Statisticians' Meeting of ICAR Institutes held at IASRI, New Delhi	Prof. Prem Narain, Director and All the Senior Scientists of the Institute
Jan., 31 and Feb. 2	Workshop on "Computer Based decision Support System" Organised by NIIT at New Delhi	Sh. S.N. Mathur, Scientist (S-3)
Feb., 4-5	Workshop on Cropping System Research held at IARI, New Delhi	Sh. P.N. Bhargava, Scientist (S-3)

1	2	3
Feb., 15-16	Workshop on Progeny Testing Programme under field conditions organised by the department of A.H. Punjab at Patiala	Sh. J. C. Malhotra, Scientist (S-3)
Feb., 19-21	X Workshop of AICRP on Poultry Breeding held at CARI, Izatnagar (U.P.)	Sh. Lal Chand, Scientist (S-2)
Feb., 27-28	Symposium on "Remote Sensing in Agriculture" organised by Indian Society of Photo Interpretation and Remote Sensing-Ahmedabad Chapter at Ahmedabad	Dr. A. K. Srivastava, Scientist (S-3) Dr. Ranjana Agrawal, Scientist (S-2) Dr. R. C. Jain, Scientist (S-2)
Mar., 11-12	Working Conference on Computer for advancement of rural society held at Akbar Hotel, New Delhi	Sh. P. C. Mehrotra, Scientist (S-3)
Mar., 11-15	Workshop of AICRP on Sheep and Goat breeding held at CSWRI, Avikanagar, Rajasthan.	Sh. S. D. Wahi, Scientist (S-1)
Mar., 12-14	Seminar on "Control of Non-Sampling Errors in relation to methods of data Collection" organised by NSSO, New Delhi at Jaipur (Raj.)	Dr. Randhir Singh, Scientist (S-3) Sh. K. B. Singh. Scientist (S-1)
Mar., 13-16	XX Annual Convention of the Computer Society of India on "Computers for rural development in India" held at Akbar Hotel, New Delhi	Sh. R. Gopalan, Scientist (S-2), Sh. S. P. Doshi, Scientist (S-2) Sh. M. L. Choudhary, Scientist (S-1) Sh. Ram Kumar, Scientist (S-1)
Mar., 17-19	National Seminar on "Pollution Control and Environmental Management" held at National Environmental Engineering Research Institute, Nagpur.	Dr. H.V.L. Bathla, Scientist (S-2)
Apr., 9-12	Third National Conference of Symposium on Animal Genetics and Breeding & Seventh Workshop on All India Coordinated Research Project on Cattle and Breeding strategy on cattle held at I.V.R.I., Izatnagar (U.P.)	Sh. J. C. Malhotra, Scientist (S-2)

1	2	3
Apr., 14-19	Symposium on Applied Statistics with special reference to Agriculture at All India U.G.C. Seminar on Statistical Inference held at Punjab University, Chandigarh	Dr. G. Sadasivan, Scientist (S-2)
May, 1	National Workshop on Crop Insurance held at Vigyan Bhavan, New Delhi organised by the Ministry of Agriculture, Govt. of India, New Delhi.	Prof. Prem Narain, Director, Dr. Shivtar Singh, Scientist (S-2)
June, 7	Seminar on, "Dairying in Hilly area, Prospect and Problems" organised by the Indian Dairy Association (North Zone) at Shimla	Dr. K.C. Raut Sr. Scientist
June, 13-19	Conference on Concepts, measurements and policy issues relating to Employment and unemployment organised by Instt. of Applied Manpower Research, New Delhi.	Dr. R. K. Pandey, Sr. Scientist Dr. Randhir Singh, Sr. Scientist
July. 17	One Day National Conference on Crop Insurance, held at N.C.D.C., New Delhi.	Prof. Prem Narain, Director, Sh. J. N. Garg, Scientist (S-1)
Aug., 22-26	All-India wheat Research workers workshop held at G. B. Pant University of Agriculture & Technology, Pant Nagar (U.P.)	Sh. P. N. Soni, Scientist (S-3)
Aug., 27-28	"National Seminar on Bio-energy Information Sources" held by SIS and DNES at Hotel Maurya Sheraton, New Delhi.	Sh. O. P. Dutta, Scientist (S-2)
Sept., 17-18	National Seminar on Soil Conservation and Watershed management held at Vigyan Bhavan, New Delhi.	Sh. P.N. Bhargava, Scientist (S-3) Mrs. Asha Saxena, Scientist (S-2)
Oct., 28-30	The National Symposium on Agricultural Education and Research in India organised by the Agricultural Society of India, Calcutta held at IARI, New Delhi.	Prof. Prem Narain. Director

1	2	3
Nov., 4-7	The XVI Annual Workshop of the All India Coordinated Agronomic Research Project held at A.P. Agricultural University, Hyderabad.	Sh. P.N. Bhargava, Sr. Scientist, Miss C. R. Leelavathi, Scientist (S-3), Sh. P.N. Soni, Scientist (S-3)
Nov , 19-20	National workshop on teaching/training of Agricultural Statistics/Computer Applications held at IASRI, New Delhi.	Prof. Prem Narain, Director, Miss C.R. Leelavathi Scientist (S-3), Sh. S.C. Rai, Scientist (S-3), Dr. P.C. Mehrotra, Scientist (S-3) Dr. K.G. Aneja, Scientist (S-3) Dr. V.S. Rustogi, Scientist (S-3), Sh. Shanti Swarup, Scienst (S-2), Dr. Bhagat Singh, Scientist (S-2), Sh. I.C. Sethi, Scientist (S-2), Dr. G.C. Chawla, Scientist (S-2,) Sh. S.D. Wahi, Scientist (S-1)
Dec., 18-19	Group Meeting of All India Coordinated Research Project on Long Term Fertilizer Experiments (ICAR) held at IASRI, New Delhi.	Sh. P.N. Bhargava, Sr. Scientist, Miss C.R. Leelavathi, Scientist (S-3), Sh. P.N. Soni, Scientist (S-3), Sh. V.N. Iyer, Scientist (S-2), Mrs. Asha Saxena, Scientist (S-2),

1	2	3
		Sh. J.K. Kapoor, Scientist (S-2), Sh. M.R. Vats, Scientist (S-1)
Dec., 19-23	The Seventh Conference of Central and State Statisticians held at Hyderabad, (A.P.).	Dr. O.P. Kathuria, Sr. Scientist
Dec., 27-29	The 45th Annual Conference of the Indian Society of Agricultural Economics, Bombay held at Institute of Rural Management, Anand (Gujarat).	Sh. T.B. Jain, Scientist (S-2)
Dec., 28-30	The 39th Annual Conference of the Indian Society of Agricultural Statistics held at Punjabrao Krishi Vidyapeeth, Akola (Maharashtra)	Prof. Prem Narain, Director, Sh. S.C. Rai, Scientist (S-3), Dr. Shivtar Singh, Scientist (S-2), Sh. H.B. Choudhary, Scientist (S-2), Sh. Jagmohan Singh, Scientist (S-2), Sh. K.C. Bhatnagar, Scientist (S-1), Sh. P.S. Rana, Scientist (S-1), Sh. D.C. Mathur, Scientist (S-1)
Dec., 28-30	The 68th Annual Conference of Indian Economic Association held at School of Social Sciences, Gujarat University, Ahmedabad.	Dr. R.K. Pandey, Sr. Scientist

*As Convenor of the sympossium on, "Crop Insurance" during the Conference.

12. Publications

During the year under report, Thirty Five papers by the Officers, staff and research students of the Institute were published in standard journals, etc. A list of these papers with abstracts is given as Appendix-IV. Also, Thirty Five papers were accepted for publication in different journals during the year, a list of which is given as Appendix V. The technical reports, compendia, etc. mentioned below were published as "IASRI Publications".

1. Mehrotra, P.C.—Pilot Sample Survey to study the impact of new technology on crop production, its disposed and employment in Agriculture in Delhi state, 1976-77 to 1978-80.

2. Singh, Jagmohan—'A study on costs and return from Inter crops in apple cultivation in U.P.'

3. Krishnan, K.S., Bhargava, P.N., Ghai, R.K., Saksena, M.P., Yeri, P.R. and Batra, P.K.— 'Annual Index of Agricultural Field Experiments', Vol. X (List of experiments conducted during 1972 and onwards and reported during 1981 under the scheme of National Index of Agricultural Field Experiments).

4. Leelavathi, C.R. and Mehta, S.C. — Statistical assessment of changes in crop production in command area of Sreeramsagar (Pochampad) river valley project.

5. Leelavathi, C.R. and Mehta, S.C.—Statististical assessment of changes in crop production in command areas of Malaprabha-Ghataprabha, Krishna and Sreeram sagar (Pochampad) river valley projects.

6. Bapat, B.R., Chandrahas and Singh, B.H.—Final report of pilot studies on pre-harvest forecasting of sugarcane yield in Kolhapur district (Maharashtra) 1977-78 to 1979-80.

7. Malhotra, J.C., Narain, Prem, Jain, J.P. and Malhotra P.K. - Growth studies on crossbred cows available at military farms in the country.

8. Khosla, R.K., Mukherjee, A.K., Swaroop, Maharaj and Singh, P.P. IASRI Statistical Newsletter, Vol. X, No. 4, Oct.-Dec., 1984.

9. Khosla, R.K., Mukherjee, A.K., Swaroop, Maharaj and Singh, P.P. —IASRI Statistical Newsletter, Vol. XI, No. 1, Jan.—March, 1985.

10. Khosla, R.K., Mukherjee, A.K., Swaroop, Maharaj and Singh, P.P.—IASRI Statistical Newsletter, Vol. XI, No. 2, April-June, 1985.

