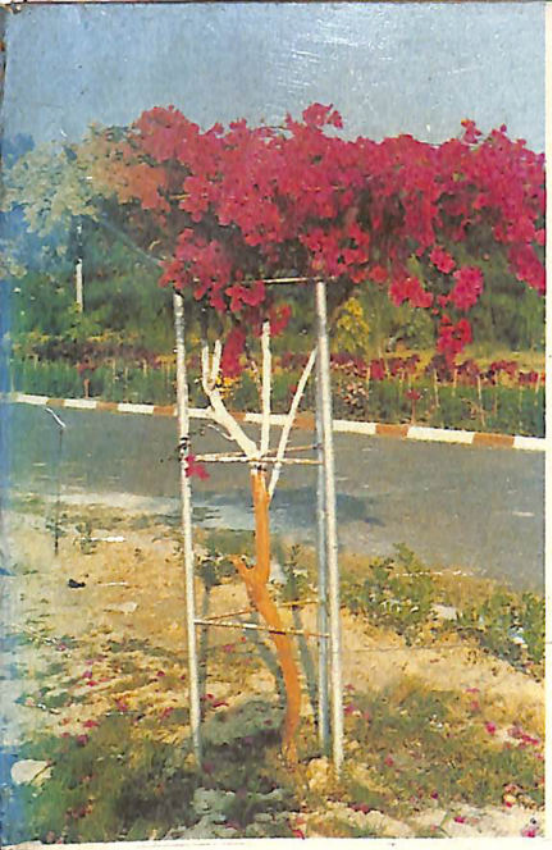

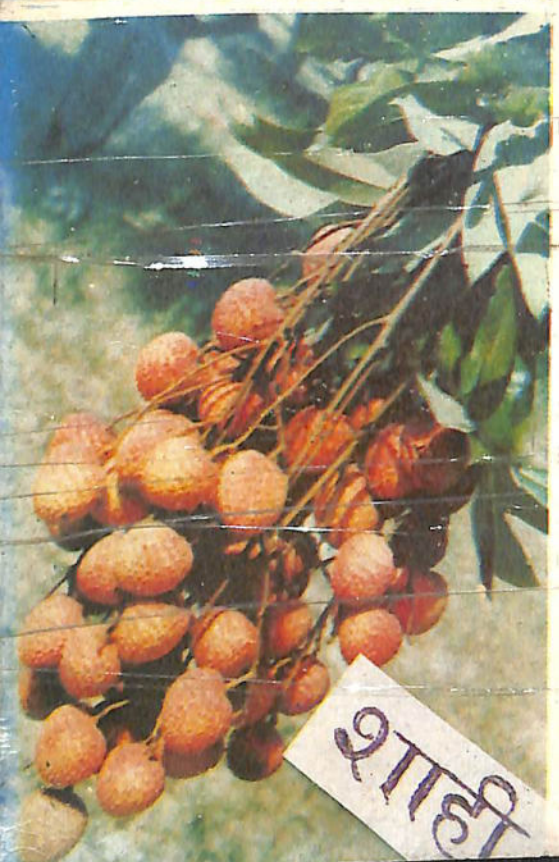

ANNUAL REPORT – 1988-89

RAJENDRA AGRICULTURAL UNIVERSITY, BIHAR

PUSA – SAMASTIPUR. PIN 848125

1. Inaugural session of the "Eastern India Farming systems Research workshop". Dr. G. Trivedi, Vice-Chancellor presided and the chief Guest, Gordon R. R. Conway inangurated.

2. Valedictory session of summer Institute on "Training Methodology for Human Resource Development in Agriculture" held on 29th May 1989 with chief Guest Dr. C. Prasad,D.D.G, ICAR.

ANNUAL REPORT

(1988-89)

Rajendra Agricultural University, Bihar
Pusa (Samastipur)-848125

FOREWORD

It indeed gives me a great pleasure in placing the Annual Report of the Rajendra Agricultural University for 1988-89 before the various University Bodies. During the period of the report, the University has certainly attained faster development in the field of agriculture & allied sciences through technological innovations transferred to the farming community. The University, by way of its commendable work in the field of Agriculture and various other activities, has created a definite sense of awareness

PREFACE

An institution like an Agricultural University is a living entity which continues to grow year-after-year and makes plans for future development. The Rajendra Agricultural University has been perfoming its various activities pertaining to teaching, research and extension education in order to serve the farming community of the State.

The University is bringing out its Annual Report every year and accordingly we have made efforts to bring out Annual Report for the year 1988-89. The report covers the salient achievements made in education, research and extension education as well as seed production. During the year under report, the University has been able to consolidate its degree programme both at Undergraduate and Postgraduate level. A number of varieties in different crops were developed and released for the benefit of the farming community of the State. Likewise, good technology have been developed in Agronomy, Soil Science, Pests and disease management and Agricultural Engineering. The College of Fisheries, Dairy Technology, Home Science and Agricultural Engineering were further developed during the year. Postgraduate programme was re-strengthened at Bihar Veterinary College, Patna. Ph.-D. programme was also started in three Departments of Veterinary faculty. In Agricultural Engineering; P. G. programme was started in three Departments namely; Farm Machinery and Power, Irrigation and Drainage and Post Harvest Technology. In Agriculture faculty, P. G. programme was started in Nematology. New Departments of Forestry, Floriculture and Land Shaping and Spices and Plantation crops were approved by the Board of Management. In Extension Education, Krishi Vigyan Kendras organised a number of good on-campus and off-campus training programmes. Trainings for extension officers from the Department of Agriculture and other client groups were also organised.

The Annual Report gives a bird's eye view of all that the University has done during the year under report. In preparation and compilation of the report, the material and help received from different Colleges/Institutes/Departments/Units is duly acknowledged.

Help rendered by those scientists who helped in compilation of the report is also acknowledged.

The Planning Cell is very much grateful to the Vice-Chancellor for his keen interest in preparation of the Annual Report.

R. N. Singh
Director, Planning.

CONTENTS

1. ACADEMIC

As per new Bihar Agricultural University Acts, the following are the Authorities of the University and the meetings of these Authorities were held during the year in order to take decisions on important matters :

Authorities of the University and their Important Decisions

1.1 Authorities of the University and their constitutions :

(a) **The Senate** :—The Senate consists of the following persons, namely-

Ex-Officio members

1. Chancellor;
2. Vice-Chancellor;
3. Agriculture Production Commissioner or the Agriculture Secretary in his absence;
4. Food Commissioner;
5. Special or Additional or Joint Secretary of the Department of Agriculture, Government of Bihar;
6. Special or Additional or Joint Secretary of the Department of Animal Husbandry, Govt. of Bihar.
7. Chief Conservator of Forest, Bihar;
8. Director of Agriculture, Bihar, Patna;
9. Director of Animal Husbandry, Bihar;
10. Director of Fisheries, Bihar;
11. Joint Director of Agriculture, Education, Bihar, Patna;
12. Director, Research, Rajendra Agricultural University, Pusa;
13. Director, Extension Education of the University;
14. All Deans of Faculties;
15. All Principals of Constituent Colleges and all Directors of Research Institutes;

Representative Members

16. Seven persons to be elected by and from amongst the members of Bihar Legislative Assembly in such manner as may be prescribed by the Speaker of the Assembly;
17. Two persons to be elected by and from amongst the members of the Bihar Legislative Council in such manner as may be prescribed by the Chairman of the Council;
18. Six teachers, other than Principals and Deans of faculties having at least five years teaching experience to be nominated in the manner prescribed by Statutes so as to give representation to all the constituent colleges of the University;
19. Five persons, one each to be nominated by the Bihar State Agro Industries Development Corporation, the Bihar State Agricultural Marketing Board, the Bihar Rajya Beej Nigam, the Bihar State Fruit and Vegetable Development Corporation and Bihar State Dairy Development Corporation;
20. One representative of the Employees of the University (other than teacher) to be elected in the manner prescribed;
21. Two farmers to be nominated by the Chancellor;

22. Two eminent Agricultural Scientists to be nominated by the Chancellor;

23. Two eminent Scientists (other than Agricultural Scientist) to be nominated by the Chancellor;

24. One meritorious student to be nominated by the Vice-Chancellor in the manner prescribed by the Statutes;

25. One student who has distinguished himself in sports and extra curricular activities to be nominated by the Vice-Chancellor in the manner prescribed by the Statutes.

(b) Board of Management :

1. The Board of Management is the Chief executive body of the University and consists of the following persons, namely;

[i] Vice-Chancellor — Chairman

[ii] Agricultural Production Commissioner/Agricultural Secretary;

[iii] Director of Agriculture, Bihar, Patna;

[iv] Director of Animal Husbandry, Bihar;

[v] One Dean of the faculty and one Director of the University to be selected by rotation in the manner prescribed for a period of two years;

[vi] One Head of the University Department to be selected by rotation in the manner prescribed for a period of two years;

[vii] A women specialist in Home Science to be nominated by the State Government for two years;

[viii] A representative of the Indian Council of Agricultural Research;

[ix] Two progressive farmers from the jurisdiction of the University to be nominated by the Chancellor for a period of two years·

[x] One eminent Agricultural Scientist from the country to be nominated by the Chancellor for a period of two years;

[xi] Three members from Legislative Assembly and one member from Legislative Council to be nominated by the State Govt. for a period of two years; Nomination shall however be restricted to the MLAS or MLCs belonging to the geographical jurisdiction of the University.

[xii] The Director of Fisheries.

2. The Vice-Chancellor shall be ex-officio Chairman of the Board of Management and the Registrar shall be its ex-officio Seeretary,

(c) Academic Council :

The Academic Council of the University shall consist of the following members, namely;

[i] The Vice-Chancellor, who shall be the ex-officio-Chairman;

[ii] The Deans;

[iii] The Directors;

[iv] Principals of the Colleges;

[v] All Chairman of the Post-graduate Department;

[vi] Three teachers of colleges on terms and conditions prescribed by the Statutes;

[vii] One Associate Professor and one Assistant Professor to be nominated by Vice-Chancellor by rotation for terms prescribed in the Statutes;

[viii] Director of Resident Instruction of

the other Agricultural University of the State;

[ix] Two other members, who may be nominated by the Board of Management after the approval of the Chancellor;

[x] The Registrar who shall be the non-member Secretary.

Meetings of Different Authorities

[A] Meeting of the Senate could not be held during the year.

[B] Five meetings of the Board of Management were held during the year.

[C] Two meetings of the Academic Council were held during the year.

[D] Meetings of Board of Studies in different faculties as well as of faculties were also held during the year.

1.3 Important Decisions of Different Authorities

1. Board of Management :

[i] Five Associate Professor were promoted to the post of University Prof. under Merit Promotion.

[ii] The Pay scale of Jr. Statistical Asstt. was revised to Rs. 850-1360.

[iii] It was accepted in principales to provide bunching facilities to the teachers of the University in U.G.C. scale.

[iv] Master degree programme was started in Nematology, Bio-chemistry, Farm Machinery, Irrigation and Drainage, Post Harvest Technology, Vety Gynaecology, Vety. Surgery and Vety. Public Health.

[v] Appointment of 14 Associate Professor was made.

[vi] Ph. D. degree programme was introduced in Plant Physiology, Genetics, Vety. Anatomy and Vety. Microbiology.

[vii] It was decided to continue Water Management Research at Madhepura and Bikramganj under Plan.

[viii] It was decided to restore the post of Administrative Officer in constituent Units.

[ix] Thirty-six Asstt. Professors were promoted to the post of Assoc. Professor under Personal Promotion Scheme.

[x] It was decided to establish a Deptt. of Forestry in the faculty of Agriculture.

[xi] It was decided to provide ten acres of land for construction of School building and residential quarters for the establishment of a Central School in University Campus at Pusa.

[xii] It was also decided to appoint Univ. Prof. in Food & Nutrition and University Professor, Dairy Technology on negotiation with Dr. [Mrs.] Uma Mehta and Dr. B. K. Chakravarty respectively.

[xiii] Appointment to the post of Dean Vety. was made.

2. Decision of the Academic Council Meeting

[i] Programme of field-oriented work experience for B. Sc. Agril. as approved by the faculty of Agriculture was approved.

[ii] The Syllabus 4½ years B. Sc. D. T. programme and 4 years B. F. Sc. programme as approved by the faculty of Vety. Science was approved.

[iii] A committee was constituted to recommend the manner in which the ideas of participatory culture in improving the function capability of teachers can be improved.

[iv] A committee was constituted to recommended the methods of introduction of External Evaluation in U. G. Programme.

[v] The Academic Council recommended to the Board of Management for establishment of the Department of Food Science and Technology.

2. Resident Instruction

The University imparts instuctions in the faculties through the Departments/ Colleges detailed as below :

Post-graduate Programme

2.1 A. Agriculture

[i] Agronomy
[ii] Plant Breeding and Genetics
[iii] Soil Science
[iv] Plant Pathology
[v] Entomology and Agril. Zoology
[vi] Agricultural Economics
[vii] Horticulture (Pomology)
[viii] Horticulture (Olericulture)
[ix] Extension Education
[x] Nematology

B. Basic Science :

[i] Statistics & Mathematics
[ii] Botany & Plant Physiology
[iii] Genetics
[iv] Biochemistry

C. Veterinary Science

[i] Veterinary Anatomy
[ii] Veterinary Physiology
[iii] Veterinary Pathology
[iv] Veterinary Medicine
[v] Veterinary Microbiology
[vi] Veterinary Pharmacology
[vii] Veterinary Parasitology
[viii] Veterinary Gynaecology
[ix] Veterinary Surgery & Radiology
[x] Veterinary Public Health
[xi] Animal Nutrition
[xii] Animal Breeding.

D. Agricultural Engineering

[i] Irrigation and Drainage
[ii] Farm Machinery
[iii] Post Harvest Technology

2.2 Faculty of Agriculture

[i] Bihar Agrieultural College, Sabour, Bhagalpur.
[ii] Tirhut College of Agriculture, Dholi, Muzaffarpur.

2.3 Faculty of Animal Husbandry

[i] Bihar Veterinary College, Patna.
[ii] Sanjay Gandhi Institute of Dairy Technology, Lohiya Nagar, Patna.
[iii] College of Fisheries, Tirhut College of Agriculture Campus, Dholi.

2.4 Faculty of Home Science

[i] College of Home Science, Pusa (Samastipur).

2.5 Faculty of Basic Science & Humanities

[i] College of Basic Science & Humanities, Pusa (Samastipur),

2.6 Faculty of Agricultural Engineering

[i] College of Agricultural Engineering, Pusa (Samastipur)

2.7 The University imparts instructions leading to the following degrees :

(a) Degree level programme

[i] B. Sc. [Agril.]
[ii] B. V. Sc. & A. H.
[iii] B. Sc. Home Seience
[iv] B. Sc. Dairy Technology
[v] B. Tech. Agricultural Engineering
[vi] B. F. Sc.

(b) Post-graduate level programme

I. M. Sc. Agril. Degree in :

[i] Agronomy
[ii] Soil Science
[iii] Plant Breeding & Genetics
[iv] Plant Pathology
[v] Entomology
[vi] Horticulture [Pomology]
[vii] Horticulture [Olericulture]
[viii] Agricultural Economics
[ix] Extension Education
[x] Nematology

II. M. V. Sc. degree in :

[i] Veterinary Anatomy
[ii] Veterinary Physiology
[iii] Veterinary Pathology
[iv] Veterinary Medicine
[v] Veterinary Pharmacology
[vi] Veterinary Parasitology
[vii] Veterinary Microbiology
[viii] Veterinary Gynaecology
[ix] Veterinary Surgery & Radiology
[x] Veterinary Public Health
[xi] Animal Nutrition
[xii] Animal Breeding
[xiii] Extension Education.

III. M. Sc./M. Sc. (Agril.) degree in :

[i] Agricultural Statistics
[ii] Botany and Plant Physiology
[iii] Genetics
[iv] Bio-Chemistry.

IV. Ph. D. degree level programme in :

[i] Agronomy
[ii] Plant Breeding
[iii] Plant Pathology
[iv] Soil Science
[v] Entomology
[vi] Agricultural Economics
[vii] Horticulture [Olericulture]
[viii] Horticulture [Pomology]
[ix] Extension Education
[x] Botany & Plant Physiology
[xi] Genetics
[xii] Vety. Anatomy
[xiii] Vety. Microbiology

2.8 The University is following semester system of Education since Academic Session, 1985-86.

2.9 **Courses :**

The course curriculum for different degree programmes under semester system of education has been formulated, and they are being regularly reviewed and revised keeping into consideration the need and utility of the courses.

