भा·कृ·सा·अ·स·
रजत जयन्ती
विशेषांक

वार्षिक रिपोर्ट
ANNUAL REPORT
1984

IASRI
SILVER JUBILEE
Special

भारतीय कृषि साँख्यिकी अनुसंधान संस्थान
(भा० कृ० अ० प०)
लाइब्रेरी एवेन्यू, नई दिल्ली - ११० ०१२
INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE
(I. C. A. R.)
LIBRARY AVENUE, NEW DELHI-110012

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Compiled and Prepared

By

R. K. KHOSLA

A. K. MUKHERJEE MAHARAJ SWAROOP

P. P. SINGH

प्राक्कथन

मैं भारतीय कृषि साँख्यिकी अनुसंधान संस्थान, नई दिल्ली की रजत जवन्ती (१९५९-१९८४) के अवसर पर प्रकाशित १९८४ की वार्षिक रिपोर्ट को पाठकों के समक्ष संहर्ष प्रस्तुत करता हूं। इसमें प्रतिवेदनाधीन वर्ष के अन्तर्गत संस्थान के पूर्ण कार्य क्षेत्र और गतिविधियों के सभी पहलुओं पर प्रकाश डालने का यथा सम्भव प्रयास किया गया है।

मुझे आशा है कि यह रिपोर्ट कृषि - साँख्यिकी क्षेत्र के अन्वेषकों व अन्य सम्बद्ध व्यक्तियों के लिये बहुत लाभदायक सिद्ध होगी। इसके अगले अंकों में सुधार हेतु किसी भी प्रकार की टिप्पणी और सुझावों का मैं आभार सहित स्वागत करूंगा।

मैं संस्थान के उन सभी अधिकारियों तथा कर्मचारियों का आभार सहित हार्दिक धन्यवाद करता हूं, जिन्होंने रिपोर्ट के इस अंक के लिये आपेक्षित सामग्री एकत्रित करने व प्रकाशित करने में सहयोग प्रदान किया है।

मैं श्री प्रमोद कुमार, श्री सोमदत्त, श्री दिनेश कुमार शर्मा और श्री के० जी० देवले का इस अंक के लिये आवश्यक सामग्री के संकलन में और श्री महेश चन्द्र, श्री कुँवर पाल सिंह, श्रीमति रजनी गुप्ता और श्रीमति हर्ष कपूर का टंकण में भरपूर सहयोग देने के लिये भी आभारी हूं।

प्रेम नारायण
निदेशक
भारतीय कृषि साँख्यिकी अनुसंधान संस्थान
नई दिल्ली-११० ०१२

PREFACE

I take pleasure in presenting to the readers this special issue of the Annual Report for the year 1984 on the auspicious occasion of Silver Jubilee (1959—1984) of the Indian Agricultural Statistics Research Institute, New Delhi. 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 agriculture 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 welcomed 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 Shri Pramod Kumar, Shri Som Dutt, Shri Dinesh Kumar Sharma and Shri K. G. Dewale for their help in compilation of the material and to Shri Mahesh Chandra, Shri Kunwar Pal Singh, Mrs. Rajni Gupta and Mrs. Harsh Kapoor for typing of this issue of the Annual Report.

PREM NARAIN
Director
Indian Agricultural Statistics
Research Institute
New Delhi - 110 012

CONTENTS

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

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

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

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

(The condolence message was conveyed to the Honourable Prime Minister of India by Prof. Prem Narain, IASRI, on behalf of the Institute).

1. INTRODUCTION

The Indian Agricultural Statistics Reasearch 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 agricultural research and development. To achieve this objective, the following functions are carried out :

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

(*ii*) To conduct post-graduate courses for training professional statisticians and in-service training courses for agricultural workers ;

(*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 post-graduate and inservice training courses in computer applications with special reference to agriculture ; and

(*vi*) To provide consultancy service in data processing.

The Institute has played a very significant role in the application of statistical methods to agricultural research in India and 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 of U.S.A., Canada and other 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 progrmmes 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. This led to the development of the crop cutting survey technique which was in the course of a few years, extended to almost the entire country for estimating agricultural produce. In the course of this work, the Statistical Section had to undertake research in sampling theory and to train a large number of statisticians and field staff.

With its increasing activities, the 'Statistical Branch' as it used to be called then, was reorganised in 1945 into two separate units, each under the charge of a Statisticians ; 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 Statisties 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 rel able 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 surveys 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 reseach 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 Rescach 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 including a play ground 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 Reseach 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 M odel-II. Electronic computer and other related equipments, while the first and the second 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 spacious auditorium on the third floor which also provided a suitable venue of the cultural and other activities of Recreation and Welfare Club of the Institute. 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 ful-fledged Institute under the administrative control of ICAR with effect from 1st 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 recommendatio ns of the Depatment 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 1st January, 1978 the name of the Institute of Agricultural Research Statistics (IARS) 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 agriculture, 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 1st 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 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.

1.1 Organisational Structure of the Institute :

The research and technical work of the Institute is organised in the following seven Divisions and one Cell :

Division of Statistical Research in Crop Sciences
" " Crop Forecasting Methodology
" " Statistical Research in Animal Sciences
" " Sample Survey Methodology
" " Econometric Analysis
" " Training and Basic Research
" " Computer Science and numerical Analysis, and statistical Genetics Cell.

In addition to above other cells known as Director Cell, Monitoring Cell and United Nations Development Programme (UNDP), Cell, have been functioning since 1973, 1979 and 1983 respectively.

The number of Class I Officers in position as on 31st December, 1984 was 119 (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 two Jt. Directors, 7 Sr. scientis (S-4), 17 Sr. Scientists (S-3), 33 Scientist (S-2), 57 Scientists (S-1), one M.T.O. (T-6), two Field Officers (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 Committe of the Institute :

The main purpose of constituting Management Committee for the Research 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 philosophy 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 programmes 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 remedial measures.

1.3 Staff Research Council :

The Staff Research Council (SRC) was constituted in 1970. The main objectitves of the SRC are to scrutinise the research programmes of the Institute to decide on priorities and watch the progress of various reserch 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-disciplinary 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 to the research workers in various disciplines of agricultural and animal sciences.

During the period under report the staff Research Council met on three occasions. The first meeting was convened for four days 23rd, 25th, 27th and 28th January, 1984 and the progress of research projects was discussed. On the second occasions it met on 24th and 25th April, 1984 and technical programme of new projects as well as Sixth Five Year Plan projects were discussed. It met on the third occasions on 6th and 7th September and 28th December, 1984 and progress of the existing research projects was discussed.

1.4 Divisional Research Committees :

Divisional Research Committee meetings are held every month under the Chairmanship of the respective Head of Division to discuss about the technical progrmmes, 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 seven division, viz. (i) Division of Statistical Research in Crop Sciences, (ii) Division of Crop Forecasting Methodology, (iii) Division of Statistical Research in Animal Sciences, (iv) Division of Sample Survey Methodology, (v) Division of Econometric Analysis (vi) Division of Training and Basic Research and (vii) Division of Computer Science and Numerical Analysis, were held under the Chairmanship of the Heads of respective Divisions. In the meeting, the points mentioned above were discussed along with 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 valueable 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 :

The Instititute has within its campus two well furnished and organised hostels, named after the two pioneers in the agricultural statistics research and development in the country, Panse Hostel and Sukhateme Hostel. Boarding and lodging in the hostel is compulsory for all the students admitted to various courses conducted by I.A.S.R. I. and I.A.R.I. There are about 56 furnished

rooms of different sizes, single, double, triple beds available at the hostels. Each hostel has a common room and there is a common dining hall at the Sukhatme hostel. Adequate arrangements for indoor and outdoor games have been provided by the authorities besides recreational facilities for the students. There is a well furnished common room in the Sukhatme Hostel with a provision of coloured T.V., Radio and in addition important news papers and periodicals are also made available. The students are provided free medical aid under the care and good supervision of a qualified medical Doctor. The hostel celebrated Holi, Deepawali, Christmas, New Year's day, Sarswati Puja and other occasions. The hostel has the privilege of hosting various scientists visiting the Instt. We had the honour this year to have prof. P.V. Sukhatme, Maharashtra Association for the cultivation of Science, Pune, as our Chief guest and a dinner on his 73rd birthday.

The general management of the hostel is vested in the warden who stays in the campus. Prof. Prem Narain, the Director is also the present warden. Every year at the commencement of the session a general body meeting of the students residing in the hostel is held to elect the Executive Committee consistings of Prefect and secretaries for sports, health, cultural, common Room, Maintenance. The class representatives, auditors and mess managers are also elected, as usual. During 1984-85, the Executive Committee of the IASRI hostel consisted of the following :-

1.	Prefect	:	Mr. S.P. Singh
2.	Sports Secretary	:	Mr. S. D. Raju
3.	Jt. Sport Secretary		(1) Mr. S. C. Lenka
			(2) Mr. Ashish Das
4.	Cultural Secretary	:	Mr. Mukesh Prabhakar
	Jt. Cultural Secy.	:	(1) Mr. Ganesh Dutt
			(2) Mr. M.D.N. Rao
			(3) Mrs. Pankaj Garg
5.	Health Secratary	:	Mr. Anil Rai
	Jt. Health Secretary (for girl students)	:	(1) Mrs. Manisha Gupta
	Jt. Health Secy.	:	(2) Mr. S.K. Gupta
6.	Common Room Secy	:	Mr P.S. Pandey
	Jt. Common Room Secy.	:	(1) Mr. Parveen Arora
	Jt. Common Room Secy.	:	(2) Mr. Chander Singh

7.	Maintenance Secretary :	Mr. Tej Prakash (Panse Hostel) Mr. K. Ravi Shanker (Sukhatme Hostel)
8.	Class representatives :	
	Ph. D.	—Mr. M.K. Wattamwar
	M. Sc. (2nd year)	—Mrs. Pankaj Garg
	M. Sc. (1st year)	—Mr. Manas Das
	Dip. (Comp. Prog.)	—Mr. Tej Prakash
	P.S.C.C.	—Mr. H. Mandal
	S.C.C.	—Mr. Hira Singh
9.	Warden's nominee	(1) Mr. P.R. Sreenath (2) Mr. S.P. Dhall
10.	Auditors	(1) Mr. P.R. Sreenath (2) Mr. Nirmal Singh (3) Mr. M.K. Wattamwar (4) Mr. P.K. Gupta (5) Mr. P.R. Khanke (6) Mr. G.V. Parasad
11.	I/c Mess Bill computerisation	Mr. Tej Prakash

The students of IASRI hostels organised the Annual Day function on 10th Oct., 1984 in the evening. Dr. Maharaj Singh, Deputy Director Genral, Education, Indian Council of Agricultural Research, New Delhi was the Chief Guest on the occasion. The function started with a few items of sports and light refreshment, when the staff and students of the Instituts took active part and prizes were awarded to the winning team and individual students. The prize distribution was followed by an excellent cultural programme.

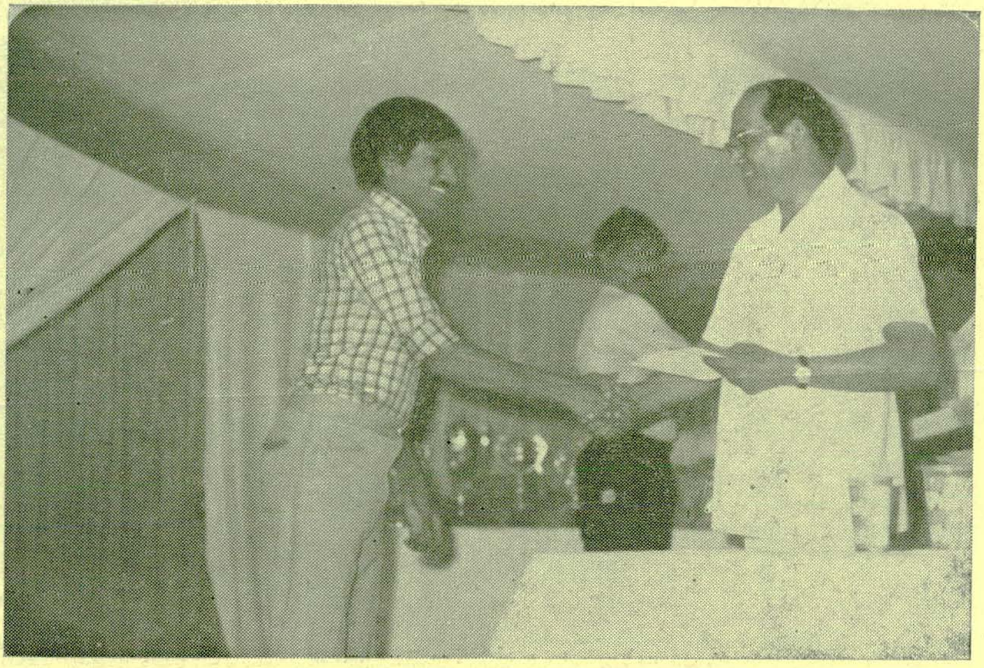
A cricket Match between staff and students was also organised on 30th Sept., 1984. The students won the Match. A chess team constituting Sh. H.S. Gill (Captain), Sh. Srivastava, Sh. N.G. Singh and Sh. Thomas Paul won the gold medal in the ICAR Inter-institutional students sports meet held at IARI, New Delhi from 28th Feb., to 2nd March, 1984.

A team consisting of three students from IASRI Sh. V.C. Nagar, Sh. Jaibir Singh and Sh. Rakesh Aggarwal participated in the Quiz contest conducted by the library society of PGSSU (IARI) in the month of Sept., 1984. Out of ten teams our team finished runners up. A prize of Rs. 120 only in the form of books was awarded to the team.

STUDENTS' ANNUAL DAY FUNCTION OF THE IASRI

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

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



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

A Scene of the Cultural programme.

1.6 Library

Library system

The Library system continued to provide Library Information and Documentation Services to the scientific, techinical and students community of the Institute.

Resource Building :

The Library of the Institute continued to build up resource collection of the literature in terms of published scientific and technical literature for the scientific, technical and student community of the Institute. The number of books acquired and accessioned during the period under report was 140. About 681 books were technicaly processed. The Library received app. 190 Indian and Foreign periodicals and received 100 news letters, bulletins etc., on complimentary basis.

Library Usage :

The Library was kept open on all working days between 9.30 A.M. to 7.00 P.M. The number of readers, who visited and consulted the Library during the year was app. 28,000 including outside bonafide research scholars for consultation. More than 33,050 publications were issued and returned during the period under report.

Inter-Library-Loan Facility :

As a part of resource sharing the Library borrowed from and lent out publications to other Libraries on Inter Library Loan System.

Reprographic Facility :

The Reprographic unit of the Library has been strengthened with the addition and installation of Xerox-1035 model plain paper copier. The unit has made copies and supplied 35,000 pages free of cost on requisition from scientific and technical community of the Institute.

Information Services :

The Library started two new monthly information services for the benefit of the users.

(i) Information Service No. 1 Latest additions of books.

(ii) Information Service No. 2 Latest additions of Reports.

Off Prints and Reports :

The Library has procured extra reprints of 17 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 140 important reports from different organisations and strengthened qrey literature.

Maintenance :

The Library got bound 800 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 Committe 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. Shri 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. Shri S.N. Mathur	,,
9. Shri L.K. Garg	,,
10. Shri S.S. Srivastava	Convenor

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

During the year under report, the display panels in the Exhibition room were removed by depicting new charts showing salient findings of projects of various Divisions of the Institute, copies of reports and other publications of Scientists of the Institute were also displayed.

1.8 Fellowships :

The courses of study for which fellowships were awarded by the institute during the year, the rate of the fellowship and number of students are given below :

Sl. No.	Name of the Course	No. of Students	F/ship PM.	Amount Rs.
1.	Ms. Sc. I Year	12	Rs. 400/- Rs. 38,400+17,600 =	56,000.00
2.	M. Sc. II Year	10	Rs. 400/- Rs. 32,000+ 6,552.70 =	38,552.70
3.	M. Sc. New entraints	13	Rs. 400/- Rs. 3173.25+15,600 =	18,773.25
4,	Ph. D. I Year	4	Rs. 600-/ Rs. 11,625 +19,200.15 =	30,825.15
5.	Ph. D. II Year	1	Rs. 600/- Rs. 4,800 + 2,760 +700 =	7,560.00
6.	Ph. D. III	2	Rs. 700/- Rs. 5631.60+5058.05 =	10,689.65
7.	Ph. D. III Year Extend	2	Rs. 700/- Rs. 1110.35+948.40 =	2,058.75
8.	Ph. D. New entraints	2	Rs. 600/- Rs. 780.00+3600.00 =	4,380.00
			G. TOTAL :	Rs. 1,68,839.50

(Rupees one lakh sixty eight thousand eight hundred thirty nine and paise fifty only)

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.
	(ii) Indian Society of Agricultural Statistics (Also Secretary of the Society as well as Chairman of Editorial Board of its Journal).
	(iii) Indian Society of Genetics and Plant Breeding (Fellow).
	(iv) General Council of the University of Edinburgh (U.K.).
	(v) Post-Graduate Faculty of P.G. School, IARI, New Delhi.

(vi) Fellow of the Royal Statistical Society, London.

(vii) Fellow of Indian National Science Academy.

(viii) Member, Editorial Board of Indian Journal of Animal Genetics and Breeding.

(ix) International Statistical Institute, Netherlands

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

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

(xii) Indian Society of Human Genetics.

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

(xiv) 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.

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

(xvi) Technical Evaluation committee for evaluation of the design and methodology on collection of catch Statistics of fish from different inland water resources, monitoring of progress of work and suggestions on improvement of sampling system for central sector scheme on Development of Inland Fisheries Statistics for implementations.

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

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

(xix) Committee of Director for the Bureau of Animal & Genetics Resources and the Institute of animal Genetics for formulation of detailed programme.

Dr. S.S. Pillai

(i) Computer Society of India.

(ii) EC-3 and LTDC-24/12 Committee of the Indian Standards Institute.

(iii) Committee set up by the Department of Electronics for import of computers for software export.

(iv) Chairman of the Publication Committee and Library Committee of the IASRI.

Dr. S.K. Raheja

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

(ii) Indian Society of Agricultural Statistics, 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+II)

(v) High level Coordination committee on Agricultural Statistics, H.P.

(vi) Sub-group of the working group on agricultural statistics, Ministry of Agriculture, New Delhi.

(vii) Sub-group for planning of survey of estimation of yield of irrigated & unirrigated crop in command areas, Ministry of irrigation, New Delhi.

Sh. K.S. Krishnan

(i) Farm Accounts Sectional Committee, AFDC-49 of the Indian Standards Institution, New Delhi.

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

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

Dr. K.C. Raut

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

(ii) Indian Dairy Association, New Delhi.

(iii) Scientific Panel for dairy and livestock products technology.

Dr. R.K. Pandey

(i) Indian Society of Agricultural Economics, Bombay.

(ii) Indian Economic Association, Bombay.

(iii) Board of Studies, discipline of Agricultural economics, IARI, New Delhi.

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 Institute, Netherlands.
	(iii) Editorial Board, Journal of Indian Society of Agricultural Statistics.
Dr. O.P. Kathuria	(i) Indian Society of Agricultural Sciences.
	(ii) Technical Evaluation Committee (CIFRI), Barrackpore for the central sector seheme in Fisheries Statistics.
	(iii) High Level Coordination Committee in Agricultural Statistics, Government of Kerala, Trivandrum.
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 Methodology Sectional Committee T.D.C. 33, XSC, New Delhi.
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.
	(iii) Board of Studies of IASRI, New Delhi.
	(iv) ICAR Scientific Panel for Entomology/Nematology.
	(v) Sub-committee of Indian Standards Institutions on Product/Process Control and Industrial Statistics and Management Committee.
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.
Sh. V.N. Iyer	(i) Scientific Panel for "Agricultural Engineering.
Dr. H.V.L. Bhathla	(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 Namatology".
Dr. A.K. Srivastava	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) P.G. Faculty of the P.G. School, IARI, New Delhi.
Sh. S.C. Rai	(i) EC 3:10.1 and 10.3 of Indian Standards Institution.
	(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.
Sh. J.C. Malhotra	(i) Indian Society of Animal Genetics and Breeding.
	(ii) Indian Society of Agricultural Statistics, New Delhi.
Sh. B.C. Saxena	(i) P.G. Faculty of the P.G. School, IARI, New Delhi.
	(ii) I.C.A.R. Scientific Panel for 'Home Sciences'.
Dr. Randhir Singh	(i) Boards of Studies, IASRI, New Delhi (Secy.).
	(ii) Indian Society of Agricultural Statistics, New Delhi.
	(iii) P.G. Faculty of the P.G. School, IARI, New Delhi.
	(iv) Secretary/Member of Selection Board of M. Sc,Ph. D. Courses, IARI, New Delhi.
Sh. Jagmohan Singh	(i) Indian Society of Agricultural Statistics, New Delhi.

	(ii) Indian Society of Agricultural Science, New Delhi.
Dr. R.C. Jain	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) P.G. Faculty of the P.G. School, IARI, New Delhi.
Sh. T.B. Jain	(i) Indian Society of Agricultural Statistics, New Delhi.
	(ii) Indian Society of Agricultural Economics, Bombay.
	(iii) NAARM, Alumuni, Hyderabad.
Sh. 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.
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.).

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. P.C. Malhotra, Dr. Shivtar Singh, Shri P.P. Rao, Mrs. Ranjana Agrawal, Sh. L.K. Garg, Sh. M.S. Batra, Sh. D.L. Ahuja, Sh. H.B. Choudhari, 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 Agricultural 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 Genetics, Bombay.

(xi) Council of the Centre for Mathematical 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-Ganga 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 Sectional Committee of the Indian Standards Institutions, New Delhi (as Chairman).

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

1.11 Distinguished Visitors

(i) Mrs. Radha Chakravarthy, Scientist and others of National Institute of Science, Technology and Development Studies (CSIR), New Delhi visited this Institute on 20.1.1984 regarding "International Comparative Study on the Organisation and Performance of research units".

(ii) Prof. P.S. Puri, Professor of Statistics, Purdue University, USA and Visiting Professor at I.S.I., Delhi Campus, visited this Institute on 6th, 8th, 14th & 15th Feb., 1984 as per following programme :

Date	Items
6.2.1984	Seminar on "Non-Identifiability Problems Among Some Stochastic Models in Reliability Theory".
8.2.1984	(i) Meeting with HDS & Sr. Scientists where the views regarding the functions & activities of the Institute and Purdue University were exchanged; and (ii) Seminar on "An Optimal Test of Poisson Hypothesis Against Compound Poisson Alternatives".
14.2.1984	Seminar on "Quantal Response Processes in Biology".
15.2.1984	Seminar on "A Mathematical Theory of Quantal Response Assays".

(iii) Dr. James H. Matis, Professor of Statistics, Texas A & M University, USA visited this Institute on 10th Feb., 1984. The functions & activities of this Institute and the Texas A & M University were also discussed in brief in the meeting of the Heads of Divisions.

(iv) Prof. J.M. Pompeu Memorla, Chefe da Assessoria de Cooperacao International, Ed. Supper Centre Vanancio 2000.9° andar, Caixa Postal 040315, 70812 Brasilla-DF Brazil visited the Institute and had discussion with the Director on 6.3.1984.

(v) Prof. Hans Rundfeldt, Director des Institutes fur Statistik und Biometric der Tieraztlichen Hochschule Hannover, Bischofsholer Damm-15, D-3000 Hannover I, West Germany visited the Institute on 7.3.1984 and had discussion with the Director with regard to the analysis of non-orthogonal data from experimental designs and functions and activities of the Institute and also went round the Computer Centre, IASRI.

(vi) Prof. Howard, L. Wright, Senior Research Officer, Common-wealth Forestry Institute, University of Oxford, Oxford, U.K. and Professor W. Finlayson, Director Commonwealth Bureau, Oxford, U.K. accompanied by Dr. David Cooke, First Secretary (Science), British High Commission, New Delhi visited the Institute on 9.3.1984 and discussed with the Director on different aspects. They also went round the Computer Centre of the Institute.

(vii) Mr. Assefa Yilala, Head of Training Services Division, Ethiopian Ministry of Agriculture, Addis Ababa, Ethopia visited the Institute on 13.3.1984. Mr. Yilala discussed with the Director and Head of the Training Division about the various training programmes and activities of the IASRI. He showed keen interest in the training programmes and discussed the possibilities of deputing trainees from his country.

(viii) Professor D.J. Finney, Professor of Statistics, University of Edinburgh, United Kingdom visited this Institute from 16th March to 2nd April, 1984 under UNDP Project. He was aquainted with the research and teaching activities of the Instiiute by different Heads of divisions. He advised regarding the successful implementation of this project.

(ix) Dr. Haugard and Dr. Rumeau, FAO Rome visited IASRI, New Delhi on 5.4.1984 and discussed with the Director with regard to the various activities of the Institute.

(x) Dr. G.D. Diwakar, Economist, I.G.S.I., Hapur visited this Institute on April 7, 1984 to discuss about the procedure for estimation of losses during harvesting.

(xi) Dr. Quance, Director, Statistics Division, FAO, Rome and Dr. H.R. Oh, FAO, Bangkok visited the IASRI on 9.4.1984 and discussed with the Director with regard to various activities of the Institute.

(xii) Mr. Gerard Van Bilzen, Commission European Communities and Mr. Rue De Lo Loi Zoo, 1049 Brussels/Belgium visited for discussion with the Director on possible training of African National in the field of Agricultural Statistics.

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

(xiv) Dr. K. Krishnamurthy, Jt. Commissioner (S & R), Deptt. of Food, Ministry of Food Civil Supplies, Govt. of India visited this Institute on 16.10.1984 to discuss with the Director and Sh. R.K. Khosla, Sr. Scientist regarding his Statistical problems and also with regard to

projects on Post-harvest foodgrain losses on wheat-crop to be started in Bullandshahr, district of U.P. during the current year.

(xvi) Sh. N.K. Gandhi, Assistant Director (Ag.), National Productivity Council, New Delhi-16, visited this Institute on 23.11.1984 and discussed with Sh. R.K. Khosla, Scientist (S-3) about the estimation of losses in Storage at farm level.

1.12 Appointments. Promotions, Transfers, Retirements and Resignation, etc :

(9) Appointments :

(i) Shri Devindar Nath was appointed as Sr. Admn. Officer with effect from 23,1.84 (AN).

(ii) Sh. D.L. Dang. was appointed as Asstt. Admn. Officer with effect from 19.10.84.

(b) Promotions :

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

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

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

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

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

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

(1)	Sh. P.P. Rao	01.07.81
(2)	Sh. S.P. Doshi	01.07.82
(3)	Sh. T.B. Jain	01.07.82
(4)	Sh. S.S. Shastri	01.07.32
(5)	Sh. Mahesh Kumar	01.07.82
(6)	Dr. V.K. Gupta	01.07.82
(7)	Dr. Pranesh Kumar	01.07.82
(8)	Dr. R.C. Jain	01.07.82
(9)	Dr. M.L. Sahni	01.07.82
(10)	Shri R.K. Ghai	01.01.83
(11)	Shri Shanti Sarup	01.01.83
(12)	Shri O.P. Dutta	01.01.83
(13)	Shrimati Asha Saxena	01.01.83
(14)	Sh. Lal Chand	01.01.83
(15)	Sh. R.L. Rastogi	01.01.83
(16)	Sh. J.K. Kapoor	01.01.83
(17)	Sh. H.C. Jain	01.07.83
(18)	Sh. V.K. Bhatia	01.07.83
(19)	Sh. P.K. Malhotra	01.07.83

(iv) The following Scientists have been promoted from Grade S-0 to Grade S-1.

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

(11)	Sh. H.O. Aggarwal	01.07.83
(12)	Sh. D.K. Sehgal	01.07.83
(13)	Sh. Ashok Kumar	01.07.83

(v) Following Technical Assistants have been inducted into Grade 'S' of ARS in the pay scale of Rs. 550-900 and transferred to other Institutes with effect from the date mentioned against each :

(1)	Sh. K.S. Scariah	31.1.1984 CMFRI, Cochin (Kerala)
(2)	Sh. S.P. Singh	7.4.1984 JARI, Barrackpore (W.B.)
(3)	Sh. Tribhuwan Rai	20.3.1984 IIHR, Bangalore (Karnataka)
(4)	Sh. Shiv Prasad	22.9.1984 (AN) IVRI, Izatnagar (U.P.)
(5)	Sh. T.A. Khan	1.10.1984 (FN) IGFRI, Jhansi (.UP.)
(6)	Sh. Krishan Lal	1.10.1984 (FN), IVRI, Izatnagar (U.P.)
(7)	Sh. Ashok Kumar-II	1.10.1984 (FN), IGFRI, Jhansi (U.P.)
(8)	Sh. Rakesh Chandra	30.11.1984 (AN), IVRI, Izatnagar (U.P.)
(9)	Sh. R.N. Garg	17.12.1984 (AN), NDRI, Karnal (Har.)
(10)	Sh. V.K. Jain	31.8.1984 (AN), Mathura (U.P.)

(vi) Consequent upon the appointment of the following Technical Personnel of this Institute to the Post of Junior Technical Officer (T-6) in category-III of the Technical Service in the Pay scale of Rs. 700-1300, they have joined their duty with effect from the date mentioned against each :

1.	Shri D.C. Pant	24.5.1984 (FN)
2.	Shri Sudarshan Kumar	24.5.1984 (FN)

(vii) Consequent upon the appointment of Shri Amar Ranjan Paul, for the post of Senior Artist in the pay scale of Rs. 700-1300 he has Joined his duty with effect from 11.10.1984 (FN).

(viii) Shri Rajender Singh, Field Officer has been given the Merit Promotion to Grade (T-8), (Category-III) in the pay scale of Rs. 1300-1700 with effect from 1.7.1983 vide office order No. 19(1)/84-Admn. II dated the 23.6.1984.

(ix) Shri S.S. Srivastava, Librarian (T-6) has been given the Meri t Promotion to Grade (T-7), Category-III, in the pay scale of Rs. 1100-1600 w.e.f. 1.7.1983 vide office order No. 19(1)/84-Admn. II dated 23.6.1984.

(x) The following Technical Personnel have been given the Merit Promotion to Grade (T-5) (Category-II) in the pay scale of Rs. 650-1200 w.e.f. the dates as mentioned against each :

1.	Shri Amar Ranjan Paul, Artist	1.1.1984
2.	Shri J.N. Sharma, Inspector	1.7.1983
3.	Shri H.C. Jain, Tech. Asstt.	-do-
4.	Shri O.P. Sharma ,,	-do-
5.	Shri M.S. Verma ,,	-do-
6.	Shri N.K. Jain ,,	-do-
7.	Shri Suresh Chand ,,	-do-
8.	Shri P.K. Mitra ,,	-do-
9.	Shri C.H. Rao ,,	-do-
10.	Shri U.N. Jha ,,	-do-
11.	Shri Prakash Lal ,,	1.1.1984
12.	Shri Kuldeep Singh ,,	-do-
13.	Shri S.M.G. Saran ,,	-do-
14.	Shri D.K. Gulati ,,	-do-
15.	Shri P.M. Rameshan ,,	1.7.1983

(xi) The following Technical Personnel have been given the Merit Promotion to Grade (T-4) Category-II in the pay scale of Rs. 550-900 w.e.f. the dates as mentioned against each :

1.	Smt. Sudesh Vaid	1.7.1983
2.	Shri Lalmani Verma	-do-

Transfer :

(i) Shri S.D. Wahi, Scientist S-1 has joined duty at IASRI w.e.f. 10.2.1984 on transfer from Indian Institute of Horticulture Research, Bangalore.

(ii) Shri R.L. Rustagi, Scientist S-1 has joined duty at IASRI w.e.f. 3.3.1984 on transfer from IVRI, Izatnagar (UP).

(iii) Shri Durga Prakash, Superintendent (A & A) who was on deputation basis at IASRI has been relieved of his duties at this Institute w.e.f. 22.3.1984 (AN) with instruction to report for duty to his parent office.

(iv) Sri Lal Chand, Scientist S-1 has joined duty at IASRI with effect from 7.8.1984 on transfer from CSWRI, Avikanagar.

(v) Sh. P.N. Wali, Accounts Officer has been transferred to CAZRI, Jodhpur on promotion to the post of Senior Accounts Officer and relieved at the IASRI w.e.f. 24.8.1984.

(vi) Dr. D.K. Aggarwal, Scientist S-1 has been transferred to ICAR, Headquarter alongwith post and relieved at IASRI w.e.f. 31.7.1984.

(vii) Sh. J.K. Kapoor, Scientist S-1 has joined duty at IASRI with effect from 29.9.1984. on transfer from IVRI, Izatnagar.

(viii) Sh. S.S. Walia, Scientist S-0 has joined duty at IASRI with effect from 29.9.1984 on transfer from IVRI, Izatnagar (UP).

(ix) Sh. A.S. Gupta, Scientist S-1 has joined duty at IASRI with effect from 22.10.1984 on transfer from Directorate of Oil Seeds Research, Hyderabad.

(x) Sh. Panna Lal, Asstt. Administrative Officer has been transferred to NRCG, Junagarh (Gujarat) on promotion to the post of Admn. Officer and relieved at IASRI w.e.f. 29.9.1984 (AN).

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

(xii) Sh. V.K. Srivastava, Technical Assistant (Stat.) has been transferred to Directorate of Agriculture, Krishi Bhavan, Lucknow with effect from 23.10.1984 (AN).

Retirement :

(i) Shri R.C. Kukrety, Senior Gestetner Operator of this Institute has retired from the services of this Institute w.e.f. 30.4.1984.

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

Resignation :

Following Technical Assistants have resigned from the services of this Institute with effect from the date mentioned against each :

1.	Shri Anup Kumar Pandey	30.3.1984
2.	Shri Tara Singh Bisht	19.3.1984

1.13 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.

1.14 Joint Council :

A meeting of the Joint Staff Council were held on 22.3.1984.

1.15 Staff Amenities

(a) Staff Quarters :

The IASRI 107 quarters of Type-I to Type-IV on an area of 8097 Sq. Mtrs. in Paschim Vihar, New Delhi were completed by the CPWD in the month of July, 1982 and the quarters were allotted to officers/staff members as per rules.

(b) 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, Volley-ball, Football, Kabaddi, etc.

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

The Annual Day function of the club was organised on 11.1.1984 in which the Director, IASRI was the chief guest. Musical chair, Fish pond and other fun games and a Quiz-Contest in general knowledge and agricultural Statistics were also organised as a part of the function. Prizes were awarded to winners of the various games and events held on that day.

The members of the club also participated in the IV ICAR (Zone-III) Inter-Institutional Sports Meet organised by NBPGR from 12th to 15th Dec., 1984. Our kabaddi team won the championship while the Volleyball (Shooting) and Volleyball (Smashing) Teams won the runners up position.

In individual events Dr. K.K. Tyagi won the runners up position in Badminton, Shri Sunil Bharihoke won the first and second position in 400 mtrs. and 800 mtrs. races, Shri P.S. Rai won second position in Pole Vault and athletes won second position in 4 x100 mtrs relay race.

The officer-bearer of Managing Committee for the year consisted of the following :

Dr. S.K. Raheja	President
Sh. K.V. Sathe	Vice-President
Sh. S.K. Mahajan	Secretary
Sh. V.P. Ahuja	Jt. Secretary
Dr. K.K. Tyagi	Sports Secretary
Sh. V.H. Gupta	Treasurer

(c) Cooperative Canteen/Store :

The ICAR (SW) Cooperative Store Limited continued its activities of providing meals, beverages and snacks as well as general merchandise and provisions to the Institute staff, under the store a canteen was run which provided tea, coffee, cold drinks, snacks, lunch, etc., at reasonable rates to the members. A provision store is separately functioning where provisions and general marchandise are made available to the Institute staff at reasonable rates.

The store has a Management Committee consisting of the following members :

1. Dr. S.K. Raheja,	President
2. Sh. R.D. Garg	Vice-President
3. Sh. B.M. Nautiyal	Hony. Secretary
4 Sh. S.L. Dua	Hony. Treasurer
5. Sh. R.K. Singh	Member
6. Sh. A.P. Verma	Member
7. Sh. Keshav Charan	Member
8. Sh. P.S. Rai	Member
9. Sh. Maksood Khan	Member
10. Sh. Sohan Lal	Member
11. Sh. V.H. Gupta	Ex-Officio Member

The accounts of the Cooperative Store for the year 1982-83 and 1983-84 were prepared and duly got audited by the Registrar of Co-operative Societies, Delhi. The accounts showed that the store was running in profit. During these years dividend as admissible under the rules was distributed to the Members. A Diwali gift was also given to the members.

(d) 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 donations received from the Institute's employees and students.

(i) On the occasion of Benevolent Fund Day on 30.6.1984, an amount of Rs. 334/- were collected from the Officers/Staff at IASRI.

(ii) 9 Officers/Officials of this Institute were enrolled as members of the IASRI Benevolent Fund during the year 1984

(iii) A sum of Rs. 13/- has been received from Dr. H.P. Singh, Welfare Officer on account of unspent balance left after the Farewell of Sh. R.C. Kukrety and Sh. Durga Dass.

(iv) An amount of Rs. 5000/- was placed in commulative fixed deposit in State Bank of India for a period exceeding five years to earn maximum rate of interest vide this office letter No. 9(6)/79- Admn. II dated 29.11.1983.

(v) On the sad demise of Shri Baldev Singh on 24.11.1984, an amount of Rs. 500/- were given to the deceased family as an assistance from the fund (1) vide Cheque No. SB/88-111981 dated 26.11.1984 for Rs. 250/- and (2) vide Cheque No. SB/88-111982 dated 11.12.1984 for Rs. 250/-

(e) IASRI Employees Cooperative Thrift and Credit Society Ltd. :

The society which is registered with the Registrar Cooperative Societies, Delhi Administration, New Delhi, Regd. No. 495/(u) continued its activities of enrolling new members and advancing loans to its members as in the past years. The total membership of the society increased to 463 on 31.12.1984. The last general body meeting was held on 20th Nov., 1984 in which the accounts for the year 1983-84 were presented and passed. The election for the new

Managing Committee was held on 21st November, 1984 and the following were elected.

1. Shri Ram Kumar	President
2. Shri D.C. Pant	Vice President
3. Shri Mahesh Kumar	Hony. Secretary
4. Shri V.K. Mishra	Hony. Treasurer
5. Sh. R.K. Jain	Member
6. Shri Naresh Chand	Member
7. Shri M.L. Chowdhary	Member
8. Sh. Satya Pal	Member
9. Sh. V.P.N. Singh	Member
10. Sh. J.K. Gahlaut	Member
11. Sh. Kuldip Kumar Jain	Member

The new management committee took charge of the society on 1st December, 1984.

During the accounting year 1983-84, the society advanced Rs. 767,600 as regular and emergent loans 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 members welfare scheme introduced in the year 1979 is still continuing and its funds amounted to Rs. 3900/-on 30.6.84. The society mourned the sudden and sad demise of its two members Shri Shispal Singh and Shri Baldev Singh and extended a help of Rs 1000/-from the members welfare fund to each of their families.

1.16 Receipt and Expenditure of the Institute during the year 1983-84 (April, 1983 to March, 1984)

Receipt for 1983-84 (in rupees)		Expenditure for 1983-84 (in rupees)
	Non-Plan	1,26,84,830.30
Receipt for 1983-84 (1.4.83 to 31.3.84) 2,99,407.47		
	Plan	15,11,440.81
	A.P. Cess	79,406.07
	Pension	85,836.90

1.17 Honours/Awards Won, etc. :

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

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

(ii) Dr. G.C. Chawla Scientist (S-I) was awarded Ph.D Degree in Agricultural Statistics from IARI New Delhi-12.

1.18 Attending training, study tour, meetings and to deliver lectures, etc. by the scientists during Jan-Dec., 1984.

Prof. Prem Narain, Director.

(i) Attended inauguration of the Central and State Statistical Organisations Conference on 17.1.1984 at New Delhi.

(ii) Attended Golden Jubilee Celebrations of the Indian National Science Academy on 17.1.84 held at INSA, New Delhi.

(iii) Attended as Chairman, the first and Second meetings 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 held on 25.1.84 and 31.1.1984 respectively. The report was finalised and submitted to the Ministry of Agriculture, New Delhi on 31.1.84.

(iv) Attended XXIII Convocation of the IARI, New Delhi held on 4th Feb., 1984.

(v) Attended metings of the Academic Council of IARI held on 9.2.84 and 19.3.84 respectively

(vi) Attended the meeting of the ICAR Standing Finance Committee on 1.3.1984 at Krishi Bhawan, New Delhi.

(vii) Attended the Annual General Body Meeting of ICAR Society on 3.3.84 at Krishi Bhawan, New Delhi.

(viii) Attended the inauguration of the FAI Training programmes for Fertilizer Promotion Executive at Hotel Imperial, New Delhi on April 2, 1984.

(ix) Attended meeting of the Sub-Committee EC 3 : 10 Handbook on Statistical Quality Control of the Indian Standards Institution on 6.4.1984.

(x) Participated in the Group Discussion on "Economics of Fertilizers Use" on 12.4.84 organised by the Fertilizer Association of India at Imperial Hotel, New Delhi.

(xi) Participated in a Programme on 'A date with Mathematicians' organised by the Mathematical Association of India with in Delhi Chapter on 3.4.1984 at University of Delhi and presided over Professor R.S. Verma, Memorial Lecture by Prof. J.S. Rustagi, Chairman, Department of Statistics, Ohio State University, USA, entitled 'Probabilistic structure of modern lottery games'.

(xii) Delivered a lecture on 'Role of Mathematics and statistics in agricultural research on 11th May, 1984 during a UGC Summer Institute on Biomathematics organised by the Deptt. of Mathematics of the Indian Institute of Technology, Kanpur.

(xiii) Attended meeting of the Committee of Direction for the National Bureau of Animal Genetic Resources and National Institute of Animal Genetics at ICAR, New Delhi on 21st May, 1984.

(xiv) Participated in the Symposium on 'Vertical Growth in Agriculture, organised by the Indian Society of Agricultural Statistics at IASRI on 27th July, 1984 on the occasion of the Felicitation Function of Prof. P.V. Sukhatme.

(xv) Attended the Academic Council meeting of IARI on 4th August, 1984.

(xvi) Attended meetings of the Executive Committee and Council of the Maharashtra Association for the Cultivation of Science, Pune on 8th and 9th August, 1984.

(xvii) Presided over two-days programme of Group Discussion on 'Crop Forecasting Models' held at IASRI, New Delhi on 13th and 14th August, 1984 in which scientists from IASRI, Indian Meteorological Department, Pune; Space Application Research Centre, Ahmedabad; ICRISAT, Patancheru; NCAER, New Delhi participated.

(xviii) Attended Fourth meeting of National Advisory Board on Statistics held at CSO, New Delhi on 21st Aug., 1984.

(xix) Attended meeting of the Sub-committee on Training Courses in Bio-statistics of the Institute for Res in Medical Statistics, New Delhi on 27th Aug., 19

(xx) Delivered a lecture on 'Livestok Planning', at the Institute of Economic Growth, Delhi on 28th Aug., 1984 in a course on "Training in Investment Planning and Project Evaluation for Officers associated with planning in the state Govts. as well as Central Ministries."

(xxi) Delivered a lecture entitled "Application of Statistical Tools in Agricultural Marketing" on 17th Sept., 1984 to the participants of the VI Course of Senior Level Training in Agricultural Marketing organised by the Dte. of Marketing & Inspection, Ministry of Rural Development, Govt. of India, New Delhi.

(xxii) Attended on 19th September, 1984 a Group Discussion on 'Agricultural Development in India' With Dr. John Mellor, Director of the Inter-National Food Policy Research Institute, Washington, D.C. Organised by the Director of the United States AID Mission, New Delhi.

(xxiii) Attended a meeting with Dr. C.H. Hanumantha Rao, Member, Planning Commisson and Members of the Study Groups on Agricultural Strategies for the Eastern Region, Rainfed Areas and Fertilizers Consumption of the Planning Commission on 19th Sept., 1984.

(xxiv) वैज्ञानिक तथा तकनीकि शब्दावली आयोग, शिक्षा तथा संस्कृति मंत्रालय के नवीनतम प्रकाशनों के विमोचन समारोह मे 21-11-84 को वैज्ञानिक तथा औद्योगिक अनुसंधान परिषद के समागार में भाषण दिया ।

(xxv) Gave a lecture entitled 'Role of Statistical Science in Agricultural Research' in the Department of Statistics, Insitute of Advance Studies, Meerut University, Meerut on 10th Dec., 1984.