11. Khosla, R.K., Mukherjee, A.K., Swaroop, Maharaj and Singh, P.P.- IASRI Statistical Newsletter, Vol. XI, No. 3, July-Sept., 1985.

12. Khosla, R.K., Mukherjee, A.K. Swaroop, Maharaj and Singh. P.P.- IASRI Annual Report, 1984.

13. Other Activities

13.1 Salient features, progress and achiements under Lab-to-Land Programme during the year 1985,

Under phase III of the ICAR Lab-to-Land programme the Institute has selected village Akbarpur Majra in Alipur Block of Delhi. This village is situated at a distance of about 30 kms. from the Institute. The total geographical area of the village is 743 acres of which 662 acres (611 acres irrigated and 51 acres unirrigated) were under cultivation during the year 1984-85. The

bench mark survey of the village was conducted in Dec., 1984, and a list of families belonging to different categories was prepared. There are 274 families in the village out of which 83 belong to the scheduled castes and 89 to backward classes. The number of marginal and small farmers is 57 and 60 respectively.

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

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

The highlights of activities/programmes carried out in the village during the period under report are given below:

1. Demonstrations on the use of balanced cattle feed.

150 demonstrations on the use of ballanced cattle feed (HAFBD cattle feed)

were conducted during March, 1985. It was found that the use of HAFED feed increased the milk yield by 1 kg. to 1.5 kg per animal per day. Again 110 demonstrations were conducted in the households belonging to the category of landless agricultural labours in Nov., 1985. This time the increase in yield was reported to be 2 kg. to 2.5 kg per animal per day.

2. Crop production.

(i) The cultivation of summer moong, short duration variety of arhar, brinjal and bottle gourd was introduced in the cropping pattern of the farmers. The good quality seeds of radish, were also supplied to the farmers for obtaining higher yields. The results obtained are given below:

| Crop | Variety | No. of demons-trations conducted | Yield/income obtained per hec. | | |
			Maxi.	Mini.	Average
Moong	Pusa Baisakhi	15	5.0 Q	1.25 Q	3.0Q
Arhar	UPAS-120	30	25.0 Q	3.75 Q	13.5Q
Brinjal	Pusa.Kranti	3	Rs. 4700.0	Rs. 2000.0	Rs. 3100.0
Bottle Gourd	Pusa Long	5	Rs. 25000.0	Rs. 1250.0	Rs. 6650.0
Radish	Pusa Chetki	30	Rs. 16000.0	Rs. 1250.0	Rs. 7000.0

(ii) Demonstrations on improved practices of wheat cultivation during the rabi season.

The farmers were educated about the improved pakcage of cultivation practices of wheat. The seeds of three varieties were supplied to 90 farmers as shown below:

Variety of wheat	Qty. of seed supplied	No. of farmers covered	Area sown
HD—2204	12 Qtls.	30	30 acres
HD—2329	12 ,,	30	30 ,,
HD—2285	12 ,,	30	30 ,,

The institute also provided 50kg. of DAP for basal application and 50 kg. of urea for top dressing in wheat to each of the farmers. The crop in all the plots was showing good germination and satisfactory growth.

3. Visit of Farmers to Krishi Vigyan Mela.

16 farmers visited the Krishi Vigyan Mela at IARI in March, 1985. They were educated about the use of balanced fertilisers, newly developed varieties of seeds and weedicides, etc. They also saw the latest implements developed by the Agricultural Engineers. Solar cookers, solar and smokeless chullas invented for efficient use of energy was also shown to them. The farmers collected literature regarding crop production and food grain storage from different stalls.

4. Distribution of extension literature.

The extension literature containing package of practices for cultivation of summer and kharif crops was distributed among the small and marginal farmers in the village.

13.2 First Crop Insurance Training Course held at IASRI, New Delhi from 8.1.85 to 13.1.85.

Considering the importance of Crop Insurance and to bring uniformity in the system through an objective and scientific approach the Ministry of Agriculture, Govt. of India planned to organise a number of training courses at various levels. On behalf of Ministry of Agriculture, the first Crop Training Course was held at the Indian Agricultural Statistics Research Institute, New Delhi from 8-13th January, 1985. Prof. Prem Narain, Director, IASRI was the Programme Coordinator of Training Course and Sh. P.P. Rao, Manager, G.I.C., Bombay was the Joint Programme Coordinator.

At the inaugural session on 8.1.85 Prof. Prem Narain welcomed the participants and Sh. K. N. Ardhanareeswaran, Joint Secretary, Ministry of Agriculture delivered the inaugural address. At the completion of the training course on 13.1.85 the Valedictory Address was delivered by Sh. R.V. Madhavrao, Managing Director, General Insurance Corporation of India, Bombay·

Thirty eight senior Officers from 12 states where the Crop Insurance Scheme is in operation and dealing with Crop Insurance attended the course. The training programme included special lectures and group discussions on various topics relating to Crop Insurance. The lectures were delivered by experts from various organisations at the Centre and the states. The topics covered were on credit, determination of Premium and Indemnity rates, procedural and other related aspects of Crop Insurance. This training at Senior level was conducted so that Senior Officers in turn would impart training to staff associated in the Crop Insurance Programme in their respective states.

13.3 Senior Statisticians Meeting held at IASRI, New Delhi from 28th to 30th January, 1985.

The meeting of Senior Statisticians of ICAR Institutes and All India Co-ordinated Research Projects of ICAR was held at IASRI from 28th to 30th January, 1985 with the objective to discus issues and to identify collaborative research projects by IASRI and the subject matter institutes.

The meeting was inaugurated by Dr. R.M. Acharya, DDG (AS), ICAR, while Welcome address was given by Prof. Prem Narain, Director, IASRI.

In all 67 participants took part in the delibrations of the meeting. There were group discussions on problems on (i) Design of Experiments and Analysis of Experimental Data, (ii) sample survey methodology and analysis of survey Data, (iii) Bio-Statistics and Statistical Genetics, (iv) Forecasting Techniques for Crops, Diseases and Pests, (v) Statistical Economics, (vi) Computing Sciences, (vii) Training Programme in Agricultural

Statistics and Computer Sciences. The recommendations made in different groups discussions were discussed and finalised in the final session chaired by Dr. R.M. Acharya.

13.4 ICAR Zone-III Inter-Institutional Tournaments.

During the year 1985-86, IASRI was grouped with ICAR Headquarter, NBPGR, New Delhi, C.I.R.G. Makhdoom and N.D.R.I., Karnal in Zone-III. The responsibility of organising the Zone-III Sports Meet was given to N.D.R.I., Karnal which hosted the Meet from 3rd to 5th October, 1985 at its Campus. For the Sports Meet, IASRI contingent consisted of 49 members, Sh. K. V. Sathe as Chief-de-Mission 33 managers, 44 sportsmen and a driver.

Dr. K.K. Tyagi, Convenor of the Institutes Sports Committee represented the Institute in the Zonal Managing Committee, constituted by the host Institutes as a member and attended its various meetings for finalising the various arrangements related to the Sports meet.

13.5 Farewell to Dr. O.P. Gautam on 13.2.1985 at IASRI (ICAR), Library Avenue, New Delhi.

Dr. O.P. Gautam, Ex. Director General, ICAR was given a touching farewell on his retirement after rendering more than 30 years of service to ICAR. Dr. N.S. Randhawa, Director General, ICAR was also present on the occassion. The meeting was arranged on 13.2.85 IASRI, New Delhi.

The following positions were won by the Institute sportsmen :

Sl. No.	Game/Event	Position	Name
1.	Kabaddi	Winner	Captain : Sh. D.P.S. Man
2.	Table Tennis (Team Event)	Winner	Captain : Sh. O.P. Khanduri
3.	Football	Winner	Captain : Sh. A.K. Robin
4.	Volleyball (Shooting)	Runner	Captain : Sh. Ram Bhool
5.	Volleyball (Smashing)	Runner	Captain : Sh. P.S. Rai
6.	Table Tennis (Open-Singles)	Winner	Sh. O.P. Khanduri
7.	800 metre race	II	Sh. Sunil Bharihoke
8.	Pole Vault	II	Sh. P.S. Rai
9.	4x100 metre relay race	II	Sh. Sunil Bharihoke Sh. P.S. Rai, Sh. P.C. Thakur and Sh. Amar Singh.

Bonquet being presented to Dr. O.P. Gautam, Ex. D.G.,
ICAR by Prof. Prem Narain, Director of the Institute

Wall Plate being presented to Dr. O. P. Gautam, by Prof.
Prem Narain, Director of the Institute.

Dr. O.P. Gautam, Ex. D.G., I.C.A.R. is delivering the speech.

Discussion among Prof. Prem Narian, Dr. O.P. Gautam and
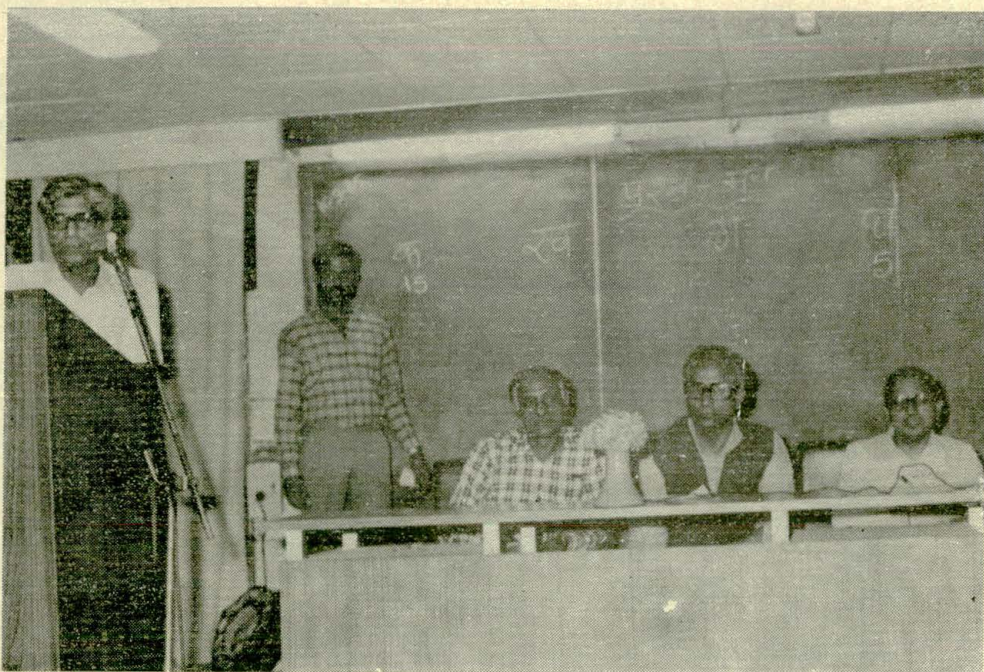Dr. N.S. Randhawan (present Director General, I.C.A.R.).