2.10 **Regulations :**

Detailed regulations on Resident Instruction for semester system of education has been prepared and adopted. It is also being reviewed and revised as per need from time to time.

2.11 **Admission :**

(a) **Under-graduate Programme :**

For selection of students for admission to different Under-graduate programme of this University, the University conducts a Combined Competitive Entrance Test Examination every year. For appearing in this examination, a candidate must have passed I. Sc. examination with :Physics, Chemistry & Mathematics or Biology for admission in B. Sc. Agriculture, B. F. Sc. and B. Sc. Home Science; with Physics, Chemistry and Mathematics for admission in B. Tech Agriculture Engineering and

B. Sc. Dairy Technology programme; and Physics, Chemistry and Biology for admission in B. V. Sc. and A. H. programme. During the year under report, a total of 18815 students submitted their applications for appearing in this examination out of which 15765 students actually appeared. On the basis of marks obtained by the students in this examination, 80 students were selected for admission in B. Sc. Agril. Course at T. C. A., Dholi and 80 students at B. A. C. Sabour, 91 students were selected for admission in B. V. Sc. & A. H. course; 26 students in B. Tech. Agricultural Engineering course; 15 students in B. Sc. Dairy Technology course; 37 students in B. Sc. Home Science course and 10 students were selected for admission in B. F. Sc. course.

(b) **Post-graduate programme**

Total intake capacity to the Masters degree of Post-graduate programme is 106 in various disciplines of Agriculture and Basic Sciences, 47 in various subjects of Veterinary and Animal Husbandry and 8 in various subjects of Agril. Engineering.

Two seats in each Discipline of Agriculture are reserved for the students sponsored by the ICAR and Department of Agriculture, Govt. of Bihar. Admission in Master's degree programme is taken on merit prepared on the basis of marks obtained by the students in Under-graduate examination.

(c) **Ph. D. programme**

During the period under report, 21 students were admitted to Ph. D. programme in different subjects.

2.12 Enrolment in different faculties :

I. Under-graduate programme :

The number of students on roll in different programmes of the faculties is given in table-I

Table-I

Number of under graduate students on roll in different faculties during the year 1988-89

Name of faculty/ college	Total no. of students on roll
A. Faculty of Agriculture	
(i) B. Sc. Agril. Programme	321
B. Faculty of Animal Husbandry	
(i) Bihar Veterinary College, Patna	230
(ii) Sanjay Gandhi Institute of Dairy Science & Technology	70
(iii) B. F. Sc.	23
C. Faculty of Home Science	
(i) College of Home Science	69
D. Faculty of Agricultural Engineering	
(i) College of Agricultural Engineering, Pusa	86

II. Post-graduate programme

The number of students on roll in different faculties for M. Sc. Ag./M. Sc./ M. V. Sc. programme is given in Table-II.

Table-II

Number of students on roll in M. Sc. Ag./ M.Sc./M.V.Sc. during the year 1988-89

Title of the Degree programme	Total no. of students on roll
(A) M. Sc. Ag.	187
(B) M. V. Sc.	37
(C) M. Tech. Ag. Engg.	2

III. Ph. D. programme :

Regular Ph. D. programme with course work in all the subjects of Agriculture available in this University.

Total number of students on roll in Ph. D. programme during the year 1988-89 was 69 only.

2.13 I. Under-graduate students who completed degree programme :

Number of students who qualified for various Undergraduate programmi of the University is given in Table-III.

Table-III

Total of degree programme	No. of students qualified
B. Sc. Agril.	242
B. V. Sc. & A. H.	50
B. Sc. Home Science	22
B. Sc. Dairy Techuology	12
B. Tech. Agril. Engineering	13

II. Post-graduate students who completed degree programme :

List of students qualified for award of M. Sc. (Ag.) M. Sc./M. V. Sc degree

Sl. No.	Name of student	Major subject and title of thesis
		Plant Breeding and Genetics
1.	Kumud Ranjan Choudhary	"Study on Irradiation Response of Pisum to Gammarey."
2.	Vinay Kumar Sharma	"Genetic Analysis of Yield and its Components in Groundnut *(Arachis hypogaea* L.*)* Genotypes in Sole Crop and Intercropped with Maize."
3.	Sidheshwar Nath Mishra	"Variability and Correlation Studies in Seedling and Clonal Generations of Sugarcane."
4.	Shambhu Nath Choudhary	"A Study on Path Analysis for Yield Components in Gram *(Cicer arietinum* L.*)* under late sown condition."
5.	Mohammed Faiyaz Alam	"Study on Evaluation on Some Maize crosses under different population densities over two seasons."
6.	Amrendra Kumar Singh	"Heterosis Manifestation in Inter Varietal crosses during the contegency of Maize *(Zea mays* L.*)* Grains."
	Vidya Bhushan Jha	"Genetic Variability for yield storage Behaviour and Biochemical Traits in Potato *(Solanum tuberosum* L.*)*."

1	2	3
		Entomology and Agril. Zoology
1.	Sabina K. Sangama	"Residues of Endosulfan and Quinalphos on/in Brinjal."
2.	Wakhom Jibon Kumar Singh	"Errectivenese of some Insecticides against Hopper Complex of Mango."
3.	Sriniwas Ray	"Studies on some asposts of *Anguina tritici* nematodes infesting wheat."
4.	Sanat Kumar Dubey	"Morphology of some Fruit Flies (Diptera Tephritidae)."
5.	Dinesh Prasad	"Studies on the pollination and foraging behaviour of Indian honey bee *(Apis cerana indica)*".
		Agronomy
1.	Anirudh Prasad	"Effect of different Water Soluble Phosphorus Carriers on Winter Maize *(Zea Mays* L*)* Cultivars under Different Crop Densities."
2.	Aditya Narayan Roy	"Studies to Asses the Yield Potential of New Wheat Varieties under varying levels of Fertilizer Application."
3.	Sunil Kumar	"Response of Wheat to Crop Geometry and Fertilizer Levels under late sown condition."
4.	Joseph Chandi	"Studies on Nitrogen Economy through Weed Management in Medium Low Land Transplanted Rice."
5.	Uday Chandra	"To Find out the Optimum Time of Planting of Turmeric Varieties."
6.	Sushil Kumar Pathak	"Response of chewing Tobacco to Zu Cu & B with and without Green Manuring in Calcareous Soils of Bihar."
7.	Anil Kumar	"To study the Effect of Neem Oil Emulsions on the Control of Suckers in Chewing Tobacco *(N. Tabacum* L.)"
8.	Ram Prakash Sahani	"Effect of different Water regimes and Nitrogen on growth and Yield of Rice."
9.	Siya Ram Singh	"Effect of variable Plant Population of Maize Verieties in relation to its growth, yield and quality."
10.	Sib Sankar Roy	"Effect of time and Frequency of Irrigation on the Growth and Yield of Short duration variety of Potato."

1	2	3
		Agriculture Economics
1.	Milon Roy	"A Study on Dynamic of Oilseeds Production in Bihar."
2.	Binod Prasad Gupta	"A study in Dynamics of Land Transaction in Rohtas District [Bihar]."
3.	Anand Kumar	"A study on Impact of Tractorization on farm Production, Productivity, Income and Employment (Distt. Patna)."
4.	Debpriya Roy	"A Study on Pineapple Economy Darchai. North Tripura."
		Botany and Plant Physiology
1.	Subal Chandra Poddar	"Evaluation of Allelochemicals for their Growth regulating activity."
		Horticulture (Olericulture)
1.	Md. Samsuddin Ansari	"Studies on the Effect of Plant Growth Regulators on Growth and Flowering of Zinnia (*Zinnia elegans* Jacq)."
2.	Ajay Kumar	"Studies on tha genotypes X environment interaction in Garlic (*Allium sativum* L.)."
3.	Kamleshwari Pd. Singh	"Genetc Variability and Correlation Studies for Yield and Physicochemical Traits of Spring Season Tomato *(Lycopersicon esculentum* Mill).
4.	Ganesh Ram	"Genetic variability and Correlation studies for green Pod Yield and biochemical Traits in Cowpea *(Vigna-unquiculata* (L) Walp.)."
5.	Umesh Kumar Choudhary	"Effect of Growth Regulators on Growth, Yield and Quality of Bhindi *(Abelmoschus esculentus* (L) Moench)."
		Horticulture (Pomology)
1.	Sarvjeet Kumar	"Studies on Floral Biology of Sapota *(Ac-hras-sapota* L.)."
		Ag. Statistics
1.	Surendra Prasad	"Study of Agricultural efficiency in Bihar."
2.	Uma Shankar Poddar	"A Statistical Appraisal of Agricultural Progress in Bihar."

1	2	3
		Extension Education
1.	Khursheed Anwar	"An Analysis of Technological gaps in Cultivation of HYVS of Paddy in the Adopted villages under Lab-to-Land Programme around Pusa-Dholi Campus."
2.	Bijay Kumar Singh	"Role Expectation and Role Performance of subject mater Specialists and Extn. Officers (SAOS and DAOS) under Training and Visit System in Bihar."
3.	Prabhat Ravi	"Training Affecting Behavioural Pattern of Rice Farmers-An Experimental Study."
4.	Uma Kant Jha	"Defferential Utilization Pattern of Farm Messages : A study in KVK System."
5.	Sachidanand Yadav	"Communication Behaviour of the Agricultural Extension Officers under the Training and Visit System in South Bihar."
6.	Bali Ram Prasad Singh	"Job involvement of training personnels of Krishi Vigyan Kendra in Bihar."
7.	Upendra Prasad Singh	"A study on ablity, willingness, knowledge and adoption behaviour of different Categories of Farmers in Relation to Scientific Rice Production Technology in Siwan District of North Bihar."
8.	Sanjay Kumar	"Impact of National Demonstration Programme in Vaishali District."
		Soil Science
1.	Suresh Prsad Gupta	"Transformation of applied Potassium in relation to its availability in calcarious soil under different cropping systems."
2.	Dipty Kumar Das	"Transformation of Applied Zinc from different sources in relation to its availability to Maize in Calcareous soil."
		Plant Pathology
1.	Sanjay Kumar Singh	"Variations in the Isolates of *Exserohilam tarcicum* (Pass) Leonard and suggs from Maize".
2.	Prem Kumar Jha	"Studies on Leaf Blight Disease of Maize Caused by *Helminthosporium maydis* Misikado & Niyake."

1	2	3
3.	Dinesh Kumar	"Studies on Morphological and Biochemical Changes in Sugarcane *(Saccharum officinarum* L.) Due to Smut *(Ustilago scitaminea* Syd.) Infection."
4.	Bhusan Kumar Singh	"Studies on Bacterial Leaf scald Disease of Sugarcane *(Saccharum officinarum)* and its control."
5.	Birendra Kumar	"Studies on Mosaic Disease of Cucumber."
		Master of Vety. Science Vey. Parasitology
1.	Anoop Kumar Roy	"Studies on Clinico-Biochemical Changes and Chemotherapy of Bovine Trypanosomiasis."
2.	Yogendra Prasad Singh	"Epidemiology of Bovine Theileriosis in North and Central Bihar in Cross-Bred Cattle and the Infective Potential of Tick Vectors."
3.	Ajeet Kumar	"Studies on the immunology and Control of Caprine Sarcocystosis."
4.	Bhawesh Gopal Deo	"The Chemoprophylaxis of drug resistant strains of *Eimeria Tenella* in Poultry."
		Animal Breeding (Ph. D.)
1.	Ram Naresh Singh	"Biochemical Genetic Studies on a Tharparkar Herd."

List of students who were declared to have qualified for the award Ph.D. degree

Sl. No.	Name of Scholar	Major subject and title of thesis
1	2	3
		Plant Pathology
1.	Bachchan Prasad Singh	"Studies on Alternaria Leaf Spot of Important Cruciferous Vegetables in Bihar."
2.	Ram Nandan Sinha	"Investigations on Red Rot disease of Sugarcane caused by *Colletotrichum falcatum* went in Bihar.
3.	Quaiser Ahmad	"Comparative studies on isolates of *Botrytic cinerea* Pers. ex Fries, the incitant of Grey mold disease of Chickpea."

1	2	3
		Plant Breeding & Genetics
1.	Ram Alakh Pandey	"Relationship between Economic Characters and their components in seedlings and clonal population in sugarcane."
2.	Prabhash Kumar Singh	"Phenotopic Stability of Grain Yield and its Components in Chickpea (*Cicer arietinnm* L)."
3.	Murli Manohar Sinha	"Inheritance of Submergence Tolerance and Important Yield Contributing Traits in Rainfed Lowland Rice."
		Agronomy
1.	Devendra Prasad	"The Economy of Fertilizers in Intercropping of Sugarcane and Tobacoo."
2.	Brajesh Kumar Verma	"Response of sugarcane to levels of Irrigation and nitrogen."
		Entomology & Agril. Zoology
1.	Suresh Chandra Gupta	"Bionomics of Sugarcane top borer, *Scirpophaga excerptalis* Wlk, in Relation to host reaction and Fertilizer Insecticide application."
2.	Ram Sanehi Choudhary	"Residue and Residual Effectiveness of some Organophosphorus Insecticides against the Pest Complex of Okra (*Abelmoschus esculantus* Linn. Moench)
		Horticulture (Pomology)
1.	Surendra Thakur	"Effect of Different Growth Regulators on Bearing of Litchi (*Litchi chinensis* Sonn.)."
2.	Birendra Kumar Singh	"Post-harvest studies on Mango (*Mangifera indica* L.)
3.	Sukdeo Roy	"Comparative Evaluation of some Graftage Techniques in Mango (*Mangifera indica* L.) Propagation."
		Soil Science
1.	Ram Binod Sinha	"Studies on the effect of pyrite in combination with organic manures in relation to iron, Zinc Sulphur and Phosphorus nutrition of crops in calcareous soil"

Faculty Development :

[i] Two Associate Professors were deputed for training in U. K. under Forestry Faculty Development Training Programme of I. C. A. R.

[ii] One University Professor in Plant Breeding [Rice] continued working for Post Doctoral work at I. R. R. I., Los Banos, Philippines.

[iii] The Vice-Chancellor visited U. K. for participating in a course on 'Teaching Agriculture in Universities' from March 20 to 31, 1988.

[iv] Two teachers were deputed to other Institution for higher studies leading to Ph. D. degree, Besides, 7 teachers of this University were selected for admission in Ph. D. programme in Agriculture faculty in different disciplines at Rajendra Agricultural University, Pusa and 19 inservice candidates were admitted to M. Sc. [Ag.] programme of this University.

[v] The University provides Scholarships at Under-graduate level and Fellowships at Master's degree level and Ph. D. level to the students based on merit. In addition, I. C. A. R. and H. R. D. P. fellowships are also available. During the year under report, following number of scholarships and fellowships at different level from different heads were provided.

Sl. No.	Name of the Programme and Scheme	Number of students benefitted						
		Ag.	Vet.	H.Sc.	D.T.	Ag. Engg.	Fisheries	Total
1.	**Under-graduate programme**							
	[i] Merit Scholarship	10	6	1	1	2	1	21
	[ii] Merit-cum-Means (Reserve)	10	6	2	1	3	1	23
	[iii] Un-reserved	10	6	1	2	2	1	22
	[iv] Other ICAR Scholarship	—	—	—	Nil	—	—	—
	[a] ICAR Merit-cum-Means	—	—	—	Nil	—	—	—
	[b] HRDP (ICAR)	5	—	—	1	2	—	8
	[v] Any other	—	—	—	Nil	—	—	—
2.	**Master Degree programme**							
	[i] Univ. Fellowship	75	18	—	—	1	—	94
3.	**Ph. D. programme**							
	[i] Univ. Fellowship	13	—	—	—	—	—	13
	[ii] ICAR Felloship	3	—	—	—	—	—	3
	[iii] ICAR, HRDP	—	—	—	Nil	—	—	—
	[iv] Any other	—	—	—	Nil	—	—	—

2. RESEARCH

(A) FACULTY OF AGRICULTURE :

Agriculture being the mainstay in the economy of Bihar plains, need based research programmes were carried out during 1988-89 to solve the problems of the farmers of various agro-ecologocal Zones falling under the jurisdiction of Rajendra Agricultural University. The highlights of researches carried out during the year are as here under :

1. Rice :

(a) Breeding–

[i] A total number of 1150 old collections & 150 new collections of germplasms were grown and cataloging of cultures was done. Ten promising cultures were utilized as donor parents in the hybridization programme. Besides these, a total number of 650 breeding lines were grown in different segregating generations from 244 cross combinations and 350 selections were made for further evaluation.