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

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

Dr. S.S. Pillai,
Jt. Director
(CS & NA)

(i) Attended the meeting of the Committee set up by ICAR for Studying the usefulness of continuing the membership of the Common Wealth Agricultural Bureau on 22.8.1984.

(ii) Attended a series of Meetings held by the Deptt. of Electronics for Selection of a suitable computer System for Oil & Natural Gas Commission at New Delhi as well as in Dehradun.

(iii) Attended a no. of meetings of the Committee set up by the Ministry of Finance for examining the requirement of computers and word processor for preparation of the budget of the central Govt.

(vi) Gave a lecture entitled 'Role of computers in Agriculture' in computer Society of India in Nov., 1984.

(v) Attended no. of meetings to take suitable decisions for scrutinising applications for the import of computers for software development and exports as a members of the standing committee.

(vi) Attended various meetings as a member of the evaluation committee set up by Deptt. of Electronics for selection of a suitable computer system for the Central Mine Planning and Design Institute in Bihar for evaluating the proposed computers which was tendered.

Dr. B.B.P.S. Goel, Jt. Director (R&T)

(i) Attended to Dr. D.J. Finney, Key Consultant under UNDP from UK who visited the Institute in the second fortnight of March, 1984 and had several meetings with him.

(ii) Attended meetings of the "Task Force on Agricultural Statistics", constituted by the CSO on 14.1.1984, 20.3.1984 and 21.3.1984.

(iii) Attended meetings of the working group on "Demand and Supply Projection and Agricultural Statistics", Constituted by Directorate of Economics & Statistics, Ministry of Agricultural, New Delhi on 23.1.84, 17.2.84 and 26.3.84.

(iv) Attended meetings of the study groups on Agricultural in the Planning Commission on 17.2.1984.

(v) Attended meeting of the study group of DHTP survey Project of CSIR on 31.1.84 and 20.3 84.

(vi) Attended meeting for the reviewing pilot crop insurance scheme in the Ministry of Agriculture, Krishi Bhavan, New Delhi on 25.2.1984.

(vii) Attended meeting of the working on A.H. in the Ministry of Agriculture, Krishi Bhavan, New Delhi on 27.2.84

(viii) Attended the meeting of the Panel of the Agricultural Statistics constituted by the Central Hindi Directorate of the Ministry of Education on 10.5.84 at IASRI, New Delhi and also presided over the above meeting on 11.5.84.

(ix) Attended the meeting of the working Group on A.H. and Dairying in the Ministry of Agriculture, on 10.5.84.

(x) Attended the meeting of the Central and State Govt. officers on Agricultural Census on 12-13th June, 1984 in the Ministry of Agriculture.

(xi) Attended the meeting of the Technical Committee on Agriculture Census in the Ministry of Agriculture, Krishi Bhavan, New Delhi on 16.6.84

(xii) Attended the meeting of the empowered committee for the implementation of Chaudhury Committee's report of improvement of crop statistics.

Dr. O.P. Kathuria, Scientist (S-4) — Attended a training programme on Manpower issues in Agricultural Sector organised by Institute of Applied Manpower Research, New Delhi from July 4-10, 1984.

Dr.M.P. Jha, Scientist (S-4) — Delivered a lecture on "Survey on Crop Losses and Crop Forecasting" to trainees of J.C.C. in Statistics sponsored by C.S.O. on 16.3.1984 at IASRI, New Delhi.

Dr. S.K. Raheja, Scientist (S-4)

(i) Delivered a lecture on, "Economics of Fertilizer use in Farmers' Fields", at the 30th FAI training programme for Fertilizer Marketing and Management Executives, New Delhi on 27th March, 1984.

(ii) Delivered a lecture on "Sampling Procedure for collection of village and soil samples for delineation of different soil series according to potasium status", at Potash Research Institute of India, Gurgaon on 7th June, 1984.

(iii) Participated in the meeting of the High Level Coordination Committee, Simla, HP, on 27.8.1984.

(iv) Participated in the meeting of the High Level Coordination Committee, Haryana, Chandigarh on 18.9.84.

(v) Acted as Chairman in the Hindi Day Function held on 14.9.84.

(vi) Delivered a lecture entitled "computation of Fertilizer Requirements and Effect of Factors like Soil & Crop on Fertilizer Demand", to FAI-NR Training Programme for field representative and State Personnel, New Delhi on 25-9-1984.

Dr. R.K. Pandey, Scientist (S-4)

Visited Mohan Lal Sukhadia University, Udaipur in connection with the Sixth Five Year Plan project entitled "Study of New Delhi Farm Technology with special Reference to Yield Gap and Associated Factors" in February, 1984.

Sh. P.N. Bhargava, Scientist (S-3)

(i) Attended working group Meeting of All India Diara-Land Project at Sabour during 8th and 9th Aug., 1984.

(ii) Attended working group meeting on Assessment of Yield advantages from Intercropping Experiment in Dry-land agriculture from 21st and 22nd Sept., 1984.

Dr. Prajneshu, Scientist (S-3)

Delivered a series of ten lectures on "Ecology and Epidemiology" at the Institute for Research in Medical Statistics (ICMR), New Delhi during the second fortnight of March, 1984.

Sh. S.C. Rai, Scientist (S-3)

(i) Attended the meeting of EC 3:10 regarding finalising Hand book on Statistical Quality Control on 3rd and 18th January, 3rd, 6th, 14th, 17th and 23rd Feb., 1984 organised by Indian Standards Institution at Manak Bhawn, New Delhi.

(ii) Attended the meeting of AFDC-57 Panel for Food Sampling on 24th Feb. and 27th Feb., 1984 at IASRI, New Delhi and Mohan Nagar, Ghaziabad respectively convened by Indian Standards Institution.

Dr. P.C. Mehrotra, Scientist (S-3)	Delivered two lectures to trainees of JCC in Statistics sponsored by CSO on (i) Large Scale Sample Surveys, (ii) sample surveys in the field of Agriculture and Animal Husbandry on 11-6-84 & 13th to 16th June, 1984 respectively.
Sh. S.N. Mathur, Scientist (S-3)	(i) Attended a talk on "Local Area Network", by Dr. S.K. Tripathi at Hotel Akbar on 27-8-84. (ii) Attended advanced training in Structured programming through 'PASCAL' from 10th to 21st Sept., 1984 at CMC, 115, Sarojini Devi Road, Secunderabad.
Dr. A.K. Srivastava, Scientist (S-3)	(i) Delivered lectures on designing of sample surveys and estimation on 12th & 13th July, 1984 to the trainees statistical officers in the Directorate of Economics & Statistics, Govt. of Madhya Pradesh. (ii) Delivered lectures between 27-8-84 to 7-9-84 in the Training course on sampling & Household survey methodology conducted by CSO in support of the national household survey capability programme.
Dr. Shivtar Singh, Scientist (S-2)	Delivered a lecture on, "Cost of production of livestock products", to CSO trainees on 13-6-1984 at IASRI, New Delhi.
Dr. V.K. Bhatia, Scientist (S-2)	Attended the course on Medical Rescue & Resusitation held at Vigyan Bhavan, New Delhi on 15th Dec., 1984.
Dr. (Mrs.) Ranjana Agrawal, Scientist (S-2)	Delivered lecture on "statistical Research in Pre-harvest Crop forecasting methodology" to ISEC trainees from CSO at IASRI, New Delhi.
Sh. S.N. Arya, Scientist (S-1)	Delivered a lecture on "Estimation of Birth and Death Rates in Bovines", to CSO trainees on 13th June, 1984 at IASRI, New Delhi.
Shri Chandrahas, Scientist (S-1)	Delivered lectures to JCC trainees of CSO on sample surveys used in Forecasting Crop Yield on 14th, 21st and 22nd June, 1984.

Sh. K.B. Singh, Scientist (S-1)	Guieded a UNDP fellow from Afghanistan on the Livestock products surveys conducted by this institute, on 3-4-1984.
Sh. R.S. Khatri, Scientist (S-1)	Delivered two lectures on, "Sample surveys on livestock" to CSO trainees at IASRI, New Delhi on 11th and 15th June, 1984.
Sh. H.C. Jain, Scientist (S-2)	Participated in the meeting of the Working Group on "Statistical Assessment of yield advantages from Intercropping Systems in Dryland Agriculture" held at IASRI, on 21st and 22nd Sept., 1984.
Dr. H.V.L. Bhathla, Scientist (S-2)	Delivered a lecture regarding activities of the Sample Survey Methodology division to the M. Sc. (Stat.) students of Andhra Pradesh University, Waltair on 2-1-1984.

1.19 Other Information :

Prof. Prem Narain, Director, participated in the following deliberations of the Focal Theme Sysmposium.

(a) In the Section of Statistics dealing with, "Statistical System in India-Quality of its output", and made observations on the agricultural statistics system in India in relation to the quality of output of statistics pertaining to crops, livestock, fishery and forestry.

(b) In the section of Anthropology, and Archaeology in the discussion relating to special lecture on "Nature, Nature and Adaptation".

At the 71st conference of Indian Science Congress Association held at Birla Institute of Technology, Ranchi from 3rd to 5th January, 1984.

He was appointed a member of the Scientific Advisory Committee of the Institute for Research in Medical Statistics, New Delhi and attended the meeting of this Committee held on 24-1-1984.

He visited the village Nilothi adopted under Lab to Land Programme. He met the families adopted under L.L.P. and discussed various components of the Programme.

He attended, as Chairman, the 3rd meeting of the Sectional Committee on Sampling Methods for food products and agricultural inputs, AFDC-57 of

the Indian Standards Institution at Mohan Meakins Ltd., Ghaziabad, U.P. on 27th Feb., 1984.

He was nominated as Member of the Technical Evaluation Committee for evaluation of the design and methodology on collection of catch statistics of fish from different inland water resources, monitoring of progress of work and suggestions on improvement of sampling system for the Central Sector Scheme on Development of Inland Fisheries Statistics for implementation at CIFRI, Barrackpore.

He was nominated a member of the Sub-committee for consideration of ad-hoc research project entitled 'Survey of animal draught power in various agro-climatic zones of the country, socio-economic features and current husbandry practices', constituted by ICAR.

Prof. Narain was also nominated by the ICAR on the Committee of Director for the Bureau of Animal Genetic Resources and the Institute of Animal Genetics for formulation of detailed programme.

Dr. S.S. Pillai, Jt. Director (CC) acted as Director of IASRI during the absence of Prof. Prem Narain, Director who was on a Study tour to U.K., U.S.A. and Canada on 10th June, 1984 for a period of one month.

Dr. Pillai, was also nominated as the chairman of the Programme Committee for the CSI-85-Convention by the Executive Committee of the Computer Society of India.

Dr. S.K. Raheja, Sr. Scientist was nominated member of the Accreditation Team Constituted by D.G., ICAR for setting up an independent Department of Agril. Statistics, Physiology and Meteorology at P.K.V., Akola, Maharashtra.

He discussed the implementation of the project, "Sample Survey for study for constraints in the transfer of improved agricultural technology under fields conditions" and concurrence of state Govt. of Orissa & Rajasthan.

He visited Orissa and West Bengal for assessment of Lab to Land Programme work in Zone-II.

He was president of the Institute Sports Committee and Chief the Mission of Institute contingent at the ICAR Zonal Tournament at New Delhi in 1984.

He visited Zone-III Centres in Assam, Tripura, Meghalaya and W. Bengal as a member of the Evaluation Committee of ICAR Lab to Land Project during April-May, 1984.

Dr. Raheja also visited Lab to Land Centres in Andhra Pradesh, Maharashtra, Gujarat and Rajasthan States as a member of the evaluation committee of ICAR Lab to Land Programme.

Dr. M.G. Mittal, Scientist (S-2) attended course on Statistical Procedures for monitoring of IRDP held at National Institute of Rural Development, Hyderabad during 23rd Jan., to Ist Feb., 1984.

Dr. Randhir Singh, Scientist (S-2) was invited to contribute an entry on "PREDECESSOR-SUCCESSOR Method" to the Encyclopedia of Statistical Sciences to be published by John. Wiley & Sons Inc.

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

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

The following scientists were deputed by the Institute for attending 15th Orientation Course on Agricultural Research Management, being conducted by the National Academy of Agricultural Research Management, Rajendra Nagar, Hyderabad (A.P.) from 6th June to 5th July, 1984.

1. Shri Satya Pal, Scientist (S-1)
2. Dr. D.L. Ahuja, Scientist (S-1)
3. Dr. G.C. Chawla, Scientist (S-1)

2. STATISTICAL RESEARCH IN CROP SCIENCES

The work on statistical research in crop sciences 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 asosciate (S) are given in brackets at the end of the description of each project.

2.1 Coordination and Planning, Designing and analysis of Experiments planned under AICARP (All India Coordinated Agronomic Research Project at CSR (Cropping System Research) Centres and on Cultivator's Fields.

The objectives of the project were - (i) to provide the statistical designs and methods of analysis for the expts. planned at Cropping Systems Research Centres under AICARP, (ii) to provide suitable sampling plan, designs of expts. and their method of analysis for the expts. on cultivators fields, (iii) to undertake the analysis and interpretation of the data of the expts. planned under AICARP both at cropping systems research centres and on cultivators' fields, (iv) to devise suitable proformae for recording of data and to prepare instruction manuals for coding of data and (v) to coordinate the work of the project at National level and also to provide necessary information to Project Coordinator, Planning Commission, ICAR and various other agencies on their requests.

The main thrust of research programme during the period under report was for the development of suitable cropping systems and their management practices including the requirement of fertilizers and other associated agronomic practices. The technical programme for the conduct of research under the project was therefore accordingly modified. Some new series of experiments were planned at cropping system research centres to include expts. on crop technology for optimum production under resource constraints, double cropping in rainfed areas, weed control crop sequence fields expts. were also planned to test the performance of promising crop sequences and their management practices in different agro-climatic regions. In the dryland areas the feasibility of growing double cropping and intercropping were tested. Apart from this, the effect of different weed control measures on the individual crops was also studied on cultivators' fields.

At cropping systems research centres, the designs adopted for the conduct of expts. were RBD, split-plot, split-split plot, confounded factorial etc. The appropriate method of statistical analysis was applied for their analysis. In simple expts. on cultivators' fields a three stage random sampling design was adopted to select the experimental site. The designs adopted for the conduct of the expts. were mostly RBD and split plot. Analysis of these expts. was also carried out by adopting the suitable statistical technique.

14 types of complex expts. were planned at 43 cropping systems research centres spread over different agro-climatic zones. The simple expts. of 8 type of cultivators, fields were planned in 49 districts spread over different agro-climatic zones. The total number of expts. available from 43 cropping systems research centres were about 500 and on ECF the total number of trials were around 7,000.

The expts. planned to study the relative performance of production potentials of crops under multiple cropping system (under optimum resources and constraint inputs) in terms of their biological stability, agronomic productivity, economic profitability and social acceptability suggested that it is possible to harvest 8-10 tonnes grain/ha per annuam under good level of management either by growing two cereal crops in succession or by growing a cereal crop followed by a grain legume or oilseed crop.

Studies on constraints limiting productivity involving interaction between monetary inputs like fertilizer and other agro-chemicals without various other crop factors like soil moisture, crop stand, date of sowing and weed control in selected cropping systems have clearly shown that delay in planting/sowing of cereals like rice and wheat by 20 days accounted for a yield reduction of about 5q/ha in rice, 7q/ha in wheat, 17q/ha in jowar and 12q/ha in bajra and around 3q/ha in gram. In crops like groundnut, pigeonpea and gram plant population had a very significant influence on yield. By maintaining the optimum plant population there was a gain in yield by 2.1q/ha in rice, 1.7q/ha in wheat, 4.3q/ha in jowar and 1.8q/ha in bajra. The effect of irrigation was generally significant for rabi crops. The crops like gram, lentil, sunflower and castor appeared to be less sensitive for irrigation.

The expts. were also planned to study the possibility of economising the chemical fertilizers through organic manures in selected crop sequences. The results indicated that kharif manuring generally had very little influence on the grain yield of rabi crops in rice-rice, maize-wheat and bajra-wheat sequences,

while in case of rice-wheat, rice-jowar and jowar-wheat sequences kharif manuring left a residual effect when part of chemical fertilizer was applied as FYM. It was also observed that in rice-wheat manuring the economy of fertilizer application in kharif is possible to the extent of 25-50% but for rabi wheat the full dose of chemical fertilizer is required. In rice-rice and rice-wheat rotations, it was generally not possible to reduce the fertilizer application for rabi crop whereas in the case of maize-wheat, rice-jowar and jowar-wheat rotations, it was possible to scale down fertilizer recommendations in rabi without any adverse affect on grain yield.

A general review of the results on evaluation trials involving various sources and levels of phosphorus in selected cropping systems indicated that there was response to this nutrient upto 90 kg. P_2O_5/ha in the laterite soils of Kharagpur, deep black soils of Siruguppa and in the red sandy soils of Bhavanisagar in rice-rice sequence and the performance of DAP Mussorie-phos and Phosphal were comparable to applied in the form of superphosphate. In rice-wheat, maize-wheat and bajra-wheat rotations the response to phosphorus was significant upto 90 kg P_2O_5/ha at most of the test locations. Unlike in the rice-rice rotation, phosphorus applied as DAP generally gave the best results at Ludhiana in maize-wheat rotation and at Hissar and S.K. Nagar in bajra-wheat rotations. Mussorie-phos applied in conjuction with FYM gave better results at Pantnagar and Palampur, while at Titabar phosphorus applied alone proved to be better.

Expts. on cultivators' fields :

Studies on rationalisation of inputs by evolving a proper blend of monetary and low-monetary inputs giving due emphasis to associated cultural and management practices, have shown that there is a significant yield reduction of about 5.0q/ha in the grain yield of kharif rice with a 25% reduction in fertilizer dose while with a further reduction of fertilizer to 50% there was a total reduction in grain yield by 9.0q/ha. However, in rabi rice and wheat the magnitude of yield reduction was significantly more than in kharif rice. Next to fertilizer, plant population appeared to be major constraint limiting the yield levels in cultivators' fields. A 25% reduction in plant population accounting for an yield reduction of 3.0q/ha in kharif rice and more than 4-5 q/ha in wheat.

Double cropping of maize and wheat at Ropar (Punjab), rice and mustard at Sambalpur (Orissa), rice and wheat at Bhandara (Maharashtra) and Sindhi

(M.P.), using appropriate varieties and recommended levels of fertilizers, recorded higher yield levels and income under rainfed conditions. Under irrigated conditions, a cereal-pulse rotation is found most promising. The input use was generally more in purely cereal based rotations, while it was the minimum in oilseed-pulse rotation. The available results are suggestive of diverting atleast a small percentage of irrigated areas which are presently being covered by purely cereal based rotations, to be brought under pulses and oilseeds.

Intercropping of mustard+wheat at Dhenkanal (Orissa), Ragi+soybean at Kolar (Karnataka) and of groundnut+blackgram at Tiruchirapalli ((TN) recorded encouraging results even under rainfed conditions. The trend of the results from all the three districts clearly show that it is possible to include a legume like soybean, blackgram or greengram as an intercrop with the major cereal crop of that region, towards increasing the general yield levels.

Studies on the effectiveness of different methods of weed control in crops have revealed that the grain yield response to weed control using a recommended herbicide followed by spot weeding was comparble to those under mechanical weed control with one or two interculturing and one or two hand weeding and these in turn were significantly superior to the normal weed control practices being followed by the farmers in rice, wheat, maize, jowar, groundnut and cotton.

(P.N. Bhargava, P.N. Soni, H.C. Jain, B.L. Chowdhary, P.K. Batra and Mrs. Rajindra Kaur).

2.2 Agricultural Field Experiments Information System :

The objectives of the project are (i) Collection of data of all the agricultural field experiments, excluding purely varietal trials, conducted at the various research stations and Institutes in the Country, (ii) Transferrence of data to and storage in magnetic tapes at a central place (I.A.S.R.I.), (iii) 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 regional staff reported during the year, data relating to 1,450 experiments conducted since 1972. Inclusive of these, data of about 19,750 experiments for the period 1972-77 and 7,050 experiments for the period 1978 and onwards have so far been reported to the Institute. For the period 1978 and

onwards, details of about 2,100 experiments were also reported on the coding schedules prescribed for the Agricultural Field Experiments, Information System. Inclusive of these, about 3,100 experiments for the System have so far been reported to the Institute. The data of experiments are analysed by using the appropriate techniques according to the designs adopted in different experiments. The scrutiny of the experimental data received in respect of A.F.E.I.S. was undertaken and the coded data after correction was being transferred on punch cards. About 750 experiments reported during 1983 for the System were loaded on tapes. The printing of "Annual Index of Agricultural Field Experiments", Vol. IX (in respect of expts. reported to the Institute during 1980) was completed. The press material of the "Annual Index of Agricultural Field Experiments", Vol. X (in respect of expts. reported to the Institute during 1981) was finalised for printing. The material for Vol. XI (in respect of experiments conducted during 1972-77 and reported to the Institute in 1982 and 1983) was under process. The editing of the material to be included in the volumes on Summarised Results of experiments on groundnut and cotton conducted in the country during 1966-77 was in progress. Preparation of the similar report on sugarcane was also in progress. Crop wise and Type-wise Pie-dia-grams in respect of the experiments conducted during the periods 1972-77 and 1978 and onwards were prepared for display at the Exhibition organised as a part of the Silver Jubilee Celebration of the Institute in October, 1984. A flow chart for the Agricultural Field Experiments System was also displayed.

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

2.3 A Statistical Study on characterization of drought in relation to a crop.

The objectives of the project are (i) to quantify drought threshold values in relation to a crop and (ii) to obtain their chances of occurrence. Yield data for Jowar, Bajra, Cotton and Groundnut was collected for Ahmendnagar and Bijapur district. Correspondence with IMD, Pune for collection of weekly rainfall data for these two districts was in progress. Trend in the field data was examined by using regression technique.

(Asha Saksena and S.C Mehta)

2.4 Statistical assessment of changes in area and food production due to availability of water in the command area of Malaprapha-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. Technique applied for analysis of the data is regression and summarisation.

Study was taken up for the command of Sreeramsagar (Pochampad) river valley project during the year and completed. Collection and analysis of data on area, production, productivity, rainfall, land development etc. for the command was done. Experimental data on response to different agrotechniques were compiled. Report for this command was prepared. The report was referred to external referee after internal referring. Comments received from external referee have been examined and the report resubmitted.

Sreeramsagar (Pochampad) river valley project is a multipurpose project planned to provide irrigation to the low and erratic rainfall area (920 - 1048 mm per annum) in the northern districts of Andhra Pradesh. The command area of 6.50 lakh hectares is to cover six taluks of Karimnagar, two taluks of Nizamabad, five taluks of Warangal, three taluks of Nalgonda, one taluk of Khammam and four taluks of Adilabad districts. Stage I of the command with an area of 2.91 lakh hectares is partially developed and assessment relates to this area. Light irrigated crops are proposed to be grown in 2/3 of command area. Important cereals are rice, maize and jowar accounting for 31.6%, 21.1% and 3.5% respectively. Groundnut is the most important oilseed crop. Irrigation potential created by June 1983 is 71.1% of the ultimate potential and land levelled is 31.8% of potential created.

With the availability of water, the productivity of cereals have increased by about 37% and that of groundnut by 30%. Area under rice has been increasing at the highest rate and targets have already been achieved. Faster growth rate in area and production have to be planned to attain targets of irrigated dry crops. There is scope for higher production in the command area through adoption of agrotechniques.

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

2.5 Yardstick of additional production of rice crop from the use of fertilizers.

The objective of the project is to workout the Yardstick of additional production of rice crop from the use of fertilizers based on the data of experiments on cultivators fields. Response of rice to fertilizer at district level were pooled over years and response functions fitted on the pooled data to estimate the response of rice to plant nutrients Yardstick of additional production and cost benefit ratio due to fertilizer application. The estimates were obtained at district, state and agroclimatic region levels.

Data of fertilizer experiment conducted on cultivator's fields during the period 1977-78 to 1981-82 (5733 experiments) were collected and analysed.

(V.N. Iyer and Onkar Swarup)

3. CROP FORECASTING METHODOLOGY

The progress of work under various research projects of the Division of Crop Forecasting Methodology 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 jowar yield on the basis of observations on biometrical characters Sangli district (Maharashtra).

The objective of the project was to develop statistical methodology for obtaining pre-harvest forecasts of jowar yield on the basis of observation on biometrical characters recorded at various stages of crop growth.

The final report of the project was issued. The study showed that yield forecast of local jowar was not possible using observations on biometrical charcters alone but forecast of hybrid jowar yield could be obtained one month before harvest for a crop of three and half months duration by using growth indices of biometrical characters.

(R.C. Jain, M.P. Jha and Ranjana Agrawal)

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

The objectives of the project were (i) to estimate the level of incidence of pests and diseases in high yielding varieties of paddy, (ii) to estimate the crop loss as a consequence of the incidence of pests and diseases and (iii) to estimate the extent of loss in crop yield avoidable through the adoption of suitable plant protection measures. The technique developed by the Institute involving Multiple Regression Analysis was employed for estimating the crop loss due to pests and diseases in which principal components of the incidences of pests and diseases at various stages were used as regressors. The avoidable loss in crop yield was estimated on the basis of paired differences in crop yields of treated and control plots.

The data for Samba season 1977 were analysed for obtaining crop loss due to pests and diseases. The data for Navarai season 1979 were analysed for

obtaining the avoidable loss in crop yield through the adoption of suitable plant protection measures.

The salient results obtained are given as follows :

For Samba season 1977, the crop loss due to pests and diseases was estimated as 3.25% (S.E. 1.07). The major portion of which viz., 1.48% was due to earhead infection by helminthosporiose. The avoidable loss in crop yield during Navarai season 1979 for the district was obtained as 5.50% (S.E. 7.30%) which in terms of absolute loss was estimated as 255 Kg/ha (S.E. 18.69 Kg/ha).

(K.G. Aneja, M.P. Jha, G.N. Bahuguna and V.K. Mahajan)

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

The objective of the project was to develop techniques for obtaining pre-harvest forecasts of apple yield on the basis of data on biometrical characters, weather variables and crop inputs.

In all 720 trees were selected in the sample for recording of data on various biometrical characters and agricultural inputs. The biometrical characters, on which measurements were taken, included girth and height of tree, spread of canopy, intensity of flowering and number of apples of peanut, and lemon size per tree. Weather observations recorded included daily maximum and minimum temperature relative humidity and sunshine hours. Treewise information on prunning, quantum of fertilizers and manures applied alongwith plant protection chemicals were also recorded.

Field work for collection of data remained in progress in Rampur and Narkanda Blocks of Simla district. The collected data on biometrical characters and management practices, etc., were scrutinised and coded for transferring on punched cards. Further collection of data for the next apple season remained in progress.

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

3.4 Pilot sample survey for estimating the incidence of pests and diseases and consequent loss in crop yield on high yielding varieties of wheat in Gorakhpur district of Uttar Pradesh.

The objectives of the project are (i) to estimate the level of incidence of pests and diseases in high yielding varieties of wheat, (ii) to estimate the crop

loss as a consequence of the incidence of pests and diseases and (iii) to estimate the extent of loss in crop yield avoidable through the adoption of suitable plant protection measures.

The work of the project had been completed and the final report was published in cyclostyled form. The salient results are summarised as follows:

(a) Incidence of Pests and diseases

The major pests which affected the wheat crop in Gorakhpur district of Uttar Pradesh during both seasons viz., rabi 1978-79 and rabi 1979-80 were found to be termites, aphids and rats. The incidence of termites, in terms of percentage number of clumps affected was obtained as 0.06 at both the first and second stage it 15 days add 30 days after germination respectively. The average incidence of aphids in terms of percentage number of tiller affected was estimated as 0.25 (S.E. 23.67%) at the fourth stage i.e. 60 days after germination. The maximum average incidence of rates in terms of percentage number of earheads affected was obtained as 0.54 (S.E. 8.56%) during 6th stage i.e. 90 days after germination.

The major diseases affecting the crop was found to be alternaria bight and its incidence in terms of average infestation score ranged between 0.08 to 2.48 from first to fifth stage. The maximum incidence was estimated as 2.48 (S.E. 3.37%) and it occured during the fifth stage i.e. 75 days after germination. The other disease affecting the crop was brown rust but its incidence was quite low. The average infestation score ranged between 0.37 to 0.42 during the last three stage i.e. from 75 days after germination through harvest time.

(b) Crop loss due to pests and diseases

The overall crop loss due to pests and diseases was estimated as 4.56 per cent and 2.56 per cent during 1978-79 and 1979-80 respectively. The major proportion (about 92%) of this overall loss was due to rates and alternative blight in both the years.

(c) Avoidable loss in crop yield

The avoidable loss in crop yield through the adoption of suitable plant protection measures against pests and diseases was found to be 12% or equivalently 411 kg/ha with a standard error of 2.88%.

(d) Sample size

The sample size study showed that by fixing the number of fields per village as 4 and number of plots per field also as 4, the sample size needed for estimating the incidence of various pests and diseases varied between 50 to 100 villages with a standard error of 10 per cent and between 80 to 200 villages with a standard error of 5 per cent. However, by using 6 fields per village and 4 plots per field, 40 to 85 villages were required to be sampled for estimating incidence of various pests and diseases with a standard error of 10 per cent while 70 to 160 villages were needed for such estimation with a standard error of 5 per cent.

(G.N. Bahuguna, K.G. Aneja and V.K. Mahajan)

3.5 Pilot studies on pre-harvest forecasting of yield of groundnut in Rajkot district, Gujarat.

The objective of the project was to develop the suitable statistical methodology for obtaining pre-harvest estimates of yield of groundnut on the basis of observations made on biometrical characters, weather variables and agriculture inputs. Primary data from selected fields of groundnut in Rajkot district for Kharif season were scrutinised.

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

3.6 Studies on forecasting crop yield on the basis of weather parameters.

The objective of the project was to study effects of weather variables on rice yield and develop forecast model using weather parameters.

The final report on the project for rice crop in Puri district was issued in cyclostyled form. The study revealed that above average maximum daily temperature had beneficial affects during early weeks of initial growth and ripening stage ; detrimental effects during later weeks of initial and reproductive stage of the crop while during active and lag vegatative phase effects were fluctuating. The effect of increase in minimum tempeature was beneficial during initial, lag vegetative and reproductive stages ; detrimental during ripening stage and fluctated during active vegetative stage. Above average relative humidity and rainfal had beneficial effects throughout the growth and detrimental effects during the ripening phase of the crop in general. The effects of rainfall and increase in number of rainy days were fluctuating

upto lag vegetative, beneficial during reproductive and detrimental during ripening stage of the crop. Effects of increase in sunshine hours were detrimental during initial growth, active vegetative and reproductive stages, fluctuating during lag vegetative and beneficial during ripenning stage of the crop. Studies on joint effects of maximum temperature and sunshine hours revealed that the effect of maximum temperature on yield was affected positively/negatively by increase in sunshine hours during the weeks when the individual effect of increase in sunshine hours, on yield was beneficial/detrimental. The effect to suushine hours on yield increased in magnitude with increase in maximum temperature throughout the crop season. Study on forecast model revealed that the model using data on maximum temperature and sunshine hours upto 10th week after sowing could be used for forecasting rice yield in Puri district.

(Ranjana Agrawal, R.C. Jain and M.P. Jha)

4. STATISTICAL RESEARCH IN ANIMAL SCIENCES

The work of statistical research in Animal Sciences was continued during the year under report as per the 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 names of the concerned project leader and his associate(s) are given in brackets at the end of the description of each project.

4.1 National Index of Animal Experiments :

The objectives of the project were to collect, analyse and record on uniform lines the research of all experiments on animals conducted at various research stations in the country during the past and to publish periodically the same in the form of compendia for the benefit of research workers and planners. The analysis of variance and co-variance and regression techniques were applied in the analysis of the data.

(a) Southern and Esteren Research Station :

Data on a large number of experiments conducted at College of Veterinary Science and Animal Husbandry, APAU. Rajendranagar, Hyderabad were scrutinised, tabulated and analysed. About 100 experiments on poultry nutrition were finalised for the format of presentation of the compendium to be published. Most of the experiments compiled belong to Completely Randomised Design (CRD).

(G.C. Chawla and A. Dey)

b) North-Western Research Stations :

250 experiments pertaining to Mathura Campus of University of Agriculture and Technolagy were scrutinized and 45 experiments pertaining to Central Arid Zone Research Institute Jodhpur were analysed. Compendium pertaining to these experiments was finalised.

(S.N. Bajpai and A. Dey)

4.2 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. This will involve three aspects, viz (i) formulation of concepts., definitions and questionnaires, (ii) sqecification of sampling design and (iii) development of estimation procedure.

Data on number of all categories of ovines were collected from all households in 105 randomly selected villages spread over the seven strata formed according to geographic contiguity of 10 talkuks of Tiruchirapalli district. These data were scrutinised and coded during the year. Analysis was in progress. The data of detailed inquiry from the selected household in each village for the 3 rounds at an interval of 2 months each were collected by the field staff.

Preliminary enumeration of 105 randomly selected villages spread over seven strata was started after the necessary training of the field staff was completed. Further, training was imparted to the field staff for detailed enqury. The collection of data of detailed enquiry from randomly selected households, in each village was started in June. Three rounds of the survey were completed. Necessary inspection tours were taken by Supervisors, Field Officers and scientists.

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

4.3 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.

Data collected from preliminary enumeration of 120 villages selected for the purpose in Ranchi Sadar and Simdega sub-divisions of Ranchi district in Bihar were utilised. Under detailed enquiry data regarding the various components of costs collected at fortnightly intervals from 170 households over 34 villages were also utilised.

Out of villages having pigs in Ranchi Sadar and Simdega sub-divisions, 120 were selected for preliminary enumeration by probability proportional to pig population in the village. Out of these, 34 villages were selected for

detailed enquiry by simple random sampling. Households in each of these 34 villages were stratified into 3 groups having 1 to 3, 4 to 6 and 7 and more pigs are household. Five households spread over these groups were selected from each village.

The training to the field staff for preliminary enumeratinn work was given in February, 1984 and the work was completed in April 1984. Training to the field staff for filling the data in schedules of detailed enquiry was given thereafter, and the detailed enquiry work started in May, 1984.

The entire data of preliminary enumeration collected from 120 villages were tabulated and the schedules received under detailed enquiry were being scrutinised and coded. The field survey work was supervised by undertaking intensive tours and the same was in progress.

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

4.4 Studies on comparative performance of mixed farming involving crops, livestock, poultry and fish.

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.

Keeping in view, the objectives of the project, suitable schedules both for preliminary enumeration and detailed enquiry were finalised for collection of requisite data. The field staff employed for the collection of primary data were given preliminary training at Bhubaneswar in September 1985, The work regarding collection of preliminary enumeration data from 54 villages selected in Salepur and Nischintkoile blocks of cuttack district commenced on 15.10.84 and the work continued during the year. The field work was inspected by one of the scientist from 11.12. 1984 to 15.12.1984.

Collection of data was in progress.

(Shivtar Singh, K.C. Raut and R.L. Rustagi

4.5 A compa rative study of some methods for estimation of mortality rates in bovines.

The objective of the project is to compare the estimates of mortality rates in bovines obtained by different procedures with a view to judging their relative merits.

The techniques mainly involved in the analysis are formation of sex-age distributions of cattle and buffalo populations over yearly age groups as well as over broad age groups, estimation of specific mortality rates by census method and Caughley's method, comparison of the estimates with those obtained by Fractional Exposures method, and regression analysis for relating the average population to the fractional exposure.

The data used in project were collected by a large scale sample survey conducted in Punjab for pilot studies on estimation of birth and death rates in bovines. The data pertain to about 2700 households in 90 villages of Amritsar district-an area under ICDP. Non-descript cattle formed the largest proportion of cattle population in the area, while Murrah breed was predominant in the buffalo population. Data on about 3,100 cattle and 5,500 buffaloes were included for analysis. Data on the estimates of death rates obtained earlier were also used for comparison.

The results obtained from the analysis were tabulated and draft write-up prepared. Further work was in progress.

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

4.6 Pilot survey to study the performance of cross-bred cattle under village conditions, Palampur area (H.P.)

The objectives of the project are (i) to evolve a technique for evaluating the performance of cross-bred and local cows under village conditions in respect of some economically important production traits and (ii) to study the constraints of adoption of cross-breeding in the area.

The production traits and associated parameters were estimated following the techniques appropriate for the character. The various production as well as adoptability characteristics were utilised to work out an index of overall merit.

Primary data were collected at monthly intervals from 768 randomly selected households maintaining milch stock, spread over 46 villages for a period of two years from April 1981. The type of data collected includes information on milk yield of individual animals, the quantity and composition of feeds actually fed, particulars of milch stock such as age at first calving, data of calving, data of drying order and stage of running lactation, etc. as well as information on bullocks. Information on market rates of feeds and fodders, labour wage rates, as also of market rates of milk and milk products was also collected.

The analysis of data was completed and the draft report on the project prepared. The draft report was further examined and inclusion of constraint analysis was considered necessary. This aspect was also being studied.

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

4.7 Pilot study for developing a suitable methodology for estimation of cost of cultivation of fodder crops, Jalandhar (Punjab)

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

Ratio mathod of estimation appropriate to a two stage random sampling design is being used for working out the estimates.

Data have been collected at regular fortnight intervals for kharif and Rabi seasons from 288 randomly selected cultivator households. The items of data collected pertain to the cost of various inputs viz. seed, mannure, irrigation, paid and unpaid labour and bullock/tractor labour, etc.

The field work of the project which was in progress since Feb. 1983 was completed in June, 1984, Scrutiny tabulation and statistical analysis of data was remained in progress.

(K.P.S, Nirman, Shivtar Singh and Hariom Aggarwal)

4.8 Estimation of cost of milk production in ICD area, Jabalpur (MP)

The objective of the project was to estimate the cost of production of cow milk and buffalo milk with a reasonable degree of precision and components of cost of production.

The project report was finalised and some salient results are as follows :

The data were collected by the State Government under the technical guidance of IASRI from 288 households spread in 36 clusters of villages. The type of information collected included particulars of individual animals such as age, breed and classification. Data on milk yield of individual animal and feed given to them were recorded by direct weightment. Information such as input on labour, market rates of feeds, labour wage rates was recorded through careful observations and enquiry.

Ratio method of estimatian in a stratified two stage random sampling was used for obtaining the estimates.

The average number of households per village in ICD area, Jabalpur was 68, of which 82 per cent were having bovines. On an average, 222 cattle and 43 buffaloes were maintained per village. About 66 per cent of households maintained only milch cows and 25 per cent had both milch cows and buffaloes and 9 per cent had only milch buffaloes.

The overall net cost per kg. of cow milk in two years including family labour was Rs. 2.54 in the first year and Rs. 2.34 in the second year. The corresponding estimates excluding family labour in two years were Rs. 2.12 and Rs. 1.80 respectively. Lower Cost of production in second year was due to lower feed cost.

The net cost per kg. of buffalo milk including family labour was Rs. 1.66 in the first year and Rs. 1.56 in the second year. The corresponding net costs excluding family labour in the two years were Rs. 1.38 and Rs. 1.25 respectively. Lower cost of production per unit of buffalo milk in the second year was due to lower feed cost, this was due to feeding less of dry roughages and concentrates as compared to first year. The average market rate per kg. of buffalo milk was Rs. 1.60 in the first year and Rs. 1.83 in the second year.

The average maintenance cost including family labour for a milch cow was estimated to be Rs. 1.67 in the first year. and Rs. 1.30 in the second year. The corresponding estimates for a milch buffalo were Rs. 2.35 in the first year and Rs. 2.01 in the second year.

(K.P.S. Nirma n, K.C. Raut and Shivtar Singh)

4.9 Optimum ration for animal production through linear programming techniques in India.

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

Using the constraints for the requirements of TDN, DCP, Dry matter, Energy, Calcium, Phosphate 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 North and South Zone were obtained. Data cards for similar results for other zones (East & West) were also prepared.

In the case of ovines, in addition to above constraints a constraint on CP was also to be used, These constraints for requirements for sheep were also calculated.

(U.G. Nadkarni and LBS Somayazulu)

4.10 Development of a suitable statistical methodology for estimating extent of labour utilization in livestock and poultry keeping in rural areas Meerut (district UP)

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. Stratified two-state random sampling with Tehsils as strata, cluster of 3 villages each as P.S.U's., and households within each selected clusters as S.S.U's. Primary enumeration of households in the project area which was in progress, which was initiated during Dec. 84.

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

4.11 Construction of life tables in bovines

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

The age-specific mortality rates of either sex of bovines already obtained in the project entitled 'Estimation of birth and death rates in bovines' carried out in (a) Vijayawada district (Andhra Pradesh), (b) Amritsar and Ferozpur districts (Punjab), (c) Kaira and Panchmahal districts (Gujarat) and (d) Kamrup district (Assam) were utilised.

The current life tables were constructed by adopting the standard method used for similar studies on human population. A proper formula was derived and used to obtain the sample variance of observed expectation of life.

The officers of General Insurance Corporation of India were also approached through correspondence and personal visits to get working knowledge of calculation of age-specific premium rates for cattle insurance. The project report was finalised and some salient results are as follows :

The standrard errors and coefficients of variation of observed expectation of life for different ages of cattle were obtained in respect of Assam centre. The coefficient of variation was less than 3 per cent in all these cases.

The differences between observed expectations of life for respective age groups were tested beween different breeds with ICD and non-ICD area and within breeds between these areas. These comparisons give some indications for the formation of uniform groups of breeds of cattle and buffalo for calculation of premimium rates, projection and for taking other developmental measures.

A note on age-specific premium rates for cattle insurance was finalised and sent to concerned persons and organisations for their comments and suggestions. The suggestions received were incorporated in calculating the premium rates.

The age-specific premium rates were calculate for non-descript cattle and buffaloes in Andhra Pradesh; non-descript cattle and Surti buffaloes in Gujarat and for non-descript cattle in Assam. It was observed that the premium rates based on actual mortality for lower age groups are much higher as compared to those charged by the General Insurance Corporation (G.I.C.). In case of male and female cattle and only female buffaloes of age between 3 to 8 years, the premiums worked out are either less or equal to those of G.I.C. in all cases except for female cattle of Punjab where there were about double of those of G.I.C. For male buffaloes the premiums are always more than those charged by G.I.C.

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

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

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

The data pertaining to 75 per cent villages of the I.C.D. area, Gujarat was ordered villiage-wise and taped. The villages were grouped into 15 groups of 5 villages each at random, Ten groups out of 15 were selected into a sample to make 50 villages. All samples $^{15}C_{10}$ (3003) were considered for obtaining estimates of age specific mortality and fertility rates in bovines.

Programme was developed for generating the samples and these were taped. Another programme was developed to calculate the mortality and fertility rates

in various categories of bovines by calculating the exposure of animals and the number of births and deaths. Obtaining of the rates was in progress for each of the 3003 samples of 50 villages each. Results for about 200 samples were obtained.

(L.B.S. Somayazulu and S.N. Arya and S.C. Agarwal)

4.13 Study of socio-economic changes in respect of milk-production, employment and income in milk shed areas of MMS, Tamil Nadu.

The object of the project is to study the changes in respect of milk production, employment and income in different agricultural holding groups. Two stage stratified sampling design with clusters of villages as the p.s.u.'s and households within a cluster as s.s.u.'s was utilised.

The present study is based on the data already collected during 1975-76 under the bench mark survey and during (1979-80) in repeat survey of the project entitled, "Impact of milk supply schemes on rural economy in milk collection areas of MMS, Chingleput-Tamil Nadu.

Since the main aim of the present investigation was to estimate the changes over a period of time in respect of various charcters under different agricultural holdings, it was necessary to reclassify all the households of different types in the selected clusters of villages. On the basis of the information obtained on holding groups viz. less than 1 hectare, 1-2 hectares, 2-4 hectares and above 4 hectares were formed. Statistical analysis in respect of milk yield, employment and income according to these four agricultural holding groups was carried out and the report was drafted after incorporting the final summary tables. During the year under report the report of the project was examined by the internal as well as external referees. The comments were incorporated and the report was finalised. Some salient results are as follows :

The estimates of various response indicators obtained in different holding groups were pooled and compared with the estimates obtained by simple random sampling. It was seen that the post-stratification adopted in the present study increased efficiency of various estimates.