Prof. Prem Narain, Director delivering the Welcome Address.

Dr. Ratnakar Pandey, Chief Guest addressing the Annual function

A view of Hindi Quiz Contest

Dr. Ratnakar Pandey presenting the running shield for maximum in Hindi to Dr. O.P. Kathuria, Sr. Scientist and Head (SSM and ASD) for the Division

14. Progress of Hindi use in the Institute

During the year 1985, following important activities with regard to implementation of various Hindi programmes were held.

In a meeting of Joint Official Language Implementation Committee of DARE and ICAR held on 16th Jan. 1985 at Krishi Bhavan, Director of the Institute was authorised to grant permission for translation and original writing of statistical books by IASRI scientists on request of the Commission for Scientific and Technical Terminology.

Regular meetings of the Official Language Implementation Committee of the Institute were held on 27th Feb, 29th May, 3rd Sept, and 4th Dec. 1985 in which progress on several items of implementation such as organisation of Hindi workshops, deputatation of staff for Hindi shorthand and typing trainings under Hindi Teaching Scheme, organisation of Hindi Seminar, compliance of Instructions 3 (3), etc. on Hindi use, timely preparation of quarterly progress report, purchase of Hindi typewriters and Hindi books, inspection of various Sections, Divisions, etc., to assess implementation progress, Hindi Publications, etc., was reviewed and effective decisions were taken and implemented.

Dr. S.K. Raheja and Sh. C.S. Verma were deputed to actively participate in a special Hindi workshop meant for the officers which was organised by Rajbhasha Sansthan on 3rd and 4th June, 1985, at Hotel Samrat.

A Special Hindi Workshop was organised on 11th and 12th July, 1985 which was inaugurated by Dr. Chandrika Prasad, Deputy Director General, ICAR on 11th, and most of the senior scientists and Heads of Divisions of the Institute were trained in various types of uses of Hindi in their related fields of working.

Resultant to a decision on publication of Krishi Sankhyiki Samachar, its first and second issues for the quarters ending on 31st March and 30th June, 1984 were brought out and publication responsibility was shouldered by Hindi Section. Fifth issue of Hindi Prasarika was published and distributed amongst all the staff of the Institute to help them make proper and maximum use of Hindi. In response to a request from Chief Editor (Hindi), ICAR, HINDI, version of latest IASRI brochure was sent to ICAR in April, 1985 for publication in their quarterly magazine 'Krishi Chayanika' for wider circulation in the country and abroad and it was accepted for publication in one of the issue of the 'Krishi Chayanika'.

During the month of September, 1985, Hindi-Use Frotnight was celebrated when Hindi Inspection Sub-Committee

appointed by OLIC of the Institute also inspected various administrative sections/units/cells and divisions of the Institute to select one Administrative section and one scientific division for their maximum Hindi use and to award them one running shield each and also to judge first, second and third individuals of the Institute for suitable prizes. Following other competitions were held on the dates noted against each :

1. Hindi noting and drafting : 12.9.1985 (Afternoon)

2. Hindi article/Essay Competition : 12.9.1985 (Forenoon)

3. Hindi debating competition : 16.9. 85 (Forenoon)

4. Hindi quiz contest : 16.9.85 (Afternoon)

Hindi Diwas was celebrated on 16th Sept. 1985, also making it an annual function as well, and on this occassion, Dr. Ratnakar Pandey, a well-known Hindi writer and noted literary dignitary, was available to be our Chief Guest who witnessed the Hindi Quiz Contest and distributed the prizes to all the winners of the Hindi Competitions of the year. In his address, while commending the Hindi progress at such a research Institute and encouraging scientists and technical staff who had started writing articles of highly technical nature in Hindi, he stressed the need of even more popularising the all-round use of Hindi at the Institute distinguishing itself as a lessioning Institute of scientific and technical standing at the national level.

'Kendriya Sachivalaya Hindi Parishad' Shakha of the Institute arranged several activities for maximum popularisation and encouragement with regard to use of Hindi, held meetings of its Executive Committee and effective decisions were taken and implemented in order to maximise the use of Official Language at this Institute under the patronship of the Director of Institute. Various scientific, technical and administrative officers of the Institute were required to implement the provisions of annual programmes for the year 1985-86 for Hindi use in response to the messages of Prime—Minister, Home Minister and Director of the Institute as per the items concerned with their sections etc. One more Hindi publication, to incorporate the articles on latest research accomplishments of the Instt. was also decided to be compiled after inviting such articles from scientists of the Instt. for the purpose.

Director of the Institute inaugrated the 5th Hindi workshop on 18th Dec, 1985 when its 8 days' programme for 14 lectures started. Distinguished lecturers like Sh. Hari Babu Kansal, Sh. Jagan Nath, Sh. Raghu Nandan Prasad Sharma and others delivered the lectures on various aspects of the administrative jobs so that Hindi use could be increased. This Workshop ended on 30th Dec, 85 and 25 staff members were trained.

List of Scientists, Technical and Administrative Officers in Position as on 31.12.1985

Prof. Prem Narain, Director
Dr. S.S. Pillai, Jt. Director (CS)

(I) Division of Design of Experiments and Analysis of Experimental Data

Sh. P.N. Bhargava, Sr. Scientist and Head

1.	Sh. K.S. Krishnan	Sr. Scientist
2.	Dr. Aloke Dey	Sr. Scientist
3.	Km. C.R. Leelavathi	Scientist S-3
4.	Sh. P.N. Soni	Scientist S-3
5.	Sh. V.N. Iyer	Scientist S-2
6.	Sh. P.P. Rao	Scientist S-2
7.	Dr. V.K. Gupta	Scientist S-2
8.	Mrs. Asha Saksena	Scientist S-2
9.	Sh. R.K. Ghai	Scientist S-2
10.	Sh. J.K. Kapoor	Scientist S-2
11.	Sh. H.C. Jain	Scientist S-2
12.	Dr. B.L. Choudhary	Scientist S-2
13.	Dr. G.C. Chawla	Scientist S-2
14.	Sh. P.K. Batra	Scientist S-2
15.	Mr. Rajinder Kaur	Scientist S-1
16.	Mrs. Suman Gupta	Scientist S-1
17.	Sh. Onkar Sarup	Scientist S-1
18.	Sh. G.L. Khurana	Scientist S-1
19.	Sh. D K. Mehta	Scientist S-1
20.	Sh. M.R. Vats	Scientist S-1
21.	Sh. D.K. Sehgal	Scientist S-1
22.	Sh. S.C. Mehta	Scientist S-1
23.	Ravinder Srivastava	Scientist S-1
24.	Sh. K.C. Bhatnagar	Scientist S-1
25.	Sh. Madan Mohan	Scientist S-1
26.	Mrs. Ajit Kaur Bhatia	Scientist S-1

Division of Sample Survey Methodology and Analysis of Survey Data

Dr. O.P. Kathuria, Sr. Scientist and Head

1.	Dr. S.K. Raheja	Sr. Scientist
2.	Dr. K.C. Raut	Sr. Scientist
3.	Dr. J.P. Jain	Sr. Scientist
4.	Dr. A.K. Banerjee	Scientist S-3
5.	Dr. P.C. Mehrotra	Scientist S-3
6.	Dr. J.S. Maini	Scientist S-3
7.	Dr. A.K. Srivastava	Scientist S-3
8.	Sh. U.G. Nadkarni	Scientist S-3
9.	Sh. V.S. Rastogi	Scientist S-3
10.	Dr. Randhir Singh	Scientist S-3
11.	Dr. G. Sadasivan	Scientist S-3
12.	Dr. H.V.L. Bathla	Scientist S-2
13.	Dr. M.G. Mittal	Scientist S-2
14.	Dr. Shivtar Singh	Scientist S-2
15.	Sh. T.B. Jain	Scientist S-2
16.	Sh. R.L. Rastogi	Scientist S-2
17.	Dr. Pranesh Kumar	Scientist S-2
18.	Sh. S.S. Shastri	Scientist S-2
19.	Sh. K.B. Singh	Scientist S-2
20.	Sh. S.S. Gupta	Scientist S-2
21.	Dr. N.K. Ohri	Scientist S-2
22.	Sh. Anand Prakash	Scientist S-2
23.	Dr. K.K. Tyagi	Scientist S-2
24.	Sh. M.S. Batra	Scientist S-2
25.	Sh. G.S. Bassi	Scientist S-2
26.	Sh. Jagmohan Singh	Scientist S-2
27.	Dr. D.L. Ahuja	Scientist S-2
28.	Sh. B.C. Saxena	Scientist S-2
29.	Dr. L.B.S. Somayazulu	Scientist S-2
30.	Sh. K.P.S. Nirman	Scientist S-2
31.	Sh. S.N. Arya	Scientist S-2
32.	Sh. S.P. Verma	Scientist S-2
33.	Sh. K.R. Rajagopalchar	Scientist S-2
34.	Sh. Satya Pal	Scientist S-1
35.	Sh. R.S. Khatri	Scientist S-1
36.	Sh. D.C. Mathur	Scientist S-1
37.	Sh. R.C. Gola	Scientist S-1