[ii] Under hybrid rice programme, 22 crosses were evaluated for identifying the restorers and maintainers. Eight restorers, two partial restorers and 14 maintainers were identificd.

[iii] Certain varieties like Sujata, Pusa-33, B. R. 34 and Mahsuri were treated with chemical and physical mutagens and attempts were made to select the disirable mutagens.

[iv] Following rice cultures were identified and found promising over their respective best cheek varieties in advance stages of testing in the station trials in differents 3 ones (Table-1).

(b) Agronomy–

[i] In medium duration varieties, only UPR 254-85-1 gave significantly superior yield than the check variety Sita and Sujata; whereas, in long duration varieties, Pankaj still occupied superior position.

[ii] Under delayed transplanting conditions, varieties like Rajshree, Sugandha and IET 7251 gave satisfactory yields [approx. 25 q/ha] when planted as late as 1st week of September.

[iii] In nitrogen efficiency trial, at lower N-level [29 kg N/ha], SCU was superior to other forms; at medium level [58 kg N/ha], SUG showed better performance and at higher level [87 kg N/ha], split application of prilled Urea [PU] gave better efficiency in comparison to other N-forms. Similar results were obtained in LGU trial also.

[iv] In integrated use of organic and inorganic fertilizers; use of USG, GM+PU and FYM+PU were found at par in giving higher rice yields.

[v] In a trial on agronomic practices for maximising rice yields, G. M. + 33% extra fertilizer and plant population gave higher yield [53.2 q/ha] followed by normal fertilizer+25 kg $ZnSO_4$/ha.

(vi) In Phosphorus management trial, or split application (in 25 splits) of DAP followed by basal application of APP @ 60 kg P_2O_5/ha gave the highest yield.

(vii) Inoculation with BGA as a supplement to nitrogen nutrition in rice showed that 25-30 kg N/ha was made available to the crop.

Table—1

Promising rice varieties for different seasons/situation and regions (1988-89).

Seasons/Situations	Promising rice cultures/entries		
	Patna (Zone III B)	Pusa (Zone I)	Sabour (Zone III A)
1. Summer	IET 3279, IET 6148	IET 8674, IET 3279, IET 6148.	IET 6148, IET 3279, ES 1-2-3, IET 6148 (Boro season)
2. Kharif			
(a) Irrigated			
Early duration	Chainung Sen 4426, Taichung Sen 4223.	ES 18-11-2- (very early) IET 7433, RP-2240-153-1-51	ES 18-8-2, ES 18-8-1 (very early) UPR 238-42-2-3, IET 4733.
Mid-early duration	IET 10451, IET 9572, IET 9188.	SBIR-38-150-2-4, BR 153-2 B-10-3	SBIR 38-150-2-4 IET 9394.
Late duration	IET 11181, IET 100016	SBR3013-493-66.	IR 33-383-9-1-1-3.
Fine scented	IET 11334, IET 10651	—	SBR 3027-2-1-1.
(b) Rainfed			
Shallow rainfed low-land	NC 499, PTI 100-57-1.	IR 21836-90-3.	CN 540, IR 13564-95-1.
Deep water	PIR 79-58-1.	Barogar-6 TCA 282 [floating type]	CN 706-3-76 CN 570-652-39-2.

in Zone II

At Agwanpur [Saharsa] following cultuces were found promising :

[i] Medium duration : IET 9354, BR 153-2 B-10-1-3.

[ii] Late duration : IET 7552, FPAR 7360

(viii) It was possible to grow *Azolia pinnata* through-out the year under Patna conditions and was utilized successfully in paddy fields. It was found to add 20-25 kg N/ha and increased the grain yield of rice.

(ix) In Zine trial, the response of 25 kg zn SO4/ah. as soil application was found superier in respect of maximising rice yields.

(x) Among the herbicides tried for the effective control of weeds in rice fields, Butachlor & Benthiocarb @ 1.5 kg a.i./ha. gave better performance, at though the highest yield was obtained from hand-weeded plots.

(xi) The period of 30-40 days from seeding was found to be the most critical period for crop weed competition in direct seeded upland rice and warranted for proper control of weeds during this period for achieving highor yields.

II. MAIZE :

(A) Kharif maize :

(a) Breeding :

In station trials, the experimental hybrids EH 3030, EH 3023, EH 3090, EH 3083 and EH 3036 were developed by RAU and gave higher grain yields with an yield increase range of 7.6 to 28.0 percent over the best check, Ganga Safed-2; although of the same maturity group. The top ranking hybrids EH 3030, EH 3023 and EH 3090 were promoted to Stage II trials for national testing.

The varietal crosses CM 500, CM 600, Jogia × M9 and EV 3044 gave higher yields than the best check M 16 composite, but were late in maturity. Similarly, the varietal crosses (cross 7532 × D 743) × CM 600 and Suwan (Y) × CM 202 gave higher yield than the best check G. S. 2, Showine 93 to 20 % increase in yield.

EVM 50 and EVM 55, developed by RAU performed better than Tarun and excelled it by giving 9 to 19 % increased yield. The EVM 55, however, was earlier, while EVM 50 was similar in maturity to 'Tarun' and composite.

In the co-ordinated trials, the following varieties proved superior against the respective checks :

Maturity group	Checks	Superior lines	% yield increase over check.
[i] Late maturity	Prabhat	EH 2237 [Also earlier in maturity]	8.5
	Suwan	do	19.2
[ii] Medium maturity	Harsha	EH 21057, EH 21037 [Early than Harsha]	15.2
[iii] Early maturity	Diara composite	J 3022 × J 52 J 3054 × ESC 1, J 3044	Signifacant

(b) Agronomy :

In date × method of sowing trial, the highest yield (36 q/ha.) was obtained when the crop was sown on 17.6.88 under flat sowing condition followed by earthing up. However, there was no significant difference between flat and ridge sowing.

In N x full season maturity germplasm trial, the maximum grain yield (33.3 q/ha) was recorded at 180 kg N/ha. The germplasm EH 2922 registered the highest yield of 39.7 q/ha at 180 kg N/ha. In N x medium maturity germplasm trial, the maximum yield of 36.8 q/ha was recorded with the germplasm EH 2042 at the highest level of N (135 kg/ha).

In a date of sowing trial, variety Suwan gave the highest grain yield of 40.7 q/ha when sown on 5.6.88.

Among the transplanted and sown crops of *Kharif* maize, the direct sown crop gave the maximum grain yield of 32.9 q/ha and transplanting of 10 days old seedlings gave 26.7 q/ha of grains. However, transplanting 10 days old seedlings was found to be significantly superior to 30 days old seedlings but at par with 20 days olseedlings.

B. Rabi Maize :

(a) Breeding :

The experimental hybrids viz., EH 3007, 3014, 3016, 3017, 3019, 3058, 3085, 3093, 3095 and 3104 exhibited their yield superiority over the check hybrids and these have been included for IET for further testing.

(CM 400 X CM 300) X Pant 7421 was found to be significantly superior to the best check Deccan 103. This has been promoted for second year advance testing in co-ordinated trial.

(b) Agronomy :

In V x N trial, the variety Pant 74-21 responded up to 180 kg N/ha, while the others showed their response only upto 120 kg N/ha. On the whole, Pant 74-21 [38-7 q/ha] alongwith Hi-starch [37.6 q/ha] and Deccan 103 [35.7 q/ha] were the highest yielders and were at par among themselves.

In date of sowing trial, Deccan 103 gave the highest yield [58.0 q/ha] when sown on November 1 and also on November 16 [46.3 q/ha], but Hemant surpassed its yield level by 4.3 q/ha when sown on December 1. On an average, Deccan 103 [46.6 q/ha] yielded the highest followed by Hemant [41.2 q/ha]. Hemant, R-2 and D 765 × D 787 gave stable yields even under delayed sowing conditions. There was a reduction of about 15% in grain yield, when sowing was delayed beyond November 16 [up to December 1].

Transplanted maize gave significantly higher grain yield on all the dates of sowing in comparison to direct sown crop. Under December 10 sowing, transplanted crop yielded 63.8 q/ha as compared to 35.8 q/ha from direct sown crop. The normal direct sown crop [sown on November, 25] also yielded only 50.4 q/ha. The increase in yield in transplanted crop as compared to the direct sown crop ranged from 18.2 q/ha under January 10 sowing to 38.8 q/ha under December 10 sowing. The production potentials of wheat [var. H.D. 2307, H. D. 2285] and tranplanted maize [var. Hemant] were found to be the same and

ranged between 38 and 41 q/ha under January 5 planting.

In maize+potato intercropping system, sowing of maize on the side of potato ridge in all potato rows produced the highest yield of maize [52.1 q/ha], followed by the sowing of maize at the bottom of furrows in all potato rows [50.0 q/ha] and maize sowing on the side of potato ridges in two rows leaving one row blank [49.2 q/ha]. However, these three treatments were at par. Potato yields under these treatments were also at par [ranging between 143 and 146 q/ha]. The yield obtained from pure crops of maize [Hemant] and potato [K. Chandramukhi] were 47.6 and 166 q/ha repectively. Maize+potato intercropping, thus, resulted in higher total production from the same area as compared to growing these crops individually/separately in pure stands.

(c) Plant protection

The yield losses due to common rust & *turcicum* leaf blight diseases in rabi maize were assessed to be as 15.8% and 14.4% respectively. *Maydis* leaf blight was recorded only at the early stages of the crop growth and that too was confined to lower leaves only, whereas; *turcicum* leaf blight and common rust were found to be the serious problem in *rabi* maize cultivation. Three sprayings with 0.2% Dithane M-45 at 15 days intervals was observed to be the best treatment against the *turcicum* leaf blight, whereas two sprays with Bangard [0.1%] or Bavistin [0.1%] at monthly intervals was the most effective control measure for the common rust.

Corn cyst nematode was found infesting the maize crop in many areas, although the level of infestation varied distinctly in different maize growing tracts. Carbofuran and Rug-by decreased the maize cyst nematode population in comparison with untreated check and consequently increased the maize grain yield significantly.

Carbosulfan and carbofuran seed treatment, as well as combination of seed treatment with foliar spray, was tested in different concentrations. Both the methods were effective in reducing the cyst population, but the combination of the two was superior. The best effect in seed treatment was revealed by carbosulfan 3% W/W.

III WHEAT :

(a) Breeding :

Studies under farmers' situations revealed that the two wheat varieties BR [RW] 346 and BR [RW] 3016 evolved and released by RAU are becoming popular among the farmers over the existing ones.

Suitability of varieties evolved by the RAU for the three crop growing situations were assessed at different research stations with following results :

Situations	Suitable varieties found at different Research Stations (1988-89)	
	Sabour	Patna
[i] Rainfed	[R] 8748	RW 3324
	K 8855	RW 596
	RW 482	RW 3329
[ii] Irrigated timely sown	K 8703	K 8803
	H.P. 1660	HUW 342
	K 8807	
[iii] Irrigated late sown	HD 2285	HUW 234
	HD 1321	
	HD 2307	
	HD 2562	

(b) Agronomy :

[i] Based on two years of experimentation at Patna, a seed rate of 150-200 kg/ha. in wheat was found to be the best under December sown conditions. There was no benefit in increasing phosphate level beyond 50 kg P_2O_5/ha.

[ii] One year ICAR trial in wheat indicated that HP 1640 entry was significantly superior to other cultivars. Grain yield significantly increased with increasing level of fertilizers.

[iii] In the second year of experimentation, huskless barley variety Karan-19 together with Karan-163 significantly out-yielded other cultivars; and grain yields increased with increase in N-levels.

[iv] Water extraction pattern by wheat crop was studied in fine textured soil of Patna under rainfed conditions. The data revealed a total soil moisture extraction of 194.1 mm from 90 cm depth of soil during the crop period. The 0-30 cm depth of soil layer contributed a major amount to this extracted soil moisture. The bulk density and infiltration values did not show any significant variation in per-sowing and postharvest soil moisture studies.

(c) Pathology :

Seed treatment with Bavistin @ 1 g/kg Seed, followed by 3 sprayings with 0.3 % Ziram reduced the disease intensity of *Alternaria* blight and increased the crop yield by 3 q/ha. [worth Rs. 906/-]. The other treatment i. e. seed treatment with Bavistin @ 1 g/kg seed plus 3 sprayings of 0.2 % Dithane M-45 0.2 % Zn SO4 was at par in yield but gave a profit of only Rs. 816/ha.

Leaf blight continued to be an immprotant disease in wheat. Highest score of leaf blight was recorded in Sonalika, HD 2329, HD 2160 and C-306 at BAC, Sabour.

At Patna, wheat varieties RW 594, RW 1022, RW 3349, RW 3331, RW 3139A, RW 3345, RW 3347, RW 3353 and HUW 206 were found to have minimum score (1 to 2) for *Alternaria* blight. Seet treatment with neem oil or captan gave promising indication in controlling the root rot of wheat caused by *Sclerotium rolfsii*.

(d) Entomology :

In entomology, varietal screening for stem borer and aphids were dond.

IV. SUGARCANE :

(a) Breeding :

In co-ordinated zonal varietal trial with mid-late varieties, B. O. 110 recorded significantly highest no. of shoots. Nine clones (Cox 59965, x 60097, Co pant 8202, Cox 60340, X 60045, Cox 59770, Cox 60148, Cox 60632 and Cox 59761) were identified as showing tolerance to salt affected soil conditions. Nine clones were identified showing high values for quality characters (brix, pol & purity percentage) at 8 to 9 months of planting. These clones are : Cox 61489, Cox 61481, Cox 61426, Cox 61493, Cox 60935, Cox 60945, X 61739, X 61812 and Cox 61747.

(b) Agronomy :

Strain X 54740 (859.8 q/ha)&X0X 74739 (785.5 q/ha) were found to be statistically as par with the standard variety B. O. 99

(774.14 q/ha). In a study on the effect of varieties × nitrogen and moisture conservation practices in rainfed sugarcane, higher N-level (with recommended dose) recorded significantly higher yield (564.5 q/ha) over the lower N level [half of recommended N doze] i.e. 475.7 q/ha only. Among the moisture conservation practices, trash mulching was found to be the best practice.

Following were the agronomic indications for varietal suitability of new varieties under different situations :

(a) Early maturity group : Co × 55885 (835 q/ha) against standard B.O. 99 (593 q/ha).

(b) Mid-early group : Co × 55478 (606.6 q/ha) & Co × 55452 (590 q/ha) against the standard B. O. 109 (506 q ha).

(c) Main season group : Co × 56736 [711 q/ha] against the standard var. B. O. 106 [592 q/ha].

Intercropping of sesamum [til], either one row or two rows between two rows of sugarcane significantly reduced cane yield.. In still another trial hand-weeding gave the highest cane yield.

In a study on the contribution of different inputs/management facters in sugarcane ratoon, the combination of all ratoon management factors gave the highest yield [656.7 q/ha] which was at par with stubble shaving + irrigation + fertilizer [639.9 q/ha]; and these were found to be significantly superior to control [no management] with the lowest yield of 395.2 q/ha.

In an experiment to study the effect of planting and harvesting dates on yield and quality of sugarcane varieties of different matutity groups, November planted cane recorded higher yield than February planted cane. Cane harvested in February recorded the highest yield.

Based on three years of zonal trials, following varieties have been found to be suitable for Co-ordinated testing :

Maturity qroups	New Varieties	Standard Varieties
Early —	Co × 51925	B. O. 90, B. O. 99
Mid-earIy —	Co × 51998 × 51809	B. O. 70. B. O. 104
Main season—	× 52367 × 52230	B. O. 106 & B. O. 108

(a) Chemistry—

Studies on the effect of P solubilizing bacteria *(B. meqatherium)* on water soluble and insoluble P- carriers indicated that the increase in cane yield was greater with TSP than MRP at all the levels of P. P-solubilizer increased can yield from 3.0 to 6.9% in these treatments. The results of bio-fertilizer expt. with *Azospirillum brasilcnse* revealed that increase in cane yield with 70 kg N/ha without inoculation with *A. brasilense* (56.7 t/ha) was at par with 35 kg N/ha with inoculation (54.1 t/ha). However, the increase inyield in no-compost series was not much with inoculation with this bio-fertilizer.