Surprisingly, the increase in daily milk production was very little in landless and marginal farmers in comparison to medium large farmers. This was so because the former type of farmers were mostly of non-commercial type. In consequence with this finding, the gross annual income of small, medium

and large farmers increased substantially over the two occasions, whereas those of landless and marginal farmers remained almost static.

As regards working force in different holding groups roughly 3 to 10% workers increased in all the holding groups except that the proportion was higest in the medium-large and the landless groups.

(B.C. Saxena, H.P. Singh and S.P. Verma)

4.14 Development of suitable methodology to study the effect of housing conditions and other factors on 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 indentified as important.

Data on milk production, amount of feeding and information on management factors covering housing conditions, feeding and milking practices, animal care etc. from 192 households were collected. Scrutiny of the data schedules was almost over. Preparation of card designs has been taken up.

(V.T. Prabhakaran and Bhagwan Dass)

5. SAMPLE SURVEY METHODOLOGY

Sample survey investigations are undertaken by the Institute with a view to evolve suitable sample survey techniques and demonstrate the applicability of the techniques of collection of information to various disciplines of agriculture and animal husbandry. The investigations which were in progress during the year under report, as per programme laid down, are briefly described in the following sub-sections. Name of project leader and his associate (s) are given in brackets at the end of the description of each project.

5.1 Pilot Sample Survey to study the impact of new technology on crop production, its disposal and employment in agriculture in Delhi State

The objectives of the project were to develop a suitable sampling methodology for studying the impact of new technology on (i) area, yield and production of crops (ii) storage and disposal of crops including sale and (iii) labour employment in the holding and employment of the members of the family of cultivators.

Final report of the project 1976-77 to 1979-80 was finalised in the light of the comments of the internal and external referees and approved for publication. Some salient results are as follows :

The proportion of farmers adopting HYV seeds in their entire area under bajra remained more or less stable around 54 percent over the four years while for wheat this proportion showed an increasing trend from about 67 percent in the first two years to 91 per cent in 1979-80. The adoption rate generally increased from very small to large holdings in case of bajra but this trend was reverse in case of wheat. The proportion of HYV wheat area receiving N and P as well as their average rates of application were more or less of the same order over the four years period being around 95 and 55 percent and 60 and 45 kg/ha respectively. However, for hybrid bajra the proportion of area receiving N was highly variable ranging from 20 to 60 percent while its rate was more or less stable being around 40 kg/ha. Use of K for wheat and P and K for bajra was rare. Almost the entire HYV wheat area received irrigation while for hybrid bajra irrigation was rarely given. Use of improved implements was

reported in a substantial proportion of the area in small and large holdings while in medium holdings this proportion was low. Hybrid bajra seed was generally obtained from institutional sources while HYV wheat seed was by and large procured from non institutional sources. Adoption of protective measures against seed borne diseases, attack of plant diseases and insect-pests, field rates and weeds were rarely taken. The main constraints in the adoption of HYV seeds were poor quality of HYV grains, inadequate water supply and low fodder availability. In case of fertilizers the main constratins were unfavourable weather, inadequate water supply, adequate use of mannures, adverse effects of fertilizers in the long run and lack of funds. The proportion of farmers availing credit facilities was either nil or negligible. The estimates of area covered under HYV of bajra and wheat as well as estimates of their avarage yield were obtained with a fairly high degree of precision. The additional yield obtained for HYV varieties of bajra and wheat was quite encouraging over the four years period. The area covered under HYV of bajra and wheat crops increased over the four years period.

In case of bajra on an average as many as 50 per cent of the farmers had no surplus, 30 per cent sold out their surplus immediately after harvest, 5 per cent partly sold out and partly retained the surplus for later disposal while the rest of the 15 per cent retained their full stock of surplus produce for later disposal. In case of wheat crop, on an average nearly 35 per cent of the farmers had no surplus, 25 per cent sold out their surplus produce immediately after harvest, 20 per cent partly sold out and partly retained the surplus for later disposal and the remaining 20 per cent retained their entire surplus for later disposal. These proportions were more or less stable over the four years period in case ef wheat while for bajra these proportions rather varied widely. A large majority of the holdings particularly small and medium used their living rooms for storage purposes. Within the living rooms the foodgrains were stored in gunny bags by nearly 80 percent of the holdings. The remaining 20 percent used metallic containers.

Of the total family members nearly 54 per cent were not availble for work, of the remaining 46 percent about 30 percent reported agriculture as their occupation, 15 percent non-agricultural and 1 percent unemployed. On an average nearly 23 man-days were spent per hectare of the holding during kharif and 66 man-days during rabi. Family and hired labour accounted for nearly 60 and 40 per cent of the total man-days spent per hectare of the holding in kharif and 75 and 25 percent in rabi.

For measuring the impact of adoption of new technology indices of adoption rate of the different components of improved technology were developed-Simple index and weighted index. Alternative schemes of grouping the cultivators on the basis of their index of adoption were also developed. It was seen that the correlation between yield and index of adoption of new technology was significant in all the years. The weighted index appeared to be more useful when rate of adoption of various improved practices was quite good while if level of adoption of improved practices was poor, simple index appeared to be more appropriate. The average yield, average marketable surplus and the average number of man-days employed,worked per hectare were of a higher order for the group with higher adoption rate compared to that with lower adoption rate.

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

5.2 Pilot sample survey to evolve sampling methodology for estimation of losses in marketing and price spread at various stages and cost of cultivation of important vegetable crops in Delhi.

The objectives of the project were to evolve a sampling methodology (i) to estimate the losses taking place in marketing of vegetables, (ii) price spread at various stages of marketing of vegetables and (iii) to estimate the cost of cultivation of important vegetable crops. The appropriate sampling design was adopted.

The report on the aspect of cost of cultivation of vegetable crops was finalised and some salient results are as follows :

Cost of cultivation per acre of land of different vegetable crops was found to vary considerably from vegetable to vegetable. However variation in respect of same vegetable from year to year was small in most of the cases, this trend was increasing from year to year. The increase in cost varied between 5-10% from year to year. The cost of cultivation per acre of land for potato crop was maximum followed by cauliflower, lady's finger and tomato. The estimate of the cost of cultivation per acre of land were obtained with lesser precision. The S.E.'s of the estimates varied between 5-10%

(A.K. Srivastava and S.K. Raheja)

5.3 Pilot sample survey on cost of production of Banana/Mango and its marketing practices in Surat and Bulsar districts of Gujarat State

The objectives of the project were (i) to develop a suitable sample survey methodology for obtaining reliable estimates of cost of cultivation of Banana/ Mango and to standardize procedure for planning future surveys for collection of such data and (ii) to study the existing marketing practices of banana/mango in the region.

Data were collected by the method of cost accounting from the sample orchards selected according to the stratified two stage random sampling technique. Cost per unit of area, per (100) trees and per kilogram of mango and banana have been estimated according to the different concepts of cost with their respective present standard errors by considering the cost of raising a young orchard to its bearing stage and the Cost of maintaining a bearing orchard for the period of two years 1979-80 and 1980-81.

Project report was written (manuscript) and submitted to H.D. (SSM) for his comments.

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

5.4 A study of variability of various components of cost of cultivation of vegetables at different stages of sampling and determination of sample sizes for given levels of precision.

The objective of the project was to study the variability of various components of cost of cultivation of vegetables at different stages of sampling like villages, cultivators and fields etc., and determinating the optimum sample sizes.

The present study is based on the secondary data. The data collected in the pilot sample survey for estimation of cost of cultivation of vegetable crops conducted in rural area of Delhi by IASRI during 1978-81 have been utilized. The crops covered are the important vegetable crops of the region like tomato, brinjal, lady's finger, cauliflower, bitter gourd, etc.

For various components of cost, variance contribution towards at different stages of sampling (p.s.u's, s.s.u's, etc.) is estimated. These variances at different stages of sampling along with suitable cost function will be used for determination of sample sizes for various levels of precision of future surveys on cost of cultivation of vegetable crops.

The main cost components are :

(i) The Labour (Human, bullock and machinery)

(ii) Inputs like seed, manure, fertilizers, irrigation, etc.

(iii) Land (lease, rent, land revenue, etc.)

Analysis of the data for between and within variance components for cost of cultivation of vegetables and its various cost components indicate that in some of the blocks, variation at second stage units were found to be much higher than at primary stage units to the extent that estimate of between p.s.u's variation is some time negative. This may be due to small sample sizes at second stage units and large variation in holding sizes of the cultivators. The report was under preparation.

(Satya Pal and A.K. Srivastava)

5.5 Pilot sample survey to study the impact of flood on agricultural production in a region of Uttar Pradesh

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

The project was taken up in Balia and Faizabad district of Uttar Pradesh.

Data were collected on general information of the selected villages like identification particulars, land utilisation statistics, irrigation system rainfall, drainage system, information about occurrence of flood & losses thereof ; list of cultivators residing in the selected villages, particulars of fields of selected cultivators and crops grown during the season.

Data on the effect of flood on the crops grown in a particular field by the selected cultivators like occurrence of flood in the field, cultural practices carried out for the cultivation of crops, impact costs incurred thereon and crop yield, damage to livestock machine/implements/dwellings and stocks, occurrence of other unseasonal factors like heavy rains, drought, etc. were collected for the crops grown in Kharif and Rabi seasons.

The crop cutting experiments were conducted in some selected fields and the yield so obtained were recorded.

Tabulation work and summary tables pertaining to schedules for the year 1981-82 had been completed.

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

5.6 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 animal husbandry department, District-Hoshangabad (M.P.)

The objectives of the project were (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.

The sampling design adopted in the survey was one of the stratified multi-stage random sampling with each tehsil as stratum. The primary sampling unit (p.s.u.) was a village whereas the unit at the second stage of sampling (s.s.u.) for the estimation of milk production was a household having animal in milk and for estimation of egg production it was a household keeping layer. The ultimate unit of sampling was an animal in milk in the case of milk production whereas there was no further sub-sampling in the case of egg production. The survey was spread over the entire year covering all the three seasons viz. rainy, winter and summer. A sample of 30 villages was selected afresh in each season and was allocated the different strata in proportion to the number of villages in them. The villages in each stratum were selected with equal probability without replacement out of all the villages in the stratum. For recording data on milk yield a cluster of seven household was selected on every milk yield of all the animal in each of the selected household was recorded by enquiry whereas it was recorded by actual weighment in only the first two households of the cluster. The number of animals observed for recording milk by actual weighment was not more than two in a selected household. A cluster of five households was selected on every day recording data on egg yield. From the households selected for recording milk yield by weighment and milk yield by enquiry was recorded in advance.

The collection of primary data in selected villages was entrusted to the veterinary field assistant (VFA's) of the state animal husbandry department by alloting a specified village that V.F.A. under whose jurisdiction the village had fallen. With the view to minimise the dislocation in the routine of the V.F.A.'s only one village was given to one person and it was kept in view that no V.F.A. has to work in more than one season. From the cluster of two household selected for collection of data on milk by weighment and enquiry

both the information feed fed to all the animals in milk and related aspects was also collected.

The data collected under the above said project was utilised for exploring the possibility of replacing the method of recording data on livestock products with the help of normal field agency of the state animal husbandry departments instead of whole time field staff. The survey was started in April, 1981 in district Hoshangabad of Madhya Pradesh and it would be spread over the full one year covering the three season i.e. rainy, winter and summer. Tehsils in the districts were constitute a stratum and a village was primary sampling units (p.s.u.). In all a sample of 30 villages was selected in each season and one village was allocated to one Veterinary Field Assistant in his jurisdiction. He was required to work for 2 days in a month. On every working day he selected a cluster of two contigous households for recording data on milk yield by actual weighment and enquiry and 5 households for collecting data on milk yield by enquiry only. In addition to this he selected 5 household for collecting data on egg production from the households keeping poultry. For the purpose of recording data on milk yield by actual weighment not more than 2 animals were taken from each of the selected household.

The survey was conducted on two products viz. milk and egg. The results pertaining to milk were reported earlier. For egg, it was found that the number of layers in the district was 18.2 thousand with a percentage standard error of 21.8. The average egg yield per layer per day was 0.55 and its standard error was 8.2 percent. The total egg production was estimated to be 3786.2 thousand with a standard error of 25.2 per cent. The writting of the report was in progress.

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

5.7 Pilot sample survey for estimating the energy requirement for different level of adoption of modern technology in agriculture

The main objective of the project is to develop suitable sampling methodology for estimating the energy requirement for different levels of adoption of modern technology in term of labour and inputs like irrigation, fertilizers, etc.

The sampling design adopted in the survey was stratified multistage random sampling. The tehsil/blocks were the strata and villages in a strata the primary stage units and the cultivators within a village the secondary stage units. A sample of 24 villages was selected from the total number of villages

of the Meerut district. From each selected village out of total number of cultivators a random sample of 8 cultivators each was selected and detailed data on area under holding/crop, inputs applied (seed, fertilizer, irrigation, pesticides, etc.) labour used (human, animal and machine) production, etc. would be collected.

The energy equivelents for various inputs both material as well as labour will be used to arrive at the total energy requirement of a given cropping system. The method of collection of data was observation-cum-enquiry for the various inputs and practices adopted for the crop growth and crop cutting experiments for determining the yield level.

The field data collection work for the rabi (1983-84) season was over, wheat being the major crop., Instructions to the field staff were imparted by the project leader regarding conducting crop cutting experiments (CCE) in wheat crop.

For the agricultural year 1984-85, fresh selection of villages was made and new head quarter of the field staff were fixed. The data collection work for the kharif season was almost over. While for the rabi season was in progress. The checking/inspection of field work was carried out by the project leader and field officer from time to time.

(K.K. Tyagi, P.C Mehrotra and S.K. Raheja)

5.8 Pilot survey for developing sampling methodology for assessment of impact of national demonstration trials on crop yields.

The objectives of the project are to develop sampling methodology to study the impact of National Demonstration Trials on crop yield, profitability, labour employment potential and marginal productivity of various agricultural inputs.

Input-output data on wheat and Bajra crop collected. The field work of the project was over in Nov., 1984.

(M.G. Mittal)

5.9 Sample surveys for cost of cultivation, agronomic practices, area and yield rates of potato.

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 agricultural practices under cultivators' conditions.

The survey was conducted in Farrukhabad district during rabi 1983-84. Three types of enquiries were envisaged under the survey (i) under the agronomic enquiry data were collected from about 640 cultivators, (ii) under the cost of cultivation enquiry data were collected from 160 cultivators, (iii) crop cutting experiments were conducted in about 200 fields, selected from 64 villages.

The field work of the project was completed in April, 1984. After a preliminary scrutiny of data at the CPRI, Shimla the data were passed on to IASRI in August, 1984. During the year the data were in the process of analysis, which consisted of scrutiny, coding, tabulation, punching, etc.

(S.S. Gupta, S.K. Raheja, A.K. Srivastava, P.S. Dahiya and V.P. Malhotra)

5.10 A study of variability of yield rates and acreage under HYV cotton.

The objectives of the project are (i) to study the variability in area and yield rates 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 secondary data as available from project—'Sample survey for methodological investigations into high yielding varieties programme' in respect of cotton crop for the period 1974-75 to 1979-80 was proposed to be utilised for the study. The analysis of data as per the objectives of the study was in progress.

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

5.11 Pilot sample survey for studying the relative merits of the data obtained by actual weighment and those through enquiry for estimation of milk production.

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.

It is a sixth plan project and was scheduled to cover 6 centres in the country in three phases. In the first phase the survey was conducted in 2 centres viz. District Rohtak in Haryana & Distt. Barabanki in Uttar Pradesh during the period 1979-80. The analysis of the data collected during the first phase was over, the report had been finalised and had been sent for printing. For the rest of the 4 centres the State Govts. of Bihar and Orissa had regretted due to paucity of funds. The Andhra Pradesh government had agreed to initiate the sample survey during the year 1984-85, whereas the Jammu and Kashmir government implemented the project w.e.f. 28th Dec., 1984.

The nature and extent of the data collected and analysed during the first phase of the survey had already been reported in the year 1982. During the second phase of the project the survey was initiated in Pulwama district of Kashmir on 28-12-1984. No data were collected during the year.

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

5.12 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 introduction of HYV 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 of HYV of wheat in the 4th and 5th plan periods and (iii) to study the distribution of yield rates over different holding size classes. Box—Jenkins techniques for forecasting had been applied.

The data relating to area, production and productivity of wheat (district wise) for the period 1946-1983 had been collected.

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

5.13 Study to find out the causes of land lying idle in the operational holdings during agricultural year 1977-78.

The objectives of the project were to ascertain reasons for non-utilization of cultivable but not cultivated lands within operational holdings for evolving suitable measures for their proper utilization and also to obtain estimate of waste-land for comparing it with existing data.

The highest number of cultivators with area under idle land was in Ratnagiri district being nearly 384 thousand. The highest area under waste land was in Chittorgarh district followed by Ratnagiri. The lowest area under waste land was in Jhansi district. In Chittorgarh the area under idle land was three times the Cultivated area while in Ratnagiri it was about two times the cultivated area. In Ratnagiri district almost the entire area under idle land belonged to private cultivators. The important causes for the land remaining idle were observed as (i) Unlevelled rocky land, (ii) lack of irrigation, (iii) lack of resources and (iv) land with low fertility and grazing land. The main remedial measures suggested by the farmers for reclaiming the land were (i) levelling and removal of rocks, (ii) provision of irrigation facilities, (iii) provision of resources and credit facilities so that the cultivators are in a position to obtain the crucial

inputs and (iv) improving the soil fertility by providing fertilizers and other chemicals.

A comparison of the estimated area under idle land with those reported in the land utilisation statistics reveal that the idle land area has increased in all the districts except for Anantapur. The reduction in the estimated area under idle land in Anantapur district could be attributed to some natural phenomenon or possibly some extension programme conducted through State Agricultural Department. On the other hand increasing trend in the area under idle land in the rest of the districts may pose serious problem and needs to be tackled quickly and firmly. The causes of land lying idle and the remedial measures suggested by the farmers of different centres are not merely indicative of the general problems of the area but are important in view of the fact that if not provided in reasonable time the land quality might further deteriorate due to lack of care and attention.

(S.K. Raheja and A.K. Banerjee)

5.14 Pilot sample survey to evolve an appropriate methodology for estimation of lac production.

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

During the year the survey was conducted in Dudhi Tehsil of Mirzapur district of Uttar Pradesh. Data on number of lac hosts and cultivated hosts in each of the selected village was collected by the enumerators for important species of lac hosts i.e. Ber, Palas and Kusum trees by complete enumeration. From among the cultivated Palas trees in each of the selected villages, 15 trees were selected randomly for crop cutting experiments. These trees were observed for lac production. Measurements like girth of the tree, number of shoots encrusted with lac, total length of encrustation and weight of shoots with lac was also recorded for each of the harvested trees. In addition to this, general information about the selected villages pertaining to lac production was collected. The data in respect of Baisakhi season 1984 had been received and was under preliminary stage of analysis.

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

5.15 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 project was started on 28-12-84.

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

5.16 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 develop sample survey methodology for estimating the cost of production of chickoo including the cost of raising/ cost of maintenance and (ii) to study the prevailing marketing practices of the fruit in the region of study.

Cost accounting data from 108 sample orchards had been collected for the years 1982-83 and 1983-84. While for the last round i.e. 1984-85, the data were flowing in because the field work was not yet over. Scrutiny, removal of discrepancies and basic tabulation for the first two rounds was completed.

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

5.17 The study of Suitable sampling methodology for estimating the yield of vegetable crops on the basis of partial harvests.

The objective of the study was to develop a suitable sampling methodology for estimating the yield of different vegetable crops based on the partial harvest data. The data used was taken from the survey on vegetables conducted during 1971-74 in Bangalore district of Karnataka State by Indian Agricultural Statistics Research Institute for estimating the extent of cultivation and total production of vegetable crops. The main survey was carried for three years in the form of three rounds each of one year duration. The crops covered are tomato, brinjal, lady's finger and beans, the crops involving multiple pickings.

The results reveal that the estimate of total production of vegetable crops can be made by recording only few picking by making use of the percentage contribution of individual pickings to total yield and also by using their correlation with total yield in double sampling technique. The method was found very efficient than the original method of recording field of all the pickings. Estimate of total production can also be made efficient with component sampling by selecting independent sample from each picking. The study indicated that the technique of double sampling along with the use of systematic sampling over time may be of more advantage for further study in this direction.

(Satya Pal and A.K. Srivastava)

5.18 A study of variability and trends of yield rates of high yielding varieties of rice during 4th and 5th five year plans.

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 4th and 5th five year plan and (ii) to study the distribution of yield rates over different holding size classes. The secondary data as available under the Institute projects on sampling investigations into HYVP are being utilised for this study. The project work was in progress as per the survey objectives.

(S.S. Shastri, V.S. Rustogi and S.K. Raheja)

5.19 Statistical summarization of results on yield rates, area and extend of adoption of improved practices for HYV millets (maize, jowar, bajra) during 4th and 5th plan periods.

The objectives of the study 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 4th and 5th 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 fertilizers in and between the two plan periods and overall as well. The project is based on secondary data as available from the Institute research schemes on sampling investigations into HYVP. The project work was in progress as per the time schedule.

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

5.20 Pilot sample survey for estimation of production of hides and skins in the districts of Agra and Kanpur (U.P.).

The objectives of the project were (i) to evolve a suitable sampling technique for estimation of production of hides and skins and (ii) to study practices like flaying of slaughtered and fallen animals covering of hides and skins and their disposal.

The appropriate statistical technique for analysis of data were being applied. The data had been analysed and the report was being drafted.

(J.S. Maini)

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

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

The project was proposed to be implemented in 28 selected districts spread over 17 states of the country. However, on account of certain technical and administrative difficulties it could be implemented in 10 states only covering 17 selected districts during the year under report.

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

6. ECONOMETRIC ANALYSIS

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

6.1 Economic study of imbalances in the production of rice and wheat crop in India.

The objective of the project is to examine the growth rates of area, production and productivity of rice and wheat as well as to examine the growth rates of inputs used in the production of these crops. The causes of difference in productivity of these two crops in different regions will also be examined. Growth rates for variables mentioned above of different kinds had been estimated. Regression equations had also been fitted for productivity of rice and wheat crops. Coefficients of variation regarding yield, area and output were also calculated.

During the year under report, the secondary data was collected for area, production and productivity of these two crops. Data on application of inputs such as chemical fertilizer, area under high yielding variety, area under irrigation and area under the crop had also been collected.

The future productivity and output of rice and wheat for the years 1989-90 and 2000 AD had also been worked out. Preparation of report was in progress.

(R.K. Pandey and Shanti Sarup)

6.2 Economic study of new farm technology with special reference to yield gap and associated factors.

The main aim of the project is to examine the new technology and its yield potential with special reference to identification of the socio-economic and other constraints responsible for gap between potential yield and actual yield achieved at farm level.

This is a co-ordinated project and work had been initiated during the year in the Operational Research Projects at Bhilwara (Rajasthan), Indore (M.P.) and Ranchi (Bihar). General data regarding the projects and selected villages as well as recommended technology had been obtained so far.

(R.K. Pandey, B.L. Kaul, Bhagat Singh and H.B. Chaudhry)

6.3 Identification of the socio-economic and other constraints operating in the spread of modern technology on rice farms in ORP area located in Raipur District (M.P.)

The specific objectives of this project area (i) to estimate the gap between the yield of rice crop obtained on farmers fields with the modern production techniques on input levels giving maximum yields and the average yield of the farmers in the area and (ii) to identify the major biological, socio-economic and other important constraints responsible for the existing yield gap.

The project report on 'Study of yield gap and constraints in rice cultivation in ORP area, Raipur Distt. (M.P.) was published during the year. The study revealed a significant yield gap between the potential yield and average yield of rice estimated on the basis of survey data. The larger yield gap was primarily caused by severe gall-midge attack on paddy. Further to study factors responsible for this yield gap the sampled farms were classified into low productivity and high productivity groups. The analysis showed that the application of nitrogen, incidence of pests and diseases and credit were the main factors responsible for variation in yield levels between the two groups.

(B.L. Kaul and Shanti Sarup)

6.4 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 tur crop in important pulse growing states as well as for the country as a whole, (ii) To study the effect of farm harvest prices on acreage adjustment behaviour and (iii) To investigate the overall causes hindering tur production.

During the period under report, data collected in respect of farm harvest prices, yield levels, gross profitability and proportion of irrigated area to gross cropped area in respect of tur crop as well as for the competing crop in the

respective states was analysed. Acreage response functions were estimated by utilizing Narlovian adjustment lag model. Multiple regression analysis was also carried out to study the effects of various input factors on the productivity of tur crop in different states. Summary tables were being prepared for interpretation of the results.

(Shanti Sarup)

6.5 Determination of constraints operating in Transfer of Technology Relating to Crop Production in ORP Villages of Tribal Area in Dangs district of Gujarat.

The objectives of the project are (i) To determine the constraints operating in transfer of modern technology among tribals with respect to crop production and (ii) to suggest policy measures for raising crop production.

Drafting of the report was under progress.

(Bhagat Singh)

6.6 Assessment of yield constraints in transfer of new farm technology in operational Research Project Area Bhilwara District (Rajasthan).

The objectives of the project are (i) to determine the yield potential of modern wheat variety grown with improved technology and (ii) to identify the bio-logical and socio-economic constraints responsible for low yield.

Project report was under finalisation and salient results are as follows :—

Wheat is an important cereal crop in Bhilwara during Rabi season and accounts for more than 20 per cent of the gross cropped area. The average yield of this crop varies from 24 q/ha to 28 q/ha in different holding sizes. On the basis of demonstration trials carried out on this crop the potential yield was observed as 49 q/ha. The gap of 21 q/ha to 25 q/ha is due to several bio-logical and socioeconomic factors.

From the results it is seen that the average rate of nitrogen application is 63 kg/ha and that of phosphate is 48 kg/ha which is equivalent to the

recommended doses of fertiliser given to the crop. The average number of irrigations given is 4.8 per holding while the recommended number of irrigations is six. Demonstrations conducted on this crop have shown that the variation in yield is 14 q/ha when the number of irrigations is increased from four to six and above.

(H.B. Chaudhry and R.K. Pandey)

7. TRAINING AND BASIC RESEARCH

7.1 Training Activities :

The Divisions of Training and Basic Research coordinates and conducts the training courses of the Institute, namely, Senior Certificate (SC) course, Professional Statisticians' Certificate (PSC) course, Advanced Diploma Course in Agricultural Statistics and Diploma course in Advanced Computer Programming, besides two degree courses viz; M. Sc. and Ph. D. in Agricultural Statistics in collaboration with IARI. Senior Certificate Course is intended for those persons who are engaged in research in Agriculture, animal husbandry and for whom knowledge of Statistics is essential for their research work. In this course generally persons deputed by various State Departments of Agriculture and Animal Husbandry and Agricultural Universities are admitted. Professional Statisticians Certificate Course is intended for those who have got Post Graduate degree in Statistics or Mathematics with experience in handling statistical data and deputed by State Departments and Research Institutes having experience in statistical data. Diploma course in Agricultural Statistics is offered for those who successfully complete P.S.C. Course or M. Sc. in Agricultural Statistics and Diploma Course in Advanced Computer programming is intended for those who posses Graduate qualification in Mathematics, Physics, Engineering or Technology. This year 13 students of the Institute completed successfully the degree courses of which 6 were from M. Sc. and 7 were from Ph. D.

The XXII Convocation of the training courses of the Institute was held on 10th October, 1984 which was presided over by Dr. O.P. Gautam, Director General of ICAR. Sh. Yogendra Makwana, Minister of State for Agriculture was the Chief guest, who gave the convocation address. A progress Report entitled "Research in Agricultural Statistics" was presented by Prof. Prem Narain, Director, IASRI. The Report on Training Activities was given by Dr. A.K. Nigam, Head, Division of Training and Basic Research. Dr. Gautam exhorted agricultural scientists to play their rightful role in policy making. He also urged them to quantify their achievements.

As a part of Convocation Programme an elocution contest was organised on 8th Oct., 84 in which the students of various courses of the Institute

1	2	3	4
4.	C.S.O., New Delhi	2-12 April, 1984	UN fellow from Afganistan
5.	C.S.O., New Delhi	11-16 June, 1984	JCC (Ag. Stat.)
6.	ISI, Calcutta/ New Delhi	12.6.1984	M. Stat.
7.	C.S.O., New Delhi	13-22 June, 1984	JCC (Large scale sample surveys)
8.	C.S.O., New Delhi	28.6.84	JCC (Data Processing)
9.	C.S.O.. New Delhi	August. 84	ISS Probationers.
10.	ISEC, Calcutta	25 Oct., 84	Official statistics and Ag. Statistics
11.	IVRI, Izzatnagar	1.11.84	P.G. students of National Diploma in Animal Husbandry
12.	ISEC, Calcutta	15.11.84	Specialised training in Ag. Stat.

7.2 Basic Research in Statistics :

The scientists of the division are actively engaged in carrying out research in various fields of statistics such as Design of Experiments, Sampling Theory and Surveys and Statistical Genetics. Some of significant findings are listed below :

(a) For large scale and/or complex surveys, where the variance estimation poses a problem, a method of balanced repeated replication based on orthogonal arrays is developed. The method helps in estimating the variance in complex surveys.

(b) For multi-character surveys, some sampling designs are studied which provide more precise estimation of the study characters. Some estimators for such situations are also developed which perform satisfactorily from the efficiency point of view.

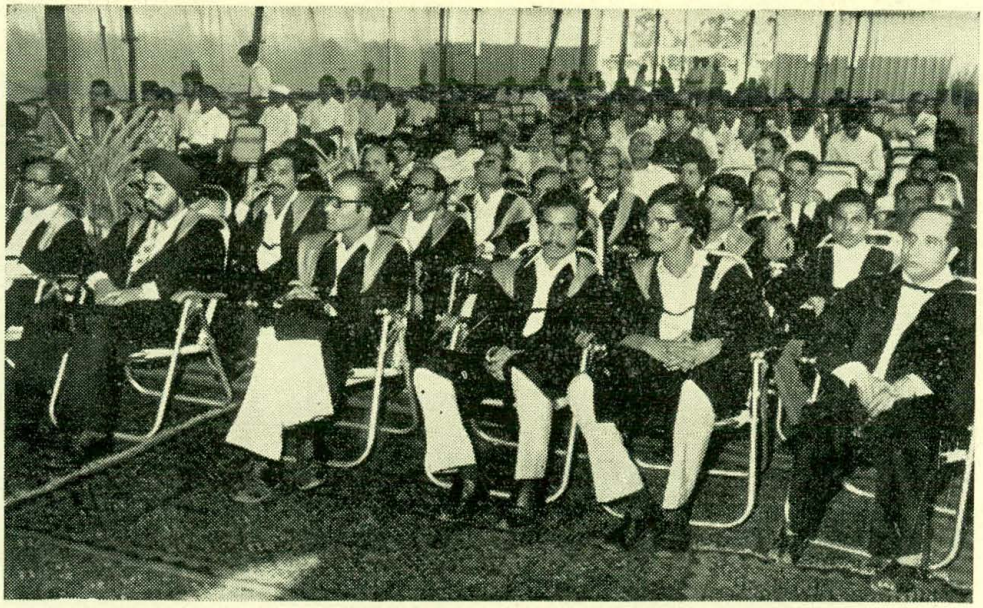
(c) Block designs for bio-assays for symmetrical parallel line assays and slope—ratio assays are developed. These are also useful as two factor factorial experiments.

XXII CONVOCATION OF TRAINING COURSES OF IASRI.

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

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

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



A View of the participants at the Convocation.

(d) Some general methods of constructing incomplete block designs for asymmetrical parallel line assays are given. These designs can be analysed easily.

(e) In order to compare the culling patterns of different cross-breds at animal farms, an estimator for the relative culling rate is developed. The heritability for all-or-none traits is also examined.

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

7.3 Research Projects :

The following three projects were also undertaken by the Scientists of the Training and Basic Research during the year. The name of the project leader and his associate(s) are given in brackets at the end of the description of each project.

(i) A study of employment and income for small farmers and landless agricultural labourers.

The objectives of the project were (i) to investigate a sampling procedure for assessing the employment and income for small farmers and landless agricultural labourers, (ii) to study whether there is sufficient employment for these people or not in the field of agriculture and (iii) to estimate the income of the people belonging to these sections.

The collection of data for Distt. Ludhiana was incomplete and data was being collected in Distt. Sultanpur (U.P.). The data was also being transferred on cards.

(Randhir Singh and A.K. Srivastava)

(ii) A statistical evaluation of agronomic factors in relation to homogeneity of error variances in groups of experiments on jowar crop.

The objectives of the Project was to study various factors like block size and plot size, which are favourable to homogeneity of error variances in groups of experiments on Jowar crop under different irrigation conditions and under different soil types. Secondary data from the volumes of NIAFE scheme was

collected and analysed. χ^2—Tests of significance for independence had been used. The manuscript of the report was under study by the internal referee.

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

(iii) Some aspects of yield-survival relationship in dairy cattle.

The objective of the project was to study some aspects of relationship between the retention of a cow in the herd and its milk production characteristic s in the first lactation. Non-Parametric techniques was applied for studying the survival distribution. Logistic model was fitted. Heritability of threshold characters was obtained. Analysis was completed. Report was at finalising stage.

(V.K. Bhatia and Prem Narain)

8. COMPUTER SCIENCE AND NUMERICAL ANALYSIS

The division of Computer Science and Numerical Analysis catered to Electronic data processing requirements of Scientists, Research Workers and Students from various Institutes under I.C.A.R. and Central Agricultural Universities and other Agricultural Colleges and Agricultural faculties affiliated to other Universities and the Directorate of Economics and Statistics, Govt. of India and department of Agriculture, U.P. State, Government of India. The Division is equipped with a medium system Burroughs B-4771 computer system with two card readers, One line printer, four magnetic tape units and four disk drives. The memory of the system is 500 K Bytes. Four Inter-active terminals have been provided for program development which have been connected to B-4771 computer through a coummunication processor. M.T. unit of the Division is equipped with 20 punches, 12 verifiers, one sorter, one re-producing punch, one accounting machine/tabulator. The use of the following old equipment have been discontinued : i) IBM 1620 computer system alongwith the peripherals w.e.f. 1st July 1984 : ii) IBM-407 accounting machine w.e.f. 1st Sept. 1984 : iii) ICL Punch 69/0 (2 machines) and ICL Verifying 169/0 (2 machines) were dis-continued w.e.f. 1st Sept. 1984. These machines were on rental charges.

Computer Utilisation :

The B-4771 computer system was run from 8 A.M. to 8 P.M. in two shifts on all working days and also occassionally during night shifts for completing the accumulated backlog. About 16,500 procuction jobs, 3900 testing jobs were processed on the computer system. Four inter-active terminals were utilised for program development by the students of Diploma course in advance computer programming and a number of scientists and other staff members of the Institute.

Programming Assistance

The Scientists of the division provide assistance in development of computer programs to meet the requirements of research problems of users

and students from ICAR Institutes and Agricultural Universities, where programmers are not available. 10 new computer programs were developed and serveral other existing programs were modified for meeting the requirement of the users. 120 Ph. D., 121 M. Sc. and 50 other research workers were extended assistance in programming and data processing.

AGRIS Data Base

The division countinued to receive AGRIS tapes every month from Vienna and selective dissemination of information from this data base was provided to Agricultural Scientists in the country.

Training Programs :

(i) The Scientists of the division were associated with the teaching progarm of the Institute. They took the courses of data processing and computer programming for Ph. D. and M. Sc. students of P.G. School, IARI and also for professional Statistician Certificate course and the Senior Certificate Course conducted by the Institute.

(ii) A new batch of 4 students were admitted for two years diploma course in advance computer programming. One of the diploma student who submitted his dissertation on 'word processing software' was accepted and he was awarded the diploma.

(iii) The division organised a short term training course on the use of computer at IASRI for the benefit of research workers from various ICAR Institutes during 11-16 Jan. 1984. It was attended by 35 participants. It covered the use of SPSSG package and other library programs available at the Centre.

(iv) Sh. S.K. Sublania M.T.O. delivered a series of lectures on CANDE Software for using the inter active terminals available on B-4771 computer system during 11-13 Sept. 1984.

M.T. Unit

M.T. Unit provided data punching facilities to users from ICAR Institutes and Central Agricultural Universities. During the year about 11 lakhs cards were punched, involving 1770 jobs. Also 840 listing, 90 sorting and 104 duplicating jobs were carried out on Unit Record machines. Guidance was also

provided to a large number of students in planning their projects in view of processing their data on electronic computer. Help was provided in development of card designs, code structures in respect of their research projects. M.T. Unit also under took the work of a project (Degree holders and Technical Personnel) Survey of West Bengal of CSIR in which 2.75 lakh cards were punched and verified.

Visits to Computer Centre :

(i) A batch of students from NDRI, Karnal visited the centre on 9th May, 1984.

(ii) A batch of students of Junior Certificate Course of C.S.O. were given training in use of computer for processing Agri. Research data in the month of June, 1984.

(iii) About 20 participants of 2nd International course on sampling methods from C.S.O. visited the centre on 3rd Sept., 1984.

Research Projects

The following research projects were undertaken by the Scientists of the division during the year under report :

1. Software development for agricultural research data analysis.

(S.N. Mathur)

Under this main project nine sub-projects were continued. They are as follows along with the component workers :-

(a) Development of computer programs and preparation of users manual for selection of predictor variables in regression analysis.

(K.V. Sathe and S.P. Doshi)

(b) Development of computer programs for the analysis of variance for factorial design.

(Mahesh Kumar and M.L. Sahni)

(c) Development of computer programs for the analysis of stability models (GXE interactions)

(K.C. Gupta, S.P. Doshi and M.L. Choudhary)

(d) Development computer programs and users manual for various tapes of analysis of diallel set data consisting of parents. (F_1 and F_2 crosses)

(S.P. Doshi, K.C. Gupta and Ram Kumar)

(e) Development of computer programes for the estimation of components of generation means and variances for different models.

(M.L. Choudhary, S.P. Doshi and Ram Kumar)

(f) Software development for calculating the cumulative probabilities, critical values and ordinates of some continuous distributions.

(R. Gopalan and D. Jain)

(g) Development of Computer programs for Genetical Analysis for North Carolina Design I, II and III.

(Ram Kumar and K.C. Gupta)

(h) Development of programs for estimating Genetic Parameters of threshold characters.

(O.P. Dutta and P.K. Malhotra)

(i) To prepare the efficient Sub-routines for commonly met statistical and Mathematical problems.

(D. Jain)

2. A Study of Job mix in multiprogramming for effective utilisation of computer system resources.

(S.N. Mathur and Mahesh Kumar)

3. Study of fluctuations in sugarcane production in Tamil Nadu State.

(A.C. Kaistha)

4. Development of Computer programs and preparation of User's manual for Genetic divergence analysis by using principal components.

(S.P. Doshi and K.C. Gupta)

5. A study on the use of split-plot designs in Agricultural Field Experiments.

(M.L. Sahni and Mahesh Kumar)

6. Adoption of Mixed integer program on B-4700 Computer.

(K.V. Sathe and Mahesh Kumar)

9. STATISTICAL GENETIC CELL

The work of Statistical Research in Genetics Cell 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.

9.1 Measurement of genetic improvement due to scientific breeding in cattle and buffaloes.

The objectives of the project were (i) to develop statistical methodology for measuring genetic improvement actually brought about in dairy herds, (ii) to formulate breeding programmes in cattle and buffaloes and (iii) critical analysis of breeding data. Technique applied for analysis of the data was method of fitting constants for non-orthogonal data and Discriminant function analysis.

The report has been finalised, it is apparent from the results that for crossbreeding programme in cattle, the level of exotic inheritance should be between 50 to 75%. Infusing exotic germ plasm beyond 75% level may result in significantly lower lactation yield coupled with probably an enhanced calving interval.

(L.K. Garg, P. Narain, J.P. Jain, Lal Chand and P.S. Rana)

9.2 Estimation of genetic variability in crop plants

The objectives of the project were (i) Estimation of relative contribution of genetic and enviromental components of variation in plants and (ii) to develop statistcal technique for estimating these components. Methods of linear regression and analysis of variance were being applied for the analysis.

Uniformity trial data on Banana from Nashirabad of Jalgaon district in Maharashtra was being utilized for the analysis. During this period weight of the fruits per plant was considered for estimating the relative contributions of genetic and environmental components of variation to the total variation in the yield. The contributions due to genetic and environmental components of variation were respectively estimated to be in the ration of 15:1.

(P.S. Rana, L.K. Garg and P.N. Bhargava)

9.3 Growth studies on cross-bred cows available at various military farms in the country.

The objectives of the project were (i) to study influence of genetic groups, farms, periods of Birth on body weights of cross-bred females at different ages, (ii) Body weight changes in cross-breds 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.

Techniques applied for analysis of the data were least square analysis by Harvey's technique, fitting of various growth curves, heritability estimates by half-sib correlation method & genetic correlations by paternal half-sib analysis of covariance.

The project report was being modified in the light of referee's comments. Some salient results are as follows :-

To examine the main causes of variation in body weights at various ages and to overcome the difficulty of disproportionate subclass numbers, the data pertaining to 902 Friesian x Sahiwal crossbred cows consisting of five genetic groups maintained at five military dairy farms were subjected to least square analysis. A three way classified fixed effects model with interaction was adopted. The fixed effects considered were farms, grades and periods of birth. The least square analysis with interaction showed that for all the characters except for first lactation yield and age at first calving, the interaction between grades and farms was not significant. The farm and period effects were significant for body weights at different ages except at 36 months for which period did not affect the body weight. On the other hand genetic group effect was found to be non-significant for body weights at most of the growth points considered.

The growth of various grades of cows as studied for different stages of growth viz., birth to 12 months, 12-24 months, 24-36 months, 12-36 months and birth to 36 months. In all seven growth functions viz., linear, linear-cum-log, quadratic, quadratic-cum-log, exponential, asymptotic and logistic were fitted to the adjusted records for each grade separately. From the consideration of percentage variation explained by various growth functions and graphs drawn, it can be concluded that quadratic-cum-log curve $Y = A + Bx + Cx^2 + D \log_e (x+1)$ is the most appropriate growth function to describe the growth from birth to one year, one to two years, one to three years and birth to three years in cows

of Friesian x Sahiwal crosses. However, for studying the growth from two to three years, asymptotic curve $Y = A - Be^{-kx}$ has been found to be the best. Where y is the expected body weight, x is the unit of time and A,B,C,D & K are parameters.

The estimates of heritability for various body weight characters for the group of cows having Holstein-Friesian blood less than 50 per cent sired by Sahiwal bulls were low with high standard errors while the estimates for group of cows having Holstein-Friesian blood greater than or equal to fifty per cent sired by Hol-Friesian bulls ranged from 0.24 to 0.46 were significantly different from zero. This suggests that body weights at early age may provide suitable selection criteria related to growth.

The genetic correlations between birth weight and body weights upto 36 months ranged between moderate to high and that between birth weight and weight at maturity was high and highly significant indicating that birth weight could be used for predicting the subsequent body weights including mature weight. Genetic correlations among body weight at various ages ranged between moderate to high suggesting that animals having higher body weights at early ages tended to be heavier at later ages.

Genetic correlalions between weight at first calving and body weights at various ages from birth to 36 months were negative and ranged from moderate to high indicating that preliminary selection for higher weight at birth would not act as a criterion for selection for higher weight at first calving. Birth weight was found to be negatively correlated with age at first calving indicating that female calves that were born with heavier birth weight reached their age at first calving at an early age than those with lower birth weight. The body weights at most of the ages had negative significant genetic correlation with age at first calving suggesting thereby that higher body weights at various ages may significantly reduce age at first calving and thus will help in the selection of the dairy animals for early age at first calving on the basis of their early body weights.

Genetic correlation between birth weight and first lactation milk yield was negative and low indicating that birth weight has very little importance so far as its impact on milk production is concerned and as such should not be over-emphasized as a criterion for selecting dairy animals. As the growth progressed and the animal attained maturity, the genetic correlation between weight at 24 months and first loctation milk yield was as high as 0.9 and also highly significant. Since the milk yield is more heritable in comparison to the

were not available there. To meet this objective the codes for exact grades of two breed crosses were finalised. The exact grades codes were written on the history cards of individual cows and these were inserted in the records of cows for the period 1955 to 1978 of the following Military Dairy Farms : Ambala, Jullunder, Lucknow, Pimpri and Dehradun. The work connected with other farms was in progress.