38.	Sh. Jagbir Singh	Scientist S-1
39.	Sh. V.T. Prabhakaran	Scientist S-1
40.	Sh. Balbir Singh	Scientist S-1
41.	Sh. S.C. Aggrawal	Scientist S-1
42.	Sh. H.O. Aggarwal	Scientist S-1
43.	Sh. H.C. Gupta	Scientist S-1
44.	Sh. V.K. Mahajan	Scientist S-1
45.	Sh. Satyal Pal	Scientist S-1
46.	Sh. S.C. Sethi	Scientist S-1
47.	Sh. D.K. Bhatia	Scientist S-1
48.	Sh. Bhagwan Das	Scientist S-1
49.	Sh. M.S. Narang	Scientist S-1

3. Division of Statistical Economics

Dr. V.K. Sharma, Scientist S-3 and Head

1.	Dr. R.K. Pandey	Sr. Scientist
2.	Sh. Shanti Sarup	Scientist S-2
3.	Dr. U.N. Dixit	Scientist S-2
4.	Sh. H.B. Choudhary	Scientist S-2
5.	Dr. Bhagat Singh	Scientist S-2
6.	Sh. B.L. Kaul	Scientist S-1
7.	Sh. Ashok Kumar	Scientist S-1
8.	Sh. Ant Ram	Scientist S-1
9.	Sh. S.P. Bhardwaj	Scientist S-1

4. Forecasting Techniques for Crops Diseases and Pests

Sh. S.R. Bapat, Scientist S-3 and Head

1.	Dr. K.G. Aneja	Scientist S-3
2.	Dr. Ranjana Agrawal	Scientist S-3
3.	Dr. R.C. Jain	Scientist S-3
4.	Sh. G.N. Bahuguna	Scientist S-2
5.	Dr. Chandrahas	Scientist S-1
6.	Sh. B.H. Singh	Scientist S-1

5. Bio-Statistics and Statistical Genetics

Prof. Prem Narain, Director and Head

1.	Dr. Prajneshu	Scientist S-3
2.	Dr. J.C. Malhotra	Scientist S-3
3.	Dr. B.S. Sharma	Scientist S-3
4.	Dr. V.K. Bhatia	Scientist S-2
5.	Sh. Lal Chand	Scientist S-2
6.	Sh. L.K. Garg	Scientist S-2
7.	Dr. P.K. Malhotra	Scientist S-2
8.	Sh. S.D. Wahi	Scientist S-2
9.	Sh. J.N. Garg	Scientist S-1
10.	Sh. P.S. Rana	Scientist S-1
11.	Sh. R.K. Jain	Scientist S-1

6. Division of Computing Science

Sh. S.N. Mathur, Scientist S-3 and Head

1.	Dr. Karmeshu	Scientist S-3
2.	Sh. K.V. Sathe	Scientist S-3
3.	Sh. A.C. Kaistha	Scientist S-3
4.	Sh. R. Gopalan	Scientist S-3
5.	Sh. I.C. Sethi	Scientist S-2
6.	Sh. O.P. Dutta	Scientist S-2
7.	Sh. M.L. Sahni	Scientist S-2
8.	Sh. S.P. Doshi	Scientist S-2
9.	Sh. Mahesh Kumar	Scientist S-2
10.	Sh. Ram Kumar	Scientist S-2
11.	Sh. M.L. Choudhary	Scientist S-2
12.	Sh. K.C. Gupta	Scientist S-2
13.	Sh. S.L. Gupta	Scientist S-2
14.	Sh. K.L. Kaul	Scientist S-2
15.	Sh. R.C. Goyal	Scientist S-1

Director's Cell

Sh. R.K. Khosla, Scientist S-3 and Head

1.	Sh. D.S. Aneja	Scientist S-1
2.	Sh. A.S. Gupta	Scientist S-1

Monitoring Cell

Dr. H.P. Singh, Scientist S-3 and Head

U.N.D.P.Cell

Sh. S.C. Rai, Scientist S-3 and Head

Administration

Sh. Sat Prakash	Sr. Admn. Officer
Sh. B.L. Jangira	Accounts Officer

Techical Officers

Sh. Rajendra Singh	Field Officer
Sh. S.K. Suri	Field Officer
Sh. S.S. Srivastva	Librarian
Sh. S.K. Sablania	M.T.O.
Sh. S.D. Sharma	Field Officer
Sh. S.K. Mahajan	J.T.O.
Sh. D.C. Pant	J.T.O.
Sh. Amar Ranjan Pal	Sr. Artist

Training Administration Cell

Dr. A.K. Nigam	Sr. Scientist and Head

List of Sanctioned and Filled up Posts as on 31.12.1985

Designation of the post	Scale of Pay (Rs.)	No. of posts sanctioned	No. of post filled	No. of SC/ST employees	
				SC	ST
Director	2000-2500	1	1	—	—
Jt. Director	1800-2250	2	1	—	—
Scientist S-3	1500-2000	30	33	—	—
Scientist S-2	1100-1600	34	53	—	—
Scientist-S-1	700-1300	76	41	1	—
Scientist S-0	550-900	14	7	—	—
C.A.O.	1300-1700	1	—	—	—
Sr. A.O.	1100-1600	1	1	—	—
Accounts Officer	700-1300	1	—	—	—
Admn. Officer	700-1300	1	—	—	—
Asstt. Admn. Officer	650-1200	3	3	—	—
Hindi Officer	650-1200	1	1	—	—
Suptd.	550-900	7	5	2	—
Supdtt. (A&A)	550-900	1	1	—	—
Sr. P.A.	550-900	1	—	—	—
Assistant	425-700	25	22	5	1
Stenographer	425-700	11	9	—	—
Jr. Stenographer	330-560	18	15	1	—
Sr. Clerk	330-560	22	22	3	1
Jr. Clerk	260-400	43	35	4	—
Receptionist	260-430	1	—	—	—
S.S. Gr. IV	225-308	} 103	102	29	2
S.S.Gr. III	210-290				
S.S.Gr. II	200-250				
S.S. Gr. I	196-232				

List of dissertations (with abstracts) approved during the year, 1985 for Award of Ph.D. and M.Sc. degree in Agricultural Statistics and Agricultural Economics, and Diploma in Agricultural Statistics.

Ph.D. Degree :

(a) *Agricultural Statistics* :

(i) Dass, U.S.-Some investigations on the design and analysis of incomplete block designs with nested classification.

The thesis deals with some aspects of construction and analysis of Nested Incomplete Block (NIB) designs. Such designs have application in situations where it is possible to think of smaller subdivisions of experimental units within a division of these units. An attempt for the evolution of some systematic methods of construction so far not available in the literature for the NBIB designs resulted in development of some general methods of construction for such designs. In fact, two general methods based on known BIB designs and one such method based on the method of differences could be obtained. Further, by applying these general methods, of construction on some known series of BIB designs, it has been possible to obtain some series of NBIB designs. Many of the NBIB designs in the list of Preece (1967) who introduced the NBIB designs, found to belong to one or other

of these series, while several NBIB designs obtainable as particular cases of these series are found absent in the list of Preece (1967) and hence considered as new ones. Few new designs are also obtained as a result of direct application of one or other of these general methods. The analysis of the designs developed has also been included in the thesis.

(Guide : Dr. A.K. Banerjee)

(ii) Malik, Thakkan-Multidimensional designs for perennial Crops and Animals.

The types of statistical problems in perennial crops are different from that of the annual crops and, therfore, the methodology relating to design and analysis adopted for annual crops is generally not directly applicable to perennial crops. The life span of perennial crops is very much longer than annual crops. Fruiting also starts generally after several years of its planting. The treatments are required to be changed during the course of experiments which is generally spread over a period of years.

In many cases, we are concerned with the experimentation of the above type involving two non-inter-acting sets of treatments and the material requiring two way elimination of heterogeneity. Specifically, we consider a row-column setting where a sequence of treatments are applied first. The same material is then used in another experiment with a

second set of treatments without leaving a wash out period for the effects of the first set of treatments to die. A general layout has been assumed in which all the four classifications, viz. row, column, residual and direct treatments are (possibly) pairwise non-orthogonal. Designs for two and more than two non-interacting sets of treatments have been considered. Construction of design for different characterization have been suggested and simplified form of the information matrix has been deduced for every situation.

The analysis of designs in two non-interacting sets of treatments has been discussed when it is desired to eliminate heterogeneity present in experimental material in two directions. Characterizations of rowcolumn designs for two non-interacting sets of treatments have been studied in detail. The designs with V_1 and V_2 treatments in first and second sets respectively have been considered with the arrangement of the experimental material in p rows and q columns.

The methods of construction of balanced designs for two non-interacting sets of treatments when row versus column classification is orthogonal for the situation when the design permits orthogonality for the first set of treatments versus rows as well as columns and when designs allows orthogonality for the first set of treatments versus rows and second set of treatments verus rows. Complete Latin square has been considered with respect to the deisgn for first set of treatments for this situation.

Some methods of construction of balance design for two-interacting sets of treatments for different characterisations when row versus column classification is non-orthogonal have been suggested. In this case incomplete Latin squares has been considered for the design with respect to the first set of treatments.

Also some methods of construction of designs for three and more than three sets of treatments have been proposed and hyper-graeco-Latin square design has been considered for the design with respect to the residual sets of treatments for this situation.

(Guide : Dr. A.K. Nigam)

(b) *Agricultural Economics* :

Thakre, R.P.-Economic Analysis of Poultry Production in Maharashtra.