In an expt. to study the effect of P-levels and their split application on cane yield, it was found that there was an increase in yield at 50 and 100 kg P_2O_5/ha, but split application of P either in two or three splits showed the significant increase at 50 kg P_2O_5/ha level only. However, juice quality was not affected significantly with the application of P as basal or in splits.

In another trial on K-nutrition of autumn planted Sugarcane for late harvest, a significant increase in cane yield (var. B. O. 91) was obtained upto 100 kg K_2O/ha. Cane yields (var. B. O. 91) increased significantly upto 13th month (i.e. January), but sucrose % in juice increased upto the 14th month; and both of them decreased significantly in the 16th month (April). Maximum deterioration in yield to the tune of 15.4% was recorded in no-k plot, where as in potash treated plots it ranged from 9.4 to 12.0% in the 16th month over the 14th month. Sucrose content in juice increased significantly upto 50 kg K_2O/ha only.

Experiments conducted with prilled urea and urea super granules (USG) for increasing the efficiency of applied nitrogenous fertiliser indicated a significant increase in cane yield upto 100% recommended dose of N in both the N-sources, but these two sources were found to be at par. USG recorded more inhibition of nitrification upto only 30 days and there after these sources were at par with respect to NH_4-N and NO_3-N.

Testing of sugarcane varieties B. O. 115 and B. O. 118 early, B. O. 113, B. O. 117 and CoP 8602 [mid early] and B. O. 119, CoP 8601 & CoP 8603 [main season] for gur quality revealed that the gur from B. O. 118 [early], CoP 8602 [mid early and B. O. 119 [main season] was superior to their respective standards B. O. 99, B. O. 109 and B. O. 108 respectively. In foliar application of B & Mn in sugarcane, significant increase in cane yield of about 22.37 and 17.1% over control [44.8 t/ha] was obtained due to the foliar application of Mn+B and Mn alone respectively. However, there was no significant effect of these treatments on juice quality.

(d) Entomology—

The incidence of shoot and root borers was observed to be 9.4% while top borer incidence was recorded as 9.2 per cent. In case of sucking insects, the incidence of pyrilla was found to be low to medium, but black bug incidence was rated low [below 10%] under natural conditions. In the seasonal history of top borer, 1st generation started in the 1st week of March, while the 6th generation in the last week of September, 1988.

For the control of shoot borers, phorate 10G and carbofuran 3G @ 1. 0 kg a.i./ha were found to be equally effective against this pest in sugarcane. Sumicidin @ 0.04% and monocrotophos @ 0.75 kg a. i./ha were obsorved to be effective against stalk borer incidence and increased crop yields.

Gamma B. H. C. @ 1.0 kg a. i./ha at the time of planting was found to be effective against shoot borers as compared to Synthetic pyrethroids.

On the besis of the seasonal history of the natural enemies of sugarcane pests, *Stenobracone deesae* cam., *Apenteles Flavipes*

cam., and *Rhachnotus scripophaga* walk, were observed on the larvae and pupae of different cane borers. Maximum parasitization was reeorded to be 47.9% in the month of September, 1988.

(e) Mycology—

Sugarcane varieties B. O. 115, B. O. 116 and CoS 7918 showed resietant reaction againtst red-rot disease, while B. O. 117, B. O. 118 and B. O. 119 were found to be moderately rasistant. These varieties were also found to be resistant to smut and wilt.

Bavistin was found to be the best as sett-dresser in enhancing sett-germinability, and reducing the incidence of red-rot and sett-rot.

(f) Nematology

Pathogenecity of *Pratylenchus zeae* was established on sugarcane plants; and 34.5 and 21.7% loss in cane yield was recorded due to inoculation with 10,000 and 1,000 individuals per 500 kg of soil.

Sugarcane variety B. O. 109 was found to tolerant against the three nematodes species namely *Tylenchorhynchus nudus*, *Helicotylenchus dihystera* and *Meloidoryne incognita*, while Co 1158, Co 1148 and CoJ 77 were found favourable for multiplication of these nematodes.

Seventy five to eighty per cent mortality of sugarcane nematodes was recorded at 100% concentration of the leaf extracts of weeds like *Anagllis arvensis*, *Argemone mexicana Cannabis sativa Datura* spp. and *Narium indicum* in 29 hours at room temperature. *Helicetylenchus dihystera*, *Pratylenchus zeae*, *Tylenchorhynchus nudus* and *Hemicriconemoides* were found to be parasitised by the nematophagus fungus *Catenaria vermicola*.

Organic manures and carbofuran were tested for their effectiveness in minimizing nematodes population and increasing cane yields in nematode infested field. Carbofuran was found to be superior by recording better cane growth characters like germination [67.4%], tillers [151608/ha], millable cane [132923/ha], yield [45.5 t/ha], and C. C, S. [49.6 q/ha] followed by mustard cake. Minimum millable cane [114689/ha], yield [37.0 t/ha] and C. C. S. [39 5 q/ha] were recorded in untreated control plot. Reduction in nematode population after 45 days was maximum [64.9%] in carbofuran treated plot followed by mustard cake [58.9%]. In untreated control plot, the nematode population increased by 312.2%.

V. OILSEED CROPS :

(A) Kharif oilseeds : 1. Groundnut.

(a) Breeding—

[i] At Dholi with various trials with bunch type varieties, Robout 33-1 [2510 kg/ha], IBK 8856 [2200 kg/ha], ICGS 44-1 [1104 kg/ha] and BPG-516 [2296 kg/ha] were identified to be superior to Kuber and AK 12-24, but were 5 to 22 days later in maturity.

[ii] In several varietal trials at Sabour, the bunch type varieties Robout 33-1 [1400kg/ha], IGS 44-1 [799 kg/ha], ICGS-65 [965 kg/ha] and BG-3 [949 kg/ha] out-yielded the respective checks. All of them matured in 99-103 days.

[iii] At Madhopur [East Champaran], bunch types ISKO-8823 [2177 kg/ha], were the top yielders against AK 12-24 [1222 kg/ha], but were late in maturity by to 11 to 14 days.

[iv] Trials with spreading types of groundnut at Dholi and Sabour revealed that variety M-13 was the top scorer with pod yields of 2247 and 1312 kg/ha respectively, and maturity periods of 135 and 129 days at respective locations.

[v] 90 single plants in F_3 were selected from 10 crosses for further studies in F_4 with the objective of breeding varieties for higher pod yields

(b) Agronomy—

At Dholi, intercropping of groundnut [JL-24] between two rows of maize [uwan composite] gave the highest gross return of Rs. 3143/ha.

(c, Plant Pathology

[i] Three sprayings of Bavistin @ 0.05 % gave the minimal score of tikka disease intensity [4.5] and maximum pod yield [1315 kg/ha] with variety MH-2 at Dholi.

[ii] There sprayings of Dithane M-45 [0.2%] plus Devosal [0.03%] reduced the rust disease intensity from 53.30% to 11.72 % in artificially inoculated plants at Sabour.

2. Sesamum

In sesamum trials at Dholi; varieties IET-8, IET-20, IET-19 were identified having the maturity periods ranging from 76-78 days, but the maximum yield of 667 kg/ha was obtained in IET-8.

Krishna, IET-13 and IET-21 were found to have field resistance to phyllody and powdery mildew.

3. Soyabean

In an agronomical trial conducted at Dholi, variety Birsa Soybean [1908 kg/ha] out-yielded the Bragg variety [1250 kg/ha]. Sowing done on 25-6-88 gave the higher seed yield of 1741 kg/ha than that obtained from 9-7-88 sowing. A row-spacing of 30 cm with 1736 kg/ha yield was found to be better than 45 cm spacings.

In a weed control trial in Soybean, the highest seed yield was obtained with pre-em. use of oxadiazon @ 0.5 kg a.i./ha followed by H. W. and other herbicides tested. However, all of them were at par and significantly superior to unweeded control.

4. Sunflower

Sunflower hybrids tested at Dholi gave the maximum yield of 582 kg/ha [NH-76] which was very low, although it matured in only 80 days. The effect of N at 25, 50 and 75 kg/ha on sunflower was at par, but significantly superior over no-nitrogen in a trial concluded at Dholi. The yields, however, were only 4.0 q/ha [very low].

The sunflower hybrids NH 76, NH 71, and NH 77 recorded resistant reaction to leaf spot and were free from head spot at T.C.A., Dholi.

5. Castor

In I.E.T. of hybrids; RH-36 [2502 kg/ha], RH 16 [2467 kg/ha], RH 28 [2317 kg/ha], RH 07 [2184 kg/ha] and RH 08 [2111

kg/ha] out-yielded SBH-18 [NCH] and Aruna [local control] at Dholi.

At Dholi, in an inter cropping experiment with Bahar arhar in castor conducted for the first year, it was revealed that one row of Aruna castor between two rows of Bahar arhar gave the highest gross return of Rs. 8586/ha as against Rs. 7916/ha obtained under the pure crop of arhar.

(B) Rabi Oilseeds

1. Rape mustard

(a) Breeding :

[i] A *tori* collection from Purnea was found to mature in 75 days and a single plant selection of yellow sarson obtained from local collection [from Pilkhi village, dist. Muzaffarpur] were found to have zero resistance to *Alternaria* disease.

[ii] Some progenies of irradiated material of *tori* were found to be better yielder than RAUTS-17, at Sabour.

[iii] Two entries of yellow sarson viz.; PYS-187 and SSK-2 matured in 96-98 days as against other entries maturing in 105 to 120 days, at Dholi.

[iv] In various coordinated trials of yellow sarson under irrigation at Dholi, varieties PYS-188 [14.84 q/ha], PYS-187 [16.52 q/ha] and YSP-843 [12.57 q/ha] outyielded the National check YST-151 [10.4 to 12.5 q/ha] and the local check YS-66-197-3 [11.23 to 13.3 q/ha].

[v] In an irrigated IET mustard variety, RH 8315 [25.5 q/ha] outyielded Kranti [21.0 q/ha], at Dholi.

[vi] Under irrgated late sown conditions [19.12.88] at Dholi and at Sabour [8.12.88], variety PR 43 [10.3 q ha and 10.2 q/ha respectively] outyielded Varuna [9.0 q/ha and 8.5 q/ha] and Kranti [8.0 q/ha and 6.2 q/ha] respectively. PB 43 showed field resistance to *Alternaria*. In another trial at Sabour, BR 40 gave the yield of 12.2 q/ha.

[vii] At Patna, mustard varieties Kranti and Pusa Bold gave encouraging yields of 6.75 and 6.5 q/ha respectively even under late-sown condition i.e. 8.12.88.

(b) Agronomy

In a trial on mixed cropping with wheat, amongst the mustard varieties tested with H. P. 1102 variety of wheat, Varuna and Kranti were found to be better than other varieties and gave the gross return of Rs. 7292/ha.

In a trial to find out the most suitable variety of mustard for different dates of sowing and specially for late sown conditions, it was revealed that variety RAU RD 1001 sown on 5.11.88 gave an yield of 12.4 q/ha as against on other dates of sowing [i,e. 15th October, 25th November and 15th December]. All the varieties i.e. Varuna, Kranti and Pusa Bold showed no specificity for dates, but the yield level went down by 2 q/ha with every delayed dates of sowing tried. Three years [1986-87 to 1988-89] field trials on the effects of varying plant geometry and levels of N on the seed yield of *rai* under late sown conditions at Patna revealed the significant effect of thinning *rai* plants to a distance of 10-15 cm apart within the row [6.3 to 6.5 q/ha]. Nitrogen leval upto 100 kg/ha had significant effect on increasing

seed yield [5.4 q/ha]. However, row spacing [20-40 cm apart] could not effect seed yields significantly.

(c) Plant Pathology

Three yellow sarson cultures i. e PYS 387, YID 387 and YPS 841 were found resistant to *Alternaria* blight. In the disease nursery trial, among the 47 mustard cultivars, 14 cultures showed resistance to *Alternaria* blight both at leaf and pod stages; and BR 43 and Kranti were amongst them.

Four sprayings with Rovral @ 0.2 % proved to be the best in controlling *Alternaria* in yellow sarson by decreasing the disease intensity to 4.75 % and increased the grain yield [17.9 q/ha].

(d) Entomology

All mustard varieties were found to be highly susceptable to aphids. In insecticidal evaluation trial, needbased approach was found to be better than the scheduled application in respect of yield attained and in reducing aphids population. Among the insecticides, phosphamidon was found to be the best in reducing aphid infestation and giving higher percentage increase in yield over control.

2. Linseed

(a) Breeding

In two years trial under irrigated conditions at Dholi, varieties LCK-8657 [1213 kg/ha), PCA-2 [2533 kg/ha], PCA-11 [2042 kg/ha], PCA-19 [1917 kg/ha] and PCA-1 [1833 kg/ha] out-yielded T 397 [1950 kg/ha]. At Sabour, PCC-1 [1135 kg/ha] and PCC-3 [1977 kg/ha] gave higher yields than T 397 [1000 kg/ha].

Linseed under late sown conditions [21 st November sowing] gave yields in the range of 2250 kg/ha [PCF-1] and 1850 kg/ha [PCF-2] at Patna.

In the dual purpose [seed+fibre] trial, variety PCC-3 even after late sowing [22 November], gave a good seed yield [1904 q/ha] as well as the yield of straw [2538 kg/ha] at Patna.

(b) Agronomy

In on expt. for N & P requirement of Shubhra linseed as a pure crop was conducted consucatively for 3 years at Dholi, and it was concluded that N60 P20, which is presently under recommendation for 7397 variety, also hold good for Shubhra variety.

Variety M 7-40-23/q linseed at Madhopur gave the highest seed yield of 6.5 q/ha as against Shubhra [6.0 q/ha] and T 397 [5.8 q/ha] on the saline-alkaline soil.

In an oilseeds based cropping sequence trial conducted for the first year at Dholi, Groundnut-Potato-Sesamum sequence gave the highest gross return of Rs. 16,264.80 per hectare followed by Sesamum-maize [Rs. 14,773.30/ha] and Groundnut-mustard-sesamum [Rs. 14.279. 30 per ha.] sequences.

VI. PULSES :

(A) Kharif pulses:

1. Arhar

(a) Breeding

In an early verietal trial, UPAS-120 gave the maximum yield [14.7 q/ha] and matured in 142 days only. Varieties AL-13 and H 87-1 matured earlier [136 days], but gave lower yields.

than DHG-82-4 [17.3 q/ha] and the check C-235 [13.6 q/ha]. Interestingly, variety BG-256 had the highest nos. of pods/plant [43.3] followed by DHG 82-4 [44.3] and C-235 [33.8].

Under late sown conditions [December 6]] genotypes GL-83035 [12.2 q/ha], JG-315 [12.1 q/ha] and C-235 [11.7 q/ha] were statistically at par and significantly superior to JG 74 [10.4 q/ha] and HUGL-101 [10.1 q/ha].

In another trial, irrigation once at the pod initiation stage of gram alongwith the foliar spray of 2% TSP improved the yield of the late-sown [7th December] crop [15.9 q/ha] followed by spray of 2% Kel [15 1 q/ha] and were significantly better than control [10.1 q/ha].

In an input management trial of Kabuli gram, variety BG 267 recorded siginificantly higher yield (12.6 q/ha) than ICCC-32 (9.8 q/ha). Variety BG-267 (with 150 kg DAP/ha alongwith one irrigation at 60 DAS) produced significantly higher yield (16.2 q/ha) than rest of the treatment combinations.

(c) Entomology—

In chemical contral experiment with dust formulation of insecticides, both methyl parathion 2% and BHC 10% dust proved efficacious against gram pod borer *(Heliothis armigera)* and produced higher grain yield (17.3-18.9 q/ha). In another trial with spray formulations Cypermethrin [0.02%], a Synthetic pyrethroid, was found as effective as endosulfan [0.02%] in minimiziug the daamge due to gram pod borer and also enhanced the crop yield (18.4 q/ha).

In Kabuli gram, some of the varieties like ICCC-49, BG-333, BG-468 and BG-356 were found to be tolerant to *Helio his* attack.