(B.S. Sharma and Prem Narain)

10. OTHER UNITS/CELLS AND THEIR ACTIVITIES

10.1 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 1983.

(ii) The Quarterly Progress Reports of the Institute falling due during 1984.

(iii) IASRI Statistical Newsletters, Vol. IX, No. 4, 1983 and Vol. X, Nos. 1-3, 1984.

(iv) Proceedings and Abstracts of Contributed Papers of the 7th Conference of Agricultural Research Statisticians held at UAS, Hebbal, Bangalore (Karnataka) from 28th to 30th July, 1983.

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 transmission 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 (1984) to be placed in the budget of the Parliament.

(iii) Regarding a schedule of Meetings/Conferences/Seminars, etc., during 1984.

(iv) Regarding 'Publication of Research Highlights and Annual Report' of ICAR for the year 1984.

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

(vi) Regarding 'ICAR in the Eighties'.

(vii) Regarding 'Implementation of Operational Research/Projects of ICAR 'Telephone Directory of IASRI'.

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

(i) Regarding Publication of 'Statistical System in India-1983'.

(ii) For International Technical Corporation in Statistics.

(iii) For 35th Annual Report on Sample Survey of current interest in India and 21st report in the ESCAP region-1983.

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

The Cell also offered the comments on the research papers, bulletins, 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 meetings 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.

10.2 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 intensive supervision of the field work of the surveys by the field officers and other supervisory staff in collaboration with the concerned project 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 organisation of field work of the surveys at the places shown against them in collaboration with the cancerned project leaders :—

(i) Sample survey for cost of cultivation, agronomic practices, area and yield rates of potato-Farrukhabad (U.P.), Simla (H.P.).

(ii) Statistical investigation on economics of pig production, Ranchi district (Bihar)-Deptt. of Animal Husbandry, Govt. of Bihar, New Secretariate, Patna.

(iii) Pilot studies for the estimation of birth and death rates in bovines, Tamil Nadu-Deptt. of Animal Husbandry, Madras (T.N.).

(iv) A study of employment and income of small farmers and landless labourers in district Nalanda (Bihar) and Sultanpur (U.P.)—IASRI, New Delhi.

(v) Pre-harvest forecasting of groundnut yield in Rajkot District of Gujarat-Rajkot (Guj).

(vi) All India Co-ordinated Agronomic Research Projects, Coimbatore (T.N.), Trichur (Kerala), Bangalore (Karnataka) and Hyderabad (A.P.), Pantnagar and Tehri Garhwal (U.P.).

(vii) Pilot studies for estimation of birth and death rates in Ovines, Tiruchirapalli and Madras (Tamil Nadu).

(viii) Statistical investigations on economics of pig production in district Ranchi (Bihar)-Ranchi (Bihar).

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

(x) Sample survey for the study of constraints in transfer of new Agril. technology under field conditions—Tamil Nadu, Kerala, Punjab and Nasik (Maharashtra).

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

(xii) Pilot sample survey to estimate the Post-harvest foodgrain losses in Bulandshahr district (U.P.)-IASRI, New Delhi-12 and Indian Grain Storage Institute, Hapur (U.P.).

(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) Sample survey for cost of cultivation, agronomic practices, area and yield rates of potatoes-Farrukhabad (U.P.).

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

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

(iv) Statistical investigation on economics of pig production, district Ranchi (Bihar).

(v) Development of a suitable methodology to study the effect of housing conditions and other related factors on milk production under village conditions in district Gurgaon (Haryana).

(vi) Pilot studies on pre-harvest forecasting of apple yield on the basis of data on biometrical characters, weather variables and agricultural inputs, Simla district (H.P.)—Rainpur and Narkunda block of Simla.

(vii) Sample survey for transfer of improved agricultural technology under field conditions.

(viii) Pilot study for estimation of birth and death rates in bovines in Tiruchirapalli district (Tamil Nadu).

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

(x) Pilot studies on pre-harvest forecasting of yield of groundnut—Rajkot district, Gujarat.

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

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

(xiii) Cost of milk production, Patiala (Punjab).

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

10.3 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. & Res.) as chairman and Jt. Director, (CS & NA), all Heads of the Divisions and Cells, CAO and Accounts Officer as members with Shri S.D. Bal as the Convenor.

Functions and Activities :

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 implementation of the various projects in-terms of the targets laid down. The progress of the projects should be reviewed for each quarter (3 months). The Monitoring Cell should submit the minutes of each of the meetings to the Director for discussion in the meetings of the Heads of the

Divisions for taking remedial measures and removing bottlenecks in respect of the project in which the progress is hampered or progress is slow due to some reasons.

Five meetings were convened by the Monitoring Cell under the chairmanship of the Director, IASRI on 17th Aug., 1st Sept., 1st Oct., 28th Oct., and 19th Dec., 1984 regarding the formulation of the VII Plan and to review the progress of the VI Plan Co-ordinated Scheme for Primary Data Collection involving Ad-hoc field staff. The procedure for handling the work under this VI Plan Co-ordinated Scheme was also fixed up.

10.4 UNDP Cell :

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

(i) To train postgraduate students in different aspects of Agricultural Statistics and Computer Application.

(ii) To take up in-service training in Agricultural Statistics for research/ extension workers of various Agricultural Universities, Institutes and State Governments of Agriculture and Animal Husbandry, so that the new methodologies developed at this Centre are transferred quickly to the users.

(iii) To intensify studies on crop forecasting systems and develop statistical methodologies for giving early warning in Agriculture.

(iv) To develop suitable methods for determining the optimum use of water and also to manage crops in case of drought condition.

(v) To take up advanced studies in epidemiology and control of animal diseases.

(vi) To develop suitable breeding programmes in agricultural crops.

(vii) To take up investigations in sample surveys for evolving suitable integrated sample survey systems.

(viii) To conduct research in Simulation and optimisation problems.

(ix) To conduct ecological and environmental studies in relation to Agriculture.

(x) To develop technique for processing large scale data on Electronic Computer.

(xi) To conduct research in Statistical Inference and multivariate analysis of data.

Prof. D.J. Finney of the Department of Statistics, University of Edinburgh, UK has been recognised as Key Consultant for advising over all planning of the activities of the project. Prof. Prem Narain, the Director is the Sub-Project Coordinator of the project.

Prof. D.J. Finney visited this Institute from 16th March to 2nd April, 1984 and looked into the existing research and training activities of the Institute, infrastructure available and constraint under which the project is to operate. He made 45 specific recommendations for successful implementation of the project.

Prof. Prem Narain, Sub-project Coordinator made a study tour of three countries, U.K., Canada and USA from 10th June to 8th July, 1984 to identify the institutions and scientists for collaboration under the UNDP Project as well as to finalise the consultants who would visit the Institute during different phases of the programme. He visited as many as 26 research institutions and universities in these countries and had useful discussions with the scientists of the various Institutions, regarding mutual collaboration for successful implementation of the Project.

Dr. H.K.F. Hoffman, Senior Agricultural Education Officer, FAO, Rome visited this Institute on the 30th October, 1984 for assessing the progress concerning work on curriculum development for Postgraduate Training in various subject matter areas covered by UNDP project. He was acquainted with the latest progress of the project. A meeting was held with Dr. Maharaj Singh, DDG (Edn.), ICAR and Project Director of the UNDP Project on 17th December, 1984 regarding the implementation of recommendations of the Key-Consultant Prof. D.J. Finney. Various recommendations of the Key-Consultant were reviewed for implementation.

The Advisory committee of the project has been finalised. The existing courses for M.Sc. and Ph.D. as well as other professional courses in Agricultural Statistics and Computer Applications were reviewed. A new course on M.Sc. in 'Computer Applications in Agriculture' was finalised.

Two electronic typewriters and One Xerox 1035 Multiple copier have been procured from UNDP assistance and put into use at the Institute. Ten Computer terminals have also been procured from UNDP fund.

A UNDP Cell has been formed at the Institute with Shri S.C. Rai, Senior Scientist and Shri Pradeep Kumar, Jr. Clerk to look after the work of the UNDP project at this Centre. They are working under Prof. Prem Narain, the S.P.C. of the Project.

11. 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 :

Crop Sciences :

Guidance given to Dr. H.C. Sharma, Project Co-ordinator, Co-ordinated Research Project for Dryland improvement, regarding the formulation of a new proforma for collection of basic data under the project. Different schedules of proformae were prepared and handed over to Dr. Sharma.

Crop Forecasting Methodology :

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

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

(iii) Guidance was given to Shri H.C. Sharma, Scientist (Stat.) and Shri S.S. Mishra, Scientist (Entomology), CPRI, Simla, H.P. for the technical programme and methodology to be followed for assessing the crop loss due to pests of potato crop.

Animal Sciences :

(i) Advice was given to Shri Sudershan Kumar, Dy. Director, Animal Husbandry Department, Punjab regarding initiation of cost of Production of Milk surveys.

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

(iii) Guidance given to Dy. Director (Stat.), of Punjab Govt., incharge of the project, "Cost of Milk Production, Patiala" regarding their project.

Sample Survey Methodology :

(i) Advice was given to the CIFRI, Barrackpore on planning sample survey for the central sector scheme on development of Inland Fisheries Statistics.

(ii) The Director of Lac Development was advised on suitable sampling design for a sample survey to be conducted in Mirzapur district of U.P. for estimating the production of lac.

(iii) Tech. Advice was given to Directorate of Education, regarding finalisation of Rules and Regulations of All India Crop Competition Scheme.

(iv) Guidance was given to Dr. S.K. Sinha, IARI, regarding compilation and tabulation of data of the project "Problems of wheat Production."

(v) Guidance given to Dr. R.K. Bhatnagar, Scientist (S-3), Division of Entomology, IARI in the statistical analysis of data pertaining to effect of various colours on the feeding habits of pigeons, the feed being served in trays of different size and shape.

(vi) Tech. Advice was given to Jt. Director, (AHS), A.H. Division, Ministry of Agriculture, New Delhi on "Procedure for estimation of meat production at district level."

(vii) Tech. Advice was given to ADG (ES&M) ICAR regarding the Project Survey of Animal Draught Power in various agroclimatic zones of the country, socio-economic features and current husbandry practices.

(viii) Advice was given to Director of Agriculture and Director of Horticulture (Punjab), and (H.P.) on "Planning and formulation of survey for Fruits/vegetables & minor crops" at New Delhi and at Chandigarh.

Training & Basic Research :-

Advice was given to Jt. Director, Deptt. of Agriculture, Haryana regarding sample size for their study on adoption of improved practices by farmers with regard to project undertaken with the assistance of World Bank.

12. PAPERS PRESENTED AT INTER-ORGANISATIONAL 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 seminars, workshops, conferences, etc., at which those were presented are given below :-

12.1 The 71st Conference of the Indian Science Congress Association held at Birla Institute of Technology, Ranchi under the auspices of the Ranchi University, Ranchi from January 3-5, 1984.

(a) Focal Theme Symposium in the Section of Agricultural Sciences dealing with, "Strategies for improvement of life through Agriculture".

NARAIN, P.-Strategies for improving the protein availability in Country.

(b) In the Section of Statistics, the symposium entitled, "Statistical Methods in Stochastic Problems".

NARAIN, P. - Stochastic methods in population genetics.

12.2 Seminar on "Data to cover newly emerging areas and for improvement in the quality of available data", organised by Central Statistical Organisation, Govt. of India on 17th and 18th Feb., 1984.

"Task Force on Agricultural Statistics".

NARAIN, P. and GOEL, B.B.P.S. - Current Status of Agricultural Statistics and Gaps in Methodology".

12.3 Seminar on, "Balanced nutrition of field crops with special reference to Secondary and Micronutrients," organised by FAI Jaipur (Raj.) on 30th March., 1984.

RAHEJA, S.K. - Economics of Balanced Nutrition of Field Crops under Intensive cropping.

12.4 Group Discussion on "Economics of Fertilizers Use" organised by the Fertilizer Association of India at Imperial Hotel, New Delhi on 12.4.1984.

NARAIN, PREM-Economic Use of Fertilizers under Cultivated Conditions.

12.5 IX Indian Social Science Congress held at Aligarh Muslim University, Aligarh (U.P.), from 16.4.1984 to 19.4.1984.

PANDEY, R.K. - Role of State in Augmenting Crop Production.

12.6 FAI Group Discussion on means to increase Crop response to fertilizer use ; organised at New Delhi on Sept., 4-5, 1984 by the Fertilizer Association of India.

(i) BHARGAVA, P.N. and JAIN, H.C. - An overview of yardstick of inputs for different crops-current status of yardstic of inputs.

(ii) RAHEJA, S.K. and MEHROTRA, P.C. - Current status of yardsticks of additional production due to factors other than fertilizers.

12.7 Symposium on 'Oilseeds production constraints and opportunities, organised by 'Hindustan Lever Research Foundation', Bombay at New Delhi on 7.9.1984.

RAHEJA, S.K., BATRA, M.S. and OHRI, N.K. - Cost of Production in India.

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

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

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

12.9 Silver Jubilee Celebration of IASRI, New Delhi held from 7th to 8th Oct., 1984.

(a) Symposium on, "Advanced sample surveys".

SINGH, RANDHIR - Non-Sampling errors in surveys.

(b) Symposium on, "Linear Models & Design of Experiments".

NIGAM, A.K. - Experiments with mixtures - a review of recent developments.

(c) Symposium on "Crop Fore-castings".
ANEJA, K.G. - Crop yield Forecasting at IASRI.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

(xiv) SARUP, SHANTI, and PANDEY, R.K. - Evaluation of Groundnut Production Technology in Puri district.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

JAIN, R.C. and DAS, M.N. - Incomplete Block Designs through - A symmetrical factorials.

13. 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 Conference/Seminars/ Symposia/Workshop, etc.	Name of the scientists with designation.
Jan., 3-5	The 71st Conference of the Indian Science Congress Association held at Birla Institute of Technology, Ranchi under the auspices of the Ranchi university, Ranchi (Bihar). The following deliberations of the Focal Theme Symposium were attended to :- (a) In the Section of Agricultural Sciences dealing with "Strategies for improvement of life through Agriculture". (b) In the section of Statistics dealing with "Statistical System in India-Quality of its output". (c) In the Section of Statistics dealing with, "Statistical Methods in Stochastic Problems."	Prof. Prem Narain, Director
Jan., 17-21	The Sixth Conference of Central and State Statistical Organisation, organised by Central Statistical Organisation at Vigyan Bhawan, New Delhi.	Dr. B.B.P.S. Goel, Jt. Director (R & T)

1	2	3
Jan, 21-Feb., 6	Workshop on, "Data Analysis for life Sciences," held by ISI, Calcutta.	Sh. O.P. Datta, Scientist (S-2)
Jan., 23-24	Workshop on Indentification of Poverty & Monitoring of Income Growth under IDRP held at National Institute of Rural Development, Hyderabad	Dr. M.G. Mittal, Scientist (S-2)
Feb., 17-18	The Seminar on "Data to cover newly emerging areas and for improvement in the quality of available data" organised by Central Statistical Organisation, Govt. of India in Yojna Bhawan, New Delhi.	Prof. Prem Narain, Director, Dr. B.B.P.S. Goel, Jt. Director (R&T)
March, 19-22	The Second working conference of computer applications in Food Production and Agricultural Engineering sponsored by Computer Society of India held at hotel Maurya Sheration, New Delhi.	Dr. S.S. Pillai, Jt. Director (C.C.), Sh. S.N. Mathur, Scientist (S-3), Sh. K.V. Sathe, Scientist (S-2), Sh. R Gopalan, Scientist (S-2), Sh. O.P. Dutta, Scientist (S-2), Sh. S.P. Doshi, Scientist (S-2),
April, 16-19	IX Indian Social Science Congress held at Aligarh Muslim University, Aligarh (U.P.).	Dr. R.K. Pandey, Scientist (S-3),

1	2	3
June, 27-28	National Seminar on "Integrated Information System for Socio-Economic Development," conducted by Society for Information Science at Indian National Science Academy, New Delhi.	Sh. S.N. Mathur, Scientist (S-3), Sh. I.C. Sethi, Scientist (S-2),
Aug., 27-29	Seminar on "Local Area Net Works" held at Taj Palace, New Delhi.	Sh. R. Gopalan, Scientist (S-2),
Aug., 27-29	15th Annual Workshop of All India Co-ordinated Agronomic Research Project held at Jaipur.	Sh. P.N. Bhargava, Scientist (S-3), Sh. H.C. Jain, Scientist (S-2), Shri P.K. Batra, Scientist (S-1), Mrs. Rajinder Kaur, Scientist (S-1),
Oct., 8-12	Silver Jubilee Celebration of IASRI held at New Delhi. (a) Symposium on, "Sampling Methodology" (b) Symposium on, "Genetics and Population Ecology". (c) Symposium on "Crop Forecasting Methodology". (d) Symposium on, "Linear Models and Design of Experiments".	Prof. Prem Narain, Director and almost all the Scientists of the Institute.
Oct., 14-16	First convention and symposium of Bio-energy organised by Bio-energy Society of India at New Delhi.	Dr. R.K. Pandey, Sr. Scientist, Dr. O.P. Kathuria, Sr. Scientist

1	2	3
Oct., 26-27	Director's Conference of the ICAR Research Institutes held at I.A.R.I., New Delhi-12.	Prof. Prem Narain, Director
Nov., 24-26	The XXXVIII Annual Conference of the Indian Society of Agricultural Statistics held at ISI, Calcutta, West Bengal.	Prof. Prem Narain, Director, Dr. Randhir Singh Scientist (S-2), Sh. V.K. Bhatia, Scientist (S-2),
Dec., 3-6	The workshop on "Structured Systems Analysis and Design", Organised by Tata Consultancy Services held at Taj Palace, New Delhi.	Sh. S.L. Garg, Scientist (S-1),
Dec., 13-15	The FAI Seminar 1984 on Productivity, cost Production and subsidiary in fertilizer Industry held at New Delhi.	Sh. P.N. Bhargava, Scientist (S-3),
Dec., 15-18	The II Annual Conference of Medical Rescue and Resusitation organised by National Council of Critical care Medicine held at Vigyan Bhawan, New Delhi.	Sh. V.K. Bhatia, Scientist (S-2), Dr. K.K. Tyagi, Scientist (S-1),
Dec., 17	National Seminar on, "Quality Control of Fertilizers", held at Vigyan Bhawan, New Delhi.	Sh. H.C. Jain, Scientist (S-2),
Dec., 21-24	Seminar on, "Recent Development in Statistical theory and Applications", sponsored by U.G.C. and organised by University of Madras, Madras.	Dr. R.C. Jain, Scientist (S-2),

14. PUBLICATIONS

During the year under report, Thirty Eight 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, twenty six 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. BAHUGUNA, G.N., ANEJA, K.G. and MAHAJAN, V.K.—Incidence of Pests and Diseases and Consequent Crop Loss in High Yielding Varieties of Wheat in Gorakhpur district (U.P.)—1978-79 and 1979-80 (Final report of the pilot sample survey studies to estimate).
2. BAJPAI, S.N. and DEY, A-National Index of Animal Experiments, Vol. 5, Part-I.
3. BAPAT, S.R., Singh, B.H., JAIN, R.C. and RAJENDRA KUMAR -Hand Book of Instructions to Field staff for the project.
4. BHARGAVA, P.N., BATRA, P.K., GHAI, R.K., YERI, P.R., SAKXENA, M.P. and SWARUP, ONKAR—Annual Index of Agricultural Field Experiments Vol. IX (List of experiments conducted during 1972 and onwards and reported during 1980 under the scheme of National Index of Agricultural Field Experiments).
5. CHANDRAHAS, SINGH, B.H. and JHA, M.P.—Final report of Pilot studies on pre-harvest forecasting of yield of Tobacco in Prakasam district (A.P.) (1976-77 to 1978-79).
6. GARG, S.L., BATRA, P.K. and CHAWLA, S.L.—Report on the project, "Development of Software for storage and retrieval of information" from National Index of Agricultural Field Experiments.
7. KAUL, B.L., SARUP, SHANTI and PANDEY, R.K.—Study of yield gap and constraints in Rice cultivation in Operational Research Project area, Raipur district (M.P.).
8. KHOSLA, R.K. and ANEJA, D.S.—Proceedings and Abstracts of contributed papers presented during VII conference of Agricultural Research Statisticians held at U.A.S., Hebbal, Bangalore during 28th to 30th July, 1983.

9. KHOSLA, R.K., MUKHERJEE, A.K., SWAROOP, MAHARAJ and SINGH, P.P.—IASRI Statistical Newsletter, Vol. IX, No. 4, Oct.-Dec., 1983.

10. KHOSLA, R.K., MUKHERJEE, A.K., SWAROOP, MAHARAJ, and SINGH, P.P.—IASRI Statistical Newsletter, Vol. X, No. 1, Jan.-March, 1984.

11. KHOSLA, R.K., MUKHERJEE, A.K., SWAROOP, MAHARAJ and SINGH, P.P.—IASRI Statistical Newsletter, Vol. X, No. 2, April-June, 1984.

12. KHOSLA. R.K., MUKHERJEE, A.K., SWAROOP, MAHARAJ and SINGH, P.P.—IASRI Statistical Newsletter, Vol. X, No. 3, July-Sept., 1984.

13. KHOSLA, R.K., MUKHERJEE A.K., SWAROOP, MAHARAJ and SINGH, P.P.—IASRI Annual Report, 1983.

14. LEELAVATHI, C.R. and MEHTA, S.C.—Statistical assessment of changes in crop production in command area of Krishna River Valley Project.

15. MEHROTRA, P.C., RAHEJA, S.K., RUSTOGI, V.S. and TYAGI K.K.—Pilot Sample survey to study the impact of new technology on Crop Production, its disposal and employment in agriculture in Delhi State-Final Report (1976-77 to 1979-80).

16. NADKARNI, U.G. and ARYA, S.N.—Estimation of Birth and Death Rates in cattle, Kamrup district, Assam.

17. NIRMAN, K.P S., RAUT, K.C. and SINGH, SHIVTAR—Estimation of cost of milk production in ICD Area, Jabalpur, (M.P.).

18. RAHEJA, S.K. and BANERJEE, A.K.—Study to find out the causes of land lying idle in the operational holdings during agricultural year, 1977-78.

19. RAUT, K.C., SINGH, SHIVTAR and NIRMAN, K P.S.—Index of cost of production of milk in ICD Area, Bhopal (MP).

20. SAKSENA, ASHA and BHARGAVA, P.N.—Water Management-in rainfed agriculture, Part-II.

21. SOMAYAZULU, L.B.S., NADKARNI, U.G., GUPTA, H.C. and SCARIAH, K.S.—Studies for developing suitable methodology for estimation of cost of poultry on egg production under small scale poultry farming conditions in A.P..

15. OTHER ACTIVITIES

15.1 Lab to Land Programme :

The second phase of the ICAR Lab-to-Land programme was launched in June, 1982 with a view to raise the socio-economic status of 7500 families belonging to the categories of small and marginal farmers and landless agricultural labourers all over the country. Various programme for improving the economic conditions of the above mentioned families were prepared and undertaken by the agricultural Scientists. The approach adopted under the programme was that the Scientists should themselves visit the adopted families and prepare suitable plans involving different agricultural and animal husbandry enterprises taking into account the resource availability of the family to ensure muximum benefit of the programme. Under this programme the IASRI had adopted 243 families in village Nilothi of Delhi as mentioned below :-

Category	No. of families				
	S.C.	S.T.	B.C.	Other	Total
Small farmers	—	—	1	49	50
Marginal farmers	—	—	2	36	38
Landless Agri. Labourers	57	—	76	22	155

The highlights of various activities/programmes carried out in the village during the year 1984 are given below :-

15.1.1 Crop production :

76 demonostrations on improved practices of wheat cultivation were conducted on six varieties during rabi season 1983-84. The results of 72 demonstrations in terms of crop yields were highly satisfactory as shown below against the average yield of 25 Q/ha before the adoption of the village :

Variety of Wheat	No. of plots	Yield obtained in Q/hactares		
		Maximum	Minimum	Average
HD-2285	14	51.0	25.0	36.71
HD-2204	18	48.0	25.0	37.11
HD-2281	9	45.0	25.0	37.11
HD-23-29	10	40.0	25 0	33.80
HD-1553	11	46.0	28.0	38.91
HH-147	10	52.0	28.0	37.20

15.1.2 Demonstrations on use of weedicides (Tolkan and Hilproturon) for control of phalaris Minor weed in wheat crop 1983-84.

Weed infestation in wheat crop was a great problem in the village. As a result of demonstrations, 19 farmers had treated 30 acres of wheat crop with weedicides against Phalaris Minor weed. The results of the spray of weedicides were found to be very satisfactory in destroying the weeds. The average yield of wheat obtained from 8 fields treated with weedicides was found to be higher by 7.37 Q/Hects. as compared to that obtained from the fields of the same varieties grown without the use of weedicides as shown below :

Average yield of wheat in Q/ha based on 8 farmers

Yields in fields	Yield in field not treated with weedicides	Average increase in yield Q/ha.
40.37	33.00	7.37

15.1.3 Land levelling and shaping.

Levelling and shaping of 24 acres of undulating land belonging to 27 farmers was undertaken during 1983-84 there by bringing under rabi cultivation 24 acres of land which was left fallow earlier. Of these, 19 acres were put under wheat and 5 acres under vegetables like Tinda, Karela, Tomato and Lauki during 1983-84. The results of 16 acres of wheat crop and 4 acres of vegetable crops are given below in terms of total yield of wheat grain and total income obtained from wheat and vegetables crops.

Crop	Area	No. of families	Total yield obtained	Total income obtained	Generation of employment in hours
Wheat	16 acres	16	228.80 Q	Rs. 34,777.00	1615
Vegetable (Tinda, Karela Tomato and Lauki)	4 acres	4	—	Rs. 12,492.00	2350

15.1.4 Demonstration on compaction techniques :

4 demonstrations were laid out with the aim of improving the water use efficiency of light soils in the fields of 4 cultivators in rabi 1983-84. Demonstrations were planned on wheat crop in collaboration with the Project Coordinator,

All India Coordinated Soil physical Condition Project, ICAR, New Delhi. The technique involved the use of 500 Kg. steel roller for compacting the surface of the field 6 times before sowing of the crop. This would help in decreasing the rate of percolation of irrigation water in light soils there by covering a larger area under irrigation in a given period. Another advantage of this technique was that the loss of fertilisers through leaching would also be reduced. During the entire crop growth period during which 5 to 6 irrigations were given, it was observed that on an average a saving of irrigation time of the order of 18% to 21% was obtained in compacted area as compared to the uncompacted area.

15.1.5 Creation of self-employment opportunities and vocational training of village youths and woman.

Ten women belonging to the adopted families were deputed for receiving 8 months training in tailoring w.e.f. 1st Oct., 1983 to 31st May, 1984 at Nangloi. They received a monthly stipend of Rs. 150/- per head from the Delhi Administration during the training period. The Delhi Administration also gave a sewing machine free of cost to each of them after completion of their training. It is expected that now they will be able to supplement their family income substantially.

15.1.6 Goat rearing.

There were 20 landless families in village Nilothi which were not having any regular source of income. It was, therefore, felt that goat rearing may be introduced in such families to improve their economic condition. Accordingly, one female goat was supplied to each family. Two male goats were also provided for meeting the breeding requirements of goats in the village. It is expected that the families covered under this programme will get additional income by way of goat milk and sale of kids in due course of time.

15.1.7 Improvement of buffalo stock.

In the absence of suitable arrangement for servicing of buffaloes in the village, the farmers were using non-descript bulls for breeding purpose. This was found to result in gradual deterioration of the stock of Murrah breed thereby affecting milk yield. Non-availability of a Murrah bull was, therefore, a serious handicap and all other efforts and measures to improve the milk yield of buffaloes would not give the desired results in the long run. Providing a Murrah bull to the village was, therefore, considered a critical

community input. Accordingly a Murrah bull procured from the N.D.R.I., Karnal and supplied to the village for the above mentioned purpose.

15.1.8 Visit of farmers to Krishi Vigyan Mela.

The farmers adopted under LLP were invited to visit the Krishi Vigyan Melas organised by the IARI, New Delhi in March, 1984. They were taken around the demonstration plots of different crops and educated about the use of balanced fertilisers and newly developed varieties of crops for higher production. They were also acquainted with the use of pesticides for control of aphids in mustard and wheat crops and weedicides for control of weeds phalaris minor and wild goats in wheat crop. They were also enlightened about the latest developments in the fields of agricultural engineering and animal husbandry. Demonstrations on the use of bio-gas and solar energy for domestic and agricultural purposes were shown to them.

15.1.9 Adoption of village Akbarpur Majra in Alipur block for Delhi.

Under phase III of the ICAR Lab-to-Land programme implement ed w.e.f. June, 1984, a number of village in Union Terriory of Delhi were surveyed for the purpose of adoption of families in a suitable village under the programme. Taking into account various aspects, the village Akbarpur Majra has been selected for the purpose. This village is situated at a distance of about 30 kms. from the Institute. It is located about 5 kms. off the Delhi-Karnal road in the North-East direction from the Alipur block headquarters. The total geographical area of the village is 743 acres of which 662 acres (611 acres irrigated and 51 acres unirrigated) were under cultivation during the year 1984-85. The bench mark survey of the village was conducted in December, 1984 and 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 occupations like service or business all the remaining 250 families belonging to the following cate gories have been adopted under phase III of the Lab-to Land programme :-

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

Programme of work

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

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

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

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

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

15.2 ICAR Zone-III Inter-Institutional Tournaments :

During 1984-85, the Council regrouped the various ICAR Institutes into 6 Zones taking into consideration the location and staff strength of the Institutes in each Zone. IASRI being grouped with NBPGR, New Delhi, ICAR Headquarters, New Delhi, NIRG, Makhdoom, Mathura and NDRI, Karnal Zone-III. NBPGR was entrusted with the responsibility of organising Zone-III Sports Meet, which was held from 12th Dec. to 15th Dec. 1984 at IARI Campus. The IASRI Sports Committee was constituted by the Director of which Dr. S.K. Raheja was the Chairman and Dr. K.K. Tyagi as Convenor. In the Zone-III Sports Meet, the IASRI contingent consisted of Dr. S.K. Raheja as Chief-de-Mission, 4 managers and 44 sportsmen. The following positions were won by our Institute Sportsmen.

Game/Event	Position	Name
Kabaddi	Winner	Captain : Sh. D.P.S. Mann
Volleyball (Shooting)	Runner-up	Captain : Sh. S.K. Batra
Badminton (open single)	Runner-up	: Dr. K.K. Tyagi
Volleyball (Smashing)	Runner-up	Captain : Sh. P.S.Rai
400 Metre race	I	Shri Sunil Bharihoke
800 Metre race	I	Shri Sunil Bharihoke
4 x 100 metre relay race	II	Sh. P.S. Rai and Sh. Ashok Kumar Sh. Amar Singh, Sh. Sunil Bharihoke and
Pole vault	II	Sh. P.S. Rai

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

INDIAN AGRICULTURAL STATISTICS RESEARCH INSTITUTE

SILVER JUBILEE

1959 - 1984

SUPPLEMENT

NEW DELHI-110 012

MESSAGES

सत्यमेव जयते

Press Secretary to the President
No. F. 2-M/84

President's Secretariat
Rashtrapati Bhawan
New Delhi-110004
August 9, 1984

Dear Dr. Prem Narain,

Please refer to your letter dated the 1st August, 1984. The President of India is glad to know that the Indian Agricultural Statistics Research Institute will be celebrating its Silver Jubilee from October 8—12, 1984. The President sends his greetings and best wishes on the occasion.

Yours sincerely,

K. Suryanarayana

(K. Suryanarayana)

उपराष्ट्रपति, भारत
नई देहली
VICE - PRESIDENT
INDIA
NEW DELHI

August 8, 1984

I am glad to learn that the Indian Agricultural Statistics Research Institute, New Delhi is celebrating its Silver Jubilee from 8th to 12th October, 1984. I send my best wishes for the success of the Celebrations and wish the Institute continued success.

(M. Hidayatullah)

कृषि मंत्री
भारत सरकार
नई दिल्ली-११० ००१
MINISTER OF AGRICULTURE
GOVERNMENT OF INDIA
NEW DELHI-110 001

August 27, 1984
Bhadra 5, 1906 (SE)

Message

I am glad to know that the Indian Agricultural Statistics Research Institute will be celebrating its Silver Jubilee during October this year. The important role that this Institute has played in the application of statistical methods to agricultural research is laudable. A good number of students from some developing countries have also been benefitted by the training imparted in this Institute. I trust, the Institute will continue to render useful service to the nation in future as well.

My all good wishes on the occasion.

(Rao Birendra Singh)

सत्यमेव जयते

Wajahat Habibullah
Director

प्रधानमंत्री कार्यालय
नई दिल्ली-११००११
PRIME MINISTER'S OFFICE
NEW DELHI-110 011

August 9, 1984

Dear Dr. Prem Narain,

The Prime Minister sends her good wishes to all the members of the Indian Agricultural Statistics Research Institute on the celebrations of the Institute's Silver Jubilee.

Yours Sincerely,

(Wajahat Habibullah)

योजना मंत्री तथा उपाध्यक्ष
योजना आयोग
भारत
नई दिल्ली-११० ००१
MINISTER OF PLANNING AND
IRRIGATION & DEPUTY CHAIRMAN
PLANNING COMMISSION
INDIA
NEW DELHI-110 001

August 21, 1984

Message

I am glad to know that the Indian Agricultural Statistics Research Institute will be celebrating its Silver Jubilee from October 8 to 12, 1984.

No doubt, the Institute has played a commendable role in the application of statistical methods to Agricultural Research, yet a lot more is needed to be done in the direction of the development of suitable sampling methodology for estimating production of principal livestock products so that the farmers in the countryside get full benefit of the new techniques developed.

I wish the Silver Jubilee celebrations a great success.

(P.C. Sethi)

PUNJAB ARTS COUNCIL

121, Sector 36-A. Chandigarh
(Phone : 31272)

Chairman :
Dr. M. S. RANDHAWA
Garden House,
Kharar (Near Chandigarh)
Phone : 85258

Secretary :
H. S. BHATTY

Message

I am glad to learn that the Indian Agricultural Statistics Research Institute (ICAR) will be celebrating its Silver Jubilee shortly. This Institute has rendered outstanding service in planning of agricultural development as well as in animal husbandry. Its most useful work has been the use of random sampling method for estimating yield by crop cutting surveys.

I wish this Institute success in its work.

(M.S. Randhawa)

Dated 21.8.1984

K. R. DAMLE
I.C.S. (Retd.)

Phone No. 58993
E-1, Dhanraj Apartments,
1224, Shivajinagar,
Apte Road,
Pune - 411 004.

28. 8. 1984

I am happy to learn that the Indian Agricultural Statistics Research Institute will be celebrating its Silver Jubilee in October next.

During my tenure as Vice - President of the I.C.A.R. and subsequently as the secretary of the Department of Agriculture, I had several occasions to draw upon its technical services. The Institute promptly obliged me on each occasion and gave valuable advice. Its contribution in various fields of statistical research in agriculture and animal husbandry has been very valuable.

I hope it will continue to render useful services in future.

K R Damle

Formerly V.P. I.C.A.R. and Secretary
Department of Agriculture

Dr. B. P. PAL
F.R.S.

P-11, Hauz Khas Enclave,
New Delhi-110016

September 12, 1984

Message

I am extremely happy to know that the Indian Agricultural Statistics Research Institue, New Delhi is celebrating its Silver Jubilee after successfully completing Twenty Five Years. The contributions of the Institute is monumental in the fiield of Agricultural Statistics and its application to Agriculture and animal sciences. The statistical techniques developed by the Institute are being adopted by State and other Organisations. The Institute has produced eminent statisticians who are well known not only in the country but abroad. I am sure the Institute will endeavour to progress further and earn fame in the world.

B.P. Pal

(B.P. Pal)

M. S. SWAMINATHAN
Director General, IRRI &
Independent Chairman, FAO Governing Council

Message

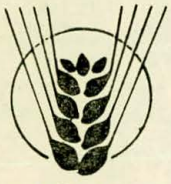
On the occasion of the 25th Anniversary of the Indian Agricultural Statistics Research Institute, I would like to salute all those who were responsible for establishing this outstanding Research and Training Center in Agricultural statistics and nurturing it to its present state of world leadership. The period 1959-84 has witnessed great changes in Indian agriculture. Starting with the intensive agricultural district programme in 1960 a whole series of programmes have been initiated from time to time to promote higher levels of crop and animal productivity and greater diffusion of economic benefits in rural areas. The IASRI has played a key role in the development of many of these programmes and in monitoring their impact. The sound statistical advice made available by IASRI as well as the large number of trained statisticians made available by the Institute have been important factors in the success of the numerous experiments conducted in the Research Institutes of ICAR and in Agricultural Universities. In particular, the All India Coordinated Research Projects owe much of their success to the guidance and assistance received from IASRI and its Computer Center.

The Institute can thus look back with pride and satisfaction on its past contributions. I am confident that in the years to come, the Director and Scientists of the Institute will not only maintain the already high standards of professional excellence achieved by the Institute but will work for even greater heights of service to the science and application of agricultural statistics.

M. S. Swaminathan

(M.S. Swaminathan)

Telegram : 'AGRIESC'
Telephone : 382629
Telex : ICAR-ND-3701



भारतीय कृषि अनुसंधान परिषद्
कृषि भवन, डा० राजेन्द्र प्रसाद रोड, नई दिल्ली-११० ००१
INDIAN COUNCIL OF AGRICULTURAL RESEARCH
Krishi Bhawan, Dr. Rajendra Prasad Road, New Delhi-110 001

Director General, ICAR &
Secretary to the Government of India

Message

On the occasion of the Silver Jubilee celebrations of the Indian Agricultural Statistics Research Institute, New Delhi, I send very warm felicitations. Twenty-five years is not a very long period in the life of an Institute but it is customary on such occasions to review the past achievements and reflect on the future plans, the new roles the Institute may have to perform.

The primary mandate of this Institute is to undertake research and impart training in Agricultural Statistics. The Institute has played a very important role in the application of statistical methods to Agricultural Research and pioneered many methodological researches resulting in more efficient and appropriate statistical tools for agro-biological research. I am sure that the Institute will continue to serve Indian agriculture as in the past and make much greater progress in the field of Agricultural Statistics for the benefit of both the agro-biological and agro-social scientists.

I wish the Silver Jubilee Celebrations of the Institute all succes.

O.P. Gautam
31-8-84

(O.P. Gautam)

16.1 FUNCTIONS, ACTIVITIES AND ACHIEVEMENTS OF THE INSTITUTE

The Institute has played a pioneering role in promoting the applications of statistical methods to agricultutural research in India and has achieved international recognition for its high quality of research and training work in the field of Agricultural Statistics. A number of research workers from the Institute have served as consultants and advisors in Asian, African and Latin American countries. Also a number of statisticians and students of the Institute are, at present, occupying high positions in Universities and other academic and research Institutions of U.S.A., Canada and other countries.

The Institute made a modest beginning as a Statistical Section of Indian (then Imperial) Council of Agricultural Research set up in 1929 on the recommendations of the Royal Commission of Agriculture. The principal functions of the section were to assist State Agricultural and animal husbandry officers in the planning of experiments, analysis of data and interpretation of results. The section was under the charge of a statistician, the first incumbent of this post being Late Shri M. Vaidyanathan. To derive full advantage of the section, the Council decided in 1933 that all technical programmes and progress reports of the Council's research schemes should be scrutinised by the statistician.

The activities of the statistical section increased rapidly with the appointment of Dr. P.V. Sukhatme as Statistician to the Council in 1940. It was found that appropriate statistical methods were not always available for solving practical problems in statistics and the section had to undertake research in the theory of statistics for developing appropriate methods. The expansion in the scope and activities of the section was accompanied by an increase in the staff from time to time.

The activities of the statistical section entered a new phase towards the end of 1943 when the Enquiry Committee set up by the Government of India to enquire into the causes of the Bengal Famine came to the conclusion that one of the main factors responsible for the famine was the defective statistics of crop production available at that time. As desired by the Government of India and ICAR, the statistical section undertook research in the methods of

collection of yield statistics of crops by developing survey techniques for yield estimation based on the methods of random sampling. In the course of this work the statistical section also undertook research in sampling theory and imparted practical training to the field staff in different States. The work involved in scrutiny, compilation and analysis of the massive data collected in the crop cutting surveys was immense and the statistical section had to be reorganised into Statistical Branch with substantial expansion in its strength and was than headed by a Statistical Advisor. The advisory work relating to agriculture and animal husbandry was separated into two units each under the charge of a Statistician.

An important development that took place in 1945 was the introduction of two regular courses, one of 6 months duration and the other of one year duration, to train professional statisticians. Subsequently, a diploma course involving a research project of one year, in addition to the professional statistician's certificate course consisting of one year course work in advanced statistics was also introduced. This necessiated the augmentation of the staff and accordingly, the strength of the Branch was increased by two Professors of Statistics and other supporting staff.

The period between 1945-49 was one of intensive activities in the Statistical Branch when under the technical guidance, yield estimation surveys by random sampling methods were carried out in almost all the States covering wheat and rice crops. By 1949, the results of sample surveys were also being used for official forecasts. Gradually these surveys were extended to other crops such as jowar, bajra, maize and cotton.

The Statistical Branch of the Council received an international recognition when under the joint auspices of the ICAR and FAO, the Statistical Office of the United Nations organised the International Training Centre on census and statistics for South-East Asia for a period of 14 weeks commencing from 1st November, 1949. The main purpose of the training centre was to help member Governments in developing appropriate census and sampling techniques as applied to population and agriculture and to disseminate information on international level regarding World Agricultural and Population Censuses to be held in 1951. In addition to trainees from various states of India, over 35 trainees from Burma, Pakistan, Nepal, Indonesia, Ceylon, Indo-China, Korea and Thailand participated in this training.

The period between 1951-55 was marked by multipronged activities for development as well as application of sample survey techniques in a number of

fields. Using these techniques the Statistical Branch successfully undertook the assessment of Grow More Food Campaign, initiated by the Government of India in 1947. Fisheries and livestock surveys were also started during this period and cost of production surveys relating to crops and milk were also initiated. In January, 1953, the Five Year co-ordinated scheme of crop cutting surveys on food crops and some other surveys were transferred from the ICAR to the National Sample Survey Organisation as the methodology had been sufficiently developed by then and integrated into the working of the various State and Central Government departments. An important event during this period was the assumption of the office as Statistical Advisor to the Council by late Dr. V.G. Panse in August, 1951, the previous incumbent Dr. P.V. Sukhatme having left the Council to take over as Chief of Statistics Branch, F.A.O., Rome. Dr. Panse, formerly Director of the Institute of Plant Industry, Indore had been closely associated with the work of the Statistical Branch of the Council and as such his appointment maintained the continuity of development of the Statistical Branch. In 1952, two F.A.O. experts, Dr. D.J. Finney of the Oxford University and Dr. Frank Yates of the Rothamsted Experimental Station, England were invited by the Government of India to advise the ICAR on research and training activities, in the field of agricultural statistics. In accordance with their recommendations, the Statistical Branch was strengthened. In 1955, it moved into its present campus situated near Pusa Institute. The building provided adequate space for Library reading rooms, lecture halls, auditoriums and office for its technical and ministerial staff. A hostel with modern amenities as well as a play ground were provided for the trainees. The Statistical Branch which was later designated as wing of ICAR was renamed as the Institute of Agricultural Research Statistics in June, 1959 in recognition of the scientific functions of research and training activities undertaken by it. A mechanical data processing unit was also added to the Institute in 1957. The Institute thus developed into a full-fledged research organisation undertaking research in various fields as well as teaching and training in Agricultural Statistics at various levels. It continues to organise international seminars and has invited eminent statisticians and professors from abroad for giving advanced courses and lectures in various branches of subjects like Statistics, Econometrics, Computer Programming, etc. . Some of the important training courses organised by the Institute in collaboration with international organisation were a three-month international training centre on 'experimental designs and survey techniques' in the later part of 1954, an international training centre on fishery statistics in February, 1959 and a training centre on agricultural census techniques for Far-East countries in the last quarter of 1968.