The present study was undertaken to examine the capital investment and to estimate the costs and returns in egg and broiler production. The estimation of production functions and productivity of resources have also been undertaken. The nature of short-term supply and optimum level of output on poultry farms have also been studied.

The study is based on primary data collected from the selected poultry farms of Bombay-Pune and Nasik region of Maharashtra state.

It was observed that on per-bird basis capital investment in broiler production is found to be significantly lower than capital investment in egg production. The feed cost is a major constituent of the total cost of maintaining layer and

broiler birds. The broiler production is more profitable as compared to egg production in the region. The study concludes that there is enough scope for re-allocation of resources on poultry farms.

(Guide : Dr. R.K. Pandey)

M.Sc. Degree

(i) Agrawal, Rakesh Chandra – An empirical study in evaluating sampling strategies for estimating the distribution of land holding sizes.

The commonly used sampling methods are generally oriented towards the estimation of point parameters like population total or population mean. In many practical situations the interest is more on estimating frequency distribution of a certain character rather than a point estimator. In order to see how conventional sampling methods can be used for estimating frequency distributions it is necessary to define certain error measures on the basis of which one can compare the different sampling strategies.

This study relates to the comparisons of certain sampling strategies empirically. For this purpose the data collected under the scheme 'Methodological investigations into high yielding varieties programme' have been taken. The two error measures namely $£_1$ and $£_2$ suggested by Murthy (1977) have been considered for the purpose of comparison.

On this basis of this study the following broad conclusions have been drawn:

1. The scheme 1.2 i. e. selecting ulti-mate units with simple random sampling without replacement is uniformaly better in respect of both $£_1$ and $£_2$ than the scheme 1.1 (simple ran- dom sampling with replacement) and scheme 2.2 (sampling with pps with replacement).

2. There does not appear to be any difference between stratified and unstratified sampling in terms of efficiency.

3. Among the schemes 2.1 and 2.2 the scheme 2.1 with arrangement (c) namely arranging the units in ascending order of p^2_{ij} is generally better than other arrangements.

(Guide- Dr. A. K. Banerjee)

2. Arya, Indulika-Some production traits of crossbred cows and their yield potential under rural management conditions.

In order to study the production traits of crossbred cows and their yield potential under rural management conditions, the data utilised in the present survey have been taken from the pilot survey conducted by Indian Agricultural Statistics Research Institute to study the performance of crossbred cattle under village conditions in Palampur area of Himachal Pradesh. Data for 109 crossbred cows have been utilized for the study.

It was observed that variations in lactation yield and also in lactation length in different orders of lactation were not significant. The average lactation yield of a cow was estimated to be 1442 kg and lactation length 536 days irrespective of their order of lactation. The milk yield per day of lactation was worked out to 2.7 kg.

Production functions have been fitted to find out the relation-ship between lactation length and lactation yield as well as between feed costs and lactation yield. Linear and Cobb-Douglas functions were considered to be appropriate functions. It was seen that if feed cost would be increased by one rupee, the net return is 35 paisa. While finding out the relationship between lactation length and lactation yield it was observed that one day increase in lactation length would increase lactation yield by 2.8 kg.

(Guide : Dr. K. C. Raut)

(iii) Atul Kumar-Pre-havest fore-casting of tobacco yield using principal components of plant-biometrical characters.

Different biometrical characters and input variables having high correlation with tobacco yield were selected for use as explanatory variables for forecasting tobacco yield. The inclusion of input variables in addition to biometric characters as explanatory variables improved the forecast model. Also, using data on biometrical characters for more than one stage simultaneously through their principal components as regressors improved the forecast model still further and with the multi-collinearity was also avoided. Of the different combinations of principal components tried in the forecast model, the ones for earlier stage biometric characters explained a lower proportion of variation in crop yield and the later stage combinations explained a larger variation of over 80 percent for 10 to 11 week old crop. This is an improvement

over earlier models which explained about 40 to 50 percent variation only.

(Guide : Dr. K. G. Aneja)

iv) Kannappan, K.T. : Use of multi-auxiliary variables in estimating parameters from sample survey data.

Multi-variate ratio estimators have been proposed by Olkin and Srivastava for estimating average of total of any character from a sample survey data when information on more than one auxiliary variable is available and they are shown to be more efficient.

In a survey conducted for 'Pilot studies for estimation of birth and death rates in ovines' data on sheep and goats and number of households having sheep and goats from 105 randomly selected villages of Tiruchirapalli district of Tamil Nadu were available. But population values of auxiliary variables i.e. total number of ovines and total number of households having ovines were not available. As such double sampling technique were required to be adopted and expressions for bias and variances were to be obtained where-ever it is not avilable. Using the data estimates for single variate ratio estimates and two multivariate ratio estimates were obtained for average number of goats per village with the above two auxiliary variables. It is found that multi-variate ratio estimators are more efficient than single variate ratio estimators. Bias in the estimates due to different procedures and percentage efficiency w.r. to simple mean based on simple random sampling are discussed.

(Guide : Sh. U.G. Nadkarni)

(v) Malhotra, Ravinder-Statistical analysis of data on growth of animals in groups of experiments.

To draw common inference about the growth performance of 124 Friesion X Sahiwal cross-bred females viz. 3/8th, half-breeds, 5/8th and 3/4th maintained on uniform feeding regime at four military farms, viz. Ambala, Jullunder, Meerut and Pimpri, a suitable statistical analysis was carried out taking into account the complexities out of the non-orthogonal nature of the data.

Nine growth functions viz. linear, linear cum-log, quadratic, quadratic-cum-log, exponential logistic, asymptotic, orthogonal polynomial of first and second degree were first fitted to the weekly growth records of each cow upto 52 weeks. Analysis of variance of the constant of the best growth curve viz. orthogonal polynomial of second degree using technique for non-orthogonal data showed that average growth rate and rate of change of growth were both influenced by environmental effects and not by levels of exotic blood in in cross-breds. Interaction between grades and farms was absent for growth rate and present for rate of change of growth. Growth functions were then fitted for data pooled over four grades for each farm separatly.

(Guide: Sh. U.G. Nadkarni)

(vi) Ravi Shankar, K. – Genetic structure of population under mixture of self and cross fertilization :

In plant populations complete cross-fertilization of complete self-fertilization may not always be found. In this context mixture of breeding systems are of interest for statistical study. The proportion of selfing x (n) and proportion. of cross-fertilization y (n) are considered as function of order of generation. The genotypic composition and variability in population are studied under changed conditions. The expressions for genotypic frequencies, mean values and variance in case of single and two factors are obtained. Particular expressions in the case of no dominance and complete dominance are deduced in cases of both single and two factors. For different functional forms of proportions of selfing, the genotypic frequencies, mean values, variance, relative change in variance are tabulated and discussed in the case of single-factor.

(Guide: Sh. U.G. Nadkarni)

(vii) Sharma, Rajiv Kumar – Role of Ancillary variables in Estimation.

The use of ancillary variable in probability sampling either for stratification of the population or for selection of units or for estimation, is a commonly used device for improving the percision of the estimate of population mean of total obtained from a probability sample. Much of the work done so far relates to the availability of an ancillary variable for a particular use. More complext problems which arise with the use of more than one variable have been attempted in this dissertation by studying empirically on one set of data. The empirical studies have been carried out by using three ancillary variables in all combinations of their roles.

The role of ancillary variables has been studied under four categories. One,

in which no ancillary variable has been used to construct the estimator of population mean, [the] estimator being the one based on simple random sampling without replacement. In the second category one ancillary variable has been used either for stratification or for selection or estimation. The third category involves the use of two ancillary variables in their different roles. In the last and fourth category all the three variables have been used in their different roles. For selection the Rao, Hartely and Cochran procedure and for estimation the regression estimator have been considered for empirical study. For allocation of the sample to the different strata made in accordance, the principal of Nayam allocation has been used.

(Guide: Sh. K.V. Sathe)

Diploma in Agricultural Statistics

R.C. Gola-on two-state successive sampling with partial replacement of units.

The dissertation deals with sampling unit on successive occasions under a two stage random sampling design with partial replacement of units. Five different schemes of replacement of sampling units involving replacement of first stage units alone second stage units alone and replacement of units at both the stage have been suggested. Of these five schemes, the matching scheme of partial replacement among first stage units as well as second-stage units has been investigated in details. Three types of estimators of the population parameters under study viz., General Linear Estimator, Ratio-type Composite Estimator and Linear Composite Estimator have been examined. An empirical comparison of the different estimators has also been attempted with the help of secondary data. It has been observed that substantial gains in the efficiency of the estimator of population parameter could be achieved using the suggested scheme of replacement of sampling units at both the stages and adopting the general linear estimator, as against the usual procedure of bio-stage sampling without replacement of units.

(Guide: Dr. P.C. Mehrotra)

List of Papers (with Abstracts) Published During the Year 1985

1. Agarwal, S.K. and Kumar, Pranesh-On two auxiliary variates in ratio method of estimation. Bio-metrical Journal, No. 2,85.

A ratio type estimator using two auxiliary variates is suggested which is found to be more practicable then that of Agarwal (1980).

2. Chawla, G. C. and Shukla P.C.—Use of algebraic equations for preparing feeds to obtain maximum milk production. Indian Journal of Animal Sciences, Vol. 55 (2), pp. 128-130.

Nutritional data on complete lactation length of Surti Buffaloes collected under the project 'National Index of Animal Expts', were utilised. Three algebraic forms of equations with output milk yield(y) and its auxiliary variates of concentrate (x_1), green fodder (x_2) and dry fodder (x_3) were derived at. Quadratic was the best fit explaining maximum variation. A maximum milk yield was worked out after substituting a combination of feeds found out by the method of maxima and minima of calculas.