(d) Pathology :

Gram varieties were screened for disease resistance in wilt sick plot under natural condition. Late sowing of gram [30 November to 15 December] minimised the severity of *Stemphylium* leaf spot.

Seed treatment with Bavistin+Dithane M-45 [0.5 gm 1.25 gm] per kg seed and two sprayings with a mixture of these two fungicides [@ 0.03%+0 125%] at fortnightly intervals proved effective against *Stemphylium* leaf spot.

(e) Microbiology :

Local gram strain DG-48 recorded maximum increase in yield [15-30%] due to *Rhizobium* inoculation.

In multi-location testing, strain IC-149 [IARI] recorded the highest grain yield, which was at par with G-567, F 73, IC-53 and KG-46.

2. Lentil

(a) Breeding :

In small seeded varietal trial, Pant L 81-73 recorded highest yield [26.1 q/ha] as against check Pant L-630 [23.4 q/ha]. The other promising entries were PDL-2 [26.1 q/ha] and Pant L-81-85 [26.2 q/ha].

In bold seeded varietal trial, the highest yielding variety was K-129 [23.6 q/ha] followed by K-126 [22.8 q/ha] and Lens 4125 [21.1 q/ha]. The check variety K-75 gave 20.0 q/ha yield only.

At Patna, in lentil the variety Arun [PL 77-12] continued to give the highest yield among all the varieties tried.

(b) Agronomy :

Variety HWL-8 proved significantly superior [16.3 q/ha] to check Pant L-406 [14.1 q/ha] in the agronomic evaluation trial at Dholi. Lentil though sown traditionally in the last fortnight of October is often sown late due to physiographic/ ecological constraints on account of late release of fields from the standing kharif paddy. In considerable areas lentil is now being sown as late as 30 days beyond the optimum period. To assess optimum seed rate and row spacing for such late sown conditions, a field trial was conducted during 1986-89 at Patna under rainfed conditions; and it was found that a seed rate of 40-50 kg/ha sown in rows 20 cm a part was the best for late sown lentil.

(c) Pathology :

Under natural conditions of infection, lentil entry LL 227 against podery mildew and entries HUL 8, HUL 31, LG 198, LG-232, L 4135, LL 278, LL 279, LL 287, LL 299, LL 311, PDL-1, PDL-4, LG-170 and LG 171 against rust showed disease free reaction.

(d) Microbiology :

Lentil *Rhizobium* strain LC-5 produced an extra yield in the range of 10-35 % due to inoculation.

3. Peas

Variety HUP-8 performed significantly better [16.3 q/ha] than T-163 [15.4 q/ha] and Rachna [14.8 q/ha]. In another trial, application of 20 kg N+40 kg P_2O_5 per ha. alongwith two irrigations at branching and bud initiation [flowering] stages produced significantly higher yield [16.9 q/ha] than rest of the treatments.

Pea varieties DMR-18, HUP-9, DMR-19 and HUP-2 were found to be least damaged due to the pod-borer *(Etiella* sp.)

Pea variety KFPD 1 showed disease free reaction under natural conditions.

4. Lathyrus

In a varietal trial, the highest yield was obtained in JP 232 [19.8 q/ha] as against LSD-3 [check] which gave the yield of 12.9 q/ha only. The other promising lines were P-505 [16.9 q/ha], JRL-16 and JP-179 [16.4 q/ha].

Strain K8 of Lathyrus recorded increased yield to the tune of 30-48 % due to inoculation.

All *Khasari* cultivars were moderately to highly susceptible to aphids.

5. Rajma

It is a recently introduced crop with a great potontiality. Efforts were underway to develop suitable varieties and package of practices for the crop.

In varietal trial, variety PDR-27 recorded the highest yield [12.7 q/ha] followed by. PDR-28 [10.3 q/ha]. These varieties were significantly superior to the check PDR 14 [8.5 q/ha].

Variety PDR-14 when sown on either 31st October [20.3 q/ha] or 15th November [20.6 q/ha] recorded signifinantly higher grain yield than rest of the treatments

except variety VL 63 sown on 31 st October [19.2 q/ha], which was statistically at par with the former.

VII. TUBER CROPS :

1. Sweet potato :

In initial evaluation trial, the highest market grade tuber yield of 224.4 q/ha was recorded by genotype X-25, followed by X-5 [217.6 q/ha] and X-24 [206.0 q/ha]. Weevil in festation was highest in cross 4 [9.9 %] and lowest in I. B. 700 [2.7 %]. In the uniform regional trial, the mean market grade tuber yield showed the superiority of X-92 [197.53 q/ha] which was at par with OP 22 [194.44 q ha] and X 91 [193.67 q/ha]. Rest genotypes were inferior to these three. The highest yield was recorded by 760 P-217 [78.12 q/ha] followed by Kanchangarh local and X-91. The lowest weevil infestation was recorded by X 38 [4.20 %] and Kanchangarh local [4.25 %]. In uniform regional trial for short duration lines, Kalmegh and X-24 turned out to be most early bulking cultivars recording the yields of 174.0 and 174.38 q/ha at 90 D. A. P. respectively followed by cross 4 and S-30. Delay in harvesting increased the tuber yield and harvesting at 105 D. A. P. recording an yield of [235.74 q/ha] by Kalmegh followed in order by S-30 [214.97 q/ha] and X-24 [212.00 q/ha]. However, amongst the new lines, 84-X-1 [264.35 q/ha] and 84-X-2 [252.8 q/ha] being at par were superior to rest of the varieties.

2. Yambean (Mishrikand) :

The crop responded significantly upto 120 kg/ha level each of N and K_2O. Variety L 19 [573.5 q/ha] scored over the released variety R.M.-1 [541.1 q/ha]. Higher K_2O rate significantly reduced tuber cracking.

Reduction in spacing significantly affected crop yield of Yambeam; and on the basis of pooled data the maximum yield of 167.5 q/ha was obtained when the crop was planted at 10 × 10 cm spacing. Delay in harvesting by 15th Jan. increased the crop yield and delayed harvesting with 20 × 15 cm spacing [472.50 q/ha] could be recommended, while for early harvesting 10 × 10 cm spacing was the best.

3. Arvi :

Under Uniform Regional Trial in both spring and kharif season [Feb. and June planting]; white Gauria, a veriety from main centre Dholi, excelled the rest of the varieties recording an yield of 195.00 & 148.5 q/ha respectively followed by Kovur [184.25 q/ha] in the spring and Sahastramukhi in kharif [136.8 q/ha].

4. Amorphophallus [Ol] :

On the basis of individual year as well as pooled analysis, Amorphophallus responded significantly upto 150 kg/ha level of N and K_2O each. The corn yield increased from 254.80 q/ha in N_0K_0 plots to 592 89 q/ha under N 150 kg 150 K_2O treated plots.

Dipping of the corm pieces of 'Ol' in Agrimycin for 12 hrs. was found to be most effective in controlling the bacterial leaf blight disease of 'Ol'.

5. Diascorea [Suthni] :

In varietal trial, an entry from Konkan Krishi Vishwavidyalay, D.E.I. recorded the highest tuber yield of 233.6 q/ha

which significantly surpassed all the test varieties followed by D.E. 23 [201.6 q/ha], D.E. 17 [129.00 q/ha] from C.T. C.R I. Trivandram & Chaparia [198.00 q/ha] from Dholi centre, but these all were at par.

In controlling the leaf spot disease of *Diascorea*, 3 sprayings of Bavistin proved better giving an yield of 200 q/ha and with a disease intensity of 28.75 per cent against 28.75 per cent in control [yield 91.66 q/ha] disease intensity 47 % .

6. Diascerea (Fur) :

In varietal evaluation of fur, entries from Dholi RDA-4, RDA-5 and RDA-1 recording 161 83, 154.63 and 142.90 q/ha yields remained statistically at par and excelled the rest entries from C.T.C.R I., Trivandram.

VIII. SPICES :

1. Turmeric

Release proposal for the recommendation of a short duration high yielding variety of turmeric with high curcumin content named as "Rajendra Holdi-10 [RH 10] was submitted.

Among the 65 turmeric germplasm maintained at Dholi, Rajepura turmeric showed good promise.

Experimental results showed that G.L. puram turmeric variety harvested at 165 days from planting yielded 168 q/ha and contained 10.12 % dry matter; while RH yield the fresh rhizomes to the tune of 205 q/ha and gave the dry matter content of 18.25 %. The optimum crop duration for getting higher yield from R.H. 10 was 210 days and that for G. L. puram I and Morangia as 292 days, white other were of medium duration [230-260 days]. In lack of mulching, the rhizome yields got reduced drastically.

In agronomical trials also, turmeric Var. RH 10 yielded significantly higher than Morangia; RH 10 could be harvested with its full yield potential by 20th Dec. and turmeric-wheat sequence could be adopted profitably.

In inter-cropping trial on turmeric, the maximum net return of Rs. 11,727/- per ha was recorded from the double inter-cropping system (i) with paddy seedlings followed by (ii) peas for green pods.

IX. VEGETABLES :

(i) Bhindi hybrids Pb 57×71-14 and Sel. 6×Sel. 10 were found to be superior yielder over Pusa Sawani and were under further evaluation. They bear the fruits earlier by 5-7 days than Pusa Sawani.

(ii) In Brinjil, the F_1 hybrid of Annamalai X Azad Kranti with 250 q/ha yield proved significantly superior to all other varieties. The other promising hybrids were Long green X Annapurna and Long green X P Br 129-5.

(iii) Pre-emergence application of Stomp @ 1.0 kg a. i.ha+one H.W. 30 DAP proved equi-effective to weed free condition 3 H. W. and proved more convenient and economical in brinjal cultivation.

(iv) In chillies, in two separate expts., Sahour Angar and LCA 235, Line 72-20 and Pusa Jwala were found to be at par in yield. Seed treatment @ 0.05% Bavistin+its 4 sprays @ 0.05% controlled the die-back disease in chillies effectively.

(v) In cauliflower, Pusa hybrid was found to be significantly superior to others but remained at par with 75-10 and Pusa Deepali.

(vi) VL-3 and Arka Niketan onions were found to be superior to Patna Red.

X. FRUITS :

1. Mango—

Among the mango hybrids developed at Sabour, Hyb. 88 Gulabkhas × Bombai and Hyb. 101 Gulabkhas × Mahmood Bahar have been selected for recommendation to the farmers. Hyb. 88 has been proposed to be named as "Vikram" and Hyb. 101 as "Jawahar".

Stone grafted plants followed by veneer grafted ones with Langra scion produced maximum growth in plants propagated by different vegetative means.

Cytozyme @ 10 ml/10 litre of water sprayed 3 weeks before fruit set, increased the fruit setting and 'Vipul' 1 ml 10 lit. water resulted in maximum yield in Langra mango.

Langra root-stock imparted dwarfing to Bombai scion.

For control of mango shoot gall, vapona indicated positive response.

2. Litchi—

Results indicated that hybrid 25 Purbi × Bedana Hyb. 37, 40 and 141 China × Bedana have better Potentialities.

3. Guava—

Studies indicated that Allahabad Safeda and Sardar were the best cvs. for this state. Work on fruit preservation mango and Litchi remained in progress.

XI. WEED CONTROL :

1. Crop-weed competition studies in direct seeded rice—

A weed-free period of 30 days since sowing was found to be most desirable, which recorded the near-maximum yield in direct seeded rice. Although the maximum yield was recorded from the weed-free condition till 90 days from sowing, it was not found to be significantly different from the former. This incicated that the critical period for weed-removal weeding in direct seeded upland rice was around 30 days after sowing.

2. Weed management in transplanted rica under different nitrogen levels :

The crop responded significantly upto 120 kg N/ha with an yield level of 30 q/ha as against the yield of 24.6 q/ha in no-nitrogen plot. Due to low weed intensity, the yield in unweeded plot was recorded as 26 q/ha which increased significantly to 36 q/ha under hand-weeding, 32.6 q/ha with Butachlor [1.0 kg a.i./ha], 32.5 q/ha with Thiobencarb [1.5 kg a.i./ha] and 30.3 q/ha with 2,4-D Sodium salt [@ 0.8 kg a.i./ha]. The interaction did not turn out to be significant.

3. Effect of herbicides and nitrogen on upland direct-sown and transplanted rice :

Among the two systems of rice culture tried, transplanting, gave significantly higher crop yield than direct seeding. The weed yield was, however, higher in direct seeded rice. The crop responded significantly upto 120 kg N/ha irrespective of the systems. Straw and weed yield

also were the highest at this level. Among the weed control treatments, Thiobencarb @ 1.5 kg a.i./ha and butachlor @ 1.5 kg a.i./ha were at par with hand-weeding.

4. Weed management in maize+groundnut intercropping systems :

In a trial on weed management in maize+groundnut intercropping system at different fertility levels, it was observed that yield in terms of maize equivalance increased significantly with increased fertility levels upto 100 per cent of recommended fertilizer dose. Among the weed control treatments; H. W. [30 & 60 DAS], Pre-emg. Fluchloralin [1.0 kg a. i./ha], Pendimethalin [1.0 kg a. i / ha], Alachlor [1.0 kg a.i./ha] and Lentagran [1.0 kg a i./ ha] proved equally effective in controlling weed and increasing crop yields as compared to weedy check.

The weed control measures employed [both H. W. and Herbicides] gave significantly higher grain yields than unweeded check. Among the herbicides tried, Lentagran @ 1.0 kg a.i./ha applied as pre-emergence gave the maximum grain yield [32.2 q/ha] and was at par with H. W. [31.02 q/ha]. The unweeded plot yielded only 24.16 q/ha. There was, thus, about 30 % increase in arhar yield due to effective control of weeds.

XII. SEED TECHNOLOGY :

Out of different treatments for breaking seed dormancy of seeds to be tested in seed testing laboratory, small incision on seed coat in Bakla *(Vicia faba)*, 2-5 minutes scarification on sand paper in *Kasuri methi* seeds, were found to be very effective. Cultivars NP 18 in Green gram [Moong] and Bahar in Red gram [Arhar] were found to be better storer in comparision to other cultivars tested. In Sonalika variety of wheat, rain soaked and normal seeds behaved similarly during storage but normal seed could yield more on sowing. In wheat the seed harvested 42 days after anthesis produced best quality and storability.

XIII. SEED PROCESSING :

The seed processing unit at Tirhut College of Agriculture, Dholi processed the following quantity of seeds during the year.

Sl. No.	Crop	Quantity of seeds (in quintals)	
		Breeder	Foundation
1.	Rice	108.88	3,398.32
2.	Maize [Kharif]	1.00	...
3.	Maize [Rabi]	10.00	90.00
4.	Pulses [Kharif]	2.80	103.00
5.	Pulses [Rabi]	68.30	3.50
6.	Oilseeds [Kharif]	5.86	6.00
7.	Oilseeds [Rabi]	8.48	9.65
8.	Finger millet *(Marua)*	0.05	---
9.	Vegetables [Kharif]	1.21	...
10.	Wheat	1308.17	913.00
	Total :	1514.75	4,523.47

(B) FACULTY OF VETERINARY SCIENCE & ANIMAL HUSBANDRY :

During the year under report the teaching, research and extension activities of the faculty were catered through the existing institutions i. e. (1) Bihar Veterinary College, Patna, (2) Sanjay Gandhi Institute of Dairy Technology, Patna, (3) College of Fesheries, Dholi and (4) Animal Productson Research Institute, Pusa.

I. Bihar Veterinary College, Patna :

The College maintains instructional animal units to conduct teaching and research of different departments.

Instructional Animal Units :

(a) Poultry–A small Poultry unit of broilers was run by the Department of Animal Nutrition. This served the purpose of instructional unit for both under and post-graduate students as well as provided broilers for research purposes besides selling broilers on live weight basis.

(b) Buffalo Unit–A small buffalo unit was also included previously under the auspices of Pharmacology Department, but now it has been merged with the composite Livestock farm. It provides materials for research as well as for teaching both for under and post-graduate students, and also for training of the farmers under short course farmers training run by the Department of Veterinary Extension of the College.

(c) Small animal lab–Comprising at present of Albino mice and Tribolium, it runs under the control of the Department of Animal Breeding and Genetics, It serves as instructional unit for under and post-graduate students specially in the disciplines of Animal Breeding, Microbiology, Physiology and other disciplines. Over and above these serve as demonstration materials for different VIP's and farmers visiting the college.