Among eminent scientists who visited the Institute during last two decades mention might be made of Dr. G.T. Tintner, Distinguished Professor, University of State California (USA) who gave a three months course of lectures in Econometrics in 1965, Dr. Carl L. Kossack, Head of the Department of Statistics, University of Georgia (USA) in 1970 and 1978 who advised the Institute on the development of its computer centre; Dr. M.L. Tikku, Professor of Statistics, Mc-Master University (Canada) who joined the Institute as Senior Professor of Statistics in August, 1975, for a period of 9 months and Dr. Jagbir Singh of Temple University, State of Philadelphia (USA) who also joined the Institute for a similar period in 1977-78. Prof. D.J. Finney of the Deptt. of Statistics, University of Edinburgh, U.K. visited this Institute during March-April, 1984 under UNDP Project 'Centre of Advanced Studies in Agricultural Statistics and Computer Application', as Key Consultant for advising over the planning of the activities of the centre at this Institute.

An important event in the development of the Institute was the upgrading of the post of Statistical Advisor to that of Director which was a fitting recognition to the important role played by the Institute in the field of agricultural research and development in the country. Dr. G.R. Seth, who took over as Statistical Advisor in 1966 (consequent to the retirement of late Dr. V.G. Panse) was the first Director of the Institute. After his retirement in 1969, Dr. D. Singh worked as Director till he left on FAO assignment in 1981. The present incumbent Prof. Prem Narain took over this post in 1981.

Consequent to its becoming a full-fledged Institute of the ICAR in April, 1970, the research and training activities of the Institute were organised in a number of Divisions with the main objectives of formulation and implementation of research projects in specific fields. The work of the Institute is at present undertaken in the following seven Divisions and four Cells. The organisational chart of the Institute appended at the end.

I Division of Statistical Research in Crop Sciences.
II Division of Statistical Research in Animal Sciences.
III Division of Sample Survey Methodology.
IV Division of Crop Forecasting Methodology.
V Division of Econometric Analysis.
VI Division of Training and Basic Research.
VII Division of Computer Science and Numerical Analysis.
VIII Statistical Genetics Cell.
IX Director Cell.
X Monitoring Cell.
XI UNDP Cell.

These divisions and Cells are supported by separate administration and account sections and a library.

In 1970, a Staff Research Council was constituted at the Institute. The objectives of the Council are to carefully examine and finalise the research programme of the Institute and to keep a watch on the progress of various projects. The Council meets once in 2-3 months and has been functioning regularly.

In October, 1975, a Management Committee of the Institute was constituted in persuance of the decision of the ICAR. The main purpose of setting up of the Management Committee is to ensure that the greater administrative and financial powers delegated to the research institutes in the reorganised set up of the ICAR are exercised to the fullest extent possible, to broad base the decision making process and to ensure efficient implementation of the approved research programmes. The research programmes of the Institute are thus broadly guided by the Management Committee.

The activities undertaken by the Institute in the various Divisions and Cells are briefly discussed below :

DIVISION OF STATISTICAL RESEARCH IN CROP SCIENCES

This Division is responsible for undertaking research to evolve statistical methodology as applied to crop sciences. In this field, the Institute is collaborating with the other ICAR Institutes, Agricultural Universities and State Departments of Agriculture in conducting large-scale experimental programmes, analysing their data and interpreting the results. Advice is also provided to various organisations as well as individual research workers in the planning of experiments. The work of the Division is currently organised in the following four sections :—

(i) *Planning and Designing of Experiments for Agronomic Research* : The principal function of this section is designing of experiments and analysis of data of All-India Co-ordinated Agronomic Research Project. This project consists of two components, namely, (a) Complex experiments at cropping system research centres and (b) simple experiments on cultivators' field. Work under these components has been in progress for the past 20 years. During this period, the programme has been modified from time to time to meet the needs of crop production research. Basic data necessary for formulating recommendations for various crops and agro-climatic regions are also

being collected and made use of to work out the yard-sticks of additional crop production through application of different plant nutrients.

(ii) *Maintenance and summarisation of Agricultural Field Experimental Data* : This section collects and summarises data of the vast number of experiments being conducted by various agencies under the Central and State Departments of Agriculture and the Agricultural Universities. The results of experiments conducted since the year 1947 are being published in successive series of compendia volumes for successive six-yearly periods. Three such series have so far been published. This project was earlier named as National Index of Agricultural Field Experiments but with the augmentation of the computer facilities at the Institute, this project is reorganised into Agricultural Field Experiments Informations System (AFEIS) which involves the storing of the experimental data on magnetic tapes in such a way that selective retrieval is feasible.

(iii) *Advisory and Consultancy Service* :—The scientists working in the Division are associated with the different scientific panels to provide the necessary guidance in planning and designing of experiments which are amenable to statistical analysis and also improve the content of the experimental programme. The advice is also rendered by this group on planning of experiments to research workers working in various agricultural research institutions and agricultural universities.

(iv) *Studies on Development of Statistical Methodology for Analysis of Data Relating to Current Problems* : This section undertakes research for developing improved techniques for experiments on various perennial and seasonal crops. Besides, sponsoring uniformity trials on these crops and studying data from different angles, the types and efficiencies of the designs adopted for various experiments are also examined. Studies have been initiated to identify and assess the effects of agronomic constraints to crop production particularly in command areas of irrigation projects. It is also proposed to undertake studies relating to water management in dryland areas. Suitable cropping patterns and input requirements for different agroclimatic regions are also proposed to be developed. Energy use of efficiencies of cropping systems will also be investigated.

II. Division of Statistical Research in Animal Sciences.

This Division is responsible for undertaking research in the field of statistical methodology as applied to animal sciences. The research covers the entire gamut of animal sciences, *viz.*, animal productivity, nutrition, disease control, assessment and evaluation, projection and planning. The work of the division is grouped into the following four sections.

(i) *Resource Productivity and Operational Research*: Studies relating to the development of statistical methodology for ascertaining the cost of livestock and poultry products and those relating to resource productivity are carried out in this section. It also deals with the development of suitable methodology for assessing the impact of development programmes in animal husbandry and dairy sectors on productivity as well as livestock economy in different areas.

(ii) *Standardization of Measurement Techniques.* Investigations into the standardisation of designs and procedures as well as operational feasibility of various techniques of measurement and sampling relating to animal improvement, animal breeding and resource productivity of animals evolved, are undertaken in the section.

(iii) *Summarizattan of Animal Experiments* : The function of this section is to collect basic data results of all controlled experiments conducted in the field of animal husbandry and to utilize the information in undertaking studies for sound formulation of research programme. It also undertakes investigation in the development of methodology for estimation of various parameters needed for livestock improvement programmes.

(iv) *Planning for Livestock and Population Studies* : For scientific planning of future animal husbandry development programmes, research studies on structures of livestock population and various factors influencing it is essential. The functions of this sections are to study various characters relating to livestock population and other production characteristics based on data available at present both under farm conditions and under village conditions. In addition, for paper projection of livestock population, pilot investigations are undertaken.

III Division of Sample Survey Methodology.

This division is responsible for evolving suitable sample survey techniques for collection of diverse types of data in agriculture, animal husbandry, fisheries

and forestry. The work of the Division is broadly grouped into the following five sections :

(i) *Surveys on Field Crops* : In this section research is undertaken to develop appropriate statistical methodology for estimation of various parameters like areas and yield of field crops with desired precision to enable collection of reliable statistics on a regular basis. Similarly for judging the success of various agricultural development programmes and monitoring their progress methodological investigations for developing survey techniques for assessment of these programmes are undertaken. Survey are also undertaken on a pilot basis to assess the extent of losses caused by natural calamities like drought and flood through application of suitable sample survey techniques.

(ii) *Surveys on Horticultural and Plantation Crops* : Fruits and vegetables constitute an important component of our diet while plantation crops like cashewnut, coconut, arecanut, etc. are important foreign exchange earners. However, no estimates of production of these crops are available on regular basis. The problems of estimation of perennial tree crops which continue to give yield over number of years as well as for vegetables which involve multiple harvests are quite different from the field crops. Statistical research is, therefore, undertaken in this section to develop appropriate sampling technique for estimation of area and yield of these crops. Another important aspect is the study of cost of cultivation of these crops for which methodological investigations are undertaken on important fruits and vegetables to estimate their cost of cultivation and returns to the farmers.

(iii) *Surveys on Livestock Products* : In this section, studies for developing sample survey techniques for estimation of production of important livestock products like milk, wool, eggs, meat, hides and skins, etc. are undertaken. One of the major achievements of this section has been the development of integrated technique for simultaneous estimation of production of several livestock products. This technique has since been adopted by the Ministry of Agriculture Government of India for a survey sponsored by them on All India basis for estimating the production of various livestock products.

(iv) *Surveys on Fishery and Forestry* : Recently the Institute has been engaged in a pilot sample survey to develop appropriate sampling methodology for estimating the extent of various inland fisheries resources and of production of fish from them.

Lac is an important forestry product and greatly influences the economy of tribal/backward regions of the country. Surveys for developing sampling techniques for estimation of lac production in important areas both at the regional and state level are therefore undertaken.

(v) *Consultancy Service and Advice on Sample Survey Projects* : Advice is rendered on the planning on surveys, their implementation and summarisation of data collected to different organisations as well as individual research workers. Advice and guidance is also provided to various scientists and research workers in the use of appropriate statistical procedures in the analysis of data collected on various sample survey projects undertaken by them.

IV. Division of Crop Forecasting Methodology.

This division was set up in September, 1978 and assigned to undertake research work for developing a suitable statistical methodology for obtaining pre-harvest forecasts of crop yields as its main responsibility. In addition, the division was also made responsible for developing the methodology for estimating the incidence of pests and diseases and their consequent loss in high yielding varieties of agricultural crops. The work of this division is being organised in the following four units :

(*i*) *Forecasting on the basis of Biometrical Characters* : Research investigations are undertaken by this unit for developing suitable statistical models for obtaining pre-harvest crop yield forecasts on the basis of using observations on plant biometrical characters as explanatory variables in the forecast regression models. These studies are carried out on the data relating to plant biometrical characters and crop yield collected from a representative sample of cultivator's fields covering three crop seasons for a given crop.

(*ii*) *Forecasting on the basis of weather Parameters* : This unit undertakes research investigations using time-series data on crop yield and weather variables covering a part of the crop season for developing yield prediction models.

(*iii*) *Forecasting on the basis of Integrated Models* : This Unit undertakes research investigations for developing crop forecasting models using data on bio metrical characters, weather variables and crop inputs as explanatory variables in the regression models.

(*iv*) *Incidence and Loss due to Pests and Diseases* : This Unit undertakes research investigations for developing the statistical methodology for estimating the incidence of pests and diseases and their consequent loss in high yielding varieties of agricultural crops.

V. Division of Econometric Analysis.

This division was formed in November, 1978 with the objectives of undertaking research in the field of econometrics, agricultural economics and related aspects having bearing on rural development and to provide guidance and assistance to other research projects of the Institute in regard to economic analysis of data and interpretation of results. The division undertakes research for the evaluation of potential yields and yield gaps for different crops. Constraints responsible for non-realisation of potential yields are also investigated. Another important activity of the division is to study the pattern of growth and to project the future supply of foodgrains in the country. The studies related to present and future resource use and resource productivity in agriculture are also undertaken. Projects related to demand for foodgrains have also been completed. The analysis of investment in crop research have also been done.

VI. Division of Training and Basic Research

The institute conducts training courses in agricultural statistics for three groups of students. Senior Certficate Course of 1 year duration is conducted for the benefit of agricultural research workers. Two other courses called the 'Professional Statisticians' Certificate and the Diploma Course each of one year duration are conducted for the benefit of students who have a post-graduate degree in Mathematics or Statistics and who possess experience of statistical work in a responsible capacity. Both deputationists and private category students are admitted to these courses. The third group consists of students who wish to qualify for M.Sc. and Ph.D. degrees in Agricultural Statistics (awarded by the Indian Agricultural Research Institute which is a deemed University). Besides teaching of statistical methods and techniques in the class room all students are taken out on educational tour and have also to undertake field projects for giving them practical training in data collection and related statistical work.

Periodically eminent scientists are invited to give special lectures for the benefit of students and staff of the Institute. Similarly lectures are also given by the research scientists of this Institute on various projects undertaken by them. Lectures are also delivered by the scientists of the Institute for the

benefit of the trainees deputed by other organisations such as Central Statistical Organisation, Department of Agriculture, Universities, etc.

VII. Division of Computer Science and Numerical Analysis

This Division is mainly responsible for providing assistance and guidance in data preparation, Computer programming and data processing of the Agricultural research data of the Scientists and research workers from various ICAR Institutes and Central Agricultural Universities.

Training programmes are also organised for the benefit of users from various organisations in computer programming and data processing. The activities of the division are described in the following four sections :

(*i*) *Data Preparation* : This section is responsible for providing guidance and advice in preparation of card designs, code structure, punching of data and their verification and processing on the unit record machines. On an average about 12 to 15 lakhs cards are punched every year for various organisations.

(*ii*) *Electronic Data Processing Facilities* : This activity involves development of computer application software for the analysis of data related to different research projects and problems of scientists and research workers and providing computer time for processing. On several occasions already developed general purpose application software has to be modified for meeting the requirements of various users. A library of general purpose programes containing frequently used programs for analysis of agricultural and animal husbandry data analysis has been made available to the users. To facilitate the users to make use of these library programs a number of users manual have been brought out. These manuals include a description of the procedure, complete listings of the computer programs with a sample data and corresponding results. It also contains guidelines for organising the data files alongwith necessary control cards so that the jobs can be submitted directly by them. With the facility of the terminals the progrommers are able to do the required modifications and debugging on their programs as and when it is needed. The Division is also initiating steps for changing the old card punching data preparation system to modern key to tape devices. This would provide a better facility to the users for data preparation and faster input to the computer.

(*iii*) *Training Activity* : The Scientists of the Division take active participation in the teaching activities of the Institute. They associate for taking courses in data processing and computer programming offered to the students of Senior Certificate Course, Professional Statisticians Certificate Course, M.Sc., Ph.D. students of Post-Graduate School, IARI. The entire course work for two years Diploma Course in Advanced Computer Programming which has been introduced during 1981 is undertaken by the Scientists of the Division. The Division also organises ad-hoc short term training courses for the benefit of Scientists and research workers from ICAR Institutes and Central Agricultural Universities and other Agricultural departments to utilise the compter facilities at IASRI. These ad-hoc courses are aimed at for making participants familiar with the application of software available at the Centre so that they can make use of this facility without any assistance in programming, etc. from the programmers of the Centre.

(*iv*) *Data Base Applications* : With the installation of Burroughs B-4700 Computer system during 1977 the activity for implementation of Information system data base was initiated. A group of Scientists of the Division under the overall guidance of Dr. S.S. Pillai, Joint Director (CS) have completed the implementation of a data base comprising of the bio-data of Agricultural Research Scientists under ICAR Institutes. Recently necessary software has also been developed for formation of a Information storage and retrieval system for National Index of Field experiments and National Index of Animal experiments. The selective dissemination information services based on AGRIS data base for which up-dated tapes are received from Vienna has been in operation since 1978. This enables the Scientists in India to obtain references on selected topics of their interest in the field of Agricultural Science and Technology. Recently some work has been initiated for formation of a data base for the research project taken up by the various ICAR Institutes and also for computerisation of personnal and financial documents of the ICAR.

VIII. STATISTICAL GENETICS CELL.

The cell is responsible for undertaking research in statistical genetics as applicable to animal and plant improvement. Methodological aspects relating to both animal and plant breeding are dealt with theoretically or empirically

including the formulation of breeding programmes. Critical statistical analysis of livestock breeding data are carried out in this Cell. It also renders consultancy services to research institutes/Universites as well as individual scientists in the field of statistical genetics apart from participating in the training activities of the Institute.

IX. DIRECTOR CELL.

To assist the Director in this increasing responsibilities in research coordination and management, a Director Cell was constituted in 1973. The main functions and activities of the Cell are (i) to collect requisite material from the different divisions of the Institute and prepare the annual reports, IASRI Statistical Newsletters (quarterly publication), Quarterly Progress Reports, Fortnightly Reports, etc., (ii) to convene meetings of the HDS and Sr. Scientists of the Institute from time to time where policy decisions regarding scientific, technical and non-technical matters are taken and to prepare the minutes of such meetings and conduct necessary follow-up action, (iii) to organise annual conference of Agricultural Research Statisticians ; to prepare and distribute the proceedings thereof and to take necessary follow-up action on the recommendations made therein and (iv) to do research and other work as assigned by the director from time to time.

X. 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. Joint Directors, all HDS, as well as CAO and Accounts Officer are the Members of this Cell. The functions and activities of the Monitoring Cell are to collect the information from the HDS regarding the implementation of the various plan projects in terms of the targets laid down. The progress of the projects is reviewed for each of Semesters (6 months). The Monitoring Cell submits the minutes of each of the meetings to the Director for discussion in the meetings of the Heads of the Divisions for taking remedial measures and removing bottlenecks in respect of the projects in which the progress is hampered or progress is slow due to some reasons.

XI. UNDP CELL

The Institute has been recognised as a Centre of Advanced Studies in Agricultural Statistics and Computer Application by the United Nations Rome under their development programme from 1st Oct., 1983 with the main objective to develop it as a Centre of Excellance with adequate infrastructure facilities

to undertake advanced training programmes to carry out research in various aspects of agricultural statistics and computer applications. A Cell known as UNDP Cell has been created from Oct., 1983 to implement the programme of this project. Prof. D.J. Finney of the Deptt. of Statistics, University of Edinburgh, U.K., has been recognised as key consultant for advising over the planning of the activities of this centre. Prof. Finney visited this Institute from 16th March to 2nd April, 1984 and advised regarding the successful implementation of this project. Prof. Prem Narain, Director IASRI and Sub-Project Coordinator of this project visited U.K., Canada and USA from June 10 to July 8, 1984 to identify the necessary consultants and suitable places for fellowship trainees under this project.

IASRI LIBRARY SYSTEM

Prior to 1955 the scientists of the then statistical wing of the ICAR used to consult ICAR Library for their research work. In 1955, with the shifting of the Institute to the present campus, books, bound journals, reports and reprints were transferred from ICAR Library. This was beginning of a separate Library at the Institute to provide help and assistance to various scientists, research workers and students of the Institute in their research and teaching, etc. The Library was housed in a part of the building with a room for keeping books and bound journals, etc. and a reading room for consultation purpose.

Gradually the Library facilities were expanded and a moderate size of holdings of various standard books on statistics and related subjects and journals was made. However, till 1965 the Library used to procure books and journals through ICAR Library, with the result the progress of procurement of books and journals was rather slow. With the allocation of separate funds for the Institute Library from 1966 onwards, the Library is engaged in resource building in the field of Institute's interest. Its growth has been fast during the last fifteen years.

The Library moved to the present new campus in 1977 and occupies complete floor with 15,000 sq. ft. area. It has a well furnished reading area, standard Library racks etc. It has nice display of Indian and Foreign periodicals. The latest annual reports of different ICAR Institutes received in the Library are also displayed separately. The Library has built up a rich resource collection and being consulted by researchers from related Institutions and organisations besides by internal users.

The present day position in terms of acquisition of journals, number of books and bound journals and reports, etc. and number of library members since 1968 is given below :

Sl. No.	Year	No. of Journals procured including complementary	Total No. of books and bound Journals & reports, etc.	No. of members (including students)
1.	1969	125	6,000	225
2.	1973	175	11,000	350
3.	1978	250	17,000	500
4.	1983	300	24,000	525

The Library is a member of Inter-Library loan consortium for scientific and technical Libraries of Delhi and participate in resource sharing on Library basis.

REPROGRAPHIC AND OTHER FACILITIES

Since May 1978, the Library has started reprographic services also primarily for internal users and attends jobs from other ICAR Institutes also on request and payment. IASRI Library system was third in initiating reprographic service in the whole ICAR System. The Library has a facility of Electronic Stencil Cutter also. The Library system is strengthening this service by installing latest plain paper copier from Xerox under UNDP project.

LIBRARY CONFERENCE HALL

The Library has also a mini conference hall for small and short duration meetings and such other activities.

ADMINISTRATION AND ACCOUNTS

The Institute has a well established administrative set up to support and assist the scientists and other staff in the performance of the functions and activities of the Institute. Similarly it has also an Audit and Accounts Section for looking after the auditing, accounts and other financial aspects.

(a) *Administration* : The administration, headed by a Chief Administrative Officer, who is assisted by a Senior Administrative Officer, a Admn. Officer and two Assistant Administrative Officers, is divided into the following sections :—

(i) *Administration-I Section* : This section is headed by a superintendent and is resposible for all work relating to the service matters in respect

of the scientists of the Agricultural Research Service, administrative staff and supporting staff other than those falling in the category of Technical Service.

(ii) *Administration-II Section* : This section is also headed by a Superintendent and is responsible for all work pertaining to the service matters in respect of members of the Technical Service and supporting service included in the Technical Service. This section is also responsible for printing and publication work as well as preparation of the budget of the Institute. Work concerned with the management Committee of the Institute is also done by this Section.

(iii) *General Section* : This section is also headed by a Superintendent and is entrusted with all house keeping work such as procurement of stationary and other office material, fixures, furniture, buildings constructions, maintenance of the property of the Institute and allotment of office and residential accommodation, etc.

(iv) *Cash Section* : This section is also headed by a Superintendent and is responsible for disbursement of salaries, T.A., H.R.A. and other advance, etc. to all officers and staff of the Institute numbering over 600.

(v) *Receipt and Despatch Section*: This section is responsible for handling all the incoming and outgoing dak of the Institute.

(vi) *Care-taker* : He functions within the overall supervision of the superintendent, general section and is responsible for the caretaking job of the Institute. He is also responsible for payment of electricity and water charges, security and horticultural operations of the Institute.

(b) *Audit and Accounts* : The work of Audit and Accounts is under the overall guidance and supervision of an Accounts Officer, who is assisted by a full-fledged section headed by Junior Accounts Officer. This section is responsible for scrutiny and passing of all bills for payments prepared by Cash Section and other Sections, for maintenance of GPF Accounts of all officers and staff, carrying all internal audit and scrutiny of expenditure proposals of the Institute, etc,

(c) *Hindi-Unit* : This Unit is headed by a Hindi Officer and is attending to all the requiremeuts and to promote Hindi work of the IASRI.

(d) *O.M.V. Unit* : This Unit is headed by C.A.O. (Vigilance Officer) who is assisted by a Superintendent. All matters relating to disciplinary cases in respect of category 'B' Staff (non-gazetted) are being dealt with in this Unit.

(e) *Publication Unit* : This unit is working under overall charge of the Jt. Director (CS & NA), IASRI assisted by AAO (II). This Unit is responsible for all printing work such as proof reading, deciding on formats, liaison work with the printing presses alongwith sale of Publications of the IASRI.

Besides the above sections/units the following sections/units are being established in the IASRI.

(i) Budgets & Accounts Section.

(ii) Estate Unit.

(iii) Plan Co-ordination.

The story of the growth and achievements of the Institute would not be complete without a mention of the contribution made by its scientists in the national as well as international field. This is described in the following paragraphs.

The various Officers of the Institute attended, from time to time, international seminars, conferences, advanced training and research courses etc. under the various technical assistance schemes of several foreign countries and F.A.O. Late Dr. V.G. Panse had made several visits outside India on important F.A.O. assignments for rendering advice to under-developed countries in sample surveys, design of experiments and agricultural statistics in general. Dr. G.R. Seth attended the first session of the Asia and the Far East Regional Commission on Agricultural Statistics as well as UNDP Regional Seminar under F.A.O. in Tokyo in 1966. He also attended a seminar on crop losses in Rome in 1967 and was a visiting Research Associate to Ohio State University/F.A.O. for some time in 1968. He joined the F.A.O. as Agricultural Statistician in 1969 and he was on UN assignment in Haiti (West Indies). With the assistance of the USSR, FAO organised almost every year international seminars on statistical problems relating to agricultural and livestock statistics usually held at Moscow for about two months. Almost every year or so, an officer of this Institute attended these seminars. So far, Dr. D. Singh, Dr. M. Rajagopalan, Sh. S.D. Bokil, Dr. S.S. Pillai and Dr. K.C. Raut visited Moscow in this connection during 1962-68. Shri K.S. Krishnan acquainted himself with the methodology of forecasting in relation to agricultural operations at the International Minerals and Chemical corporation Skokie, Chicago, for about a month in December,

1966-67. Prof. P. Narain spent two years at the Institute of Animal Genetics, Edinburgh, U.K. during 1967-69 for training in Advanced Statistical Methodology in Animal Genetics and Breeding Research under the Colombo Plan. Dr. S.K. Raheja attended an International Seminar on Administrative Data Processing in London, U.K. during July-December, 1967, under the Colombo Plan. Shri U.G. Nadkarni underwent training in Advanced Statistical Techniques used in studies of fibres characteristics for manufacturing operations at the Bradford Institute of Technology, Bradford, U.K., from Nov., 1967 to May, 1968, under the Colombo Plan. Dr. J.P. Jain spent one year at the University of Missouri, USA during 1968-69 under the FAO fellowship. Dr. D. Singh attended the FAO Conference held in Bangkok in 1964 as one of the delegates of Govt. of India. In 1965 he was appointed as Statistical Advisor to the Royal Govt. of Afghanistan and posted at Kabul. During 1965-66 he worked on FAO assignment as Agricultural Census Advisor to the South East Asian countries. Dr. D. Singh attended the workshop and Demonstration Centre for 1970 Agricultural Census at Washington D.C. USA from May to August, 1968. He again visited USA as Visiting Professor at Ohio State University in 1973,

Late Shri T.P. Abraham went on FAO assignment to Teheran (Iran) in early 1971. On his return he bec ame Director in the National Sample Survey Organisation, New Delhi. Late Dr. B.V. Sukhatme left in 1967 to join as Professer of Statistics at the IOWA State University; USA. Shri G.L. Ghai left for higher studies to USA. He was Assistant Professor at Miami University, USA. Dr. M.P. Jha, Statistician-cum-Associate Professor remained on deputation from December 1968 to January 1973 in South Korea as a FAO Expert. Dr. M.N. Das went as a Visiting Professor to Canada for about 6 months in 1973. He had since left the Institute and became Director in the Central Water Commission, New Delhi. Shri. S.S Narula, Statistician-Cum-Associate Professor proceeded on FAO assignment at Accra (Ghana) in 1974 and got retirement in 1978. Dr. S.S. Pillai was deputed to attend the International Training Course for Senior Application Programmer held at Budapest (Hungary) from 14th October to 14th Decmber, 1974 under the AGRIS of the United Nations Development Programme. Shri S.N. Mathur visited Ankara (Turkey) between 16 to 20th June, 1975 to participate in the International Training Seminer on AGRIS (international information system for Agricultural Sciences and Technology and INIS (international Nuclear Information System) organised by International Atomic Energy Agency and FAO of the United Nations. Dr. G.R. Seth proceeded on leave

in 1969 and thereafter he retired. Dr. D. Singh took over the charge of the Insitiute as Director then, joined Agricultural Census Commission, New Delhi as a Deputy Agricultural Census Commissioner in May, 1971, handing over the charge to Dr. M.N. Das Subsequently he rejoined the Instiute as Director in October, 1973. Shri R.K. Mahajan and late Shri S.K. Bhora went to Iraq in August, 1974 on teaching assignments to University of Sulamania and Institute of Technician respectively. Dr. D. Singh was elected as President of the Section of Statistics for 63rd Session (1975-76) of the Indian Science Congress in January, 1975 by the Indian Science Association. Dr. D. Singh was selected as a member of the Editiorial Board of the Journal entitled "Statistical Planning & Inference (JSPI)", from Colorado State Univeresity, Fort Colines Colorado, USA, in 1976.

The name of Dr. D. Singh was selected by M/s. Famous India publications, Daryaganj, Delhi for inclusion in their reference work, "Famous India-Nation's who's who, 1976", being brought out for international circulation. Prof. P. Narain, Senior Professor visited the Deptt. of Statistics of IOWA State University, USA from Feb. to March, 1976 and delivered a series of lectures. He was also admitted as Fellow of the Indian Socicty of Genetics and Breeding in March, 1976.

Shri R.K. Khosla delivered a series of lectures on statistical aspects to the participants of the workshop on "Assessment of Crop Losses due to pests and Diseases," organised by the FAO/UN at Bangalore in September, 1977. Prof. Prem Narain attended the international Workshop on "Inventory of livestock resources in Asia", held at Manila (Philippines) in January, 1977. Shri S.R. Bapat, Scientist acted as a consultant to Rice Project, Sierra Leone (West Africa) on behalf of UNDP/FAO/IITA in early 1977 and again in early 1978. Dr. D. Singh, Director worked as guest lecturer at the Asian Statistical Institute, Tokyo (Japan) from May to June, 1977. In Tokyo he also participated in the seminar on advanced sampling theory and in advanced seminar on agricultural statistics. Dr. D. Singh, visited Rome (Italy) during Nov.-Dec., 1977 to co-ordinate and edit the material regarding the guidelines for the taking of a Census of Agriculture. Dr. A. Dey, Associate Professor was elected as a member of the International Statistical Institute, Hague, in 1977. Prof. Prem Narain, Senior Professor was awarded Rafi Ahmed Kidwai Memorial Prize for the biennium 1974-75 in Agricultural Statistics and Economics. He shared this prize with Dr. C.H. Hanumantha Rao, Director, Institute of Economic Growth, New Delhi. This is the first time that this

prestigious award has been given in the field of Agricultural Statistics and Economics. Prof. Prem Narain, Senior professor was honoured by being elected as Fellow of the Indian National Science Academy (FNA) in 1977. He was chosen for his outstanding contributions in the field of statistical genetics. The name of Dr. D. Singh, Director was also selected by the Editors for admission of his capsule profile to the pages of who's who in Indo-American Education (2nd Edition), World's first gather together biographical reference work on Indian and American Educationists.

The name of Prof. Prem Narain, Joint Director was included in the India Who's who 1977-78, ALPHA Publications, New Delhi in 1978. He was also elected as a member of the International Statistical Institute, Hague. Dr. D. Singh, Director attended the 7th Session of the FAO Asia and the Far East Commission on Agriculture held at Bangkok (Thailand) in August, 1978. He was selected as a member of the FAO Statistics Advisory Commitee of Experts in December, 1978, on the basis of his specialised knowledge, for the purpose of giving advice on FAO's statistical policy.

Dr. D. Singh visited Rome from 22nd April to 30th April, 1979 to attend the FAO Statistical Advisory Committee of Experts of the Food and Agriculture Organisation of United Nations. He presided over one of the sessions. He went abroad on 17th April, 1980 for about two months to help His Majesti's Govt. of Nepal as FAO Consultant to prepare, "1980's Pilot Census of Agriculture" in Nepal. He went to Rome to attend the meeting of the FAO Statistical Advisory Committee of Experts held from May 11-18, 1981. He retired from Council Service w.e.f. September 30, 1981 and joined as Senior Statistical Advisor to Hashemite Kingdom of Jordon, Aman on FAO assignment and Prof. Prem Narain took over the charge as Director since that date.

Prof. Prem Narain, visited the Department of Statistics of IOWA State University, Ames, IOWA, USA from 15th Feb. to 31st March, 1976 and delivered a series of lectures entitled, "Theory of Selection Limits and distribution of time taken to attain them". He also gave a seminar entitled, "On the Method of Conditioning the Diffusion Process in Genetics" on 10th March, 1976. He further delivered a seminar on "conditioned diffusion process in population genetics" in the department of Statistics, Colorado State University, Fort Collins, Colorado, USA. He was admitted as Fellow of the Indian Society of Genetics and Plant Breeding in March, 1976. He delivered a seminar talk on "Workshop on Inventory of livestock resources in Asia" held

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

A view of the participants at the Inaugural Function.

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

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

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

24. SINGH, H.P. and JAIN, J.P.—Standardisation of techniques for assessment and evaluation of livestock developmnt programmes.

25. SONI, P.N. and BHARGAVA, P.N.—Experiments in cultivators' field a review.

26. SRIVASTAVA, S.S.—The Growth of Library and information activities at IASRI.

25 years (1959-1984) Research High lights and I.A.S.R.I. Brochure were also released on this occasion.

17. SUMMARY OF THE REPORT

17.1 STATISTICAL RESEARCH IN CROP SCIENCES

17.1.1 Coordination and planning, Designing and analysis of Experiments under AICARP (All India Coordinated Agronomic Research Project at CSR (Cropping System Research, Centres and on cultivators' Fields.

The objectives of the project are—(i) to provide the statistical designs and methods of analysis for the expts., planned at cropping system research centres under AICARP, (ii) to provide suitable sampling plan, designs of experiments and their method of analysis for the experiments on cultivators' fields, (iii) to undertake the analysis and interpretation of the data of the experiments planned under AICARP both at cropping system research centres and on cultivators' fields, (iv) to devise suitable proformae for recording of data and to prepare instruction manuals for coding of data and (v) to coordinate the work of the project at National level and also to provide necessary information to Project Coordinator, Planning Commission, ICAR and various other agencies on their requests.

The main thrust of research programme during the period under report was on the development of suitable statistical methodology for identifying promising cropping systems, their management practices, fertilizer requirements and other associated agronomic practices. Some new series of programme planned at Cropping System Research Centres included various types of experiments on crop technology for optimum production under resource constraints, double cropping in rainfed areas and weed control experiments on crop sequences. The technical programme for experiments on cultivator's fields also underwent modifications to include experiments on studying the effect of different weed control measures on different crops and testing the feasibility of double cropping and intercropping in dry land areas.

At cropping system research centres, the designs adopted for the conduct of experiments were RBD, split-plot, split-split plot confounded factorial, etc. The appropriate method of statistical analysis was applied for their analysis. In simple experiments on cultivators' fields a three stage random sampling design was adopted to select the experimental site. The designs adopted for the conduct of the experiments were mostly RBD and split plot. Analysis of

these experiments was also carried out by adopting the suitable statistical technique.

14 types of complex experiments were planned at 43 cropping systems research centres spread over different agro-climatic zones. The simple experiments of 8 types of cultivators' fields were planned in 49 districts spread over different agro-cilmatic zones. The total number of experiments available from 43 cropping systems research centres were about 500 and on ECF the total number of trials were around 7,000.

Studies on constraints limiting productivity involving interaction between monetary inputs like fertilizer and other factors like soil moisture, crop stand, date of sowing and weed control in selected cropping system had clearly indicated that delay in planting/sowing of cereals like rice and wheat by 20 days accounted for a yield reduction of 5-7q/ha in rice and wheat, 17q/ha in jowar, 10q/ha in bajra and around 3q/ha in gram.

In experiments planned to study the possibility of economising the chemical fertilizer through organic manure in selected crop sequences, the results indicated that kharif manuring by fertilizer had little influence on the grain yield of rabi crops in rice-rice, maize-wheat and bajra-wheat sequences, while in case of rice-wheat, rice-jowar and jowar-wheat sequences, it left a residual effect when part of chemical fertilizer was applied as FYM.

Experiments on cultivators' fields

Studies on rationalisation of inputs by evolving a proper blend of monetary and low-monetary inputs giving due emphasis to associated cultural and management practices have shown that there is a significant yield reduction of about 5.0 q/ha in the grain yield of kharif rice with a 25% reduction in fertilizer dose while with a further reduction of fertilizer to 50% there was a total reduction in grain yield by 9.0q/ha. However, in rabi rice and wheat the magnitude of yield reduction was significantly more than in kharif rice. Next to fertilizer, plant population appeared to be a major constraint limiting the yield levels in cultivators' fields. A 25% reduction in plant population accounting for an yield reduction of 3.0 q/ha in kharif rice and more than 4-5 q/ha in wheat.

Double cropping of maize and wheat at Ropar (Punjab), rice and mustard at Sambalpur (Orissa), rice and wheat at Bhandara (Maharashtra) and Sindhi (M.P.) using appropriate varieties and recommended levels of fertilizers, recorded higher yield levels and income under rainfed conditions. Under irrigated conditions, a cereal-pulse rotation is found most promising.

The input use generally was more in purely cereal based rotations, while it was the minimum in oilseed-pulse rotation. The available results are suggestive of diverting at least a small percentage of irrigated areas which are presently being covered by purely cereal based rotations to pulses and oilseeds.

Intercropping of mustard + wheat at Dhenkanal (Orissa), Ragi + Soybean at Kolar (Karnataka) and of groundnut + blackgram at Tiruchirapalli (TN) recorded encouraging results even under rainfed conditions. The trend of the results from all the three districts clearly show that it is possible to include a legume like soybean, blackgram or greengram as an intercrop with the major cereal crop of that region, towards increasing the general yield levels.

17.1 2 Agricultural Field Experiment Information System

The principal objective of the project is to maintain at a central place the results and other ancillary information on agricultural field experiments conducted at various research Institutes in the country. The data will be transferred to and stored in magnetic tapes at IASRI. During the year under report, experiments reported by the regional staff during 1983 for the system were loaded on tapes. The System aims at putting the data on tapes in respect of experiments planned and conducted from the year 1978 onwards.

The printing of Annual Index of Agricultural Field Experiments Vol. IX (in respect of experiments reported to the Institute during 1980) was completed whereas press material for Vol. X was finalised.

17.1.3 A statistical study on characterization of drought in relation to a crop.

The objectives of the project are (i) to quantify drought threshold values in relation to a crop and (ii) to obtain their chances of occurrence. Yield data for jowar, Bjara, Cotton and Groundnut was collected for Ahmed Nagar and Bijapur district. Trend in the yield data was examined by using regression technique.

17.1.4 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. Technique applied for analysis of the data is regression and summarisation.

During the year collection and analysis of data on area, production, productivity, rainfall, land development for the command area of Sreeramsagar (Pochampad) was completed and the project report finalised. The results indicated that the productivity of the cereals have increased by about 37% and that of groundnut by 30%. Area under rice has been increasing at the highest rate and the targets have already been achieved. Faster growth rate in area and production have to be planned to attain targets of irrigated dry crops. There is a scope for higher production in the command area through adoption of agro-techniques.

17.2 CROP FORECASTING METHODOLOGY

The progress of work in respect of each project of the Division is summarised below :

1. Pilot studies on pre-harvest forecasting of fowar yield on the basis of observations on biometrical characters Sangli district (Maharashtra).

   The final report of the project was issued. The study revealed that yield forecast of hybrid jowar was possible one month before harvest.

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

   The crop loss due to pests and diseases for Samba season (July to December) 1979 was obtained as 3.25% of which the major portion (1.48%) was due to earhead in section by helminthosporiose. The avoidable loss in crop yield during Navarai season (January to June) 1979 was estimated as 5.50% of the yield possible through the adoption of suitable plant protection measures.

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

   The data collected were scrutinised and coded. Collection of data for next apple season remained in progress.

4. Pilot sample survey for estimating the incidence of pests and diseases and consequent loss in crop yield on high yielding varieties of wheat in Gorakhpur district of U.P.

   The final report of the project was published. The overall crop loss due to pests and diseases for 1978-79 and 1979-80 was obtained as 4.56 and 2.56 per cent respectively of which a major portion to the extent of 92% was due to rats and alternaria bright. The avoidable loss was estimated as 12% of the possible yield through the adoption of suitable plant protection measures.

5. Pilot studies on pre-harvest forecasting of yield of groundnut in Rajkot district, Gujarat.

   The data collected for kharif season were scrutinised. The field work for collection of data for further period remained in progress.

6. Studies on forecasting crop yield on the basis of weather parameters.

   The final report of the project for rice crop in Puri district was published.

   The model using data on maximum temperature and sunshine hours upto 10th week after sowing could be used for forecasting rice yield in Puri district.

17.3 STATISTICAL RESEARCH IN ANIMAL SCIENCES

The Division of Statistical Research in Animal Sciences continued to undertake research in the field of statistical methodology as applied to animal productivity, operational research and animal population projection. The field work of four projects, namely (i) Pilot studies for estimation of birth and death rates in ovines (Tamil Nadu), (ii) Statistical investigation on economics of pig production, (iii) studies on comparative performance of mixed farming involving crops, livestock, poultry and fish, and (iv) Development of a suitable statistical methodology for estimating extent of labour utilization in livestock and poultry keeping in rural areas (Meerut district, U.P.) was initiated and continued for collection of relevant data. The statistical analysis in respect of the following four projects remained in progress : (i) Pilot study for developing a suitable methodology for estimation of cost of cultivation of fodder crops, Jalandhar, (ii) Optimum ration for animal production through linear programming techniques in India, (iii) Study of distribution of age-specific mortality and

fertility rates in bovines, and (iv) Development of suiiable methodology to study the effect of housing conditions and other factors on milk production under village conditions.

In the pilot survey to study the performance of cross-bred cattle under village conditions, Palampur (HP) the production traits and associated parameters were estimated following the techniques appropriate for each character. The various production as well as adoptability charactersistics were utilised to work out to index of overall merit for evaluating the performance of cross-bred cows vis-a-vis local cows. The analysis of constraints in the adoption of crossbreeding programme in the area by two approaches namely, (i) causal modeling and (ii) production function remained in progress.

One project completed during the period relates to estimation of cost of milk production ICD Area, Jabalpur, (MP). It was found that the overall net cost per kg. of cow milk in two years including family labour was Rs. 2.54 in the first year and Rs. 2.34 in the second year. The corresponding estimates excluding family labour in two years were Rs. 2.12 and Rs. 1.80 respectively. Lower cost of production in second year was due to lower feed cost. The net cost per kg. of buffalo milk including family labour was Rs. 1.66 in the first year and Rs. 1.56 in the second year. The corresponding net costs excluding family labour in the two year were Rs. 1.38 and Rs. 1.25 respectively. The average market rate per kg. of buffalo milk was Rs. 1.60 in the first year and Rs. 1.83 in the second year. Another study completed during the year was on construction of life tables for different breeds and sexes of cattle and buffaloes. The current life tables were constructed by adopting the standard methods used for similar studies on human population. A proper formula was derived and used to obtain the sample variance of observed expectation of life. The difference between observed expectations of life for respective age groups were tested between different breeds within ICD and non-ICD areas and within breed between these areas. The age specific premium rates were calculated for different breeds of cattle and buffalos. It was observed that the premium rates based on actual mortality for lower age groups are much higher as compared to those charged by the General Insurance Corporation (G.I.C.). In case of male and female cattle and only female buffaloes of ages between 3 to 8 years, the premiums worked out are either less or equal those of G.I.C. in all cases except for female cattle of Punjab.

17.4 SAMPLE SURVEY METHODOLOGY

The Division of Sample Survey Methodology continued to take up during 1984 sampling investigations with a view to evolve suitable sampling methodo-

logies and to demonstrate the operational feasibility and practical applicability of these methodologies for collection of data related to diffierent fields of agriculture field crops, horticultural crops, livestock, fishery, forestry. etc. A total of 21 research projects were under operation during the year under report. In respect of 8 projects preparation of annual final reports was in progress/ completed. In the remained project field work for collection of data/analysis of data was in progress.

Final report on 'Pilot sample survey to study the impact of new technology on crop production, its disposal and employment in agriculture in Delhi state' was prepared. One of the main achievements under the project was the development of indices of adoption rate of different components of new technology, which in turn were utilized for measuring the impact of new technology in terms of yield, etc. In respect of the project on 'Study to find out the causes of land lying idle in the operational holdings' during the agricultural year 1977-78, the main causes were observed as (i) Unlevelled/rocky land, (ii) lack of irrigation, (iii) lack of resources and (iv) land with low fertility/ grazing land. The main remedial measures as put forward by the farmers for reclaiming the land were (i) levelling and removing of rocks, (ii) provision of irrigation facilities, (iii) provision of facilities in cash and kind and (iv) improving the soil fertility. The salient findings for the project on 'Study of suitable sampling methodology for estimating the yield of vegetable crops on the basis of partial harvests' were that the estimate of total production of vegetable crops can be made by recording only few pickings by making use of the percentage contribution of individual pickings on total yields as also by using their correlation with total yield following double sampling technique. This procedure was found to be more efficient than the usual approach of considering all pickings. Estimate of total production could also be obtained efficiently following component sampling technique by selecting independent samples for each picking. The study indicated that the technique of double sampling along with the use of systematic sampling over time may be of more advantage for further study in this direction.

During the year under report, the following two new research projects were initiated.