3. Doshi, S. P., Gupta, K. C. and Mishra, J. P.-Diallel cross Technique in rual development. Journal of computer society of India, Annual convention. Volume III, 1985.

India is traditionally an agricultural country. Its uplift lies in its rural development for which the main responsible factors are the improved genotypes/varieties of crops on one hand and improved production techniques on the other. Horizontal growth probably has, by now lesser scope. Hence, for vertical growth, high yielding crop varieties suitable for different agro-climatic regions of the country need to be developed. Testing of such crop varieties for direct crop production or for utilization in hybrid programmes is done through various crossing, design and perhaps, the diallel-cross techniques are the most widely used techniques all around the world. As a matter of fact, these techniques have helped in the development of most of the present day varieties. Different synthetics, diara composites, double cross and double top cross hybrid including 'Histrach' in maize and many more examples can be quoted where their development is based on information available from diallel crossing and by way of which the crop production in the country has got re-

volutionaised Jowar hybrids have shown tremendous success even under rainfed conditions, where other crops have failed to create any impact. The diallel cross analysis provides information on the nature and amount of various genetic parameters for different characters and also on the combining ability of the parental varieties and their crosses. This technique helps on recording enormous informations which can be analysed in different ways to arrive at valuable inferences. Definite and timely conclusions from such huge data can be drawn only if these are analysed accurately and quickly and here the use of modern computers becomes absolutely essential. This paper has been prepared to deal with the use of diallel cross techniques and to elaborate the role of computers in rural development through crop improvements.

4. Goel, B. B. P. S. and Singh, K.B.— Increase in Livestock Productivity from Non-Monetary Inputs. *Proceedings of Symposium-Jr. of Indian Society of Agricultural Statistics, April, 1985.*

Every input has a money value. However, since no immediate payment is involved in two inputs viz. family labour and management, these can be assumed to be non-monetary and also their availability for Production somewhat flexible so that there is a scope for manipulation with them. In India, there is a complementary relationship in agricultural and livestock production and the farmers are often faced with the problem of allocation of their resources including cash, between them. The problem of exploiting the family labour and available managerial skill in increasing livestock productivity is similar to that an agricultural production. As a part of the managerial input decisions, such as how much of the produce to sell and when and where so that the return per unit of investment in monetary terms is maximum, are more important in the case of livestock production than in agricultural production, for the simple reason that most of the livestock products are easily perishable under normal conditions.

Though no statistical studies seem to have been undertaken in India to directly quantify and estimate the increase in livestock productivity from non-monetary inputs in physical or value terms yet there is ample evidence available in literature to show that non-monetary inputs such as full exploitation of family labour and managerial skill can sizeably contribute to increasing livestock productivity. The present paper surveys some of the available literature on the relevant studies carried out with regard to bovines, ovines, swines, poultry and their products under farmers condition carried out at IASRI and else where. Use of optimal feedmix for feeding the livestock considerably increasing milk, meat, and work output of animals. Grazing of animal involves a little extra labour and cows and buffaloes, which are grazed in addition to being stallfed yield significantly more milk than their stallfed counterparts. Improved breeding, with lot of emphasis and faci-

lities being provided by government free of cost, is more or less a non-monetary input and contributes substantially to increase productivity of various species of livestock and poultry. Prevention against diseases and timely treatment of sick animals with free government veterinary facilities available, also constitute non-monetary inputs in so far as India is concerned and influence the productivity of livestock. Management practices such as how the animals are housed, clealiness of the stalls, providing clean drinking water, timely feeding and milking and washing of the animals are also known to have significant effect on the productivity of cows and buffaloes and other livestock. Providing timely service to the dry animals reduces the dry period of cows and buffaloes and increases their productivity. Slaughtering of the animals at their optimum age yields higher return per rupee of investment.

Proper utilisation of by products of livestock such as dung, droppings, slaughter house by products, hair, bristles and carcasses also contributes to higher economic return on livestock without any additional monetary requirements.

5. Gupta, V.K. and Nigam, A.K.—A class of asymmetrical orthogonal resolution-IV designs. JSPI, No. 11, pp. 38 -383, 1985.

This article introduces the concept of d-resolvability of orthogonal arrays of strength $(d+1)$. This concept is exploited in constructing orthogonal resolution-IV plans of the type nt.n. $2^{n(M-1)}/mn^2t$. These plans are minimal and many of these plans are new.

6. Iyer, V.N. and Sehgal, D.K.—A study on the production potential of crops under resource constraints. Seed and Farms, Vol. IX, No. 9-10, Sept.-Oct.-1984.

To study the production potential of intensive crop rotations under resource constraints an experiment was conducted at the cropping systems research centre, Rudrur, Andhra Pradesh during the period 1979-80 to 1981-82. These crops sequences viz cereal-cereal, cereal-pulse and cereal-oilseed were considered for the study. Fertilizer and irrigation were the resources under constraint-for the rabi crop. The kharif crop which was the same in all the three viz rice was grown under optimum conditions .The study revealed that in case of wheat crop and black gram there was no scope for reduction in either of the resources from their optimum levels. However, for redgram irrigation could be applied at the reduced level and fertilizer at two third of the optimum rate. On the other hand for groundnut there was absolutely no scope for reduction of irrigation from the optimum level through fertilizer even if it was reduced by one third. There was no appreciable fall in production.

7. Iyer, V.N., Onkar Swarup and Mehta, D.K.—Profitability of potassium in balanced fertilization of rice and wheat. *Seed and Farms, Vol. XI, No. 10, Oct., 1985.*

A study on the contribution of potassium in the profit due to balanced fertilization of rice and wheat was made on the data of experiments on cultivators'

fields conducted during the period 1977-78 to 1981-82 in different states of the country. In the case of rice the states of Himachal Pradesh, Karnataka, Tamilnadu, Manipur, Kerala, Madhya Pradesh, Andhra Pradesh and Gujarat gave profits to potassium application at 60 kg. K_2O/ha which ranged from 25 to 38 paise for every rupee invested in fertilization. At the lower level of potassium application viz. 30 kg. K_2O/ha the profit was higher and ranged from 28 paise to one rupee. For wheat the profit due to potassium varied from 26 to 50 paise at the higher level. At the lower level it ranged from 28 to 63 paise in the States of Himachal Pradesh, Karnataka, M.P., Orissa, A.P., Maharashtra and Rajasthan. Thus it was observed that in above half the number of states where the experiments were conducted. potassium application gave a profit of 25 paise or more on every rupee invested in balanced fertilization of rice and wheat.

8. Iyer, V. N. and Vats, M. R.-A study On the Efficiency of Rhizobium Culture in nitrogen management of legume-cereal rotation. *Seeds and Farms, Vol. XI, No. 6, June, 1985.*

Studies under the All India Coordinated Agronomic Research Project of ICAR has shown that rhizobium treatment of legumes was beneficial at Bichpuri (Agra) for green gram (response 130 kg./ha) and cowpea (149 kg/ha) at Hissar for green gram (209 kg/ha) and blackgram (185 kg/ha) and at Akola for blackgram (170 kg/ha). The gross return from the rotations varied from Rs.11,602/ha in Hissar for blackgram wheat rotation to Rs. 6, 406/ha in Parbhani for blackgram-Jowar rotation. The economics of rhizobium treatment of legumes and its residual effect on the following cereal crop showed that the additional return from the total effect of rhizobium treatment of kharif legume and its residual effect on the succeeding cereal crop varied from Rs. 381 to Rs. 223 at different locations.

9. Jain, R.C., Agrawal, R. and Jha, M.P. -Use of growth indices in yield forecast. *Biom, J., 27 (1985) 4, p.p. 435-439.*

A model has been developed for forecasting of crop yields in which growth indices of biometrical characters based on two or more periods simultaneously have been utilised. The growth indices are obtained as weighted accumulations of observations on biometrical characters in different periods, weights being respective correlation coefficient between yield and biometrical characters. This model has been found better than the models in use.

Key word : Growth index

10. Jain, R.C. and Das, M.N.-Incomplete block designs through symmetrical factorials. *Jour. Indian Society of Agricultural Statistics, Vol. XXXVII, No. 3 (1985). p. p. 252-260.*

The object of the present paper is to exhibit a very close link between factorials, both complete and fractional, and incomplete block designs. Several series of incomplete block designs can be obtained almost trivially by utilising the properties of such links. The method

essentially consists of using different sets of numbers as the level codes for different factors instead of some set of numbers as levels for all factors and then use all these levels codes as the different varieties.

Keywords : Fractional Factorial, Confounding, adjusted treatments, contrasts.

11. Mehrotra, P.C., Srivastava, A.K. and Tyagi, K. K-On post stratification for cluster sampling. Journal of the Indian Society of Agricultural Statistics, Vol. XXXVI, No. 3, Dec., 1984, pp 91-104.

Post stratification in uni-stage unequal cluster sampling on the basis of elements of the selected clusters has been discussed. It has been empirically demonstrated that the suggested procedure not only provides estimates of the character under study according to the strata variable, but also improves the precision of the overall estimates compared to the usual cluster sampling procedure.

12. Mishra, S. P., Shukla, P. and Doshi, S. P.-Heterosis and combining ability in Pea-Agric, Sci. Digest, 4 (2) : 1984. pp-95-98.

Studies on heterosis and combining ability were carried out in diallel crosses involving 9 parents. Both additive and non-additive gene action were important as revealed by analysis of variance for combining ability. $KPMR_{10}$ and 6583 were desirable parents and $6587xP_{38.8}$ cross combination for grain yield. Differences among the crosses were significant for all the characters except pod length. Positive and significant heterosis over superior parent for grain yield was observed in the crosses $P_{185} \times KPMB_{10}$ $L_{116} \times KPMR_{10}$ and $6587 \times P_{388}$.