RESEARCH

1. Department of Animal Breeding & Genetics :

(i) Title of the Project : Studies on genetics of adoptation of crossbred cattle.

Data on 240 Hariana & 185 JXH half breds of Cattle Farm, Pusa on five physiological states (lactating & dry cows, heifers, male & female calves) were analysed. This revealed that compared to their respective contemporary Hariana cattle, JXH (F_1) lactating and dry cows had lower and heifers and calves higher haemoglobin gram percentage.

From April to September in the Summer and rainy seasons, all animals showed higher Haemoglobin (gm%)percentage; Higher Haemoglobin (gm%) in cross-bred calves and Heifers is indicative of better vitality of these animals compared to Hariana animals. But lower haemoglobin (gm%) of lactating and dry crossbreds might indicate the lower vitality of these animals when they come in production and might serve as vectors for more porasitic infections and economic conditions. In turn their adaptation to this climatic condition might be affected.

2. Department of Livestock Production & Management :

(i) Title of the Project–Selection, evaluation and maintenance of Bihar type Bengal goats.

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2. Department of Livestock Production & Management :

(i) Title of the Project–Selection, evaluation and maintenance of Bihar type of Bengal goats.

Pilot survey of Bihar type of Bengal goats obtained from different sources showed the average length, height & girth to be 22.04 ± 0.58, 21.96 ± 0.42 and 24.22 ± 0.49 inches respectively. Study of colour pattern belonging to different age group of these goats showed 20 % black, 14% grey and 24 % brown colours.

(ii) Title of the Project : A study on the germ plasm research of Diara buffaloes of Bihar.

A Pilot study revealed that Patna District accounted for 85% of Diara type of buffaloes wereas Vaishali and Chapra District each accounted for 5% unknown origin. The mean girth, height and length of these buffaloes sampled were recorded to be 193.15±2.59, 130.75+1.07 and 138.55±1.55 cm respectively. On the basis of first 15 days milk yield, the average daily milk yield was 9.47 litres. The study of phenotypic correlations between girth and height, height and length and girth and length were observed to be 0.714, 0.417 and 0.299 respectively and all of them were positive.

3. Department of Veterinary Medicine :

(i) Title of the Project : Studies on clinical efficacy of some antimicrobials [Kenamycin, Gentamycin & Indox] in acute staphylococcal mastitis in cow.

Out of the affected quarters Staph. aureus was isolated from 63.6% quarters, strepto, uberis, strepto agalactiae from 12.7 % and 9.1 % quarters respectively, whereas, 14.6% quarters were found to be affected with Coli. The study revealed that Staph. aureus was the most important causative agent for acute mastitis and Gentamycin turned out to be the highly efficacions drug to be used in staphylococcal and E. Coli affected quarters.

4. Department of Veterinary Surgery :

(i) Title of the Project : Studies on cystoplesty with preserved bladder in bovine.

Altogether 30 experimental cystoplasties with preserved urinary bladder in buffalo calves were conducted. Clinical mainfestations like rumination, defaecation, appetite, urination and urine colour were normal in operated animals till observation period. The average post operative temperature, pulse and respiration varied between 100.0°F and 101.8°F, 46 and 62 per minute & 18 and 29 per minute respectively. Average post operative level of urea Nitrogen in blood (BUN) ranged from 32.4 to 40.6 mg/100ml blood. In operated animals, gradual regeneration of bladder tissues around the preserved bladder graft was clearly observed histologically.

5. Department of Veterinary Gynaecology & Obstetrics :

(i) Title of the project : Immunological & Physiochemical characteristics of oestrial mucus of normal & repeat breeder cows.

To treat repeat breeder cows mainifesting oestrus with palpable and non-palpable c. l., different medicines like chorulon Dinofertin and Raceptal were tried. In anovular heat [non-palpable c. l.] chorulon and Raceptal were used; and where palpable c.l. was found, Dinofertin was utilised. Raceptal was found to show better results over chorulon in anovular cases. Better response was observed when Dinofertin was used during resumption of next cycle.

6. Departmnet of Veterinary Pathology.

(i) Title of the Project : Pathology of Mycoplasma infection in respiratory and reproductive organs of sheep and goats.

Clinical symptoms in the experimental study with *Mycoplasma mycoides* sub sp. *mycoides* in goats were found to rise in temperature from fourth day post inoculation which continued upto the 18th day. Other significant symptoms were nasal discharge, lacrimation, coughing, sneezing, anorexia, depression and dyspnoea.

Haematological studies revealed significant haemoglobin content and total Leucocyte count. Differential count pointed out significant changes like increase in lymphocytes on the 3rd and 7th day post infection. On the 3rd and 7th day after infection, neutropenia was observed. Mycoplasma could not be isolated from swabs of goats inoculated i/v though from blood it was recovered. Goats sacrified at different days interval after infection showed pneumonia with marked marblod appearance. In a few cases chronic pneumonia were also observed.

7. Department of Veterinary Parasitology.

(i) Title of the project : Intracellular blood protista with particular reference to immuno prophylaxis and control.

Prevalence study showed that 18.01 % of crossbred cattle, 39.70 % exotic cattle and 23.49 % of indigenous cattle were postive for haemoprotozoan parasites. Significant differences in the infection rate was observed amongst the various breeds of cattle under study.

The females of crossbreds and exotic cattle were found to harbour the infection more frequently than their male counterparts. But in indigenous cattle no marked sex difference could be noticed. Infestation rates with tick vectors were fairly high in crossbreds [54.97 %] and exotic jersey cattle [57.35 %] as against 11.44 % in indigenous cattle.

Although ticks were encountered throughout the year on animal body, during the months from March to October the tick activity was most notable. It was observed that *B. microplus* and *H. anatolicum anatolicum* were observed in almost all parts of the body of infested cattle specially in regions between two forelegs neck, dewlap chest, scrotum/udder. Compared to weak & emaciated animals, well fed and properly nourished animals were found to harbour lighter tick loads.

(ii) Title of the Project : Studies on the epidemiology and control of poultry coccidiosis.

On the basis of 600 birds faecal samples, both layers and broilers in and around Patna the overall infection rate was recorded to be 15.83 % and the predominant species met with were E. tenella, E. necatrix, E. acervulina and E. maxima. Broilers showed higher rate of coccidial incidence [21.33 %] over the layers [10.33 %]. Younger birds were more susceptible than the adult ones. Maximum incidence was observed during winter [October-January] [30 %] and the lowest in summer [April-June] [7.33 %].

(iii) Title of the Project : Studies on the epidemiology of Sarcocystis infection in goats.

About 51 % of a total of 288 goats examined showed Sarcocystis incidence.

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About 51 % of a total of 288 goats examined showed Sarcocystis incidence. Adults showed higher infection rate [57.35 %] over the younger ones below 6 months of age, females carried higher infection rate [67.5 %] over their male counterparts. Maximum incidence was noted in rainy season [July-October] and lowest during summer [March-June]. Organs most frequently affected by Sarcocystes were Oesophageal muscle, heat and Keletal muscles and muscles of eye and diaphragm in descending order Two distinct type of cysts having detectable variation in morphology were met with during the study and it appeared to be the first report of occurrence of S. hircicanis in India.

8. Department of Veterinary Microbiology :

Title of the Project : Study of the relation role of humoral and cellular immune response and of macrophages in the recovery of bovine & laboratory animals from Foot & Mouth Disease virus infection.

Out of 13 F. M. D. clinical samples obtained from 13 outbreaks, one sample was found to be negative and 9 were due to serotype '0' followed by Asia 1-2 and Type C-1. Cell mediated immune response to type 'O' F.M.D. virus showed specific increasein skin thickness of juinea pigs varying from 1.9 to 2.2 mm over the normal skin.

In the macrophage stimulated juinea pigs, later appearance of smaller size vesicles and extent of covering heel pad surfaces by 20%, and longer time for generalization were the characteristics

9. Department of Veterinary Pharmacology :

(i) Title of the project : Pharmacokinetics of Doxycycline in poultry.

The mean plasma drug concentration following intravenous administration [5 mg/kg] was estimated to be 4.08 ± 0.22 μg/ml. The drug was present in therapeutic concentration [0.5 μg/ml] till 3 hours. Presense oil drug in detectable concentration was noticed till 48 hours.

10. Department of Extension Education :

Under the Integrated Rural Development Programme, three adopted villages alongwith Dhanaur and Mahuabagh were being served. The number of A. H. production units operated in these villages were; Dairy-20, Poultry-10, Goat-150. Thus 180 families were associated with animal production programme.

Under Lab-to-Land Programmes, 60 families were selected for intensive training, guidance and for providing technical know how.

Both in campus and out of campus, farmer's training programmes were organised and the trained farmers, farm youths and farm women numbered 240, 44 and 36 respectively thus making the over-all number of trained farmers to 320. Besides, 182 farmers were deputed by the District Animal Husbandry Officer, Patna for training in Dairy, Goat, Pig, Poultry, Animal health and management etc.

The regular services of mass vaccination, general health check up, creep feeding in pigs, castration of scrub bulls, cheap poultry ration, use of ecto and endo paraciticides, introduction of impr ved fodder varieties, preservation of fodder as silage, debeaking of birds, introduction of frozen semen technique, clean milk production etc. were also provided to the

livestock owners of the adopted villages and to the villages under Lab-to-Land programmes. A total of 1318 families were served under it.

11. Veterinary Clinics :

(a) Cases treated :

[i] New ones	—	9893
[ii] Old ones	—	5480

(b) P.M. findings by Pathology Department : Clinical diagnosis of urine, faeces and blood samples of different species obtained from Exotic Cattle Breeding Farm, Patna, Poultry Farm, Pusa, A.I. Centre, Patna, Police Dog Squad, Patna, Sanjay Gandhi Biological Park, Patna etc. were processed and P.M. conducted.

167 faeces samples, 129 urine samples and 160 blood samples were received during the year and analysed for diagnosis of disease and reports sent to concerned authorities.

Ambulatory Veterinary Clinic Centre, Nargada :

In this centre during the year under report, 465 clinical cases in medicine, 685 cases in Gynaecology and 172 cases in Surgery were treated.

Gynaecology Department Clinic
At out-door clinic

[a] Cases of infertility attended	—	4036
[b] A.I. in [i] Cattle	—	2991
[ii] Buffaloes	—	284

At clinical centre, Nargada

[a] Cases of infertility attended	—	412
[b] A. I. in [i] Cattle	—	341
[ii] Baffaloes	—	186

II. Sanjay Gandhi Institute of Dairy Technology.

During the year under report this institution remained engaged mainly in instuctions of B.Sc. [Dairy Tech.] students. Due to paucity of teachers in the different departments, no research project could be underteken. The teachers mostly remained busy in the teaching schedule besides undertaking some extension programme to accomplish the students academic requirements and to carry out the national programmes. Acute shortage of staff in all the departments was felt in carrying out the routine works of instruction. During the year 1988-89, however, the laboratory equipment worth Rs. 1,50 lakhs were purchesed. 18 students of B. Sc. [D. T.] were sent for in plant training in developed dairy plants of the country for six months of which 14 students completed the degree successfully.

III. College of Fisheries :

The College of Fisheries is actively involved in motivating the farmers to take up extensive and intensive aquaculture practices, seed production etc. The socio-economic survey of the fishermen residing in Dholi, Raine village was also carried out. Technical suggestions were given to a fish farmer of Muzaffarpur district for the development of new fish farm. The fish farmers of the nearby areas were advised in tackling certain fish diseases by the fish pathologist of the College. The College Fisheries participated in the Kisan Mela and obtained first prize for setting up the best stall.

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Year	Species	Quantity of seed produced
1988	Rohu	40,000 spawm
1989	Rohu	80,000 spawm
	Common Carp	7 lakh spawn

IV. Animal Production Research Institute, Pusa :

(i) Title of the project : To develop high yielding stock of cows through cross-breeding programme with average yield of 3000 literes of milk per lactation in agro-climiatic condition of Pusa, Bihar.

The total milk produeed during the year 1988-89 was 1,27, 123 litres as aganist total milk production of 1, 44, 850 litres during last year [i. e, 1987-88]. This reduction in the total milk yield during 1988-89 was attributed not due to decreased productian rate, but was due to reduction in the total herd strength of milch cows due to culling in the preceeding year.

The wet average during 1988-89 was recorded to be 6.27 litres, whereas it was 6.038 litres in 1987-88 showing an increase of 0.233 litres in the year under report. The wet average was found to be highest [8.005 litres] in 50% exotic crossbreds followed by 75% crossbred [7.350 litres] and Hariana [3.460 litres] cows. Thus an improvement in wet average occurred as compared to the last year.

The herd average during 1988-89 was reckoned to be 4.899, 4.666 and 1.209 litres for 50% cross-breds, 70% crossbreds and Haryana cows; where as, during 1987-88, the same was found to be 4.621 litres.

Average dry period during 1988-89 was found to be 58.5, 69 and 134 days respectively for 50% × B, 75% × B and Hariana cows showing a declining trend as compared to 1987-88 indicating adoption of better sexual health control measures.

Average age at first heat was found to be 34, 23 and 24 months respectively in Hariana 50% × B and 75% × B. indicating thereby onset of earlier puberty in 50% × B. Similarly, average age at first calving was recorded to be lowest in 50% × B [.5 months] followed by 75% × B [38 months] and Hariana [44 months].

Average calving interval was recorded to be 407; 443 and 548 days in 50% × B. 75% ×B and Haryana cows during 1988-89. Average service period was recorded to be 68.5, 94.0 and 134 days in 50% × B, 75% × B and Haryana cows. Average no. of services per conception was found to be 2.1 and 1.6 respectively with frozen and liquid semen.

A total no. of 26 animals died during the year whereas the mortality during the year 1987-88 was recorded to be 42. Thus a tremendous decline in mortality rate was noticed during 1988-89 which is an indicative of adopption of better health care and management.

(C) FACULTY OF BASIC SCIENCE AND HUMANITIES :

The departments of the faculty of Basic Science and Humanities were involved in finding out solutions to break the barriors for maximising crop production and in the process following are the highlights of achievements :

1. Botany & Plant Physiology

In rice, genotype IR 36 was found to be tolerant, IET 4561 was susceptible and

IET 6148 was highly susceptible to Fe deficiency chlorosis. The latter responded to Fe-spray by increased shoot dry matter yield of 143 % while the tolerant genotype had a non-significant response. Elemental composition of shoots like Fe^{2+}, Fe^{2+}/Zn, P/Fe^{2+} ratios could be usefully used for screening efficient rice genotypes in relation to Fe-chlorosis in breeding programmes.

In green gram, based on its germination under different levels of moisture stress, genotypes T44 and 12/333 (Sona) were considered to be tolerant while DHMM-116 and 11/395 were susceptible. The germination, vigour index and mobilization efficiency values were significantly higher in tolerant group and could be used for screening tolerant mungbean genotypes against moisture stress in breeding programmes.

Considering the health and environmental hazards of alfa toxins produced by *Aspergillus flavus*, various plant products were tested against *A flavus*. Among caffein, geraniol, citral and citronellol, maximum inhibition was recorded with geraniol, which completely inhibited the mycelial growth of the fungus at 650 ppm concentration. Its vapour also inhibited fungal growth.

In an attempt to exploit the use of plant products as plant growth regulator, maximum activity of 2-4 dihydroxy benzoic acid was recorded at 1 and 4 mm concentration which inhibited the radicle growth of *Amaranthus spinosus* by 50 and 70 % respectively.

In *Vigna mungo* sub-lethal concentration (1 mm) of mimosine, an allelo-chemical, inhibited the transfer of reserve food from cotyledon to the embryo by 57 %. This was due to the inhibition in the break down of protein and starch through inhibition of protease & amylase activity. This threw light on the mode of action of mimosine on crop plants and emphasised the need of study of the allelopathic compatability of crops and trees (like *Subabul* producing mimosine) introduced in agro-forestry systems. When *Cassia* seeds were sown in *Parthenium* infested areas, the emerging *cassia* plant completely dominated over *Parthenium*.

Collection of medicinal and aromatic plants were in progress in the herbal garden and about 93 plant species belonging to 44 families were being maintained.

In a *Sesbania* species producing stem nodules, the same *Rhizobium* species was found to be responsible for root as well as stem nodulation. Further investigation was, however, needed.