1. Pilot sample survey for estimation of area of grazing land and its utilisation. The objective of the project are (i) to evolve a sampling technique for estimation of area of grazing land, (ii) yield of herbage and (iii) botanical classification and analysis of herbage samples. The project was launched in December, 1984 in Tamil Nadu.

2. Sample survey for study of constraints in transfer of new agricultural technology under field conditions. The objectives of the projects are (i) to develop suitable sampling methodology for studying the effect of new agricultural technology for increasing productivity of land, (ii) to determine the extent to which the potential of HYV has been achieved under field conditions and (iii) to identify and investigate constraints in transfer of new agricultural technology to cultivators fields. The project was implemented in 10 states of the country for field data collection.

17.5 ECONO METRIC ANALYSIS.

17.5.1 Economic study of imbalances in the production of rice and wheat crop in India.

The project deals with the growth rates of area, yield and production of rice and wheat crops. The crop yield will also be examined in different regions. The future productivity of these crops for the years 1989-90 and 2000 AD have also been worked out.

17.5.2 Economic study of new farm technology with special reference to yield gap and associated factors.

This is a Sixth Plan Coordinated project and was initiated in the ORP areas at Bhilwara (Rajasthan), Indore (M.P.) and Ranchi (Bihar) in 1984. The basic data and the recommended technology for the selected villages of the area has been collected and sampling plan finalised.

17.5.3 Identification of the socio-economic and other constraints operating in the spread of modern technology on rice farms in ORP area located in Raipur district (M.P.).

In the four villages which comprise of ORP area in Raipur district socio-economic and other constraints operating on the selected rice farms were studied. The project report was published on yield gap and constraints in rice cultivation. The study revealed a significant yield gap between the potential and actual yield estimated on the basis of survey data. The important factors contributing to difference between low and high productivity farms were observed as the application of nitrogen, incidence of pests and diseases and credit availability.

17.5.4 Economic Analysis of acreage response for Tur crop of India.

The main objective of the project is to study the trend in area, yield and production of tur crop in important pulse growing states and also to study the effect of farm harvest prices on allocation of area under the crop. Acreage response functions were estimated and multiple regression analysis was carried out to study the effect of input factors on yield of tur crop in different states.

17.5.5 Determination of constraints operating in transfer of technology relating to crop production in ORP villages of tribal area in Dangs district of Gujarat.

The project was undertaken in the tribal area of Dangs district of Gujarat with a view to determine the costraints in transfer of technology among tribals pertaining to crop production and suggesting policy measures for the same. The drafting of the report was in progress.

17.5.6 Assessment of yield constraints in transfer of new farm technology in operational project area Bhilwara District (Rajasthan)

A study was undertaken in the ORP area of Bhilwara district of Rajasthan with the objective of studying potential and actual yield obtained on cultivators fields and the constraints responsible for the yield gap of wheat crop. The study revealed a yield gap of 21 q/ha to 25 q/ha varing in different holding sizes between the potential yield of 49 q/ha demonstrated on the farmers fields. The study reveals a large variation in yield to the extent of 14 q/ha when the number of irrigations to the wheat if increased from four to the recommended six.

17.6 TRAINING AND BASIC RESEARCH

The regular training courses namely M. Sc., Ph. D. in Agricultural Statistics and Senior Certificate and Professional Statistician Certificate Courses, Diploma in Agricultural Statistics and Diploma in Advanced Computer Programming Courses were conducted as usual. During the year 13 students of the Institute completed successfully, the degree courses of which 6 were from M. Sc. and 7 were from Ph. D.

The XXII Convocation of the training courses was held on the 10th Oct., 1984, which was presided over by Dr. O.P. Gautam, Director General, ICAR.

Sh. Yogendra Makwana, Minister of State for Agriculture was the Chief Guest, who delivered the Convocation Address. The progress report was presented by Prof. Prem Narain, Director, IASRI, and the report on training activities was given by Dr. A.K. Nigam. As a part of Convocation Programme an elocution contest was organised on 8th Oct., 84 in which the students of various courses participated. The topic of the contest was 'roll of design of experiments in the field of aggriculture and animal husbandry'. The session was chaired by Dr. M.N. Das, ex-Director of the Institute. At this Convocation 26 candidates were awarded certificates and Diplomas out of which 15 were from Senior Certificate Courses, 10 from Professional Statistician Certificate Course and 1 from Diploma in Advanced Computer Programming. During the year under report 34 students were admitted to various courses.

During the year 56 Seminar talks were held at the Institute which were delivered by the students, Scientists and distinguished vtsitors from the country and abroad.

Special training programme were arranged for trainees deputed from other organisations such as ICAR Institutes, Agricultural Universities, C.S.O. and other Research Organisations.

The Scientists of the Division were actively engaged in carying out research in various fields of Statistics such as Design of Experiments, Sampling and Statistical genetics. Three research projects were undertaken by the Scientists during the year.

17.7 COMPUTER SCIENCE AND NUMERICAL ANALYSIS

The Division continued to extend EDP facilities to research workers/ Scientists from Institutes under ICAR and Central Agricultural Universities, Directorate of Economic and Statistics, Govt. of India and Department of Agriculture, U.P.

The Burroughs B-4700 computer system was utilised during two shifts from 8 AM. to 8 PM and also occassionally during night shifts for completing the accumulated backlog. About 16500 production jobs and 3900 testing jobs were processed on the computer. The Inter-active terminals were utilised for program development by students and research workers of the Institute

Programming assistance was provided to 120 Ph. D., 121 M.Sc. and 50 other research workers. For meeting their requirments 10 new computer programs were developed and several others were modified. The selective

dissemination services from AGRIS data base was continued. The Scientists of the Division associated in conducting data processing and computer programming courses for students of PG School, IARI and also other certificate courses of the Institute. A Short duration course on use of computer at IASRI was organised during 11th to 16th June 1984. It was attended by 35 participants from various ICAR Institutes.

A few lectures were arranged on CANDE Software for using the terminals available on B-4700 computer system during 11th to 13th Sept. 1984.

Mechnical Tabulation Unit of the division undertook 1770 jobs for data punching involving punching/verification of about 11 lakhs cards. Also 840 listing, 90 sorting and 104 duplicating jobs were undertaken on Unit record machines. Six research projects related with development of computer programs and preparation of users manuals were completed during the year under report.

The project thesis of one of the Diploma student on "Word Processing Software" was accepted and was awarded the Diploma in Advanced Computer Programming.

17.1 STATISTICAL GENETICS

17.8.1 Measurement of genetic improvement due to scientific breeding in cattle and buffaloes.

Thr objectives of the project were (i) to develop statistical methodology for measuring genetic improvement actually brought about in dairy herds and (ii) to formulate breeding programmes in cattle and buffaloes and (iii) critical analysis of breeding data.

Techniques applied for analysis of the data were method of fitting constants for non-orthogonal data and Discriminant function analysis.

The report has been finalised, it is apparent from the results that for crossbreeding programme in cattle, the level of exotic inheritance should be between 50 to 75%. Infusing exotic germ plasm byond 75% level may result in significantly lower lactation yield coupled with probably an enhanced calving interval.

17.8.2 Estimation of genetic variability in crop plants.

The objectives of the project were (i) Estimation of relative contribution of genetic and environmental components of variation in plants and (ii) to

develop statistical technique for estimating these components. Methods of linear regression and analysis of variance were being applied for the analysis.

Uniformity trial data on Banana from Nashirabad of Jalgaon district in Maharashtra was utilized for the analysis. Weight of the fruits per plant was considered for estimating the relative contribution of genetic and environmental components of variation to the total variation in the yield. The contributions due to genetic and environmental components of variation were respectively estimated to be in the ratio of 15:1.

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

The objectives of the project were (i) to study influence of genetic groups, farms and 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 up to 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.

Techniques applied were least square analysis by Harvey's method, fitting of various growth curves, heritability estimates by half-sib correlation method and genetic correlations by paternal half-sib analysis of covariance.

The project report was being modified in the light of referee's comments. Some salient results arc given below.

The data pertaining to 902 Friesian x Sahiwal crossbred cows consisting of five genetic groups maintained at five military dairy farms were subjected to least square analysis. The data were adjusted for the effects of non-genetic factors. In all seven growth functions viz., linear, linear-cum-log, quadratic, qnadratic-cum-log, exponential, asymptotic and logistic were fitted to the adjusted records for each grade separately. From the consideration of percentage variation explained by various growth functions and graphs drawn, it can be concluded that quadratic-cum-log curve $Y=A+Bx+Cx^2+D\log^{e(x+1)}$ is the most appropriate growth function to describe the growth from birth to one year, one to two years, one to three years and birth to three years in Friesian x Sahiwal crossbred cows. However, for studying the growth from two to three years, asymptotic curve $Y=A—Be^{-kx}$ has been found to be the best where Y is the expected body weight, x is the unit of time and A, B, C, D and K are parameters.

17.8.4 Use of Discriminant function for comparing different grades in crossbreeding 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 covariance matrices of the populations to be compared are unequal, (ii) to obtain discriminatory power of the functions developed and (iii) to compare this with the Fisher's linear discriminant function.

Techniques applied were least square analysis by Harvey's method, Likelihood ratio criterion for testing the equality of covariance matrices, linear discriminant function introduced by Fisher and the best linear function using Minimax procedure given by Anderson and Bhadur.

The data on Greasy fleece weight, fibre length and fleece density pertaining to local, halfbreds, three-fourths and Pure Rambouillet sheep collected at the Sheep Breeding Farm, Banihal-Reassi, Jammu and Kashmir and on six month wool yield, staple length, fibre diameter and modulation percentage for Malpura, Chokla, Jaisalmer and their crosses with Rambouillet from CSWRI, Malpura were utilised for this study. The equality of covariance matrice was tested for all possible pairs of grades in both the data sets by using likelihood ratio criterion given by Anderson (1972). In case of J and K data, out of six pairs of covariance matrices, all except one were found significantly different. As regards Malpura data, out of 91 pairs of covariance matrices, 78 pairs were found significantly different whereas remaining 13 were non-significant.

17.8.5 Statistical analysis of crossbreeding data at military dairy farms.

The objectives of the project are (i) to study the problems associated with adjustment of data by least square technique, (ii) to study the suitability of various grades of cross-bred cattle for life-time production traits and to study the genetic divergence among the cross-bred grades, (iii) to study genotype x environment interactions and (iv) to collect the data on cross-bred cattle available at military dairy farms from 1979 to 1983 and update the data file already existing at IASRI.

The codes for exact grades of two breed crosses were finalised and inserted in the records of cows for the period 1955 to 1978 of military farms at Ambala, Jullundur, Lucknow, Pimpri and Dehradun. The work in respect of other farms was in progress.

17.9 SILVER JUBILEE OF IASRI (1959-1984)

The Silver Jubilee of the Institute was celebrated in the 2nd week of Oct., 1984. Hon'ble Union Minister of Agriculture, Rao Birendra Singh inaugurated the Celebration on the 9th Oct., 1984. To mark the Silver Jubilee occasion a "Silver Jubilee Souvenir" was also released by him. Dr. O.P. Gautam, Director General, I.C.A.R. graced the occasion by his benign presence. Prof. Prem Narain, Director of the Institute presented an over view of achievements in research, training and computer application at the Institute.

The XXII convocation of the training course of the Institute was held on 10th Oct., 1984, which was presided over by Dr. O.P. Gautam, D.G., I.C.A.R.. Mr. Yogendra Makwana, Hon'ble Minister of State for Agriculture was the Chief Guest and delivered the convocation address. Prof. Prem Narain, Director of the Institute presented the Institute's Progress Report.

A Symposium on "Statistical Methodology" having four sessions on the topics viz., "Sampling Methodology", "Genetics and Population Ecology", "Crop Forecasting Methodology" and on "Linear Models and Design of Experiments" were arranged during this period. About 250 delegates from India and abroad participated in the deliberations of the Silver Jubilee Celebration. 25 years (1959-1984), Research Highlights and I.A.S.R.I. Brochure giving functions & activities of the Institute were also published on this occasion.

भारतीय कृषि सांख्यिकी अनुसन्धान संस्थान

(भा० कृ० अ० प०)

वार्षिक रिपोर्ट, १९८४

१८. सारांश

18.1 फसल विज्ञान में सांख्यिकीय अनुसंधान

प्रतिवेदनाधीन वर्ष के दौरान फसल विज्ञान में सांख्यिकीय अनुसंधान का कार्य नियत कार्यक्रम के अनुसार चलता रहा। कार्यक्रम में शामिल की गयी अनुसंधान की विभिन्न मदों से संबद्ध कार्य की प्रगति संक्षेप में नीचे दी गयी है।

18.1.1 फसल प्रणाली अनुसंधान केन्द्रों (फ० प्र० अ० के०) और कृषकों के खेतों पर अखिल भारतीय सस्य अनुसंधान परियोजना (अ० भा० सस्य अ० प०) के अधीन किये गये प्रयोगों का समन्वय एवं नियोजन, अभिकल्पना तैयार करना एवं विश्लेषण।

परियोजना के उद्देश्य थे :—

I. अ० भा० सम० स० अ० परि० के अधीन फसल प्रणाली अनुसंधान केन्द्रों पर नियोजित किये गये प्रयोगों के लिए सांख्यिकीय अभिकल्पनाएं एवं विश्लेषण की विधियां उपलब्ध करना।

II. कृषकों के खेतों पर किये जाने वाले प्रयोगों के लिए उपयुक्त प्रतिचयन योजना, प्रयोगों की अभिकल्पनाएं एवं उनके विश्लेषण की विधि उपलब्ध करना।

III. फसल प्रणाली अनुसंधान केन्द्रों एवं कृषकों के खेतों पर अ० भा० सम० स० अ० परि० के अधीन नियोजित किये गये प्रयोगों के आंकड़ों के विश्लेषण एवं उनकी विवेचना का कार्य करना।

IV. आंकड़े वर्ग करने के लिए उपयुक्त प्रपत्र तैयार करना और आंकड़ों के कोड़िंग के लिए निर्देश संहिताएं तैयार करना।

V. राष्ट्रीय स्तर पर परियोजना कार्य का समन्वय करना तथा परियोजना समन्वयकों, योजना आयोग, भा० कृ० अ० प० एवं अन्य अभिकरणों को उनके अनुरोध पर आवश्यक सूचनाएं उपलब्ध करना ।

प्रतिवेदनाधीन वर्ष के दौरान अनुसंधान कार्यक्रम के अधीन आशाजनक फसल प्रणालियों के प्रतिपादन, उनके प्रबन्ध कार्यों, उर्वरक आवश्यकताओं एवं सहयोगी सस्य कार्यों के लिए उपयुक्त सांख्यिकीय क्रिया पद्धति का विकास करने पर मुख्य बल दिया गया । फसल प्रणाली अनुसंधान केन्द्रों पर कार्यक्रम की कुछ नई श्रृंखलाएं नियोजित की गयी, जिनमें, संसाधन व्यवरोधों के अधीन इष्टतम उत्पादन के लिए फसल प्रौद्योगिकी पर विभिन्न प्रकार के प्रयोगों वर्षावृष्टि वाले क्षेत्रों में दुहरी फसल लेने एवं फसल अनुक्रमों पर खरपतवार नियंत्रण प्रयोगों को शामिल किया गया । कृषकों के खेतों पर प्रयोगों के लिए तकनीकी कार्यक्रमों में भी संशोधन किये गये ताकि भिन्न-भिन्न फसलों पर भिन्न-भिन्न खरपतवार नियंत्रण उपायों के प्रभाव का अध्ययन करने के निमित्त प्रयोगों को शामिल किया जा सके और शुष्क भूमि वाले क्षेत्रों में दुहरी फसल लेने और अन्तः फसल प्राप्त करने के औचित्य की परीक्षा की जा सके ।

फसल प्रणाली अनुसंधान केन्द्रों में प्रयोग करने के लिए अपनाई गयी अभिकल्पनाएं थी— आर० बी० डी०, विभक्त भूखण्ड, विभक्त-विभक्त भूखण्ड सकरित क्रमगुणित, इत्यादि । उनके विश्लेषणार्थ उपयुक्त सांख्यिकीय विश्लेषण पद्धति लागू की गयी । कृषकों के खेतों पर साधारण प्रयोगों में, प्रायोगिक स्थल के चयन हेतु एक तीन स्तरीय यादृच्छिक प्रतिचयन अभिकल्पना अपनाई गयी । प्रयोग करने के लिए अपनाई गयी अभिकल्पनाएं अधिकतर आर० बी० डी० और विभक्त भूखण्ड थीं । उपयुक्त सांख्यिकीय तकनीकों को अपना कर इन प्रयोगों का विश्लेषण भी किया गया ।

भिन्न-भिन्न सस्य जलवायवी जोनों में स्थित 43 फसल प्रणाली अनुसंधान केन्द्रों पर 14 प्रकार के जटिल प्रयोग नियोजित किये गये । भिन्न-भिन्न सस्य-जलवायवी जोनों में स्थित 49 जिलों में कृषकों के खेतों पर 8 प्रकार के सरल प्रयोग किये गये । 43 फसल प्रणाली अनुसंधान केन्द्रों से उपलब्ध प्रयोगों की कुल संख्या 500 के लगभग थी और कृषकों के खेतों पर परीक्षणों की कुल संख्या 7000 के लगभग थी ।

उत्पादकता को सीमित करने वाले व्यवरोधों जिनमें वित्तीय निवेशों जैसे उर्वरक और अन्य कारकों जैसे मृदा, नमी, फसल, बुवाई की तिथि एवं चयनित फसल प्रणाली में खरपतवार नियंत्रण के बीच अन्योन्य क्रिया शामिल हैं, के अध्ययन से इस बात के स्पष्ट संकेत मिलते हैं कि, यदि खाद्यानों जैसे चावल और गेहूं के रोपण/बुवाई में 20 दिन का विलम्ब हो जाए तो चावल और गेहूं में 5-7 क्वि०/है०, ज्वार में 17 क्वि०/है० बाजरा में 10 क्वि०/है० और चने की उपज में लगभग 3 क्वि०/है० की कमी आ जाती है ।

चयनित फसल अनुक्रमों में रासायनिक खाद द्वारा रासायनिक उर्वरकों में किफायत करने की संभावना का अध्ययन करने के लिए नियोजित किये गये प्रयोगों के परिणामों से पता चलता है कि खरीफ के मौसम में उर्वरकों की खाद डालने पर रबी के मौसम की चावल-चावल, मक्का-गेहूं और बाजरा-गेहूं अनुक्रमों की फसलों की खाद्यान उपज पर काफी कम प्रभाव पड़ता है, जबकि चावल-गेहूं, चावल-ज्वार और ज्वार-गेहूं अनुक्रमों में एफ० वाई० एम० के रुप में कुछ रासायनिक उर्वरक डालने पर अवशिष्ट प्रभाव पड़ते हैं ।

कृषकों के खेतों पर प्रभाव :—

सहयोगी कृषक एवं प्रबन्ध कार्यों पर समुचित जोर देते हुए वित्तीय एवं निम्न-वित्तीय निवेशों के समुचित मिश्रण के विकास द्वारा निवेशों की तर्कसंगत व्याख्या का अध्ययन करने पर पता चलता है कि खरीफ के चावल में 25 प्रतिशत की उर्वरक डालने पर खाद्यान उपज में महत्व-पूर्ण 5-0 क्वि०/हैक्ट० की कमी होती है जबकि आगे उर्वरक की मात्रा में 50 प्रतिशत तक की कमी करने पर खाद्यान्न की उपज में 9-0 क्वि०/है० की कमी होतो है । मगर, रबी के चावल एवं गेहूं की उपज में कमी का परिणाम खरीफ के चावल से कहीं अधिक था । उर्वरक के कृषकों के खेतों पर उपज स्तर को सीमित करने वाला जो मुख्य व्यवरोध है वह पादप संख्या है । पादप संख्या को 25 प्रतिशत कम कर देने पर खरीफ के चावल की उपज में 3.0 क्वि०/है० की और गेहूं की उपज 4.5 क्वि०/है० की कमी हो जाती है ।

समुचित किस्मों एवं स्वीकृत स्तर पर उर्वरकों के उपयोग से वर्षावृष्टि स्थिति में रोपड़ (पंजाब) में मक्का एवं गेहूं, सम्बलपुर (उड़ीसा) में चावल एवं सरसों, भण्डारा (महाराष्ट्र) और सिंधी (म० प्र०) में चावल एवं गेहूं की दुहरी फसलें लेने पर उपज के स्तर में एवं आयु में अधिकतम वृद्धि दर्ज की गयी । सिंचित परिस्थितियों में खाद्यान्न दाल का फसल चक्र काफी आशाजनक पाया गया । विशुद्ध खाद्यान्न फसल चक्र में निवेश का उपयोग सामान्यतः अधिक था, जबकि यह तिलहन दालों के फसल चक्र में काफी कम था । उपलब्ध परिणामों के आधार पर यह सुझाया गया है कि फिलहाल ऐसा सिंचित क्षेत्र जहां पर विशुद्ध रुप से खाद्यान्न फसल चक्र चल रहा है उसके थोड़े से हिस्से पर दालों एवं तिलहन के फसल चक्र की खेती की जाए ।

वर्षावृष्टि स्थिति में ढेकनाल (उड़ीसा) में सरसो+गेहूं, कोलार (कर्नाटक) में रागी+सायाबीन और त्रिचुरापल्ली (त० ना०) में मूंगफली+उड़द की अन्तः सस्य करने से उत्साहजनक परिणाम प्राप्त हुए । सभी तीनों जिलों के परिणामों की प्रवृति से स्पष्ट होता है कि उस क्षेत्र की मुख्य खाद्यान्न फसल के साथ सोयाबीन, उड़द, मूंग जैसी फली वाली फसल पैदा करना संभव है इससे उपज के सामान्य स्तर में भी वृद्धि होती है ।

18.1.2. कृषीय क्षेत्रीय परीक्षण सूचना प्रणाली :

देश में विभिन्न अनुसंधान संस्थानों में किए गये कृषीय क्षेत्रीय परीक्षणों के परिणामों एवं अन्य सहायक सूचनाओं को एक केन्द्रीय स्थान पर एकत्रित करना इस परियोजना के प्रमुख उद्देश्य थे। आंकड़े भा० कृ० सां० अ० सं० को हस्तानांतरित किए जाएंगे और उन्हें चुम्बकी टेपो में भरा जाएगा। प्रतिवेदनाधीन वर्ष के दौरान प्रणाली के लिए क्षेत्रीय स्टाफ द्वारा 1983 के प्रयोगों के सूचना को टेपों में भरा गया। प्रणाली का लक्ष्य वर्ष 1978 से आगे नियोजिय एवं किए गये प्रयोगों से सम्बद्ध आंकड़ों को टेपों में भरने का है।

कृषीय क्षेत्रीय परीक्षणों का वार्षिक सूचकांक खण्ड IX (जो 1980 के दौरान सस्थान को सूचित किए गए प्रयोगों से संबद्ध है) के मुद्रण का कार्य पूरा हो चुका है और खण्ड X की प्रेस सामग्री को अन्तिम रुप दिया गया।

18.1.3 फसल के संदर्भ में सूखे के लक्षणो पर एक सांख्यिकीय अध्ययन :

परियोजना के उद्देश्य थे :—

I. फसल के संदर्भ में सूखे के आरंभिक मानों को निर्धारित करना। II. उनके होने के अवसरों का पता लगाना।

अहमद नगर और बीजापुर जिले में ज्वार, बाजरा, कपास और मूंगफली के उपज आंकड़े एकत्रित किए गये। समाश्रयण तकनीक के माध्यम से उपज आंकड़ों में प्रवृत्ति की परीक्षा की गयी।

18.1.4 कर्नाटक में मालाप्रभा एवं घाटाप्रभा नदी घाटी परियोजना, महाराष्ट्र में कृष्णा नदी घाटी परियोजना और आंध्र प्रदेश में पोकमपड नदी घाटी परियोजना के कमान क्षेत्र में जल की उपलब्धता के कारण, क्षेत्र एवं खाद्य उत्पादन में हुए परिवर्तनों का सांख्यिकीय मूल्यांकन।

अपनाई गयी फसल पद्धति में सिचाई के अधीन क्षेत्र की वृद्धि, भिन्न-भिन्न फसलों की औसत उपज, कमान क्षेत्र में सिचाई की उपलब्धता के कारण कृषकों द्वारा अपनाए गए कृषण कार्यों में आए परिवर्तनों का अध्ययन करना और सस्य संबन्धी लक्ष्यों को पूरा न कर पाने के कारणों का पता लगाना, इस परियोजना के मुख्य उद्देश्य थे। समाश्रयण एवं संक्षिप्तिकरण की तकनीकों को आकड़ों का विश्लेषण करने के लिए प्रयोग में लाया जाता है।

प्रतिवेदनाधीन वर्ष के दौरान श्रीरामसागर (पोकमपड) के कमान क्षेत्र, में क्षेत्र उत्पादन, उत्पादकता वर्षावृष्टि और भूमि विकास से संबंधित आकड़ों को एकत्रित करने और उनके विश्लेषण का कार्य पूरा किया गया और परियोजना रिपोर्ट को अन्तिम रुप दिया गया। परिणामों से पता चलता है कि खाद्यानों की उत्पादकता में 37% तक और मूंगफली की उत्पादकता में 30 प्रतिशत तक वृद्धि

हुई है। चावल के अधीन क्षेत्र में भारी मात्रा में वृद्धि हुई है और लक्ष्यों की प्राप्ति के लिए क्षेत्र एवं उत्पादन में तीव्र वृद्धि दर नियोजित करनी है। सस्य तकनीकों को अपनाकर कमान क्षेत्र में उच्चतम उत्पादन प्राप्त करने का व्यापक क्षेत्र हैं।

18.2 **फसलपूर्वानुमान क्रिया-पद्धति :**

प्रभाग की प्रत्येक परियोजना के कार्य की प्रगति का संक्षिप्त विवरण नीचे दिया गया है :—

18.2 1 **जैव सांख्यिकीय लक्षणों पर किए गए पर्यवेक्षणों के आधार पर ज्वार की उपज के कटाईपूर्व के पूर्वानुमानों पर मार्गदर्शी अध्ययन—जिला सांगली (महाराष्ट्र)।**

परियोजना की अंतिम रिपोर्ट जारी की गई। अध्ययन से पता चला कि संकर ज्वार की उपज का पूर्वानुमान फसल की कटाई से एक माह पूर्व लगाना संभव है।

18.2.2 **पीड़कों और रोगों के प्रभावों का आकलन करने और परिणाम स्वरुप तमिलनाडु के दक्षिणी आरकोट जिले में उच्च उपजशील किस्म की फसल को हुई हानि का भी आकलन करने के लिए मार्गदर्शी प्रतिदर्श सर्वेक्षण।**

वर्ष 1979 के दौरान साम्बा मौसम (जुलाई से दिसम्बर) में पीड़कों और रोगों के प्रभाव से फसल को हुई हानि 3.25% थी जिसका प्रमुख भाग (1.48%) हेलमिन्थोस्पोरिऔस द्वारा बाली-संक्रमण के कारण प्रभावित था। वर्ष 1979 के नवराई मौसम (जनवरी से जून) में फसल की उपज में परिहार्य हानि, संभव उपज का 5.50% आंकी गई जो उपयुक्त पादप संरक्षण उपायों को अपनाकर ही रोक पाना सभव था।

18.2.3 **जैवसांख्यिकीय लक्षणों, मौसम चरों एवं कृषि निवेशों पर एकत्रित आंकड़ों के आधार पर सेव की उपज के कटाईपूर्व के पूर्वानुमान पर मार्गदर्शी अध्ययन—जिला शिमला (हिमाचल प्रदेश)।**

एकत्रित आंकड़ों की जांच की गई और उन्हें संग्रहित किया गया। आगामी मौसम के सेवों से संबद्ध आंकड़े एकत्रित करने का कार्य प्रगति पर है।

18.2.4 **उत्तर प्रदेश के गोरखपुर जिले में गेहूं की उच्च उपजशील किस्म की फसल को जीवाणुओं एवं रोगों के प्रभाव से हुई हानि का आकलन करने के लिए मार्गदर्शी प्रतिदर्श सर्वेक्षण।**

परियोजना की अंतिम रिपोर्ट प्रकाशित हो चुकी है। वर्ष 1978-79 और 1979-80 के दौरान जीवाणुओं और रोगों के प्रभाव से क्रमशः 4.56% और 2.56 प्रतिशत फसल को कुल

हानि हुई। जिसका प्रमुख भाग (92%) चूहों और आल्टरनेरिया ब्लिट से प्रभावित हुआ। उपयुक्त पादप संरक्षण उपायों द्वारा परिहार्य हानि संभावित उपज का 12 प्रतिशत आंकी गई।

18.2.5 गुजरात के राजकोट जिले में मूंगफली की उपज के कटाईपूर्व पूर्वानुमान पर मार्गदर्शी अध्ययन।

खरीफ के दौरान एकत्रित किये गए आंकड़ों की जांच की गई। आगे के समय आंकड़ों को एकत्रित करने का कार्य प्रगति पर है।

18.2.6 मौसमी प्राचलों के आधार पर फसल की उपज के पूर्वानुमान पर अध्ययन।

पुरी जिले में चावल की फसल से संबद्ध परियोजना की अंतिम रिपोर्ट प्रकाशित हो चुकी है। पुरी जिले में चावल की उपज का पूर्वानुमान लगाने के लिए, बुवाई के 10 सप्ताह बाद अधिकतम तापमान पर आंकड़ों के द्वारा और सूरज चमकने के घण्टों के माडल का उपयोग किया जा सकता हैं।

18.3 पशु-विज्ञान में सांख्यिकीय अनुसंधान :

सांख्यिकीय अनुसंधान (पशु विज्ञान) प्रभाग, पशु उत्पादकता, सक्रियात्मक अनुसधान एवं पशु संख्या प्रक्षेपण के लिए लागू की जाने वाली सांख्यिकीय पद्धति के क्षेत्र में अनुसंधान कार्य कर रहा है। चार परियोजनाओं अर्थात् (I) भेड़-बकरियों में जन्म एवं मृत्यु दर के आकलन हेतु (त० ना०) मार्गदर्शी अध्ययन, (II) सूकर उत्पादन के लाभों पर सांख्यिकीय अन्वेषण, (III) मिश्रित कार्मिंग जिसमें फसल, पशुधन, मुर्गी पालन एवं मत्स्य पालन भी शामिल है के तुलनात्मक कार्य-निष्पादन पर अध्ययन और (IV) मेरठ जनपद, उ० प्र० के ग्रामीण क्षेत्रों में पशुधन एवं मुर्गीपालन में इस बात का आकलन करने के लिए कि श्रमिकों का उपयोग कहां तक किया गया के लिए उपयुक्त सांख्यिकीय पद्धति का विकास, का कार्य आरंभ किया गया और सुसंगत आंकड़े एकत्रित करने का कार्य जारी रहा। निम्न चार परियोजनाओं से संबद्ध सांख्यिकीय विश्लेषण का कार्य अभी भी प्रगति पर है। ये परियोजनाएं इस प्रकार हैं : (I) जालन्धर में चारे की खेती की लागत के आकलन के लिए उपयुक्त पद्धति के विकास हेतु मार्गदर्शी अध्ययन, (II) भारत में रेखीय प्रोग्रामिंग तकनीकों के माध्यम से पशु उत्पादन के लिए इष्टतम राशन, (III) गोवंशीय पशुओं में आयु-विशिष्ट मर्त्यता एवं उर्वरता के आबंटन का अध्ययन और (IV) ग्रामीण परिस्थितियों के अधीन दुग्ध उत्पादन पर आवास स्थितियों के एवं अन्य कारकों के प्रभाव के अध्ययन के लिए उपयुक्त पद्धति का विकास।

ग्रामीण परिस्थितियों, पालमपुर (हि० प्र०) के अधीन संकर नस्ल की गायों के कार्य-निष्पादन के अध्ययन हेतु मार्गदर्शी सर्वेक्षण में प्रत्येक लक्षणों के लिए समुचित तकनीकों के अनुसरण से उत्पादक विश्लेषक एवं संबद्ध प्राचलों का आकलन किया गया। स्थानीय गायों की तुलना में संकर नस्ल के गायों के कार्यनिष्पादन के मूल्यांकन के लिए कुल श्रेष्ठता का सूचक तैयार करने के लिए विभिन्न उत्पादन एवं अनुकूलता लक्षणों का उपयोग किया गया। दो उपगमनों द्वारा अर्थात् (I) आकस्मिक माँडलिंग और (II) उत्पादन कार्य अभी भी प्रगति पर है, क्षेत्र में संकरण कार्यक्रम को अपनाने के मार्ग में आने वाले व्यवरोधों का विश्लेषण।

वर्ष के दौरान जबलपुर (म० प्र०) के आई० सी० डी० क्षेत्र में दुग्ध उत्पादन की लागत के आकलन से संबद्ध एक परियोजना पूरी की गयी। ऐसा पाया गया कि दो वर्षों के गाय के दूध की प्रति कि० ग्रा० कुल लागत पारिवारिक श्रम सहित पहले वर्ष में रू० 2.54 और दूसरे वर्ष में रू० 2.34 थी। पारिवारिक श्रम छोड़कर दो वर्षों के समरुप आकलक क्रमशः रू० 2.12 और रू० 1.80 थे। भैंस के दूध की कुल लागत प्रति किलो ग्राम, पारिवारिक श्रम सहित पहले वर्ष में रू० 1.66 और दूसरे वर्ष में रू० 1.56 थी। पारिवारिक श्रम को निकाल कर संगत कुल लागतें दोनों वर्षों में क्रमशः रू० 1.38 एवं रू० 1.25 थी। वर्ष के दौरान पूरा किया गया दूसरा अध्ययन था—गाय और भैंसों की भिन्न-भिन्न नस्ल एवं लिंगों के लिए जीवन सारिणी तैयार करना। वर्तमान जीवन सारिणी तैयार करने के लिए वही मानक पद्धतियों को अपनाया जा रहा है जो मानव जनसंख्या के अध्ययन के लिए अपनायी जाती हैं। जीवन की पायी गयी संभावनाओं के प्रतिदर्श विचलन प्राप्त करने के लिए एक उपयुक्त सूत्र निकाला गया। आई० सी० डी० एवं गैर आई० सी० डी० क्षेत्रों में भिन्न भिन्न नस्लों के बीच और नस्लों में इन क्षेत्रों के बीच क्रमानुसार आयु समूहों के लिए जीवन की पायी गयी संभावनाओं के बीच की भिन्नताओं की परीक्षा की गयी। गाय और भैंसों की भिन्न-भिन्न नस्लों के लिए आयु विशिष्ट प्रीमियम दरों की गणना की गयी। ऐसा पाया गया कि निम्न आयु समूहों के लिए वास्तविक मर्त्यता पर आधारित प्रीमियम दरें उन दरों की अपेक्षा काफी अधिक हैं जो सामान्य बीमा निगम (सा० बी० नि०) द्वारा की जाती हैं। नर एवं मादा गायों और मात्र 3 से 8 वर्ष के आयु समूह की भैंसों के लिए निकाली गयी प्रीमियम दरें पंजाब की मादा गायों को छोड़कर सभी मामलों में या तो सा० बी० नि० की दरों से कम हैं या उनके बराबर हैं।

18.4 प्रतिदर्श सर्वेक्षण पद्धति प्रभाग :

एक उपयुक्त प्रतिचयन पद्धति का विकास करने और कृषि क्षेत्रीय फसलों के विभिन्न क्षेत्रों, सस्य फसलों, पशुधन, मत्स्य पालन, वानकी, इत्यादि से संबद्ध आंकड़ों को एकत्रित करने के लिए इन पद्धतियों का प्रचालन उपयुक्तता एवं व्यवहारिकता का प्रदर्शन करने के उद्देश्य से 1984 के दौरान प्रतिदर्श सर्वेक्षण पद्धति प्रभाग ने प्रतिचयन आन्वेषण का कार्य किया। रिपोर्ट के अधीन

वर्ष के दौरान 21 अनुसंधान परियोजनाएं चलाई गयीं। आठ परियोजनाओं की वार्षिक अन्तिम रिपोर्टों की तैयारी का कार्य पूरा हो चुका है। शेष परियोजनाओं के आंकड़ों को एकत्रित करने, विश्लेषण करने का क्षेत्रीय कार्य प्रगति पर था।

दिल्ली राज्य के फसल उत्पादन, इसके विक्रय एवं कृषि में रोजगार में नई तकनीकी के प्रभावों का अध्ययन करने के लिए "प्रायोगिक प्रतिदर्श सर्वेक्षण" की अन्तिम रिपोर्ट तैयार की गई। नई तकनीकी के विभिन्न संघटकों के अपनाए जाने के दर के सूचकांकों का विकास करना परियोजना की एक मुख्य उपलब्धि थी, बाद में जिसका प्रयोग उपज, आदि में नई तकनीकी के प्रभावों को मापने के लिए किया गया। 1977-78 कृषि वर्ष के दौरान "संक्रियात्मक जोतों में बेकार पड़ी भूमि के कारणों का पता लगाने के लिए अध्ययन", नामक परियोजना के अन्तर्गत निम्न मुख्य कारण पाए गये थे :—

(I) असमतल/पथरीली, (II) सिचाई की कमी, (III) संसाधनों की कमी एवं (IV) कम उपजाऊ चरागाह की भूमि। भूमि को कृषि योग्य बनाने के लिए कृषकों द्वारा कई सुझाये गये उपचारी उपाय थे।

(I) भूमि को समतल करना तथा चट्टानों को दूर करना, (II) सिचाई सुविधाओं की व्यवस्था करना, (III) नकद तथा किसी भी प्रकार में सुविधाओं का प्रावधान व्यवस्था, तथा (IV) मिट्टी की उर्वरता में वृद्धि करना। "आंशिक कटाई के आधार पर सब्जी की फसलों की उपज को आंकने के लिए उपयुक्त प्रतिचयन पद्धति का अध्ययन" नामक परियोजना के मुख्य परिणाम ये थे कि सब्जियों की फसल के कुल उत्पादन का आकलन हम कुल उपज के लिए पृथक-पृथक समाहरण की प्रतिशत द्वारा कुछ समाहरणों को दर्ज करके और दोहरी प्रतिचयन तकनीक को अपनाकर कुल उपज के साथ उनके सहसम्बन्ध से भी कर सकते हैं। सभी समाहरणों को नियत करने की आम प्रक्रिया की तुलना में यह प्रक्रिया अधिक दक्ष पाई गई। प्रत्येक समाहरण के लिए अलग-अलग प्रतिदर्शों का चयन करके संघटक प्रतिचयन तकनीक अपनाकर कुल उत्पादन का आकलन निपुणता पूर्वक प्राप्त किया जा सकता है। अध्ययन से ज्ञात होता है कि इस दिशा में और अधिक अध्ययन करने के समय पर, आयोजित प्रतिचयन के प्रयोग से दोहरी प्रतिचयन तकनीक अधिक लाभदायक सिद्ध हो सकती है।

रिपोर्ट के अधीन वर्ष के दौरान निम्न दो नई अनुसंधानिक परियोजनाएं चालू की गई :—

१. चरागाह की भूमि के क्षेत्र का आकलन व उसके उपयोग पर प्रायोगिक प्रतिदर्श सर्वेक्षण। परियोजना के उद्देश्य हैं :—

(I) चरागाह की भूमि के क्षेत्र को आँकने के लिए प्रतिचयन तकनीक का विकास करना,

(II) घास-पात की उपज एवं (III) घासपात प्रतिदर्शों का विश्लेषण एवं वानस्पतिक वर्गीकरण ।

परियोजना तमिलनाडू में दिसम्बर 1984 में चालू की गई ।

2. क्षेत्रीय दशाओं के अन्तर्गत नई कृषि प्रौद्योगिकी के हस्तान्तरण में प्रतिबन्धों के अध्ययन हेतु प्रतिदर्श सर्वेक्षण । परियोजना के उद्देश्य हैं ।

(I) भूमि की उत्पादकता में वृद्धि करने के निमित्त नवीन कृषि प्रौद्योगिकी के प्रभावों के अध्ययन हेतु उपयुक्त प्रतिचयन पद्धति विकसित करना, (II) क्षेत्रीय दशाओं के अन्तर्गत उच्च उपजशील किस्म के बीजों की उपलब्ध क्षमता को किस सीमा तक बढ़ाया जाए, एवं (III) कृषकों की भूमि में नई कृषि प्रौद्योगिकी के हस्तान्तरण में प्रतिबन्धों का पता लगाना एवं उनकी जांच करना । यह परियोजना क्षेत्रीय आंकड़े एकत्रित करने के लिए देश के 10 राज्यों में चालू की गई ।

18.5 अर्थमितीय विश्लेषण :

18.5.1 भारत में चावल एवं गेहूं की फसल के उत्पादन में असन्तुलन का आर्थिक अध्ययन ।

यह परियोजना चावल एवं गेहूं की फसलों के क्षेत्र, उपज एवं उत्पादन की विकास वृद्धि दर से सम्बन्धित है । भिन्न-भिन्न क्षेत्रों में फसल उपज की वृद्धि दरों में भिन्नताओं के लिए उत्तरदायी कारकों की भी परीक्षा की गयी । वर्ष 1989-90 एवं 2,000 ए० डी०के लिए, इन फसलों कीभावी उत्पादकता की संभावनाओं का भी पता लगाया गया है ।

18.5.2 उपज अन्तराल एवं सहयोगी कारकों के विशेष संदर्भ में नवीन फार्म प्रौद्योगिकी का आर्थिक अध्ययन ।

यह छठी योजना की समन्वित परियोजना है और भीलवाड़ा (राजस्थान), इन्दौर (म० प्र०) एवं रांची (बिहार) के ओ० आर० पी० क्षेत्रों में 1984 में इसे आरम्भ किया गया । संबद्ध क्षेत्रों के चुने हुए गांवों के लिए प्रारम्भिक आंकड़े एवं सुझाई गई प्रौद्योगिकी को एकत्रित किया जा चुका है और प्रतिचयन योजना को अन्तिम रुप दिया जा चुका है ।

18.5.3 मध्य प्रदेश के रायपुर जिले में स्थित ओ०आर०पी क्षेत्र के चावल के फार्मों पर आधुनिक प्रौद्योगिकी के प्रसार में आए समानार्थिक एवं अन्य ब्यवरोधों का पता लगाना ।

रायपुर जिले में ओ० आर० पी० क्षेत्र के अधीन गांवों में चुने हुए चावल के फार्मों में आए समानार्थिक एवं अन्य व्यवरोधों का अध्ययन किया गया । चावल की खेती में उपज-अन्तराल एवं व्यवरोधों पर परियोजना रिपोर्ट प्रकाशित की गई । अध्ययन से पता चलता है कि सर्वेक्षण के

आकड़ों पर आधारित आकलन से सक्षम एवं वास्तविक उपज के बीच अभूतपूर्व उपज अन्तराल देखने में आया। फार्मों की उच्च तथा निम्न उत्पादकता अन्तर के जो कारण देखने में आए वे थे—नाइट्रोजन का उपयोग, पीड़कों एवं रोगों के प्रभाव एवं ऋण की उपलब्धता।

18.5.4 भारत में तूर फसलों की जोत अनुक्रिया का आर्थिक विश्लेषण।

क्षेत्र की प्रवृत्ति का, दाल उगाने वाले महत्वपूर्ण राज्यों में तूर फसल की उपज एवं उत्पादन का अध्ययन करना और फसल क्षेत्र के आबंटन पर फार्म पर कटाई के बाद मूल्यों के प्रभावों का भी अध्ययन करना, इस परियोजना के मुख्य उद्देश्य थे। विभिन्न राज्यों की तूर फसलों की उपज पर निवेश कारकों के प्रभावों का अध्ययन करने के लिए अनुक्रिया कार्यों का आकलन किया गया एवं बहु समाश्रयी विश्लेषण किये गये।

18.5 5 गुजरात के डंग जिले में जनजातीय क्षेत्र के ओ०आर०पी० गांवों में फसल उत्पादन से सम्बन्धित प्रौद्योगिकी के हस्तान्तरण में परिचलित प्रतिबन्धों का निर्धारण।

फसल उत्पादन से संबद्ध आदिवासियों में प्रौद्योगिकी के हस्तान्तरण में आए व्यवरोधों का निर्धारण करने और इसके लिए नीतियां सुधारने के उद्देश्य से गुजरात के डंग जिले के आदिवासी क्षेत्र में परियोजना का कार्य हाथ में लिया गया। रिपोर्ट के प्रारुप तैयार करने का कार्य प्रगति पर था।