13. Nadkarni, U.G. Arya, S.N. And Ram Gopal-Mortality rates for milch bovines in Punjab and Gujarat. *Indian Journal of Dairy Sciences, 38(3), 1985.*

The age-specific mortality rate for broad age groups 3-6 years, 6-9 years, 9-12 years and 12 years and above for cattle and buffaloes in Punjab and Gujarat are presented in the paper. It shows that rates of mortality in bovines in I. C. D. area were less than those in non-I. C. D. area. This indicates that cattle development programmes have been effective in reducing mortality rates and there is ample scope for improvement in the area not covered under such programme.

14. Narain, P.– Computers and the Agrarian society. Computers, March-1985, pp 43-45.

The advent of computers in our country has made revolution. Whether it is research, education, business or public services, the use of computer for introducing speed is being talked about almost everywhere. The shape of things to come in future will probably see computer as much a part of our daily life as buying groceries at a departmental store. All this may sound inevitable in so far as urban stratum of our society is concerned but it will startle everybody if someone comes up to prophesy that the time is not very far when the computer revolution would have made in roads in the agrarian

society. Agriculture plays a predominant role in our society, contributing nearly 40 per cent to the national income and providing employment to about 70 per cent of the working population. As such, if the modern computer technology is to make substantial impact on the economy, sooner or later it has to go to interior in the villages. It has to make an impact on the thinking and working of our rural breathern who usually get cut off from any development involving modern technology unless it is taken to their doorsteps. It is, therefore, high time to look into the prospects of computer use in the rural areas both by those who are engaged in their uplift as well as by those who live therefore their livelihood. In this article, an attempt is made to highlight some of these prospects of computer use in relation to Indian Agrarian Society.

15. Narain, P., Kathuria, O. P. and Srivastava, A. K. Estimation of extent of cultivation and production of fruits and vegetables in India. *Book 2 of the Volume on Contributed papers of the 45th Session cf International Statistical Institute, 12-22 Aug., Amsterdam (1985), p.p. 477-78.*

The problems of estimating the extent of cultivation and production of fruits and vegetables in the Indian context are discussed. Sampling techniques have been evolved taking into account the special features of these various crops.

16. Narain, P., Kathuria, O. P. and Singh, K. B.-A study on availability and consumption of Bio-energy. Proceedings of *Bio-energy society first convention and Symposium 1985.*

The sixth five year plan has outlined a detailed strategy for self reliance in the energy sector in India. Emphasis has been given to harnessing renewable sources of energy like forestry, biomass and bio-gas from agricultural wastes and dometic wastes specially to meet the energy requirement of rural communities. Fuel wood occupies a predominant place as an energy source in rural India. As against the estimated requirements of about 133 million tonnes of fuel wood per annum, all the present sources taken together can meet only about 30% of the actual requirement. Because of such wide gap between the need and supply of fuel wood, considerable quantities of animal dung and agricultural residues are also burnt as fuel which otherwise would have been meaningfully used in restoring soil fertility and increasing food production. If the present trend continues the fuel requirement to cook the food rather than food to cook may pose the greater challenge. In this paper an attempt has been made to study the gap between the need and availability of energy from forestry biomass, agricultural, domestic and human wastes, etc. Suggestions have also been made for further research work for getting the estimates of different parameters involved in the production of bioenergy.

17. Narain, P., Kathuria, O. P., Srivastava, A. K. and Singh, K.B.— Some observations on methods of data collection in agricultural surveys *Proceedings of seminars on 'Control of non-sampling errors in relation to methods of data collection' organised by national Sample Survey Organisation.*

In any sampling investigation 2 types of errors viz., sampling and non-sampling are likely to occur. Sampling errors can be controlled by adopting a suitable sampling design or by increasing the sample size. However, non-sampling errors can be reduced by controlling the factors contributing to it. These are improper training of field staff, personal bias of the interviewer use of faulty equipment, unspecified reference period, lack of knowledge of local language and the inappropriate methods of data collection. A proper case taken at the initial stage in selecting enumerators, imparting training, allocating the field work to the enumerator will reduce the non-sampling errors to a great extent and improve the quality of data.

Among different methods of data collection the observation method is known to provide better quality of data than the interview method and the record based enquiries. Quite often situations are distinctly identified for a particular method to be adopted. However, in some cases one may have to choose among different methods of data collection in view of quality, time constraints as well as practical feasibility. Studies regarding comparison of different methods gain importance in this context. The choice of the method of collection of data which can reduce the non-sampling errors depends on the character under study, the required reliability of the estimate, the period of reference, the field agency to be used etc.

18. Narain, P., Pandey, R. K. and Sarup, Shanti - On food grains Production Projections' *Agricultural Situations in India August, 1985: pp. 353-358*

The main aim of this study is to examine future production and productivity levels of foodgrains in the country. The grains selected for this purpose are rice, wheat, jowar, maize, bajra and pulses. The estimated regression equations for examining the productivity of different crops indicate that the contribution of fertilisers, proportion of high yielding varieties to the total cropped area and proportion of irrigated area devoted to the crop are main variables affecting crop productivity in case of rice and wheat. Weather seems to be an important factor affecting pulses production. The projections of foodgrains output for 1984-85 and 1983-84 based on this approach confirms well with the realised output for these years.

The study showed that foodgrains production would reach a level of 179 million tonnes in 1990 if the selected inputs would grow at their current level of growth (alternative I). This will be adequate to meet the demand for foodgrains as predicted by Sanderson Roy. The higher output level of 189 million tonnes could be produced by raising the

use of selected inputs by 10 percent above their predicted use level in 1990. The input needed for achieving 189 million tonnes of food- grains production would be 134.5 million hectares of gross cropped area, 6.5 million tonnes of nutrients, 85 million hectares of area under high yielding varieties and 48.3 million hectares of irrigated land.

19. Nigam, A.K., and Boopathy, G.M - "Incomplete block design for symetrical parallel line assays", JSPI, 11 (1985).

New series of incomplete block designs for symetrical parallel line are proposed. From the designs important contrasts are estimated free from block effects. The designs have simple analysis.

20. Nigam. A.K. and Gupta, V.K.-A method of sampling with equal or un-equal probabilities without replacement. Applied Statistics, Vol. 33, No. 2, (1984).

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

21. Pandey, R.K. and Ashok Kumar-Role of commerical bank in financing agriculture-A study of tertiary Sector. Conference volume of Indian Economic Association, 1984.

The paper aims at examining the growth of commercial banks, its deposits and advances to agriculture. The relationship between the agricultural production and the advances made by commercial banks to agriculture have also been studied. The study is based on secondary data for the years 1961-69 to 1970-79.

The study indicated that during the year 1979, State Bank group consisting of 8 banks accounted for 45 percent of the total advances to agriculture by the commercial banks. The remaining finance was provided by other nationalised commercial banks. The growth rates of advances of public sector banks to agriculture was quite impressive. The maximum growth rate was financed for the United Bank of India while the lowest growth was observed in the State Bank of Mysore. The study also indicated that the direct finance to farmers is relatively more important for increasing food production. Therefore, its extent should be increased for achieving higher productivity and production of farms.

22. Pandey, R.K. and Sarin, B.S. - Economic study of acreage response of rice in Uttar Pradesh, Margin, Journal of National Council of Applied Economic Research, Oct., 1984.

The paper aims at examining the acreage response of farmers for rice crop in different regions of Uttar Pradesh. The study is based on the adjustment lag model proposed by Nerlove. Using

secondary data. it was observed that the farms harvest price has no perceptable impact of acreage allocation of rice in the state. Other variables do have significant influence on supply of the crop. Acreage under rice can be increased in the Eastern and Bundelkhand region by bringing more area under irrigation, particularly in the case of the farmer region where the impact is more. The impact of technological changes reflected through increase in the yield of the crop is more on this crop.

23. Pandey, R.K., Sarup, Shanti and Ved Prakash-Potential of Brick Kiln-A case Study — *Yojna, Vol. 29, No. 11, 1985.*

This paper aims to examine the pattern of employment and capital structure of brick kilns located in the areas around Karnal City Haryana and Delhi. The study reveals that about 90 persons are employed for a period of 120 to 150 days during a year on a brick kiln provinding 25 to 30 lakhs of bricks annually. The current employment level is about 2.7 million persons. This is expected to rise in the future. Total capital outlay per kiln was estimated to be Rs. 6.74 lakhs. The expenditure on fuel was maximum accounting for over 46 percent.

24. Rai, S.C.-Khadya Vigyan Men Samwedi Mulyankan. *Hindi Prasarika, Vol.5, pp 14-17 and 27.*

The experimental requirements of taste-testing experiments have been investigated in this paper through paired comparision model. The selection of judges for the experiment has been made on the basis of duo-trio taste. The data have been analysed using Bradely-Terry model and the results have been presented in the paper.

25. Rai, S.C. — Paired and Triad Comparisons in Sensory Evaluation *Jr. Ind. Soc. Agril. Stat., 371 : 244-251.*

Methods of analysis of sensory evaluation experiments in paired and triad comparisons have been discussed. Two models, one of paired comparisons and the other for triad comparisons have been formulated and their properties have been studied. The models permit test of hypothesis of equality of treatment ratings. The procedure developed is quite general and it can be used with simple calculations. It cover wide range of obesrvatiɔns without making any normality assumption. The procedure is explained through illustrative numerical examples.

26. Sadasivan, G. and Scariah, K.S. Some contributions to statistical methods in food and allied sciences. Bulletin of the centenary Volume of the International Statistical Institute, Netherlands. 1985.