2. Bio-chemistry

Studies on bio-gas production and degradation of cellulosic portions of various agricultural residues in bio-gas diagester indicated that the development of individual enzyme activities varied with the type of residue used. *Cannabis* and *Parthenium* plants when used in the digester checked gas formation. However, the heat dried residues did not affect gas production.

Leghemoglobin content of nodules from uninoculated lentil and chickpea plants were analyseed at 60th day. Highest amount was found in C-235 followed by Plant G-114.

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Effect of waterlogging on one month old seedlings of maize was investigated. Waterlogging for 24 hrs. decreased the chlorophyll content by about 50% with no change in protein and dry matter contents. In 48 hrs. of waterlogging, the protein content remained the same as in case of 24 hrs. of waterlogging but the protein and dry matter contents decreased to the extent of 50 and 35% respectively.

3. Genetics :

A promising potato culture, PC-46 [red] indicated its superiority over the prominent variety K. Sinduri with respect to tuber yield, skin colour and tolerance to late-blight in farmer's fields. The spontaneously occurring male sterility motants of TCA-72 and BR-34 were found to be cytoplasmic in nature. Analysis of maize inbreds and their hybrids indicated a parallelism of genomic response to hybridity stress and tissue culture stress.

Work on tissue culture on potato and prosso-millet were in progress, the significant aspect of potato tissue culture were microtuberization, plantlet formation and self resistant callus formation. In case of prosso-millet tissue culture, inter-varietal differences were observed in the differentiation of plantlets.

4. Statistics :

Crop yield forecast model developed for wheat crop was tested to be quite valid. The work on model validation and perturbation analysis on the crop yield forecast model for wheat based on weather parameters for Patna district indicated that the forecast ability of the model [measured in R^2] was affected only to the extent of 1% by removing any one year data from the entire data set of 20 years.

A fore-cast model for grain crop yield was formulated which exhibited a good fit [$R^2=82.53\%$] based on fortnightly average of weather data. model validation continued.

5. Microbiology :

Work in other departments remained in progress. In Microbiology section, the isolation of fungi belonging to basiomycetes group possessing high wood [ligmin] degrading activities was made. About one kg of fresh mushrooms was obtained from 1 kg of straw in isolate [No. 5]. few local varieties of edible mushrooms were included under production trial.

(D) FACULTY OF HOME SCIENCE :

In food and nutrition department, survey work was completed and compilation and consolidation of data relating to the food patterns and nutritional status remained in progress.

In child development department, studies on pre-school children, a diagnostic study of immunijation and health care of pre-school children in ICDS areas of north Bihar, and a study of child rearing practices and health care in the families residing in adopted villages by the RAU were proposed.

In the Deptt. of Clothing & Textiles, studies were proposed on the utilization of agril. and kitchen wastes for the development of vegetable dyes; and local tailoring trends in Pusa block.

Under family resource management, new studies were proposed to be intiated

in the ensuing years. Home science extension education also, was geared up to undertake socio-economic studies on rural women.

(E, FACULTY OF AGRICULTURAL ENGINEERING

1. Farm Machinery :

In comparison between the use of power tiller and traditional method for puddling in rice cultivation, Kubota power tiller was found to be economical than other methods. There were less weed infestations in Kubota puddled fields as compared to National Power Tiller and bullocks. The highest yield [30.85 q/ha] was obtained with rotovator. Harvesting cost was found to be lesser in case of reaper than when done with sickles. Threshing cost by power thresher was only Rs. 12.70/q as against Rs. 27.00/q through manual threshing.

For wheat, rotovator was found to be most effective for seedbed preparation. The weed population was nearly 50% less in rotovated plots than by the use of *desi* plough, and the grain yield was also higher under the former. The power reaper had higher efficiency than manual method and the cost involved was only Rs. 118/ha as compared to Rs. 252/ha by manual harvesting.

2. Farm Power and Renewable Energy :

Investigations on bullock drawn speed multiplier, Solar charkha, wind mill and solar water heater remained in progress.

3. Irrigation and Drainage :

In studies on channel lining seepage loss per unit wetted surface for unlined channel was found to be higher; which could be reduced to the extent of 65.1% by brick lining, 56.5% by soil cemant and 81.3% by LDPE.

Work on drainage were in progress, and irrigation cum-drainage plan for *chaur* lands were in the process of development.

4. Soil and Water Conservation :

Studies were made on chaur land soil and its hydrology.

Studies on physical soil environment in relation to plant root growth revealed the formation of root restricting layer at 15-20 cm depth in Pusa soils. The layer had high bulk density [1.50-1.62 gm/cm^3] and high penetration resistance [2-5 Megapascal] at field capacity. The layer restricted the root growth and affected maize yields.

Soil penetration resistance of more than 4.25 MPa seemed to be the critical penetration resistance for maize root growth.

5. Post-harvest Technology :

Work on chilli processing, evaluation of processing parameters of crops, Solar drier, rice processing, maize sheller and low cost small capacity storage structures reonained in progress.

3 EXTENSION EDUCATION

An Agricultural University is not only a Centre of higher learning and research but also an institution to serve the farming community with latest fruits of research in agriculture and allied fields. Education and training of farmers, and field functionaries popularly known as 'Extension Education' is an important activity of the University along with teaching and research. With this end in view the University has implemented a number of Extension Education Programmes for upgrading professional competence of field functionaries and quick transfer of technologies from Lab to the fields. The Extension Education Programmes of the University can be grouped under four categories, viz. Training, Communication, Farm Advisory Service and Field Programme.

I. TRAINNING PROGRAMME

A number of Training Programmes for the Field Functionaries, Subject Master Specialists (T & V Project) of the Department of Agriculture, Field Officers of Input Manufacturing Firms, I.A.S. Probationers, professionals/Adopted farmers, Rural Youth for Self Employment, Cane Development Officers/Managers of Sugarcane Factories, farm women etc. at Pusa, Dholi, Patna, Sabour Campuses, as well as, at Regional Stations were organised. In addition to the sponsered training programmes; Seminars, Workshops, Monthly-Workshop-cum-Training for the senior level Extension Officers and S.M.S. working under T & V project were organised regularly at Pusa, Sabour, Patna, Agwanpur, Bodh Gaya, Madhopur and Munger campuses/centres of the University. Scientists of this University are also required to participate in various kinds of training programmes at State/District/Block and village levels. Details of training programmes organised during the year 1988-89 appear below :

(a) Other then State Govt./Univ. Sponsored Training Programmes :

1. UNICEF-Sponsored Training Programme on Enter Reneourship Development for DWCRA Group Organisers

Under the able guidance of Dean, College of Home Science and the Faculty Members, more than 150 Ladies of Samastipur and Madhubani districts have been trained on leadership, self employment, Vim/Soap/Candle making, management of money, marketing, finance, budgeting and accounting, Banking practices etc.

2. Training on Sug. Rc. Ine. Production for the Department of Agriculture of the Government of Nepal

Scientists of Sugarcane Research Institute, Pusa participated in a training programme organised by the Department of Agriculture of the Govt. of Nepal at Jitpur. Recent technologies for increasing Sugarcane/Sugar Production in Nepal were discussed in detail by the Sugarcane Scientists of this University.

3. Central Sponsored Inter-State Training-cum-Discussion Seminar on Winter Maize and Summer Pulses

Sponsored by the Government of India, Directorate of Extension, a Inter-State training-cum-discussion Seminars on Winter/Rabi maize production & Summer

Pulses were organised at Dholi and Pusa campuses from 27.2.89 to 14.3.89 and 6.2.89 to 8.2.89, respectively. Problems and possibilities of increasing winter Maize and summer Pulses production in different parts of the country were discussed and technologies generated by the Scientists of this University were communicated through field demonstrations and practical training.

4. Inter-State Workshop on Extension Management for Special Rice Production :

Sponsored by the MANAGE, an Inter-State Workshop on Extension Management on special Rice Production in Eastern Zone was organised at Pusa from 13.3.89 to 18.3.89 in which 28 Senior Extension Officers from P. M., Orissa, Bengal and Bihar state partictpated.

5. Government of India Sponsored Crop-Wise Training Programmes for Field Functinaries of Agricultural Department

Government of India sponsored crop-wise training pragrammes for the field functionaries of the Depatment of Agriculture, Bihar which were organised on wheat, summer rice, kharif rice, summer maize and pulses at Pusa, Sabour and Patna campuses during the year 1988-89.

Type of training	Period/Venue	No. of participants
1. Kharif Maize Production Technology.	31st May-3rd June, Sabour.	30
2. Kharif Paddy Production Technology.	20th-23rd June, Sabour.	20
3. Summer Rice Production Technology,	23-26th Feb., Sabour,	12
4. Bore Rice Prodution Technology.	11th-14th Oct., Pusa.	24
5. Kharif Rice Production Technology.	6th-9th June, Pusa.	26
6. Kharif Maize Production Technology.	2nd-5th June, Dholi.	16
7. Kharif Rice Production Technology.	20th-23rd June, Patna.	24
8. Summer Rice Production Technology.	12th-15th Feb., Patna.	18

6. Workshop on Orientation, Communication and Extension Teaching Methods :

A workshop-cum training programme on Orientation, Communication and Extension Teaching Methods was organised at Sabour campus from 20th to 26th April, 88 by the Training Experts of Extension Education Institute, Nilokheri. A similar workshop was also organised at Bihar Agricultural College, Sabour from 14-3-89 to 16-3-89 for the subject-matter-specialists (T & V Project) working in Bhagalpur

(b) State Goverament/University Sponsored Training Programmes :

1. Training programme on Oilseed Production Technology :

A training-cum-discussion seminar on Oilseed Production Technology was organised at Sabour campus on 13th and 14th October, 88 for the DAOs and senior S. M. Ss. of the Department of Agriculture. Possibilities of adopting recent technologies were discussed in detail with the 14 Extension Officers of Bihar.

Pulses were organised at Dholi and Pusa campuses from 27.2.89 to 14.3.89 and 6.2.89 to 8.2.89, resoectively. Problems and possibilities of increasing winter Maize and summer Pulses production in different parts of the country were discussed and technologies generated by the Scientists of this University were communicated through field demonstrations and practical training.

4. Inter-State Workshop on Extension Management for Special Rice Production :

Sponsored by the MANAGE, an Inter-State Workshop on Extension Management on special Rice Production in Eastern Zone was organised at Pusa from 13.3.89 to 18.3.89 in which 28 Senior Extension Officers from P. M., Orissa, Bengal and Bihar state partictpated.

5. Government of India Sponsored Crop-Wise Training Programmes for Field Functinaries of Agricultural Department

Government of India sponsored crop-wise training pragrammes for the field functionaries of the Depatment of Agriculture, Bihar which were organised on wheat, summer rice, kharif rice, summer maize and pulses at Pusa, Sabour and Patna campuses during the year 1988-89.

Type of training	Period/Venue	No. of participants
1. Kharif Maize Production Technology.	31st May-3rd June, Sabour.	30
2. Kharif Paddy Production Technology.	20th-23rd June, Sabour.	20
3. Summer Rice Production Technology,	23-26th Feb., Sabour,	12
4. Bore Rice Prodution Technology.	11th-14th Oct., Pusa.	24
5. Kharif Rice Production Technology.	6th-9th June, Pusa.	26
6. Kharif Maize Production Technology.	2nd-5th June, Dholi.	16
7. Kharif Rice Production Technology.	20th-23rd June, Patna.	24
8. Summer Rice Production Technology.	12th-15th Feb., Patna.	18

6. Workshop on Orientation, Communication and Extension Teaching Methods :

A workshop-cum training programme on Orientation, Communication and Extension Teaching Methods was organised at Sabour campus from 20th to 26th April, 88 by the Training Experts of Extension Education Institute, Nilokheri. A similar workshop was also organised at Bihar Agricultural College, Sabour from 14-3-89 to 16-3-89 for the subject-matter-specialists (T & V Project) working in Bhagalpur

(b) State Goverament/University Sponsored Training Programmes :

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2. Training Programme for I. A. S. Probationers :

A seven-day training programme from 23rd to 29th June '89 on recent advancement in the field of Agriculture, Dairy Technology, Fisheries etc. was organised at the main campus of the University at Pusa for I. A. S. probationers. Participating I. A. S. probationer trainees visited experimental plots and demonstrations on adopted farmer's fields Practical demonstrations were conducted and printed technical information/lecture notes were provided to the trainees.

3. Papaya Production Technology :

A training programme on papaya production technology was organised at Pusa with the help of Papaya Specialists of I.A.R.I., Botanical Sub-Station, Pusa in the month of August, 1988.

4. Special Rice Production Training Programme (S.R.P.P.) :

About 2400 progressive farmers from selected Blocks under Special Rice Production Programme visited Pusa, Patna and Sabour campuses of the University. Rice Scientists arranged field visit programme and imparted training for increasing rice production under different agro-climatic conditions of Bihar.

A Special team consisting of Rice-Breeder, Pathologist, Entomologist and Agronomist was constituted separately for Tirhut, Saran, Darbhanga, Kosi and Patna Divisions for providing guidance to intensive rice growing areas. The team visited rice fields of farmers and provided technical information.

5. Monthly Workshop-cum-Training on Sugarcane Production :

A workshop-cum-training programme on sugarcane production technology was organised in every month at Sugarcane Research Institute, Pusa for the Cane Development Officers and other field officers of Sugarcane Department. Technologies for increasing Sugarcane/Sugar production were communicated and field problems were discussed throughly by the Sugarcane Scientists. Messages in the form of hand-out in Hindi were also distributed among the participating Sugarcane Extension Officers.

6. Self-training short-duration Mali Training Programme :

Scientists of Horticulture Department at Pusa have conducted two week's duration courses on mali training, in which some 76 youths from different Districts of Bihar have been trained. This novel mothod of training without any cost of the University and at the cost of the trainees themseves aimed a skill-oriented income-generating and self employment of the Malis may be regarded as a unique innovation of training, the model of which has been developed by the faculty of Agriculture of the University.

7. Special Training Programme :

Some specialised training programmes on winter rice production technology, Soyabeen production technology, Banana production technology, on bee-keeping and farm mechineries were also organised by the scientists at different campuses.

8. Farmers' Training Programme :

A number of short-term training programmes for the farmers, farm women and rural youth were organised all the year round. About 1500 progressive farmers and extension officers were imparted field-based training for increasing production at different campuses.

(c) Training and Visit System of Agricultural Extension :

The University has been actively associated with the work of T & V system and is involved in organising Monthly Workshop, Joint Field Visits, Adaptive Trials, Zonal Research and Extension Advisory Committee meetings and Organisation of Workshop on Orientation, Communication and Extension Teaching methods of field functionaries under Training and Visit system of Bihar.

1 Monthly Workshop :

The Monthly Workshop is organised regularly in each month for two days at different campuses and centres of the University at Pusa, Sabour, Patna, Madhopur, Agwanpur, Bodh-Gaya and Munger, in which Officers of the State Department of Agriculture, namely; District Agricultural Officers, Subject Matter Specialists, Sub-Divisional Agricultural Officers and Assistant Agronomists [Adaptive Research] participated. On the first day, field problems are discussed thoroughly and Master Trainers of the University bring their plan/recommendation for formulation and discussion on the recommended practices of the month. On the second day field/Laboratory visits are arranged and formulation of meassage is made in the form of Handout in Hindi and distributed among the participating Extension Officers.

2. Communication :

Technical communication through Radio, TV and Press, publication of farm literature, organising Kisan Mela and participation in religious fairs and exhibitions are some of the important activities of information communication.

Talks of Specialists of the University on different facets of rural life were broadcast through Radio and Television for the benefit of the rural people and field functionaries. The University published Adhunik Kisan [a monthly magazine in Hindi], Adhunik Kisan Diary and a number of booklets, bulletins and folders on Package of practices of crops, fruits and vegetables, plant protection, dairying etc. for the benefit of farmers and Extension Workers. These publications have become very popular among farmers and field functionaries.

Kisan Mela was organised at Pusa and Sabour Campuses of the University in February to expose farmers and field functionaries to the latest production technologies in agriculture, animal husbandry, fisheries, home science, agricultural engineering and allied fields. The Mela attracted a large gathering of farmers at each campus. The Mela provided a good opportunity for farmers to participate in discussion and question-answer session, got their soil and water samples analysed and to purchase seeds of new varieties from the University and other accredited input agencies at one place. Besides this,

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the University participated in Sonepur fair, Kisan Mela and Gosthi at Shekhodeora, Sikandra and Shambho Diara in Munger district.