18.5.6 भीलवाड़ा जिला (राजस्थान) के परिचलित परियोजना क्षेत्र में आए उपज व्यवरोधों का मूल्यांकन।

राजस्थान के भीलवाड़ां जिले के ओ० आर० पी० क्षेत्र में कृषकों के खेतों पर प्राप्त सक्षम एवं वास्तविक उपज का और गेहूं की फसल में उपज-अन्तराल के लिए उत्तरदायी व्यवरोधों का अध्ययन करने के उद्देश्य से एक अध्ययन किया गया। अध्ययन से देखने में आया कि कृषकों के खेतों पर 49 क्वि0/है0 की सक्षम उपज के बीच विभिन्न आकार की जोतों में 21 क्वि0/है0 से 25 क्वि0/है0 तक उपज अन्तराल अदलता-बदलता रहा। अध्ययन से पता चला है कि यदि गेहूं में की जा रही चार सिचाई के स्थान पर सुझाई गई छः सिचाई की जाए तो उपज में 14 क्वि0/है0 तक का विचरण होता है।

18.6 प्रशिक्षण एवं मौलिक अनुसंधान

कृषि सांख्यिकी में एम० एस० सी०, पी० एच० डी० एवं वरिष्ठ प्रमाण-पत्र और व्यावसायिक सांख्यिकीविद् प्रमाण-पत्र पाठ्यक्रम और समुन्नत संगणक प्रोग्रामिंग पाठ्क्रम में

डिप्लोमा जैसे नियमित प्रशिक्षण पाठ्यक्रम सामान्य रुप से चलते रहे । प्रतिवेदनाधीन वर्ष के दौरान संस्थान के 13 छात्रों ने डिग्री पाठ्यक्रम में सफलता प्राप्त की जिनमें से 6 ने एम० एस० सी० और 7 ने पी० एच० डी० की डिग्री पूरी की ।

दिनांक 10 अक्टूबर, 1984 को संस्थान के प्रशिक्षण पाठ्क्रमों का बाईसवां दीक्षांत समारोह सम्पन्न हुआ, जिसकी अध्यक्षता भा० कृ० अ० प० के महानिदेशक डा० ओ० पी० गौतम द्वारा की गयी और इस अवसर पर कृषि राज्य मंत्री माननीय श्री योगेन्द्र मकवाना मुख्य अतिथि थे और उन्होंने दीक्षांत भाषण दिया । प्रगति रिपोर्ट भा० कृ० सां० अ० सं० के निदेशक डा० प्रेम नारायण ने प्रस्तुत की और डा० ए० के० निगम द्वारा प्रशिक्षण गतिविधियों से संबद्ध रिपोर्ट प्रस्तुत की गयी । 8 अक्टूबर, 1984 को दीक्षांत समारोह के एक हिस्से के रुप में एक वक्तता प्रतियोगिता का आयोजन किया गया जिसमें विभिन्न पाठ्यक्रमों के छात्रों ने हिस्सा लिया । प्रतियोगिता का शीर्षक "कृषि एवं पशुपालन के क्षेत्र में प्रयोगों की अभिकल्पना की भूमिका" था । इस सत्र की अध्यक्षता सस्थान के भू० पू० निदेशक डा0 एम0 एन0 दास ने की । इस दीक्षांत समारोह में 26 प्रत्याशियों को डिग्री एवं डिप्लोमा प्रदान किये गये, जिनमें से 15 वरिष्ठ प्रमाण पत्र पाठ्क्रम के, 10 व्यवसायिक सांख्यिकीविद् प्रमाण पत्र पाठ्यक्रम के और 1 समुन्नत संगणक प्रोग्रामिंग में डिप्लोमा के थे । प्रतिवेदनाधीन वर्ष के दौरान 34 छात्रों को विभिन्न पाठ्यक्रमों में प्रवेश दिया गया ।

प्रतिवेदनाधीन वर्ष के दौरान संस्थान में 56 गोष्ठी वार्ताओं का आयोजन किया गया जो छात्रों, वैज्ञानिकों एवं देश विदेश के गणमान्य आगन्तुकों द्वारा प्रस्तुत की गयी ।

भा० कृ० अ० प० के संस्थानों, कृषि विश्वविद्यालयों, के० सां० संग० एवं अन्य अनुसन्धान संगठनों द्वारा प्रतिनियुक्त प्रशिक्षुओं के लिए विशेष प्रशिक्षण कार्यक्रमों की व्यवस्था की गयी ।

प्रभाग के वैज्ञानिकों द्वारा सांख्यिकी के विभिन्न क्षेत्रों, जैसे प्रयोगों की अभिकल्पना, प्रतिचयन एवं सांख्यिकी आनुवाँशिकी में अनुसंधान करने में सक्रिय भाग लिया । प्रतिवेदनाधीन वर्ष के दौरान वैज्ञानिकों द्वारा तीन अनुसंधान परियोजनाओं का कार्य हाथ में लिया ।

18.7 संगणक विज्ञान एवं संख्यात्मक विश्लेषण

यह प्रभाग भा० कृ० अ० प० के संस्थानों और केन्द्रीय कृषि विश्वविद्यालयों, अर्थशास्त्र एवं सांख्यिकीय निदेशालय, भारत सरकार और उत्तर प्रदेश कृषि विभाग के अनुसंधानकर्ताओं/वैज्ञानिकों को इलेक्ट्रानिक आंकड़े संवर्धन की सुविधाएं प्रदान कर रहा है । एकत्रित पुराने कार्य पूरा करने के लिए बरोज-4700 का उपयोग दो पालियों प्रात: 8 बजे से सायं 8 बजे तक और कभी-कभी रात की पाली में भी किया जाता है । संगणक पर लगभग 16500 उत्पादन कार्य और 3900 परीक्षण कार्य संवर्धित किये गये । संस्थान के छात्रों एवं अनुसंधानकर्त्ताओं द्वारा प्रोग्राम विकास के लिए इण्टर-एक्टिव टर्मिनलों का उपयोग किया गया ।

एक सौ बीस मानद, 121 विज्ञान स्नातकोत्तर एवं 50 अन्य अनुसंधानकर्त्ताओं को प्रोग्रामिंग सहायता उपलब्ध की गयी । उनकी आवश्यकताओं को पूरा करने के लिए 10 नए संगणक कार्यक्रमों को विकसित किया गया और अन्यानेक कार्यक्रमों को संशोधित किया गया । एग्रीस (AGRIS) दत्त आधार से चुनिन्द विकीर्णन सेवाएं जारी रहीं । भा०कृ०अ०प० के पी०जी० स्कूल के छात्रों के लिए दत्त संवर्धन और संगणक प्रोग्रामिंग पाठ्यक्रम आयोजित करने और संस्थान के अन्य प्रमाण-पत्र पाठ्यक्रम आयोजित करने के लिए भी प्रभाग के वैज्ञानिक संबद्ध रहे हैं । 11 से 16 जून, 1984 के दौरान भा० कृ० सां० अ० सं० में संगणक के उपयोग पर एक अल्पकालीन पाठ्यक्रम आयोजित किया गया । इसमें भा० कृ० अ० प० के 35 व्यक्तियों द्वारा हिस्सा लिया गया ।

11 से 13 सितम्बर, 1984 के दौरान बी-4700 संगणक प्रणाली पर उपलब्ध टर्मिनलों के उपयोग के लिए सी०ए०एन०डी०ई० साफ्टवेयर पर कुछ व्याख्यान दिए गये ।

मैकेनिकल टेब्यूलेशन एकक प्रभाग द्वारा लगभग 11 लाख कार्डों के डाटा पंचिंग जिसमें पंचिंग/पुष्टिकरण शामिल है के लिए 1700 कार्य किए गये । यूनिट रिकार्ड मशीनों पर 840 लिस्टिंग, 90 छंटाई एवं 104 डुप्लीकेटिंग कार्यों को पूरा किया गया । प्रतिवेदनाधीन वर्ष के दौरान संगणक प्रोग्रामिंग के विकास एवं प्रयोत्या संहिता तैयार करने से संबद्ध छ: अनुसंधान परियोजनाओं को पूरा किया गया । एक डिप्लोमा छात्र के परियोजना शोध प्रबन्ध जो "वर्ड प्रोसेसिंग साफ्टवेयर" पर है को स्वीकृत किया गया और समुन्नत संगणक प्रोग्रामिंग में डिप्लोमा दिया गया ।

18.8 सांख्यिकीय आनुवंशिकी कक्ष

18.8.1 वैज्ञानिक प्रजनन के कारण गाय और भैंसों में आनुवंशिक सुधार के उपाय ।

परियोजना के उद्देश्य थे—(I) डेयरी के झुण्डों में किये गये वास्तविक आनुवंशिक सुधारों को मापने के लिए सांख्यिकीय पद्धति का विकास, (II) गाय और भैंसों में संकरण कार्य-क्रम तैयार करना और (III) संकरण आकड़ों का समीक्षात्मक विश्लेषण ।

आकड़ों के विश्लेषण के लिए लागू की गयी तकनीक थी—अस्वतंत्र आकड़ों के स्थिरांकों के असंजन की पद्धति एवं विवित्यकर फलन विश्लेषण ।

रिपोर्ट को अन्तिम रुप दिया जा चुका है. परिणामों से ऐसा आभास होता है कि गायों में संकरण कार्यक्रम के लिए विदेशी वंशागतित्व का स्तर 50 से 75 प्रतिशत के बीच होना चाहिये । 75 प्रतिशत स्तर के बाद गर्भप्लास्य के निशेचन के फलस्वरुप न्यूनतम दुग्धस्रवण का उत्पादन दो गुना हो जाता है और सम्भवत: बछड़ा डालने की अवधि भी बढ़ जाती है ।

18.8.2 फसल के पौधों में आनुवंशिकी परिवर्तिता का आकलन :

परियोजना के उद्देश्य थे—(I) आनुवशिक एवं पादपों में विचलन के मौसमी घटकों के सापेक्ष योगदान का आकलन और (II) इन घटकों के आकलन हेतु सांख्यिकीय तकनीक का विकास।

विश्लेषणों के लिए रैखीक समाश्रयण एवं चरों के विश्लेषण की पद्धति प्रयुक्त की गयी।

विश्लेषणों के लिए महाराष्ट्र में जलगांव जिले के नशीराबाद से केले पर एक समानता परीक्षण आकड़ों को प्रयोग में लाया गया। उपज में हुए कुल विचलन के सापेक्ष योगदान के आकलन हेतु प्रत्येक पेड़ पर लगे फलों के भार को ध्यान में रखा गया। आनुवंशिक एवं मौसमी घटकों के विचलनों के कारण योगदानों को क्रमशः 15 : 1 के अनुपात में आंका गया।

18.8.3 देश के भिन्न—भिन्न सैनिक डेयरी फार्मों पर उपलब्ध संकर नस्ल की गायों पर वृद्धि अध्ययन्।

परियोजना के उद्देश्य थे—(I) आनुवंशिक समूहों, फार्मों और भिन्न-भिन्न आयु में संकर नस्ल की मादाओं के शरीर के वजन पर जन्म की अवधियों के प्रभाव का अध्ययन, (II) विदेशी वंशागतित्व के स्तर में संकर नस्लों के शरीर के वजन में परिवर्तन, (III) तीन वर्ष की आयु की संकर नस्ल की गायों में वृद्धि वक्र, (IV) वृद्धि दर और इससे, पहली बार बछड़ा डालने के समय वजन एवं आयु तथा प्रथम ब्यांत के समय दुग्ध उत्पादन का सम्बन्ध और (V) बढ़वार की भिन्न-भिन्न अवस्थाओं में आनुवंशिक प्राचलों का आकलन।

हार्वे की पद्धति द्वारा न्यूनतम वर्ग का मूल्यांकन, विभिन्न वृद्धि वक्रों का सांमजस्य, अर्ध-सहोदर सहसंबंध पद्धति द्वारा आँकी गई वंशागतित्व और सहप्रसरण के पैत्रिक अर्ध-सहोदर मूल्यांकन द्वारा आनुवंशिक सहसंबंधों की तकनीकों का उपयोग किया गया।

निर्णायकों की टिप्पणियों के परिपेक्ष्य में परियोजना रिपोर्ट को संशोधित किया गया। कुछ प्रमुख परिणाम नीचे दिए गये हैं।

5 सैनिक डेयरी फार्मों पर 5 आनुवंशिक समूहों की पल रही 902 फ्रीजियन x सहिवाल संकर नस्ल की गायों से संबद्ध आकड़ों पर न्यून वर्ग मूल्यांकन किया गया। गैर-आनुवंशिक कारकों के प्रभावों के लिए आंकड़ों को समायोजित किया गया। कुल मिलाकर सातों वृद्धि फलन अर्थात् रेखीय, रेखीय-एवं-लांग, द्विघात-एवं-लांग, चरघातांकी, उपगामी और सुप्रचालनिक को पृथक-पृथक प्रत्येक श्रेणियों के समायोजित रिकार्डों में आसंजित किया गया। विभिन्न बढ़वार फलनों एवं खींचे गये ग्राफों से विवेचित प्रतिशत विचलनों पर विचार करने पर यह निष्कर्ष निकाला जा सकता है कि फ्रिजियन x सहिवाल नस्ल की संकर गायों की, जन्म से एक वर्ष, एक से दो वर्ष, एक से तीन वर्ष और जन्म से तीन वर्ष तक, बढ़वार की विवेचना करने के लिए द्विघात-एवं-लांग वक्र

$Y = A + B X + C X^2 + D \log_e (X+1)$ बढ़वार फलन सबसे उपयुक्त है। मगर दो से तीन वर्ष तक की बढ़वार का अध्ययन करने के लिए उपगामी वक्र $y=A-Be^{-kx}$ बेहतरीन पाया गया, जहां y शरीर का संभावित भार, x समय की इकाई और A, B, C, D, और K प्राचल है।

18.8.4 भेड़ो के संकरण कार्यक्रम में भिन्न-भिन्न श्रेणियों की तुलना करने के लिए विविक्तकर फलन का उपयोग।

परियोजना के उद्देश्य थे—(I) तुलना की जाने वाली समष्टि के सहप्रसरण आव्यूह के असमान होने की स्थिति में आर्थिक लक्षणों के परिपेक्ष्य में भिन्न-भिन्न श्रेणियों की भेड़ों के कार्य-निष्पादन की तुलना करने के लिए एक बेहतरीन तकनीक विकसति करना और (II) फिशर के रेखीय विविक्तकर फलन से इसकी तुलना करना।

लागू की गई तकनीक थी—हार्वे पद्धति द्वारा लघुत्तम वर्ग विश्लेषण, सहप्रसरण आव्यूह की समानता का परीक्षण करने के सम्भावित अनुपात कसौटी, फिशर द्वारा प्रतिपादित रेखीय विविक्तकर फलन और एंडरसन एवं बहादुर द्वारा दी गयी अल्पमहिष्ठ पद्धति (minimax procedure) के प्रयोग से बेहतरीन रेखीय फलन।

इस अध्ययन के लिए भेड़ प्रजनन फार्म, बनिहाल-रेस्सी, जम्मू और काश्मीर में तीन चौथाई और शुद्ध रामबुईलेट (Rambouillet) भेड़ की चिकनी ऊन के वजन, रेशे के व्यास, रेशे की लम्बाई और ऊन के घनत्व संबंधी आंकड़े एकत्रित किये गये तथा मालपुरा, चोकला की 6 माह की ऊन उपज, स्टेपल लम्बाई, रेशे के व्यास और मज्जायन प्रतिशत एवं उनके सी० एस० डब्ल्यू० आर० आई० की रामबुईलेट के साथ संकरण पर एकत्रित आंकड़ों का प्रयोग किया गया। एंडरसन (1972) द्वारा दी गयी सम्भावित अनुपात कसौटी के माध्यम से आंकड़ों के दोनों ही सेटों में श्रेणियों के सभी सम्भावित युग्मों के लिए सहप्रसरण आव्यूह की समानता की परीक्षा की गयी। जम्मू और काश्मीर के संदर्भ में सहप्रसरण आव्यूह के 6 युग्मों में से एक को छोड़कर सभी महत्व-पूर्ण रूप से भिन्न थे। मालपुरा के आंकड़ों के सम्बन्ध में सहप्रसरण आव्यूह के 91 जोड़ों में से, 78 जोड़े महत्वपूर्ण रुप से भिन्न पाये गये जबकि शेष 13 महत्वपूर्ण नहीं थे।

18.8.5 सैनिक डेयरी फार्मों पर संकरण आंकडों का सांख्यिकीय विश्लेषण।

परियोजना के उद्देश्य थे— (I) लघुतम वर्ग तकनीक द्वारा आँकड़ों के समायोजन से संबद्ध समस्याओं का अध्ययन, (II) जीवन भर उत्पादन विशेषकों के लिए संकर नस्ल की गायों की विभिन्न श्रेणियों की उपयुक्तता का और संकर नस्ल की श्रेणियों के बीच आनुवंशिक बदलाव

का अध्ययन करना, (III) 'जीनप्रारुपी x वातावरण' अन्योन्य क्रिया का अध्ययन और (IV) सैनिक डेयरी फार्मों पर उपलब्ध संकर नस्ल की गायों पर 1979 से 1983 तक के आंकड़े एकत्रित करना और भा० कृ० सां० अ० सं में पहले से ही उपलब्ध आंकड़ों की फाईल को पूरा करना।

दो संकर नस्लों की परिशुद्ध श्रेणियों के कोणों को अन्तिम रुप दिया गया और उनकी प्रविष्टि अम्बाला, जालन्धर, लखनऊ, पिम्परी और देहरादून के सैनिक डेयरी फार्मों की गायों के वर्ष 1955 से 1978 तक के रिकार्डों में की गयी। अन्य फार्मों का कार्य प्रगति पर था।

18.9 भा०कृ०सां०अ०सं० की रजत जयन्ती (1959—1984)

संस्थान के रजत जयन्ती समारोह का आयोजन अक्टूबर, 1984 के दूसरे सप्ताह में किया गया। केन्द्रीय कृषि मंत्री माननीय श्री राव बीरेन्द्र सिंह ने 9 अक्टूबर, 1984, को समारोह का उद्घाटन किया। उन्होंने रजत जयन्ती के अवसर पर एक "रजत जयन्ती स्मारिका" जारी की। भा० कृ० अ० प० के महानिदेशक, डा० ओ० पी० गौतम ने समारोह में उपस्थित होकर समारोह की शोभा बढ़ाई। प्रो० प्रेम नारायण, संस्थान के निदेशक ने अनुसंधान प्रशिक्षण एवं संगणक प्रयोग में उपलब्धियों पर एक रिपोर्ट प्रस्तुत की।

संस्थान के प्रशिक्षण पाठ्यक्रमों का 22वां दीक्षांत समारोह 10 अक्टूबर, 1984, को मनाया गया, जिसकी अध्यक्षता भा० कृ० अ० प० के महानिदेशक डा० ओ० पी० गौतम ने की। केन्द्रीय कृषि राज्यमन्त्री माननीय श्री योगेन्द्र मकवाना मुख्य अतिथि थे तथा उन्होंने दीक्षान्त भाषण दिया। संस्थान के निदेशक प्रो० प्रेम नारायण ने संस्थान की प्रगति से संबद्ध एक रिपोर्ट प्रस्तुत की। इस अवधि के दौरान "प्रतिचयन पद्धति", "आनुवंशिकी एवं जनसंख्या परिस्थिति विज्ञान", "फसल पूर्वानुमान पद्धति" एवं "रेखीय माडल एवं प्रयोगों के डिजाइनों" नामक चार क्षेत्रों में "प्रतिचयन पद्धति" विषय पर एक संगोष्ठी आयोजित की गयी। रजत जयन्ती के इस कार्यक्रम में भारत तथा विदेशों के लगभग 250 प्रतिनिधियों ने भाग लिया। इस अवसर पर 25 वर्ष (1959-1984) की अनुसंधानिक विशिष्टताओं एवं संस्थान के कार्य तथा क्रियाकलापों पर एक विवरणिका भी प्रकाशित की गई।

अनुवादक
श्री अखिलेन्द्रपाल सिंह

निरीक्षक
श्री महाराज स्वरुप व श्री फणीन्द्रपाल सिंह

१९. हिन्दी के प्रगामी प्रयोग में प्रगति

भारतीय कृषि सांख्यिकी अनुसंधान संस्थान के विभिन्न प्रभागों, अनुभागों, एकक एवं कक्ष आदि के कार्य संचालन में, प्रतिवेदनाधीन वर्ष के दौरान, हिन्दी का प्रयोग निरन्तर बढ़ता रहा । इस अवधि के दौरान, हिन्दी के प्रति कर्मचारियों की रुचि प्रदर्शित करने वाली अनेक प्रतियोगिताओं में भाग लेने संबंधी प्रेरणादायक कार्यक्रम हुए तथा अन्यानेक विधाओं में हिन्दी प्रयोग बढ़ाने पर विशेष बल दिया गया । इस अवधि के कुछ विशेष कार्यक्रमों का संक्षिप्त ब्यौरा निम्न प्रकार है:—

केन्द्रीय सचिवालय हिन्दी परिषद की संस्थान शाखा का वर्ष 1905 (संवत्) का सदस्यता अभियान बहुत जोरों पर था तथा 201 कर्मचारियों को सदस्य बनाया गया । 21 जनवरी, 84 को शाखा कार्यकारिणी की बैठक में प्रतियोगियों को पुरस्कृत करने का तथा वार्षिकोत्सव संबंधी कार्यक्रम आयोजित करने आदि के निर्णय लिए गए ।

तीस जनवरी, 1984 को वार्षिकोत्सव के अवसर पर, केन्द्रीय कृषि राज्य मंत्री, श्री योगेन्द्र मकवाना, मुख्य अतिथि के रुप में आए ओर उन्होंने प्रश्नमंच आदि कार्यक्रम के बाद हिन्दी के अनेक प्रतियोगियों को पुरस्कार वितरित किए तथा अपने प्रेरणाप्रद भाषण से हिन्दी प्रेमियों का उत्साह बढ़ाया । हिन्दी प्रसारिका के प्रथम मुद्रित अंक का विमोचन किया गया तथा निदेशक महोदय ने हिन्दी को बढ़ावा देने का आश्वासन दिया ।

भारतीय कृषि अनुसंधान परिषद से जारी किए जाने वाले 'समाचार' (आई० सी० ए० आर० रिपोर्टर) में प्रकाशन के लिए फरवरी माह में लेख भेजे गए, संस्थान के सूचना पत्रों तथा वार्षिक प्रतिवेदन में प्रकाशन के लिए भी अनेक हिन्दी के लेख लिखे तथा अनुवादित किए गए ।

संस्थान की निरीक्षण उपसमिति ने 5 मई, 1984 को संस्थान के विभिन्न प्रशासनिक अनुभागों का निरीक्षण किया तथा हिन्दी में किए जा रहे कार्यों का आकलन किया गया । संस्थान के पुस्तकालय में हिन्दी साहित्य की खरीद के लिए कृषि विज्ञान एवं पशु पालन विषयों पर 28 पुस्तकों की तथा 9 शब्दकोषों, आदि की सूची तैयार करके अगली कार्यवाही की सिफारिश की गई ।

केन्द्रीय सचिवालय हिन्दी परिषद, की संस्थान शाखा की कार्यकारिणी की बैठक 29 मई, 1984 को हुई और अनेक प्रतियोगिताएं तथा कार्यशालाएं आयोजित करने के लिए दो उपसमितियां

गठित करने के अलावा अनेक महत्वपूर्ण विषयों पर विचार विमर्श किया गया। इन उपसमितियों की बैठकें 21 तथा 26 जून और 4 तथा 6 अगस्त को हुई जिनमें विस्तृत कार्यक्रम तैयार किए गए।

दिनांक 13 अगस्त से 25 अगस्त, 1984 तक हिन्दी व्यवहार पखवाडा मनाया गया। इसके दौरान हिन्दी में अधिकाधिक कार्य करने वाले अनुभागों तथा कर्मचारियों को हिन्दी व्यवहार प्रतियोगिता के अन्तर्गत पुरस्कृत करने का निर्णय लिया गया। दिनांक 27 अगस्त से 4 सितम्बर, 1984 के दौरान, हिन्दी कार्यशाला आयोजित की गई जिसके लिए संस्थान से बाहर के तथा संस्थान के व्याख्यानदाता आमंत्रित करके प्रशासनिक अनुभागों के कर्मचारियों को हिन्दी में काम करने के लिए प्रशिक्षित किया गया। दिनांक 7 सितम्बर, से 13 सितम्बर, 1984 की अवधि के दौरान, हिन्दी व्यवहार, लेख, टिप्पणी एवं प्रारुप लेखन, वाद-विवाद तथा प्रश्न-मंच प्रतियोगिताओं का आयोजन किया गया। "हिन्दी दिवस" के शुभ अवसर पर दिनांक 14 सितम्बर, 1984 को हिन्दी का वार्षिकोत्सव मनाया गया जिसमें वरिष्ठ सांसद एवं साहित्यकार श्री रामचन्द्र भारद्वाज ने मुख्य आतिथ्य स्वीकार करके हिन्दी प्रतियोगियों में पुरस्कार वितरित किए तथा संस्थान में किए जा रहे हिन्दी कार्यों की सराहना की। दिनांक 15 सितम्बर, 1984 को केन्द्रीय सचिवालय हिन्दी परिषद् की संस्थान शाखा की नई कार्यकारिणी का गठन किया गया।

दिनांक 23 अगस्त, 1984 तथा 6 नवम्बर, 1984 को संस्थान शाखा की कार्यकारिणी की बैठकें हुइ जिनमें हिन्दी को बढ़ावा देने सम्बन्धी कार्यक्रम आयोजित करने के लिए अनेक महत्वपूर्ण निर्णय लिए गये। इस विषय में अन्य प्रभावकारी मुद्दों के अलावा, संस्थान से संबन्धित विषयों पर विचार गोष्ठी आयोजित करने का निर्णय चर्चा के योग्य है।

संस्थान की राजभाषा कार्यान्वयन समिति की बैठकें, इस वर्ष के दौरान, निदेशक महोदय की अध्यक्षता में, क्रमशः 24 फरवरी, 16 मई, 25 अगस्त तथा 31 दिसम्बर को हुईं। इन बैठकों में हिन्दी को प्रोत्साहित करने वाले विषयों पर विचार विमर्श करके लिए गए निर्णयों को कार्यान्वित करने के ठोस उपायों पर ध्यान दिया गया और संस्थान की निरीक्षण उपसमिति को सुझाव दिया गया कि वे समय समय पर निरीक्षण करके प्रशासनिक अनुभागों में हिन्दी कार्य को बढ़ावा देने पर जोर दें।

APPENDIX-I

LIST OF SCIENTISTS, TECHNICAL AND ADMINISTRATIVE OFFICERS IN POSITION AS ON 31.12.1984

Prof. Prem Narain, Director

Dr. S.S. Pillai, Jt. Director (C.C.)

Dr. B.B.P.S. Goel, Jt. Director (R & T) (On leave)

(1) Division of Training & Basic Research

Dr. A.K. Nigam, Sr. Scientist, Head

1. Dr. Aloke Dey	Sr. Scientist
2. Dr. Prajneshu	Sr. Scientist
3. Sh. S.C. Rai	Sr. Scientist
4. Dr. G. Sadasivan	Scientist (S-2)
5. Dr. Randhir Singh	Scientist (S-2)
6. Sh. P.P. Rao	Scientist (S-2)
7. Dr. V.K. Gupta	Scientist (S-2)
8. Dr. V.K. Bhatia	Scientist (S-2)
9. Dr. Pranesh Kumar	Scientist (S-2)
10. Sh. V.K. Mahajan	Scientist (S-1)
11. Sh. K.R. Rajagopalachar	Scientist (S-1)

(2) Division of Statistical Research in Crop Sciences

Sh. P.N. Bhargava, Sr. Scientist, Head

1. Sh. K.S. Krishnan	Sr. Scientist
2. Sh. P.N. Soni	Sr. Scientist
3. Miss C.R. Leelavathi	Sr. Scientist
4. Sh. V.N. Iyer	Scientist (S-2)
5. Sh. H.C. Jain	Scientist (S-2)
6. Sh. R.K. Ghai	Scientist (S-2)
7. Smt. Asha Saxena	Scientist (S-2)
8. Sh. J.K. Kapoor	Scientist (S-1)
9. Dr. Basant Lal	Scientist (S-1)
10. Smt. Suman Gupta	Scientist (S-1)
11. Sh. P.K. Batra	Scientist (S-1)
12. Smt. Rajinder Kaur	Scientist (S-1)

(3) Division of Crop Forecasting Methodology

Dr. K.G. Aneja, Sr. Scientist, Head

1. Dr. M.P. Jha	Sr. Scientist
2. Sh. S.R. Bapat	Sr. Scientist
3. Dr. Ranjana Agrawal	Scientist (S-2)
4. Dr. R.C. Jain	Scientist (S-2)
5. Sh. G.N. Bahuguna	Scientist (S-1)
6. Sh. Chandrahas	Scientist (S-1)
7. Sh. B.H. Singh	Scientist (S-1)

(4) Division of Statistical Research in Animal Sciences

Dr. J.P. Jain, Sr. Scientist, Head

1. Dr. K.C. Raut	Sr. Scientist
2. Dr. H.P. Singh	Sr. Scientist
3. Sh. U.G. Nadkarni	Sr. Scientist
4. Dr. Shivtar Singh	Scientist (S-2)
5. Sh. R.L. Rastogi	Scientist (S-2)
6. Sh. H C. Gupta	Scientist (S-1)
7, Sh. B.C. Saxena	Scientist (S-1)
8. Sh. V.T. Prabhakaran	Scientist (S-1)
9. Dr. L.B.S. Somayazulu	Scientist (S-1)
10. Sh. K.P.S. Nirman	Scientist (S-1)
11. Sh. T.B. Jain	Scientist (S-1)
12. Sh. S,N. Arya	Scientist (S-1)
13. Sh. S.P. Verma	Scientist (S-1)
14. Dr. G.C. Chawla	Scientist (S-1)

(5) Division of Sample Survey Methodology

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

1. Dr. S.K. Raheja	Sr. Scientist
2. Dr. Padam Singh	Sr. Scientist
3. Dr. A.K. Banerjee	Sr. Scientist
4. Dr. J.S. Maini	Sr. Scientist
5. Dr. P.C. Mehrotra	Sr. Scientist
6. Dr. A.K. Srivastava	Sr. Scientist
7. Sh. S.S. Shastri	Scientist (S-2)
8. Sh. V.S. Rastogi	Scientist (S-2)
9. Dr. M.G. Mittal	Scientist (S-2)

10. Dr. H.V.L. Bathla	Scientist (S-2)
11. Sh. S.S. Gupta	Scientist (S-1)
12. Sh. J.N. Garg	Scientist (S-1)
13. Dr. K.K. Tyagi	Scientist (S-1)
14. Sh. Anand Prakash	Scientist (S-1)
15. Sh. K.B. Singh	Scientisi (S-1)
16. Dr. N.K. Ohri	Scientist (S-1)
17. Sh. Satya Pal	Scientist (S-1)
18. Sh. M.S. Batra	Scienttst (S-1)
19. Sh. G.S. Bassi	Scientist (S-1)
20. Sh. Jagmohan Singh	Scientist (S-1)
21. Dr. D.L. Ahuja	Scientist (S-1)
22. Sh. D.C. Mathur	Scientist (S-1)
23. Sh. R.S. Khatri	Scientist (S-1)
24. Sh. A.S. Gupta	Scientist (S-1)
25. Sh. R.C. Gola	Scientist (S-1)
26. Sh. Jagbir Singh	Scientist (S-1)

(6) Division of Econometric Analysis

Dr. R.K. Pandey, Sr. Scientist, Head

1. Shri Shanti Sarup	Scientist (S-2)
2. Sh. S.C. Gupta	Scientist (S-1)
3. Sh. B.L. Kaul	Scientist (S-1)
4. Dr. Bhagat Singh	Scientist (S-1)
5. Sh. H.B. Chaudhry	Scientist (S-1)
6. Sh. Ashok Kumar	Scientist (S-1)

(7) Division of Computer Science and Numerical Analysis

Shri S.N. Mathur, Sr. Scientist, Head

1. Shri K.V. Sathe	Scientist (S-2)
2. Sh. A.C. Kaistha	Scientist (S-2)
3. Sh. R. Gopalan	Scientist (S-2)
4. Sh. I.C. Sethi	Scientist (S-2)
5. Sh. Mahesh Kumar	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. D.K. Agarwal	Scientist (S-2)

10. Sh. Ram Kumar	Scientist (S-1)
11. Sh. S.L. Garg	Scientist (S-1)
12. Sh. M.L. Chaudhry	Scientist (S-1)
13. Sh. K.C. Gupta	Scientist (S-1)
14. Sh. K.L. Kaul	Scientist (S-1)
15. Sh. D.C. Pant	(T-6)
16. Sh. S.K. Mahajan	(T-6)

Director Cell

1. Shri R.K. Khosla,	Sr. Scientist
2. Shri D.S. Aneja	Scientist (S-1)
3. Shri A.R. Paul,	Artist (T-6)

Statistical Genetics Cell

1. Shri J.C. Malhotra	Scientist (S-2)
2. Shri L.K. Garg	Scientist (S-2)
3. Sh. B.S. Sharma	Scientist (S-2)
4. Sh. Lal Chand	Scientist (S-2)
5. Shri P.S. Rana	Scientist (S-1)
6. Shri R.K. Jain	Scientist (S-1)
7. Shri P.K. Malhotra	Scientist (S-1)

Administration

1. Chanan Lal	Chief Administrative Officer
2. Sh. Devinder Nath	Sr. Admn. Officer
3. Shri P.N. Vali	Accounts Officer
4. Shri Panna Lal	Asstt. Admn. Officer
5. Sh. S.L. Dua	Asstt. Admn. Officer

Technical Officers

Shri Rajendra Singh	Field Officer (T-8)
Shri S.K. Suri	Field Officer (T-7)
Sh. S.D. Sharma	Field Officer (T-6)
Sh. S.S. Srivastava	Librarian (T-7)
Sh. S.K. Sublania	M.T.O.

APPENDIX-II

LIST OF SANCTIONED AND FILLED UP POSTS AS ON 31.12.1984

Sl. No.	Designation of the post	Scale of Pay (Rs.)	No. of posts sanctioned	No. of post filled	No. of SC/ST employees	
					SC	ST
1.	Director	2000-2500	1	1	—	—
2.	Jt. Director	1800-2250	2	1	—	—
3.	Scientist (S—3)	1500-2000	22	25	1	—
4.	Scientist (S—2)	1100-1600	29	32	—	—
5.	Scientist (S—1)	700-1300	64	58	1	—
6.	Scientist (S—0)	550-900	35	11	—	—
7.	C.A.O.	1300-1700	1	1	—	—
8.	Sr. A.O.	1100-1600	1	1	—	—
9.	Accounts Officer	840-1200	1	—	—	—
10.	Admn. Officer	700-1300	1	—	—	—
11.	Field Officer	700-1300	3	2	—	—
12.	M.T.O.	700-1300	1	1	1	—
13.	Librarian	700-1300	2	1	—	—
14.	Jr. Tech. Officer	700-1300	4	2	—	—
15.	Sr. Artist	700-1300	1	1	—	—
16.	A.F.O.	650-1200	1	1	—	—
17.	Estate Officer	650-1200	1	—	—	—
18.	Asstt. Admn. Officer	650-1200	3	2	—	—
19.	Hindi Officer	650-1200	1	1	—	—
20.	Security Officer	650-1200	1	—	—	—
21.	E.C.O./Sr. T.A.	550-900	8	8	—	—
22.	Artist	550-900	1	—	—	—
23.	Supdts.	550-900	8	6	2	—
24.	Sr. P.A.	550-900	1	1	—	—
25.	Photographer	425-700	1	1	—	—
26.	T.A. (Stat)	425-700	171	98	7	—
27.	T.A. (Eco.)	425-700	2	2	—	—
28.	T.A. (Lib.)	425-700	2	1	—	—
29.	A.E.C.O.	425-700	6	5	1	—

1	2	3	4	5	6	7
30.	F. Inspect.	425-700	2	2	—	—
31.	Hindi Translator	425-700	2	2	—	—
32.	Assistant	425-700	25	22	5	1
33.	Stenographer	425-700	29	22	—	—
33A.	Jr. Stenographer	330-560				
34.	Sr. Clerk	330-560	22	22	3	1
35.	F. Supervisor	330-560	6	6	—	—
36.	Punch Supervisor	330-560	8	4	1	—
37.	Card Librarian	330-560	2	1	—	—
38.	Receptionist	330-560	1	—	—	—
39.	Electrician	260-430	1	—	—	—
40.	K.P.O.	260-430	40	48	4	1
41.	F. Investigator	260-430	30	30	5	—
42.	Coders	260-430	20	—	—	—
43.	Ref. Asstt.	260-430	1	—	—	—
44	Counter Asstt.	260-430	1	—	—	—
45.	Tel. Operator	260-430	3	3	—	—
46.	Tubewell Ope.	260-430	1	1	—	—
47.	Sr. Gest. Ope.	260-430	1	1	—	—
48.	Carpentor	260-430	1	1	—	—
49.	Drivers	260-430	5	4	3	—
50.	Zerox Ope.	260-430	1	—	—	—
51.	Jr. Clerk	260-400	43	30	3	—
52.	Supp. Staff Gr. IV	225-300				
53.	„ „ Gr. III	210-290				
54.	„ „ Gr. II	200-250	103	99	28	2
55.	„ „ Gr. I	196-232				

APPENDIX-III

List of dissertations (with Abstracts) approved during the year 1984 for Award of Ph. D. and M. Sc. degree in Agricultural Statistics and Agricultural Economics, and Diploma in Advanced Computer programming.

Ph. D. Degree :

(a) Agricultural Statistics :

1. AGARWAL, S.K.—Block Designs with nested blocks and their applications to bio-assays.

In this thesis, we have given a fairly general theory of analysis of 'Nested incomplete block designs' and constructions and analysis of nested incomplete block designs for SPL and SR-assays.

The main purpose of this thesis is to introduce nested incomplete block designs and develop their analysis. This is done by considering a fairly general setting of an equi-replicate and proper partially efficiency balanced design nested within another equireplicate and proper partially efficiency balanced design. It was felt that the subject of nested blocks, though very useful, has not been extensively developed. In bio-assays although incomplete block designs have been in extensive use, designs with nested blocks are not available. As the experimental units in bio-assays require a block size of eight or more units, it seems appropriate to develop theory, analysis and construction of incomplete block designs, with nested blocks which may be applicable in bio-assays.

For getting nested incomplete blocks designs for parallel line assays first some conditions are derived under which important contrasts are estimable free from block effects and next these conditions are explored to derive the designs. A large number of nested incomplete block designs have been obtained through this approach under the technique, four series of nested incomplete block designs for SPL-assays of 'n' even is obtained. It was found that for the same set of parameters (i.e. number of doses, number of blocks, sub-blocks, replications, block and sub-block sizes) two designs can be obtained following different sub-blocking systems and found that the designs changed from SPEB to PEB with 3 efficiency classes. Two series for nested incomplete block design for SPL-assays of 'm' odd is also obtained.

In nested incomplete block designs for SSR-assays, designs are obtained from the design for SPL-assays, by adding a blank dose to each of the sub-block of the designs. These designs estimate the contract L_1 free from block differences. These designs are available with the sub-block size h=5.

In all the series of designs for SPL-assays, the method of construction was to satisfy the conditions for estimating the major contrasts L_p+L_{2n+1} and L'_{2n+1} free from block differences. All such designs are PEB and can be very easily analysed in view of their special structures.

(Guide : Dr. A.K. Nigam)

2. PRABHAKARAN, V.T.—On certain aspects of estimation of heritability.

This dissertation deals with a detailed investigation on the probability of obtaining inadmissible estimates of heritability from sib analysis and intra-sire regression under the more general additive-dominance-epistasis model and on procedures for improved estimation.

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

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

The required sample size for a particular design may, at times, be beyond the resources of the experimenter. For such situations, a number of procedures of obtaining improved estimates have been described and illustrated with data on egg production in poultry. A logistic transformation estimator with

exponential correction has been developed which has been shown to give more reliable estimates of heritability and is, therefore, recommended for wider use, when a *priori* information on the range of heritability is known.

(Guide : Dr. J.P. Jain)

3. SINGH, RAVENDRA—Optimum Allocations in two way Stratification.

Bryant, Hartley and Jessen (1960) had considered the problem of estimation in two-way stratification when the number of observations to be selected from each cell i.e. stratum is not sufficient to get an unbiased estimate of variance. They have allocated the sample in each cell on the basis of marginal sample sizes by adopting proportional allocation. While allocating the sample to the marginal rows or columns. They have not considered the variability within rows and/or columns. While the variability within cells may not be very large, the same may not be case for variability within rows and/or columns. Therefore, by considering optimum allocation of sample units among rows and columns, it should be possible to obtain a better estimator than that with proportional allocation. However, it has been found that optimality with respect to one factor of stratification may not always lead to optimality with reference to other factor of stratification. Therefore, there can arise a number of cases other than the case of optimum allocation along both directions. In this paper, a number of alternative methods of allocations have been studied and their theoretical and empirical comparisons made to see under which conditions a particular case of allocation performs better than others.

(Guide : Dr. O.P. Kathuria)

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

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

When the population domain size (N_i) is unknown an important and useful estimator of N_i based on ratio method approach and which may at

times before precise then the usual estimator of Ni based on mean per unit has been developed

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

(Guide : Dr. O.P. Kathuria)

(b) Agricultural Economics :

1. DIXIT; U.N.—Economic study of constraints in pulse production in Haryana.

The specific objectives of the thesis were :

1. To analyse the trend of gram production in Haryana.
2. To study the response of gram supply and changes in the price and non-price factors.
3. To study the constraints which inhibit the farmers for allocating land and other resources to gram production and
4. To suggest probable measures to enhance the production and productivity of pulse in the state.

The study is based on secondary data for the state of Haryana as well as primary data collected from a sample of farmers in Gurgaon and Rohtak districts. The study revealed that wheat and rice crops have significant positive trend with respect to the area, production and productivity, while the gram and total pulses maintained negative trend in the pre as well as post green revolution periods. Study of shift in cropping patterns revealed that cereals have been continuously growing acreage, while gram and total pulses had been loosing area under cultivation. Analysis of price and non-price factors revealed that price of gram is a weak factor to influence the acreage under it.

Besides, the regression analysis, the programming approach was also followed in the analysis. A perusal of the results obtained by the MOTAD approach for different categories of farmers showed that the risk rises with the

level of expected profits. At the higher level of profits expectations, risk rises at a faster rate. In the opinion of farmers, besides risk and uncertainly unsuitability of soils, unfit water available for irrigation and adverse effects of nitrogen application on gram yield compel the farmers not to allocate land resources in gram.

(Guide : Dr. R.K. Pandey)

2. LAVANIA, ARUN—Estimation of Economic Benefits from New Rice Technology in India.

The research was undertaken with the main objective of estimating the economic benefits from high yielding varieties of rice and its distribution between producers and consumers. The efficiency of rice improvement of research in India was also examined. The concept of producers' and consumers' surplus was used in deriving the total annual benefits from research by aggregating the separate surpluses accruing to the consumers and producers. The returns to rice improvement research was measured in terms of changes in the surpluses brought about by the upward shift in the production function by the adoption of high yielding varieties of rice, The shifts in the production function, shift the supply curve from upward to right. The benefits were estimated in two situations-closed economy and the open economy and the reality was supposed to live between these two. The values of internal rate of returns were 60 and 50% in the closed and open economy respectively. It is based on supply elasticity of 0.3, demand elasticity of 0.7 and the annual national shifts in the production function varying from 6.22% in 1970-71 to 11.41% in 1976-77.

(Dr. R.K. Pandey)

M.Sc. Degree :

AGRICULTURAL STATISTICS

1. BHATNAGAR, AMITA—A review of asymmetrical factorial designs.

A number of research workers have contributed towards the development in the field of Designs for asymmetrical factorial experiments which was first initiated by Yates in 1937 but the work of all the authors in this field is scattered in the journals. Thus, an attempt has been made in the present investigation, to produce them at one place. Various methods of construction and analysis of designs for asymmetrical factorial experiments are reviewed in a chronological order, in the present work.