The method of paired comparisons plays a key role in the sensory evaluation of food and agricultural products. Selection procedures using paired comparison design are suitable for identifying the best of groups of best products. In this paper we give a brief overview of the recent development made by the authors in this area. First we discusss a Bradely-Terry type model for measurement of order effects in experiments using paired com-

parison design. The model is a generalisation of Davidson and Beaver (1977). The parameters in the model are estimated by the method of maximum likelihood using iterative procedures. Three tests have been developed viz. (i) a test for presence of order effect, (ii) a test for equality of order effects and (iii) a test for appropriateness of the model.

Next we develop a Thurstone Mosteller type model for order effects. This is quite different from the model developed in Sadasivan (1983) although the techniques used are similar. Least square estimation procedures of the parameters are developed with a test of goodness of fit of the model. A numerical illustration is also given.

Next selection procedures under the generalised Thurstone Mosteller model of Sadasivan (1982) are developed. We have given rules for selection of the best treatment under (a) indifference Zone approach (b) Sub-set selection approach. All the results have been developed on an exact as well as asymptotic approach and the problem is seen to be similar to ranking means in multivariate normal populations.

In the next section of 'k' best treatments out of 't' using full pair design is discussed under indifferent zone formulation. The procedure is an extension of Trawinski and David (1963). The selection rule under the model is set out as follows;

Obtain the score vector $(a_1, a_2, \ldots a_k)$ using full pair design with n repetitions per pair and declare k treatments with

the highest scores as the best. If m t-p of them tie for the best k-p places k-p of them are declared as the best at random where $p = 0, 1, 2, \ldots k-1$ are the number of best scores out of k. Then the slippage configuration under the model is defined and the corresponding probability of correct selection is worked out. An asymptotic minimum is also obtained for this probability. For an experiment involving 't' treatments this lower bound is set up at p^* and the resulting equations is solved for n, the smallest number of repetitions which ensures that the highest k scores in an experiment of t treatments with n replications will correspond to the best k treatments with at least a preassigned probability p^*.

We also develop similar selection procedures with a standard treatment. Possible applications in food, nutrition and agricultural sciences are also discussed.

27. Sarup, Shanti and Pandey, R.K. - Socio-Economic Characteristics Effecting Fertilizer Use in Orissa. Artha-vikas, Vol. 18, No. 1-2, Jan.-Dec., 1982.

The study was conducted in 10 villages adopted under the Operational Research Project on integrated pest control programme in Cuttack district. The discriminant function technique was used. The farmers were classified into two groups on the basis of fertilizer Use. From the analysis it was evident that innovative attitude of the farmers in terms of adoption of high yielding varieties seeds and plant protection measures and

availability of short term credit during the crop season were the important socio-economic characteristics which was useful in classifying the farmers into two groups namely the fertilizer users and non-users.

28. Sarup, Shanti and Pandey, R.K. - Assessment of Improved Groundnut Production Techniques on Acidic Soils, Seeds and Farms, Vol. X, No. 1, 1985.

This paper examine the yieid potential as well as the economic viability of the recommended groundnut production technology on acidic soils in the operational research project area in Puri district For this purpose, yield data obtained through conduct of field trials on groundnut under farmers' environment in the study area are utilized. The analysis reveals that the yield rate of groundnut crop can be increased by 80 percent through adoption of the recommended level of improved practices. The economic analysis of recommended practices suggests that the identified technology is economically viable and can yield an extra profit of Rs. 1400/-per hectare. Marginal and small farmers having limited resources and financial constraints should be advised to use the recommended level of fertilizers as it will fetch them a net earning of 526 percent of the additional cost of about Rs. 150/- per hectare.

29. Sharda and Rana, P.S. –A discrete time queueing problem with S-heterogeneous groups of channels, *Microelectronics and Reliability. Vol. 25, No. 3, pp. 455-459, 1985*

Steady state behaviour of a discrete time first come first in. limited space, queueing problem with S-heterogenious groups each having a parallel channels is considered. Probabilities of departure between the groups of channels are different but within the groups all the channels have equal probability if departure mean number of units in the system and explicit steady state probability for the number of units in the system are obtained. Some particular cases of interest are also derived at the end.

30. Singh, Randhir-Estimation from incomplete data in longitudinal surveys-Jour. of Statistical Planning and Inference, 11, 1985 pp 163-170.

In many situations a number of observations have been made on the same sampling unit at some specified time stages for obtaining an estimate of population mean or total e.g. lactation yield of cattle, vegetable yield etc. Out in such situations it is not uncommon that some of the observations are not recorded due to one reason or the other. In this case if all those units are to be discarded for which even one observation is missing then the data mortality may be quite high.

In the present investigation an estimation procedure has been suggested which makes use of all the available information and is seen to be more efficient than the one based on only completly observed units.

31. Singh, Randir-Double sampling for two auxiliary characters. Bulletin, Calcutta Stat. Association, Vol. 33, No. (131-132) Sept., 1984, pp. 193-197.

It is well known that in sampling theory the precision of the estimates may be improved substantially by the use of auxiliary information. When ready information on the auxiliary character is lacking, we resort to the usual technique of double sampling where first a large preliminary sample is selected for observing the auxiliary characther alone and a second small sample is selected for observing the character under study. Second phase sample may either a sub-sample of the large first-phase sample or it may be selected independently as as Cochran (1977), Rao (1972), discuss regression estimator for two phase sampling. In case of one auxiliary character, it is well known that generally the efficiency increases if the smaller sample on which 'y' is observed is taken independently of the large sample on which 'x' is observed rather than taking the former as sub-sample of the later. In the present investigation efficiency of these selection procedures has been examined when two auxiliary variables are used.

32. Singh, Randhir-Estimation from incomplete data in longitudinal surveys Jour. of Stat. Planning and Inference, II, 1985 pp. 163-170.

In longitudinal surveys where a number of observations have to made on the same sampling unit at specified time intervals, it is not uncommon that observations for some of the time stages for some of the sampled units are found missing. In the present investigation an estimation procedure for estimating the population total based on such incomplete data from multiple observations is suggested which makes use of all the available information and is seen to be more efficient than the one based on only completely observed units. Estimotors are also proposed for two other situations: firstly when data is collected only for sample of time stages and secondly when data is observed for only one time stage per sampled unit.

33. Subba Rao, C. And Narain, P.— 'Multi-Triangular Sampling Plans for Partial Diallel Crosses' *Jour. Ind. Soc. Ag. statistics, Vol. XXXVII, No.2 (1985), pp. 205-211.*

Partial diallel crosses based on multi-triangular design (MTD) have been constructed and analysed when the number of parental lines is of the from p (p-1) (p-2) (p-3)/24 with 'p' as an integer greater than 4. Designs based on multi-triangular association plans are more efficient than circulent designs of Kempthorne and Curnow.

34. Sukhatme, P.V. And Narain, P.—The Genetic Significance of Intra-individual variation in energy requirement in W.G. Cochran's Impact on statistics Ed. by P.S. R.S. Rao and J. Sedransk, 1984 pp. 275-284. John Wiley & Sons, New York.

Based on current nutrition theory, variation in daily energy balance over time in men maintaining body weight and engaged in a fixed level of physical activity should be near zero or negligible relative to variation between men of the same age, sex, and engaged in similar activities. However available data do not support this assumption (Sukhatme, 1977a, 1977b, 1978). The variation observed is much

larger than can be explained by chance causes and is found to persist even when data are averaged over several days. The current notion that the energy requirement of a healthy man engaged in fixed taks from day to day and maintaining body weight man is equal to his habitual intake cannot therefore be valid. To hold to this notion is to ignore a coefficient of variation of the order of 12-15% in mean weekly balance. Evidently man consciously regulates his energy balance by adjusting either intake or expenditure or both to keep the variance constant. In a sense these conclusion were to be expected because they accord with the known facts, namely that humans posses a physiological mechanism for controlling appetite and energy expenditure. Analysis of available data canfirm that the daily variation in energy balance is stochastically stationary in nature (Sukhatme 1977, 1978). The obvious explanation of this stationarity in variance is that man is able to bring for himself a change in the rate of energy flow, speeding it sometimes and slowing it down on other occasions to mantain health. In other words nutrition state is a process in which genetic entities in man interact with the environment. This is equivalent to saying that man cases to be the same man as he advances in time from day to day, Is it then not possible to extend the concept of heritable variance to apply to the observation on the same man in order to isolate and evaluate the interaction between genetic and environmental components to account for the constancy of the intraindividual variation? This is the problem which has been attempted in this paper,

35. Suman, C. L., Wahi, S. D. And Bhattacharjee, S. K.—'Genetic Divergence in Dahlian, *Ind. J. Hort., 41, pp-299-302, 1984*

The nature and magnitude of genetic diversity as measured by mahalaronobis's D^2—statistics was studied for a set of seven quantitative characters in 39 indigenous and exotic cultivors of Dehlia variabilis DEFs. Those cultivors were grouped into nine different clusters. The principal component analysis showed that the major portion of variability in the population was explained be the first two cannonical roots.

List of Papers Accepted for Publication During the Year, 1985

1. Agarwal, S.C. and Nadkarni, U.G.—Effect of transactions in poultry birds on egg production. *Ind. Journal Anim. Sci.*

2. Agarwal, S.C. and Nadkarni, U.G.—Net return in relation to capital in commercial poultry farms. *Ind. Journal of Animal Science, 56(3), March, 86.*

3. Bhatnagar, K. C., Agarwal, S. B., Singh, Bhupal, Singh, Kubar Ram—A study on the effect of Non-genetic factors on production performance characteristics of cross-bred cows. *Indian Journal of Dairy Science.*

4. Bhatnagar, K. C. and Mehta, D. K.—Review of pot culture and other laboratory experiments. *Agril. Sc. Digest.*

5. Jain, T.B., Nadkarni, U. G. and Kumar, Ramesh—Survivorship for some breeds of bovines in Punjab. *Indian Journal of Animal Sciences, Vol. 56, 1986.*

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