(Guide - Dr. A.K. Banerjee)

2. GOEL, PRACHUR—Use of Growth Indices in Forecesting Jowar Yield.

The uses of forecasting of crop yields need hardly be emphasised. Pre-harvest forecasting of crop yield in advance planning of the crops to be grown, their prices, storage, bufferstocking, export, import, etc. A pilot study was undertaken by the Indian Agricultural Statistics Research Institute, New Delhi in Sangli district of Maharastra state in 1977-78 for examining the possibility of making pre-harvest forecasts of yield of Jowar crop based on observations on the biometrical characters. The present investigation deal with the data collected during this study. These investigations concern the hybrid Kharif Jowar and are aimed at developing suitable models for pre-harvest forecasting of this Crop.

A stratified multi-stage random sampling design was used in the survey. The district Sangli was divided into four relatively homogenous zones. Tasgaon Taluk (Zone IV) was found to be the major hybrid jowar growing region. Villages, Fields and plots were collected according to the above said design. In Tasgaon taluk four fields of pure hybrid jowar were selected in each selected viilage. Forty Eight fields were selected in this zone. Biometrical characters viz, No. of plants per plot, plant height, number of leaves per plant, length and breadth of top most fully opened leaf, length and breadth of flag leaf, length and breadth of third leaf and length of the earhead were observed. Such observations were taken as five stages of crop growth viz., 6-8, 8-10, 10-12, 12-14 weeks after planting and at harvest.

The primary objective of the study was to predict the yield rate of hybrid kharif jowar at some early stage of crop growth. The data were subjected to the following types of analysis.

(a) Estimation of means of biometrical character,

(b) Calculation of partial correlation coefficients between yield and biometrical characters and standardise partial regression coefficients of crop yield on biometrical characters,

(c) Formulation of growth indices using these coefficients as weights and

(d) relationship between crop yield and growth indices using multiple regression technique in which information on two or more crops growth stages were utilised simultaneously.

The results obtained indicate that except for number of plants, plant height and number of green leaf per plant, the plant biometrical character

remained more or less, constant after the second crop growth stage, i.e. 10 weeks after sowing. Stepwise regression was used to identify significant growth indices. The results indicate that around 71 percent variations in crop yield can be explained by using growth induces based on partial correlation coefficients between yield and a biometrical characters while 70 percent variation in crop yield can be explained by using growth indices based on standardised partial regression coefficients of crop yield on biometrical characters. The results also show the superiority of the models used over previous models, as against around 70 per cent variation explained by our models, the previous models could explain only around 59 percent and 41 percent variation in crop yield at the end of third crop growth stage.

Hence, the present investigation establish that the yield rate of hybrid kharif jowar can be predicted after the third crop growth stage i.e. for a crop of these and half month duration, the forecast it feasible one months before harvest.

(Guide : Dr. K.G. Aneja)

3. JHA, P.K.—A Statistical appraisal of fertiliser's response on wheat crop and its economy.

Foodgrain production has to increase that too at an escalated rate to feed our ever increasing population. Agricultural production can, no doubt, increase with extension in the area under cultivation, but land-man ratio have already reached a critical point, there is no sign of success in this direction. So, any programme aimed at agricultural production must, therefore, necessarily assign a meaningful role to enhance fertilizer use. This requires a better understanding of the fertilizer responses to the crops. Due to wide variation in the yield to the wheat crop and its importance to our economy, the study of the responses of this crop becomes an obvious choice.

The experiments conducted on the cultivators' fields under the AICARP scheme (80-81) in 20 districts were subjected to the statistical analysis. The reason for selection of experiments on cultivators field was their greater suitability for such analysis as they represented the typical management and soil fertility conditions of major wheat growing areas of the country. In order to study the response behaviours of wheat crop to different levels of N.P. and K fertilizer application, a fractional factorial of 10 treatments out of the combinations consisting of 4 levels each of Nitrogen (N_0, N_{80} and N_{120}), Phosporous (P_0, P_{20}, P_{60}) and Potassium (K_0, K_{20}, K_{40} and K_{60}) were used

for the experimentation. The data were collected using Multi-stage stratified random sampling plan.

The attempted study indicates that under restricted as well as adequate availability of fertilizer, profitability of fertilizer application can be increased only by balanced use of plant nutrients. Intercomparison of economics of fertilizer application in various agro-climatic regions and soil-groups indicated wide variations both in respect of net profit and percent profit. Moreover, in all, the regions there were consistent increases in respect of these economic parameters with application of Potassium which is ascribable due to its lower cost and higher efficiency, in making available nutrients to the soil in a balanced way.

With the spread of the fertilizer responsive HYV seeds, the need for making available information on minimum recommended rate of fertilizer in actual field condition faciliating the policy makers regarding subsidies to the small and marginal farmers is as important as the need for the information on optimum use of fertilizer for fostering the agricultural planning.

To study the lower and upper limit of fertilizer application, the quadratic response function was fitted in the form as follows :

$$Y = a_0 + a_1 X + a_2 X^2$$

$$a_1 > 0,\ a_2 < 0$$

And subsequently, the optimum levels and minimum recommended rates were worked out. The concept and desirability of the minimum recommended rates have been discussed on new line.

The formulae for the optimum doses and M.R.R. were defined as follows :—

Optimum dose :

Optimum dose maximises the net profit and for the quadratic function it was taken as :

$$X_{opt'} = \frac{q - p\ a_1}{2p\ a_2}$$

p = Price of yield per quintal

q = cost of fertilizer

Minimum recommended rate :

It maximises the net return per rupee invested on fertilization and is independent of cost of produce. This depends on the cost of fertilizer and its application and is derived from the solution of

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

where f(x) is the quadratic function and 'a' is the cost of its application, it follows from the above expression :

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

$$\text{where } \alpha = \frac{a}{q}$$

(Guide : Shri P.N. Soni)

4. Singh, N.K.—On the use of inconplete frames in sample survey.

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

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

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

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

(Guide : Dr. Randhir Singh)

DIPLOMA IN ADVANCED COMPUTER PROGRAMMING

Solmby, Nagendaa Singh — Word Processing Software.

A word Processing software has been developed using the Burroughs Programming language. Linked structure has been used for Disk file records. The editing facilities include-corrections, insertions and deletions of the text. The documenting features of the software provide facilities for—New page, New para, next line, set width of text, setting margin and some more procedures.

(Guide—Shri S.N. Mathur)

APPENDIX-IV

LIST OF PAPERS (WITH ABSTRACTS) PUBLISHED DURING THE YEAR 1984

1. AGARWAL, RANJANA; JHA, M.P. AND SHUKLA, S.B.L.—Sampling for Sugarcane Stalk-Borer Incidence, *Jour. Ind. Soc. Agri. Stat., Vol. XXXVI, No. 2, April 1984.*

Attempts have been made to obtain suitable sampling unit, size and technique for recording stalkborer incidence in a field. Results indicated that stratified sampling performed the best followed by two stage sampling with systematic sampling for selection of first stage units. 2% sample taking the plots consisting of 3 or 4 rows each of one metre length as sampling units was found optimum.

2. AGARWAL, RANJANA; SINGH, D. AND SINGH, PADAM—Systematic sampling using varying probabilities—*Jour. Ind. Soc. Agri. Stat., Vol. XXXVI, No. 1, April, 1984, pp. 99-119.*

A modified systematic sampling scheme is obtained by combining the concept of random interval with the use of unequal selection probabilities. The suggested scheme enjoys the simplicity of systematic sampling and is free from the drawback of non-estimability of variance. Three sets of probabilities for selecting sampling interval have been discussed. Empirical comparison with SRS and usual circular systematic sampling indicated that the suggested scheme can be used as an alternative to systematic sampling scheme.

3. GUPTA, H.C. AND NADKARNI, U.G.—On ratio estimate in cost of production studies. *Jour. Ind. Soc. Agri. Stat., Vol. XXXVI, No. 1, April, 1984, pp. 92-98.*

In the study of cost of production of a commodity, the cost per unit is obtained by taking the ratio of total cost of all units tend the number of units produced. Numerator in this is generally a sum of product of two random variables. In the present study formulae have been obtained for relative bias and variance of the estimate of (RN) by considering the variable occuring in

the number of (i) a single variate, (ii) product of two independent variates and (iii) product of two dependent variates. For the latter two cases, expressions for variates, expressions for variances have been obtained using approximate and exact formulae given by Goodman.

4. JAIN, J.P., NARAIN, P. AND JAIN, R.K.—Rates of Genetic Improvement by Progeny Testing in Dairy Herds of Various Sizes. *Ind. J. Anim. Sci., Vol. 54, pp. 721-730, 1984.*

Rates of annual genetic improvement under progeny testing for alternative combinations of tested and untested sires in use each cycle have been completed for herds of 600, 300, 200 and 150 breedable females separately for indigenous purebred cattle, crossbred cattle and buffaloes. For comparison the rates expected under no-progeny testing have also been given. The procedure used for estimating genetic gain including an adjustment for the loss in production due to inbreeding as a result of the restricted size of the breeding population and a slight refinement in the pattern of selection among females and manner of computing selection intensities under the constraints of stability in the herd strength from generation to generation.

The peak progress is achieved when the selection intensity of bull sires is the top 2 or 3 out of the progeny tested bulls in each batch according to the amount of depression caused by inbreeding is mild or significant. In smaller sized herds of 150 breedable females, although progeny testing is seen superior to no-progeny testing, but in view of the small gains and heavy cost involved in its operation its use may not be warranted.

5. JAIN, R.C., SRIDHARAN, H. AND AGRAWAL, RANJANA—Principle component technique for forecasting sorghum yield. *Ind. Jour. Agri. Sci., Vol. 54 (6), 1984, pp. 467-470.*

Principle component technique has been used to forecast the yield of hybrid sorghum [*sorghum bicolor* (Linn.) Moench,] using principle components of biometrical characters. The results indicate the possibility of forecasting yield 1 months before harvest of a crop of 3½ months duration.

6. KATHURIA, O.P., BATHLA, H.V.L. AND SINGH, JAGBIR—Groundnut and Rapeseed—The Linkages, *Farmers Journal, Vol. IV, No. 1, pp. 22.*

The importance of groundnut and rapeseed mustard in the oilseed economy of country has been stressed. Responses of these two crops to

irrigation and of the irrigated crop to fertilizers have been examined. The target set for the sixth five year plan for the two crops being nearly within reach, an attempt has been made to evolve a production strategy.

7. KHOSLA, S.K., GILL, S.S. AND MALHOTRA, P.K.—Effect of non-genetic factors on lactation length and lactation yield in herdbook-registered Murrah buffaloes under village conditions. *Indian Jour. Anim. Sci, 54(1), pp. 1-5, January, 1984.*

The effects of non-genetic factors on lactation length and lactation yield were studied in 1,108 Murrah buffaloes in different orders of lactations and registered under the Central Herd Registration Scheme of the Govt. of India in 4 states of Uttar Pradesh, Haryana, Delhi and Rajasthan. Lactation length was significantly affected by the states in all the 4 lactations. Year of calving had significant influence on lactation in the third lactation. Lactation yield was significantly affected by states in the first, second and fourth orders of lactations. Year and season of calving had significant effect on milk yield in the third lactation. The adjusted mean lactation lengths lactation-wise were 281.9± 0.965, 283.2±0.820, 283.8±0.892 and 283.5±1.630 days in the first 4 lactations. The adjusted mean lactation yields lactation-wise were 2,426±19.98, 2,635± 23.16, 2,782±26.28 and 2,656±47.40 kg. in the first 4 lactations. The adjusted yearly averages for 1978, 1979 and 1980 were 26,27±54.94, 26,01±19.47 and 2,618+145.41 kg. respectively. The static yield indicated that there was scope for following better breeding practices including use of pedigreed bulls in the breeding tract of Murrah buffaloes.

8. KUMAR, PRANESH, KATHURIA, O.P. AND AGARWAL, S.K. – On a sampling scheme with inclusion probability proportional to size—*Math. Operat. Statist, Ser. Statistics, 15*(4), *1984.*

An inclusion probability proportional to size sampling scheme for selecting sample of two units is suggested. The sample selection ensures the non-negative Yates and Grundy's (1953) variance estimator. For a number of natural populations, the proposed sampling scheme performs better, in terms of smaller variance, than many of the existing unequal probability sampling schemes.

9. KUMAR, PRANESH., SRIVASTAVA, A.K. AND SINGH, PADAM—Study of Price Behaviour of Vegetables in some Colonies of Delhi—*Jour. Ind. Soc. Agri. Stat., Vol. XXXVI, No. 1, April 1984, pp. 30-50.*

Random samples of retailers and wholesalers were selected for studying the behaviour of average retail prices of tomato with respect to whole sale

prices. Fractile graphs and concentration curves were drawn for each sample and the concentration ratios were worked out. The behaviour of the average retail prices was not different in East Patel Nagar and Ajmeri Gate Mandis during January-March, 1977. Similarly, the price of behaviour of tomato was nearly the same in the months of February and March at East Patel Nagar Mandi. The concentration ratios were very small showing the inelastic nature of retail price of tomato in both the Mandis.

10. MALHOTRA, P.K., DUTTA, O.P., AND MALHOTRA, J.C.—Persistency of milk yield of Murrah buffaloes registered in the herd book under village conditions. *Indian Jour. Anim. Sci., 54(2), pp. 145-148, Feb., 1984.*

The persistency of milk yield in Murrah buffaloes maintained under village conditions in the states of Uttar Pradesh, Haryana, Delhi and Rajasthan was studied with the help of data available from the Central Herd Registration Scheme of the Government of India. Lactation-wise persistency indices for the first 4 lactations were 0.9745 ± 0.0017, 0.9766 ± 0.0018, 0.9745 ± 0.0017 and 0.9593 ± 0.0036. The correlations between persistency and total milk yield were significant in the first 3 lactations. Persistency was affected by states and season of calving upto the third lactation. Year of calving had significant effect in the second lactation. In the fourth lactation none of the non-genetic factors showed significant effect.

11. NADKARNI, U.G. AND ARYA, S.N.—Cattle in the field. *"Farmers' Journal, Vol. IV, No. 3, July, 1984.*

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

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

12 NADKARNI, U.G., JAIN, T.B. AND AGARWAL S.C.—Optimum flock size for pigs in a rural area of Uttar Pradesh—*Ind. Jour. Anim. Sci., Vol. 54, No. 4 April, 1984 pp. 360-362.*

Optimum flock size of pigs under rural area of Aligarh district (Uttar Pradesh) was estimated utilizing the data collected in the survey for studying the economics of pig rearing by minimising the gross cost. The number of pigs maintained per household ranged from 1 to 28. About 48% of households maintained 4 to 7 pigs. The optimum flock size estimated was 20 and the break up of this into different categories of pigs is also estimated according to the ratio of average number of pigs in the category to the average total number of pigs maintained.

13. NARAIN, PREM—On Contributions of P.V. Sukhatme in the field of Nutrition. P.V. Sukhatme Felicitation Volume entitled—'*Impact of P.V. Sukhatme on Agricultural Statistics and Nutrition*',. *pp. 24-45, July, 1984.*

The contributions of Dr. P.V. Sukhatme in the field of nutrition has been briefly described in this paper. The most important outcome of Dr . Sukhatme's deliberations in this field during the last over 20 years is the demonstration how the science of statistics can be of great assistance in understanding the nutritional concepts and in helping thereby to tackle serious and important issues like malnutrition, undernutrition and health. The paper reviews his work under seven sub-heads viz. (1) Introduction, (2) the World's Hunger and Future Needs is Food Supplies, (3) Protein Malnutrition, (4) Measurement of Undernutrition and Poverty, (5) Models for Protein Deficiency, (6) Genetic Interpretation of Intra-individual Variation, and (7) Newer Concepts in Nutrition, and their Implementations for Policy, and (8) An Approach to Rural Development.

14. NARAIN, PREM AND BHARGAVA, P.N.—Strategies for improving the protein availability in the country—*Agricultural Situation in India, August, 1984.*

Protein are essential to life and every cell of animals and plants is composed in part of these large molecules compounded in differing proportions from more simple units called aminoacids. The nutritive value of food in terms of protein is dependent both on quantity of protein contained in it as well as on its quality. The protein content of different foodgrains varies considerably being of the order of about 6 to 14%. Leafy vegetables contain around 13% on a moisture free basis in case of pulses, oilseeds and nuts. It is around 20 to

25%. Animal products such as cheese, meat and fish contain about 15 to 25% but much more on a moisture free basis. The quality of protein is generally in the ascending order of grains, pulses, oilseeds and animal products. Available supply per capita protein in India is around 50 gm. which is much lower as compared to other countries like USA, Europe and USSR. In India, grains are the staple food and are the major source of protein, the proportionate supply through this source is about 70% and about 27% through pulses, oilseeds and nuts. The contribution due to animal protein is only 3%.

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

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

15. NARAIN, P., BHARGAVA, P.N. AND SAKSENA, ASHA—A Statistical Study on incidence of drought in relation to agricultural production—*Mausam, Vol. 35, No. 3, pp. 391-396, 1984.*

Assessment of drought is of great significance for crop planning. In the present paper an attempt has been made to characterize drought in the three districts Jalgaon, Jamnagar and Surendranagar falling in semi-arid and arid regions of western India. Data on yield of Jowar and rainfall for various period was examined to work out threshold values beyond which rainfall becomes relatively ineffective in determining the yield. It was found that if there is no rain for two consecutive weeks at any stage of the crop growth it does not result in

moisture deficiency for the crop but, if the minimum amount of rainfall is less than 3, 3 and 20 mm in three consecutive week in Surendranagar, Jamnagar and Jalgaon respectively, there is significant reduction in yield. Similar drought base values for various duration of drought were worked out alongwith their chances of occurence. It was found that a drought of 9 weeks duration between 3rd July and 5th August is expected to occur once in 4, 5 and 10 years in Surendra Nagar, Jamnagar and Jalgaon respectively.

16. NARAIN, P., JAIN, J.P., AND JAIN, R.K.—Increase in Inbreeding Coefficient in a Progeny Testing Programme—*Ind. J. Anim. Sci., Vol. 54, pp. 810-812, 1984.*

In this paper the expression for the amount of inevitable inbreeding which accrues under a progeny testing programme where only a few top sires are used has been derived. In addition the inbreeding coefficients over the first ten generations under progeny testing with different bull selection schemes have been given.

17. NARAIN, PREM AND KHOSLA, R.K.—Statistical Methodology for Estimation of Post-Harvest Food Grain Losses—*The report of the "Workshop on Post-Harvest Losses and Small Farmer Storage" New Delhi, 19-24 April, 1982, pp. 131-137 brought out by the common wealth secretariat, London, U.K.*

The paper discusses the statistical methodology for estimating the foodgrain losses at different post-harvest stages, viz. harvesting, threshing or shelling, cleaning and winnowing, drying, storage, transportation, processing, packaging and handling at farm level in the developing countries. The statistical methodology for estimating the losses due to relative humidity, moisture content, incidence of pests and diseases and other biological and chemical changes, etc. on the basis of observations taken in storage has also been suggested.

18. NARAIN, PREM AND KHOSLA, R.K.—Post-Harvest Estimation of Losses of Agricultural Products Due to Biotic and Abiotic Factors—*The proceedings of the India Statistical Institute Golden Jubilee International Conference on 'Frontiers of Research in Agriculture, Calcutta, September 27-October 1, 1982, pp. 411-427.*

It is a well known fact that there are appreciable losses of agricultural products due to various factors at different Post-harvest stages, but reliable and objective estimates of those losses are seldom available. Such estimates

of losses are not only important but also pre-requisite for planning effective and economical measures to control those losses. Keeping the importance in view the statistical methodology for estimation of agricultural products at different stages, viz., harvesting, threshing/shelling, cleaning/winnowing, drying, storage, transportation, etc., at the level of farm inter-mediaries and warehouses, covering a larger area such as district, region, state, etc. has been discussed. The statistical methodology for working out the losses due to different biotic and abiotic factors such as insect pests, micro—organisms, temperature, relative humidity, moisture content and other biochemical and chemical changes based on the objective type observations taken in the selected storages and estimation of avoidable losses by adoption of recommended control measures in the storages has also been suggested.

19. NARAIN, PREM AND KHOSLA, R.K.—Estimation of Post-Harvest Food grain Losses.—*Jour. Ind. Soc. Agri. Stat., Vol. XXXVI, No. 1, April, 1984 pp. 127-142.*

Considerable foodgrain losses are incurred at different post-harvest stages every year. The work done in this field has been reviewed in brief and observed that the reliable and objective estimates of those losses are not available in this country. Such estimates are very important rather pre-requisite for carrying out control measures more efficiently and economically and also for improving post harvest technology so as to minimise those losses.

Keeping the importance in view, statistical methodology for estimating foodgrain losses at different post harvest stages, viz., harvesting, threshing/ shelling, cleaning/winnowing, drying, handling (at farm/market levels) transportation, packing, storing, etc. at farm, intermidiary and warehouse level have been discussed. The methodology for working out the damage due to different causes such as temperature, relative humidity, moisture content, incidence of pests and diseases and other biological and chemical changes etc. on the basis of the observations taken in the storage has also been discussed.

20. NARAIN, PREM and KHOSLA, R.K.—Review of the Proceedings of the Indian Statistical Institute, Golden Jubilee International Conference, "Frontiers of Research in Agriculture" held at Calcutta from September 21-October 1, 1982 ; Jour. *Ind. Soc. Agri. Stat., 36(2), pages 68-78.*

The review of the Inaugural Address, Special Lectures, Key Note Addresses in the different six Sessions and the lectures of the invited speakers,

presented, discussed and various recommendations made in the Conference by the Eminent International Scientists of different subjects, has been made in brief for the benefit of the workers, engaged in fundamental and applied research.

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

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

22. NARAIN, PREM and LAL, CHAND—Lactation Performance indices in Dairy cattle—*Ind. Jour. Dairy. Sci., Vol. 36., No. 3, 1983, pp. 325-326.*

In dairy animals, economic considerations suggest that apart from higher lactation yield, the animals should also have optimum lactation length, smaller calving interval, smaller dry and shorter service periods. It is, therefore, required to devise an index which could combine these economic characters in an optimum manner. Narain and Chand (1980) developed such an index based on the four characters viz., lactation yield, lactation length, calving interval and dry period with the help of data on Sahiwal and Hariana cattle. In this note, this procedure taking lactation yield, length and dry period as the three component characters has been examined with the help of data on Sahiwal and Friesian cattle maintained at Military Dairy Farm, Meerut as well as data on half-breds (Friesian x Sahiwal) and Hariyana cattle maintained at Military Dairy Farm at Lucknow and Agra respectively.

23. NARAIN, PREM., PANDEY, R.K. and SARUP, SHANTI—Perspective for foodgrains production in 2000 A.D.—*Commerce, Vol. 148 No. 3813. June, 30, 1984.*

The study is based on secondary data for the years 1968-69 to 1978-79. It covers crops such as Rice, Wheat, Maize, Jowar, Bajra and pulses, The study revealed that foodgrains production would reach a level of 225 million tonnes in 2000 AD, if the inputs such as nutrient consumption, cropped area,

area under HYV and irrigated area would grow at their current level of growth. This would be adequate to meet the demand for foodgrains as predicted by the National Commission on Agriculture and by Sanderson and Roy. The higher output level of 251 million tonnes would be achieved by raising the use of these inputs by 20% above their predicted use in 2000 AD. The input needed for this purpose would be 142 million hectares of gross cropped area, 9.7 million tonnes of nutrient and 97.2 million hectares of area under high yielding varieties and 60.4 million hectare of irrigated land.

24. NIGAM, A.K., GUPTA, S.C., and GUPTA, S—A New Algorithm for Extreme Vertices Designs for Linear Mixture Models—*Technometrics, Vol. 25, No. 4 (Nov., 1983) pp. 367-371.*

A new algorithm for obtaining extreme vertices designs for linear mixture models is proposed. The algorithm generally produces designs that are as efficient as those produced by the XVERT algorithm of Snee and Merquardt (1974) but with less computational effort. Use of the algorithm in obtaining designs is also described.

25. NIGAM, A.K. and GUPTA, V.K.— 'A Method of sampling with equal or Unequal Probabilities Without Replacement'—*Applied Statistics, 33, pp. 227-229, Dec., 1983.*

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

26. PANDEY, R.K. and SARIN, B.S.—Estimation of Demand for Foodgrains in Uttar Pradesh. *Jour. of National Council of Applied Economic Research, MARGIN, Vol 18, No. 3, April, 1984.*

This study is based on secondary data. It confirms that an increase in prices of wheat, rice and maize will lead to a fall in their demand. However, the extend of decline will be different for these commodities in different regions. With the increase in retail price of rice the maximum decline in demand for rice will take place in Bundelkhand followed by the central and eastern regions. The price rise of maize will reduce the demand most in Bundelkhand followed by the eastern, western and central Uttar Pradesh. If there is an increase in

per capita income, the demand for wheat and rice will increase while with some exceptions it will fall for maize. The effect of income in the case of wheat is maximum in the eastern region and minimum in the central region. For rice the income coefficient was the highest in Bundelkhand followed by the eastern region.

The co-efficients associated with the price of wheat were statistically insignificant in almost all regions while these were statistically significant in all the regions exeept the western. For maize the coefficient of its price were statistically significant in all the regions except the central and western. The co-efficients of per capita income variable were positive and statistically significant for wheat with one exception. The situation is more or less similar in case of rice but the income co-efficients were either negative or statistically significant for maize. The price of substitute commodity had a positive effect through statistically insignificant effect in many situations on the demand of these commodities.

It is evident from the study that the effect of different factors are idssimilar on the demand of the selected grains in the different regions of the state.

27. PATEL, R.H., DESAI, K.B., DOSHI, S.P. AND DESAI, D.T.—"Phenotypic stability for panicle characters in grain Sorghum".

"The F_1 populations of grain Sorghum (Sorghum bicolor (Linn.) Moench) has not only yielded more but also showed stability at 3 Locations. The female parents were sensitive than the males to environmental vagaries. Hybrids with '36A' were more sensitive than those with '2077A'. Hybrid combinations '2077A X M13' and '2077A X M28' registered high mean yield value for grain yield/plant and panicle length along with high magnitude of 'bi' than unity, with negligible non-linear component".

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

This is a review paper to introduce techniques of non-parametric analysis without the knowledge of specific probability distribution from which the observations have arisen. The techniques of analysis of two related samples in the form of Mc. Nemar test, Sign test, Wilcoxon Matched-Pairs Signed Ranks test and Randomisation test have been presented with their merits and demerits. In case of K related samples ($K>2$), Cochran Q test, Priedman test and Likelihood Ratio test are described stating the situations, when one is preferred

over the other, Fisher's exact probability test, X^2-test, Median test, Mann-Whitney test, Kolomogorov—Smirnov test and Krushal—Wallis test are reviewed indicating their merits and demerits.

Tests based on Sensory evaluation have also been given. Models for paired and triad comparisons are presented. Non-parametric method for analysing groups of experiments in randomised block designs has been given. The method can be used even when the error variances are heterogeneous and interaction absent.

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

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

30. RAI, S.C. AND RAO, P.P.—Rank Analysis of Groups of Split-plot Experiments—*Jour. Ind. Soc. Agri. Stat., Vol. 36, No. 3, pp. 156-167.*

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

31. RAM GOPAL, NADKARNI, U.G., ARYA, S.N.—"Fertility in bovines in rural areas of Gujarat"—*Ind. J. Anim. Res., 18(2).*

Using data collected under a sample survey conducted by Indian Agricultural Statistics Research Institute in an Intensive Cattle Development (I.C.D.) area and adjoining non-I.C.D. area, the variation in percentage of births in bovines over breeds, seasons and areas has been studied. Breed in the case of buffaloes were found to have significant effect, while the area and its interaction with breed were significant for both the species.

32. RAUT, K.C.—Productivity Enhancement in Milk Yield through Breeding, Feeding and Labour Input in a Rural Area—*Ind. Jour. Anim. Sci., Vol. 54, No. 6, June, 1984, pp. 524-526.*

The present study is an attempt to estimate the difference in the level of production of non-descript cow and crossbred ones, in a rural area (Krishna Nagar) of West Bengal, and to know quantitatively how much increase in Milk yield is due to breeding and how much of it is due to increased quantity of feeds and fodders fed and labour input. The average lactation yield of a crossbred cow was about 961 kg. and of a nondescript cow 333 kg. The yield per day of lactation of a crossbred cow was 2.78 kg. and of a nondescript cow 1.31 kg. Utilising decomposition to 1.47 kg. it was estimated that, of the total change in milk yield amounting to 1.47 kg. the contribution of breeding was 38.7% and of increased use of feed input, was 32.5% to the total change in milk yield. Increased labour input would only marginally (1.4%) contribute to additional output.

33. RAUT, K.C.—Planning for increased milk production-reducing losses due to mortality—*Indian Dairyman, Vol. 36(4), April, 1984, pp. 185-189.*

Untimely death of milch animals results in substantial loss in milk production. Similarly calf mortality adversely effects the milk yield and other production traits. Attempts have been made to give the mortality rate, lifespan in age and calving of milch stock as well as estimates of loss in milk production utilising data collected during livestock surveys in some areas by the IASRI. The extent of loss in milk yield due to calf mortality has also been worked out in some of the areas. If adequate health care can be taken, mortality can be reduced and thereby productivity of milch stock could be enhanced resulting in an improvement in the economic conditions of the rural people.

34. RAUT, K.C.—Procedure for determination of milk yield per animal and estimation of annual milk production of the country-problems and constraints—*Indian Dairyman, Vol. 36(4), April, 1984, pp. 191-193.*

The procedure and methodology of working out the estimation of milk production as evolved by IASRI based on a series of sample surveys have been mentioned. Difficulties experienced by States in conduct of these surveys and obtaining results in time have also been highlighted.

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

An attempt has been made in this paper to quantify this performance gap for jowar, maize and bajra crops and also to analyse the cause inhibiting

realization of the production potential of these crops in different states of the country. The study is based on the results of the National Demonstration Trials conducted during the Fifth Plan period and the actual productivity of these crops achieved in each state during this period. The data on recommended levels of crucial input factors have been compared with the actual input-use for production of these crops.

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

36. SARUP, SHANTI, PANDEY, R.K., SAHNI M.L. AND VED PRAKASH—Some aspects of groundnut production in India—*Eastern Economist, Vol. 1, No. 4, Jan.-March, 1984.*

This paper examines various aspects of groundnut production in the country during the recent years. The study is based on available data on the estimates of area, production and productivity from the Directorate of Economics & Statistics, Ministry of Agriculture. Results of National Demonstration Trials by Indian Council of Agricultural Research and data obtained from a sample survey conducted for Methodological Investigations into High Yielding Varieties Programme conducted by Indian Agricultural Statistics Research Institute, New Delhi, covering the period 1968-79. The compound growth rates of area, production and productivity have been estimated for important states growing this crop. To examine the pattern of production of over the years, variability in acreage, production and productivity are estimated. The available data is further analysed to examine shifts in the relative position of the selected states with respect to crop productivity at the national level. The pro-

duction potential of this crop achieved under the national demonstration trials have been compared with the actual performance of the crop to give an idea about the existing untapped yield potential of this crop with the available groundnut production technology in the different states of the country. Lastly this paper presents the resources and cultural practices used in crop production by the groundnut growers and identifies constraints for non-adoption of improved groundnut technology in the states under study.

37. SAXENA, B.C., NARAIN, P. AND SRIVASTAVA, A.K.—Multiple frame survey in two stage sampling—*Sankhya B, (1984), 46, Pt. I.*

In this paper, the theory of multiple frame surveys for multi-stage sampling designs has been developed. Estimation of population total for two stage sampling designs with unequal first stage units, when selection at either stage with equal probabilities is considered.

For multistage designs, the theory of multiple frame surveys (Hartley; 1962-74) becomes somewhat complicated as the alternatives for multiple frame approach multiply e.g. in two stage sampling there may be multiple frames at the first stage and single frame at the second stage or vice-versa. The advantages through multiple frames are illustrated using two frames at the first stage and a single frame at the second stage.

The gain due to application of multiple frames instead of single frame at both the stages has been examined. The following two cases have been derived ;

(i) Two frames at Ist stage and single frame at 2nd stage.

(ii) Single frame at Ist stage and multiple frames at 2nd stage.

In the first case, the variance reductions due to the use of multiple frames has been shown. It is seen that it remains quite stable with respect to change in relative cost as well as the relative variabilities at the two stage of selections. For the second case, the result were not presented. In the entire discussion it is assumed that the parameters like σ_a^2, σ_{ab}^2, σ_{ei}^2, etc, the domain variances are known. When they are not exactly known their close guess values may be used.

38. SINGH, H.P., JAIN, J.P. AND SAXENA, B.C.—Estimation of Impact Due to Milk Supply Schemes in a Dynamic Population—*Jour. Ind. Soc. Agri. Stat., Vol. 36, No. 1, April, 84, pp. 119-126.*

Jain and Rajagopalan (1) suggested earlier a simple heuristic approach for estimating the change in the total of a character in dynamic populations. However, when psu's change partially over time its use may mean sacrificing part of the data. To deal with this situation a suitable methodology has been delineated. The formulae developed has been illustrated with the data collected from the rural areas covered under the madhavaram Milk Supply Scheme, Chingleput (T.N.) during 1975-76 and 1979-80.

APPENDIX-V

LIST OF PAPERS ACCEPTED FOR PUBLICATION DURING THE YEAR, 1984

1. AGARWAL, S.K. AND KUMAR, PRANESH—A ratio cum PPS estimator. unequal probability sampling. Math. Ope. Res. Stat. Series, Statistics.
2. AGARWAL, S.K. AND KUMAR, PRANESH—On two auxillary variates in ratio method of estimation, Biometrical Journal.
3. CHAWLA, G.C. AND SHUKLA, P.C.—Use of Algebraic Equations for preparing feeds to obtain maximum milk production—*Ind. Jour. of Animal Sciences.*
4. DOSHI, S.P. GUPTA, K.C. AND MISHRA, J.P.—Diallel 'cross techniques in rural development—*Journal of Computer Society of India.*
5. GUMASTA, S.K., KHAN, A.G., CHAKRABARTI, R.L., POULOSE, M.V. AND DUTTA, O.P.—Pulled Variability Status of Pure-Bred Strains of White Leghorn Breed, Influence of Hatch and Year on Interstrain variations in pulled-Mortality—*Ind. Jour. of Poultry Sci.*
6. GUPTA, A.K., GARG, R.N., SRIVASTAVA, A.K. AND KUMAR, PRANESH—Impact of labour and irrigation on the yield of vegetables—*Annals of Agriculture science, Dec. 1984.*
7. GUPTA, V.K. AND NIGAM, A.K.—On a class of asymmetrical factorial of resolution—*IV, Jour. Stat. Plan. Inf.*
8. JAIN, J.P. AND MALHOTRA, J.C.—Effectiveness of paternal sisters and dam's records as supplement to progeny performance in dairy sire selection—*Ind Jour. Anim. Sci.*
9. KUMAR, PRANESH, GUPTA, V.K, AND NIGAM, A.K.—On inclusion probability proportional to size sampling scheme—*Jour. Stat. Plan. Inf.*
10. MEHROTRA, P.C., SRIVASTAVA, A.K. AND TYAGI, K.K.—On Post stratification for Cluster sampling—*Jour. of Ind. Soc. of Agri. Stat., Dec., 1984.*
11. NIGAM, A.K. AND BOOPATHY, G.M.—Designs for symmetrical parallel line assaya, J.S.P.I.
12. NIGAM, A.K. AND GUPTA, V.K.—Construction of orthogonal main effect plans using Hadamard matrices. *Technometrics.*

13. NIGAM, A.K., KUMAR, PRANESH AND GUPTA, V.K.—Some Methods of inclusion probability proportional to size sampling—*Jour. Roy, Stat. Soc. (B).*

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

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

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

17. SINGH, B.H., CHANDRAHAS AND BHATNAGAR, S.K.—A study on preharvest forecasting of yield of Tobacco—*Agril. Situation in India, Jan., 1984.*

18. SINGH, H.P., JAIN, J.P. AND SAXENA, B.C.—A further study for estimating changes in dynamic populations, *Jour. Ind. Soc. Agri. Stat., Vol. XXXVI.*

19. SINGH, RANDHIR—Double sampling for the auxiliary characters—*Calcutta Statistical Association, Bulletien.*

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

21. SINGHAL, R.A. AND JAIN, J.P.—Estimation of hertitability for samples from non-normal situations—*Biom. Journal.*

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

23. SONI, P.N. AND (Mrs.) RAJINDER KAUR—Cropping systems for high productivity—*Journal of Ind. Society of Agronomy. Vol. 29(3).*

24. SONI, P.N. AND SINGH, HARNAM—Nitrogen Economy, *Ind. Jour. of Agronomy.*

25. WAHI, S.D. AND NADKARNI, U.G.—Optimum levels of grading in out-breeding programme—*Ind. Jour. Anim. Res., Vol. 18, No. 1, 1984.*

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

OBITUARY

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

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

PERIODICAL PUBLICATIONS

I.A.S.R.I. (STATISTICAL NEWSLETTER)

The I.A.S.R.I. Statistical Newsletter is a quarterly publication giving such information about the current activities of the Institute as is likely to provides useful information to research workers in the field of Agricultural Statistics.

ANNUAL REPORT ON SAMPLE SURVEY METHODOLOGY

The Annual Report of Sample Surveys for Methodological Investigations into High Yielding Varieties Programme (H.Y.V.P.) are being published since 1974-75.

ANNUAL INDEX OF AGRICULTURAL FIELD EXPERIMENTS

The Annual Index gives information on the objectives of agricultural field experiments other than varietal trials conducted during that year on various crops at different experimental research stations and their year of commencement and termination under the scheme of National Index of Agricultural Field Experiments.

NATIONAL INDEX OF AGRICULTURAL FIELD EXPERIMENTS

The results of statistical analysis of the data pertaining to agricultural field experiments (other than varietal trials) conducted at the various research stations all over the country, are published in the forms of compendia series. Three such series in respect of the various States pertaining to the periods 1948-53, 1954-59 and 1960-65 have already been completed and the data for the period 1966-71 have been collected and are under process which would be published in the form of cropwise compendia series.

OTHER PUBLICATIONS

	Price (Rs.)
Sample Survey for Estimation of Milk Production in Punjab (1956-57)-V.G. Panse, Daroga Singh and V.V.R. Murty.	5.50
Sample Survey for Estimation of Milk Production in Eastern Districts of U.P. (1957-59)-V.G. Panse, Daroga Singh and V.V.R. Murty.	4.25
Cost of Milk Production in Madras (1963)-V.G. Panse, V.N. Amble and K.C. Raut.	4.75
Green Manuring of Crops (1965)-V.G. Panse, T.P. Abraham and C.R. Leelavathi.	2.50
Cost of Milk Production in West Bengal (1967)-V.G. Panse, V.N. Amble and K.C. Raut.	5.50
Monograph on Estimation of Wool Production (1970)-Daroga Singh, M. Rajagopalan and J.S. Maini.	2.60
Monograph on Estimation of Milk Production (1970)-Daroga Singh, V.V.R. Murty and B.B.P.S. Goel.	4.10
Survey on Mango and Guava in U.P. (1971)-G.R. Seth, B.V. Sukhatme and A.H. Manwani.	3.50
Incidence of Pests and Diseases on Paddy (1971)-G.R. Seth, D. Singh, M.G. Sardana and R.K. Khosla.	.....
Cost of Milk Production in Delhi (Revised in 1972)-D. Singh and K.C. Raut.	9.00
Survey on Vegetables in Rural Areas of Delhi (1973)-B.V. Sukhatme, A.H. Manwani and S.R. Bapat.	3.50
Economics of raising Cattle and Buffaloes (1973)-K.C. Raut, V.N. Amble and Shivtar Singh.	.....
Estimation of Availability and Cost of Production of Milk (1975)-K.C. Raut, D. Singh and Shivtar Singh.	.....
Monograph on Study on Size and Shape of Plots for Field Experiments on Vegetable and Perennial Crops (1975)-D. Singh, P.N. Bhargava, R.K. Khosla and Asha Saksena.	.....

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Sampling Methodology for Estimation of Egg Production and Study of Poultry Keeping Practices (1977)-D. Singh, B.B.P.S. Goel, J.N. Garg, K.B. Singh and Rajagopalan. .....

Handbook on Methods of Collection of Agricultural Statistics in India (1978)-K.C. Raut and D. Singh. 4.00

Handbook on Sampling Methods (1978)-D. Singh, Padam Singh and Pranesh Kumar. 10.00

Impact of Milk Supply Schemes on the Rural Economy in Milk Collection Areas (1978)-J.P. Jain, K.P.S. Nirman, K.G. Aneja and Prem Narain. .....

Estimation of Area of Grazing Land and its Utilisation, Jhansi Distt. (U.P.) (1978)-K.C. Raut, U.G. Nadkarni. P.R, Srinath and B.C. Saxena. .....

Estimation of Production of Lac (1978)-D.V.S. Rao and S.D. Bokil. .....

Sampling Methodology for Estimation of Meat Production (1978)-D. Singh, J.S. Maini, B.B.P.S. Goel and G.S. Bassi. .....

Report on Sample Survey for Estimation of Production of Hides and Skins in Punjab during 1974-76 (1978)-J.S. Maini, B.B.P.S. Goel and D.C. Dahiya. ...

Pilot Sample Survey for Estimating Yield of Cotton in Hissar (Haryana) during 1976-77 (1978)-S.K. Raheja, B.B.P.S. Goel, P.C. Mehrotra and V.S. Rustogi. .....

Impact of Milk Supply Scheme on Rural Economy in Milk-collection Areas of Madhavaram Milk Supply Scheme, Chingleput (Tamil Nadu)-A Bench Mark Survey, IASRI Bulletin (1978)-H.P. Singh, B.C. Saxena, Prem Narain and S.P. Verma. .....

Estimation of Birth and Death Rates in Bovines-A pilot survey in Andhra Pradesh (1979)-T. Jacob, B. Marutiram and S.N. Arya. ... ..

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Impact of Milk Supply Schemes on the Rural Economy in Milk Collection Areas of Dudhsagar Dairy, Mehsana, Gujarat (1979)-J.P. Jain, B.C. Saxena and P. Narain. ... ..

Souvenir Volume of I.A.S.R.I., New Delhi released on the Occasion of ICAR Golden Jubilee (1929-1979)-P. Narain, R.K. Khosla, D.S. Aneja and R.S. Khatri. .....

Sampling Methodology for estimation of Milk Production in Southern Region. A.P., 1971-74 (1979)—D. Singh, B.B.P.S. Goel, J.N. Garg and K.B. Singh. .. ...

Statistical Methodology for Developing Efficient Selection Prodcedures in Poultry Breeding (1979)-Prem Narain, L.K. Garg, J.P. Jain, J.C. Puri, Prakash Lal and P.S. Rana. .....

Forecasting of rice yield based on weather Parameters-Raipur district, (1980)-Ranjana Agrawal, R.C. Jain and M.P. Jha. .....

Preharvest forecasting of Jowar yield in Sangli district Maharashtra (1976-77 to 1979) (1984)-R.C. Jain, M.P. Jha and Ranjana Agrawal. .....

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Pilot Sample Survey for studying the relative merits of the data obtained by actual weighment & those through enquiry for estimation of milk production—District Rohtak (Haryana) & Barabanki (U.P.) (1984)-B.B.P.S. Goel, K.B. Singh and J.P. Goel. .....

Sample Survey for methodological investigations into high yielding varieties programme, Final Report 1977-78 to 1979-80, Volume I-Area Estimation Enquiry (1984)-S.K. Raheja, A.K. Banerjee, P.C. Mehrotra, V.S. Rustogi, S.S. Gupta, N.K. Ohri, S.S. Shastri, G.S. Bassi and D.L. Ahuja. .. ...

Pilot Sample Surveys for estimating yield of Cotton in Hissar (Haryana) and Jalgaon (Maharashtra)-1977-78 and 1978-79 (1984)-B.B.P.S. Goel, S.K. Raheja, P.C. Mehrotra and V.S. Rustogi. .....

Handbook on methodology of Sample Surveys for Estimation of Livestock Number and Products (1984)-P. Narain, B.B.P.S. Goel and J.N. Garg. 13.00

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