3. Farm Advisory Service :

The specialists of the University visited the adopted villages around the campuses, research stations/sub-stations and Krishi Vigyan Kendras to provide on-the-spot techaical guidance to the farmers. Farmers' queries were also replied through correspondences.

4. Special Field Programmes :

A number of field programmes have been implemented with a view to bridging the gap between the thchnologies available at the research institutes and practices being adopted in the farmers' fields. Some of the important programmes are : National Demonstration Project, National Oilseeds Development Project, Krishi Vigyan Kendras, Operational Research Project, Popuarising of non-conventional energy sources, Development of technology modules for socio-economic development of scheduled castes and a number of specific crop-oriented projects.

(i) National Demonstration Project :

The National Demonstration Project is functioning in two districts, namely, Vaishali and Gaya. Under this project; demonstrations are conducted on farmers' fields by the scientists to demonstrate the production potential of new agricultural technologies per unit area per unit time.

During the year 1988-89, altogether 91 demonstrations were conducted in Vaishali district : 10 demonstrations on three-crop sequence, 14 demonstrations on two-crop sequence and 32 demonstrations on single-crop and one demonstration on problems were conducted. Nine field days were organised at the sites of demonstration plots to educate farmers and field functionaries about the latest crop production technologies.

Among high-yielding variety of Rice, Sita recorded highest yield of 41.0 q ha followed by Radha [40.0 a/ha] and I R.-36 [38.0 q/ha]. The high-yielding variety of wheat, namely HP-1209 recorded highest yield of 39.0 q/ha with an average yield of 35.0 q/ha. Maize Laximi recorded highest yield of 65.75 q/ha with an average yield of 61.32 q/ha.

In Gaya district, altogether 94 demonstrations; 7 on three-crop sequence, 24 demonstrations on two-crop sequence and 15 on single crop demonstrations were conducted. Fifteen field days were organised at demonstration sites. Among high-yielding varieties of rice, Sita and Sujata recorded highest yield of 49.50 q/ha followed by IR-36 & Mansoori [44.0 q/ha]. In case of wheat, HP-1209 recorded highest yield of 37.50 q/ha followed by Sonalika [32.60 q/ha] and UP-262 [31.40 q/ha]. In case of Pulses crop, P-256 [a high yielding variety of gram] recorded highest yield of 17.80 q/ha and BR-65 [an improved variety of arhar] recorded highest yield of 13.60 q/ha.

The Scientists posted under National Demonstration Projects also participated in training programmes organised by the Department of Agriculture under Special Foodgrain Production Programme in the respective districts.

(ii) Krishi Vigyan Kendra :

There are three Krishi Vigyan Kendras, one each located at Munger, Banka and Agwanpur [Saharsa]. Short and long-term need-based and skill-oriented training programmes for farmers, farm women and farm youth in agriculture, horticulture, animal husbandry and allied fields are organised through-out the year to train them in latest production technologies. Each Krishi Vigyan Kendra has adopted a number of villages for training-cum-demonstraion purposes. Training programmes are also organised in the villages.

During the year 1988-89, a total of 169 training courses were organised at K.V.K., Munger and 2147 farmers were trained in different fields, namely, crop production, horticulture, animal production, agricultural engineering and home science.

At Krishi Vigyan Kendra, Banka, 193 training courses were organised and 2897 trainees [farmers farm women and rural youth] were trained. At Krishi Vigyan Kendra, Agwanpur, 54 training courses were organised and 901 trainees were trained.

Besides organising training progrmmes at the Kendras and in the villages, each K.V.K. conducted number of demonstration in farmers fields' and organised field days to educate farmers and field functionaries in latest technologies of crop production under National Oilseeds Development Project and Lab-to-Land Programme. The Monthly Workshop for S.M.Ss. and Extension Officers of T & V system was also organised at K.V.K., Munger.

(d) Lab-to-Land Programme :

The programme for transfer of proven and viable technologies from laboratories to the farmers, fields, popularly known as Lab-to-Land Programme launched in the country on the 1st June, 1979 as a part of the Golden Jubilee Celebrations of the Indian Council of Agricultural Research has been implemented in the villages around campuses and research stations right from June, 1979.

Under Lab-to-Land Programme; 5660 farm families belonging to the catogory of small and marginal farmers and landless labourers spread over 148 villages of the State have been benefitted during the last seven years. Majority of them belong to backward communities and scheduled castes.

The adopted farm families are provided with technical guidance and critical inputs by a team of multi-disciplinary scientists for adoption of new farm technologies. Besides crop production, the adopted families are also motivated to take-up subsidiary occupations like dairying, goat-keeping and be-keeping for increasing their income.

As a result of intensive extension work in the adopted villages, the present yield level of important crops of the adopted villages are : maize [54.20 q/ha], wheat [33.50 q/ha], and rye 19 22 q/ha]. The responses of farmers to the programme have been very encouraging. Productivity, income and employment opportunities of the adopted farm families have considerably increased.

(e) Regional Centre for Biogas Training and Development :

The Regional Centre for Biogas Training and Development was established in January 1984 at the Headquarters of the Rajendra Agricultural University, Pusa with the financial assistance of the Department of Non-Conventional Energy Sources, Ministry of Energy, Govt. of India. This centre organises training in construction and maintenance of biogas plants, Users, training for Bihar and Orissa State and demonstrations on biogas slurry manure to increase crop yield. Some salient achievements of this centre during 1988-89 are as under :

1. Training Programme : Seven Trainer's trainings each for 16 days, were organised by the scientists of the centre in which 66 Supervisory staff and 20 masons were trained and 112 days were spent on training. Two trainings for construction and maintenance of biogas plants were organised at this centre in which 23 masons were trained and 42 days were spent on training. Thus a total of 109 persons were trained for construction and maintaenance of biogas plants and 154 days were spent on training. In addition, 15 User's training, each for one day, were organised to impart training to users for maintanance of the biogas plant and use of biogas and its slurry manure. In practical session, main emphasis was given on construction of Biogas plants by the trainees themselves.

2. Demonstrations : To demonstrate the manurial value of biogas slurry manure, 20 demonstrations were conducted of which 10 demonstrations on paddy in kharif season; while in Rabi season, 4 demonstrations on Rai, 2 demonstrations on Rabi maize and 4 demonstrations on wheat crop were conducted at the beneficiaries field.

In rice crop demonstration, there was 2.01 quintal per hectare average increase in yield in slurry-treated plot. Average increase in yield in case of slurry treated Rai and wheat plot was found to be 1.25 quintal per hectare and 0.83 quintal per hectare, respectively.

(f) Adoption of villages to make smokeless chulha : One village namely Bela. Samastipur, Sadar Block has been adopted to saturate with biogas plants and to impart training for adoption of smokeless chulha. Similarily, village Haripur situated near main campus of the University, has been adopted to saturate with biegas plants and has been declared "Bio-gas Village."

1. Training to local masons : 29 local masons of neighboring blocks namely Pusa, Muraul, Kalyanpur and Samastipur Sadar were trained in biogas plants construction and maintenance work. Thus, this centre is acting as a boon to the neighbouring villages to get them the facilities of fuel and lighting and also manuring of fields.

(g) Economics of biogas plant in operation : A field study entitled "Socio-economics and personal correlates of Adopters and Non-adopters of Biogas Technology in North Bihar Block" was conducted under the supervision of training Organiser, of this centre. The study revealed that per annum net income from 2 CM., 3 CM.,

and 4 CM. biogas plants in operation was Rs. 2207.25, Rs. 2374.45 and Rs. 4155.95 respectively.

II. OPERATIONAL RESEARCH PROJECT

With a view to developing appropriate technologies for a given socio-economic and agro-ecological zone and solve operational constraints in adoption of new technologies, Operational Research Projects have been implemented, one each at Binda diara [Munger district] for diara areas, Barahiya Mokamah Tal for Tal areas and Agwanpur [Saharsa District] for Kosi embankment areas and Operational Research Project for S/C and O.B.C. in Pusa [Samastipur] Block. These projects have developed location specific appropriate technologies for socio-economic and agro-ecological zone and the same are being transferred to the farmers' fields through training, demonstrations, specialists' visits to farmers' field, field days, etc.

1. Operational Research Project, Barahiya Tal :

The Operational Research Project, Barahiya Tal functioning with effect from 5.11.85 with its objective of bringing radical improvement in pulses production in this pulses bowl of the State. The average yield is low due to use of lacal traditional varieties. Tal lands are vast stretches of bowl-shaped areas remaining inundated for two to four months and even more. There is no feasibility of growing *Kharif* crops during this period. The significant achievements activities of the project for the year 1988-89 are as under :

1. The Gram variety, Pusa-256 [18.40 q/ha] followed by SGS 82-2 and RAU-52 have been screened out for Tal areas.
2. The lentil variety Pl-77-2 yielded 17.31 q/ha followed by L 9-12.
3. The applications of Aldrex @ 10 ml/kg of seed for seed treatment against cutworm minimised the damage and enhanced the yield of gram & lentil.
4. Seed treatment with Bengard @ 2g/kg of Seed reduced seedling mortality & increased the yield of gram & lentil.
5. A pilot-trial on Potato Var. PC-46 and intra-row mixed cropping local variety of gram and wheat [3:1] was tried; and observed that it has an edge over sole crop of local gram.
6. The Govt. of Bihar, Deptt. of Agriculture conducted 187 demonstrations on gram Var. P256 and 1200. Pheromon traps were used for controlling the pod borers in pulses.
7. In addition, the parasits [*Trichograma*] and NPV has been used by the surveillance Deptt. of the Govt. of India for controlling pod borers in standing gram and lentil.
8. Scientists of the Project could broadcast four Radio Programmes through AIR, attended workshop, published four Research papers, presented one Status paper, attended two Kisan Melas and also attended one Agril. Exhibition-cum-fair during the period 1988-89.

2. Operational Research Project, Binda Diara :

This project started functioning at Diara with effect from 1984. Prior to that,

this project was operating in Taufir Diara. The main objective of this project was to improve the cropping system with maximising the yield after introducing the newer technology in diara area. The significant achievements of this project for the year 1988-89 are as under :

1. Appropriate seed rate of wheat and maize have given produced higher yield on comparision to high seed rate as shown in the trials of Diara area.

2. Wheat Var. BR 346 proved high yielder than the Var. UP 262 in irrigated condition and Var. BR 3016 & C 306 for unirrigated condition in Diara area.

3. Maize Var. Laxmi, Hemant, Hi-Starch and Swan are performing better than the local and C.V. Tulbulia.

4. For escaping the suitable medium duration maize variety from flood water, the Var. Ganga Safed-2 and Swan were found to be superiod to local and Tulbulia.

5. 65×25 on spacing was found to be suitable and productive spacing for maize in diara area.

6. Gram Var. Sg-2 and C-235 are well suited variety for Diara area and Pea Var. 66-B has also been screened for diara area.

7. The Rajmah cultivation is encouraging for the people of locality.

8. In vegetable cultivation, *Parwal* in cucurbits is doing well and the Var. Hilly and Nimia are going to replace the local variety in Diara Area.

9. Cultivation, of Bhindi, Bittergourd, Bottle gourd, Cucumber, water melon, Tomato and Potato cultivation is in progress.

10. Furadan 3 G @ 10-12 kg/ha and metasystox 35 EC @ 1 lit./ha/proved to be the best insecticides with Dithane M-45 for disease control in Maize.

11. Metacid 50 EC @ 1.5 lit/ha was found to the best for controlling the pest and disease in gram.

12. Sumicidin 50 EC @ 1 lit/ha or Rogar 50 EC @ 1.5 lit/ha has been found most effective to save the parwal crop against diseases and pests.

13. For the timely control of pests and diseases in Rai crop, it was found that the application of Metasystox 35 EC @ 1 lit/ha incrensed the yield.

14. Three folders and one technical bulletin have been published by the project scientists and distributed in Diara farmers.

15. A number of research papers have been published, Scientists have participated in Kishan Mela and Gosthi and AIR. programme.

III. NATIONAL SERVICE SCHEME :

1. Strength of Unit : The strength of units was increased from 8 to 10 during the period under report. The total enrolment of students was 770 (Male 670 and Female-100).

2. Orientation of Programme Officers and Students : Out of a total of 10 programme Officers in this University, 6 have been duly oriented, 400 newly enrolled students also received training.

3. Advisory Committee Meeting : Advisory Committee Meeting at University level and at the level of various Colleges were held to review the achievements and approve the annual programme.

4. Organisation of NSS Cell at University Level : One NSS has been appointed for which the stipend is being paid by the Government of India.

5. Organisation of National Integration Camp : For the first time in Bihar, our University organised a National Integration Camp from 14-20 February, 1989 at Tirhut College of Agriculture, Dholi Campus, in which 101 NSS Volunteers, NSS students (male 87, female-42 and teachers 32) from 11 Universities and 7 States participated. The programme consisted of rural re-construction, exchange of youths' view through debate, seminar, symposia, essay writting and lectures on important topics related to National Integration. Several prizes and certificates were awarded to Campers for outstanding performances. This programme was sponsored by the Govt. of India.

6. Organisation of orientation course for programme Officers of the Bihar State : As a sponsored programme, an orientation course was organised by this University from 18-29 December, 1988 at Pusa in which altogether 92 Programme Officers from 4 Universities within the State participated and successfully completed the training.

7. M. P. F. L. Programme : Different units have duly lunched MPFL Programme in their adopted villages and have so far distributed about 1000 literacy kits amongst identified learner. Students are involved in this programme as a regular activity.

8. Organisation of relief to victims of Earthquake : 51 NSS students of S. G. I. D. T., Patna alongwith the Programme Officer organised a relief work and assisted the District Authorities, Darbhanga in relief work.

9. Farmers' Advisory Service : Progamme for alleviation of proverty, under regular activities, students were involved in carrying out technical advisory service for improved agriculture, animal husbandry and fisheries in the adopted villages. Vaccination in cattle against contageous diseases, collection and analysis of soil samples, demonstration on production technology for oilseeds and pulses and on fruit and food preservation, candle and soap-making and preparation of cheap nutritive diet were organised with the help of students.

10. Celebration of Important Days : Units organised functions like Antipollution Day, World Literacy Day, World Women Day, Jawahar Birth Centenary etc. under general awareness programme.

11. Participation in N. I. Camp outside State : Ten students of the NSS unit of B.A.C., Sabour participated in N.I. Camp organised at Kokan Agricultural University, Dapoli, (Ratnagiri) Maharasta.

IV. TECHNICAL SUB-MISSION ON OILSEED PRODUCTION TECHNOLOGY

As envisaged in the Annual programme duly approved and recommended by

the Extension Education and Research Councils of the University, commitments were fulfilled and targets achieved successfully in the field of Oilseed extension and development and also in the field of oilseed research during the period under report.

(i) Kharif 1988-89 (Groundnut, Sesamum, Castor):

(a) Groundnut : Trainings were organised for farmers at village, Panchayat and Block level to impart knowledge of do-how-required for production of groudnut. Altogether 9 demonstrations were carried on farmers's fields at village—Pilkhi and Mahmada to show the economic viability and yield potentiality of groundnut (cultivar, M-13). Critical inputs were supplied through lab-to-land scheme and a team of 6 Oilseed Scientists supervised, monitored and evaluated the programme. The highest yield level of 36.5 q/ha was obtained in village Pilkhi (Sh. Shiva Chandra Jha). The average yield of well-dried (8.0% moisture) pod was 21.8 q/ha. Farmers in large number attended in two field days. The Agricultural Production Commissioner, Bihar, the Vice-Chancellor and Directors and Deans visited the fields and were highly impressed by the prospects of groundnut cultivation in North Bihar.

(b) Sesamum : Demonstrations were carried to show the correct production technology. On farmers field the highest yield level of 8.5 q/ha and an average of 5.6 q/ha were obtained from cultivar *Krishna*.

(c) An average yield level of 11.2 q/ha was obtained on farmer's plot [cultivar *Aruna*] under late sown [18. 8. 88] condition.

(ii) Rabi, 1988-89 (Rapeseed mustard):

During 1988-89, fortysix demonstrations were conducted in village Pilkhi [40 demonstrations] and Mahamada [one demonstration] to popularise high-yielding variety of mustard [i.e. Varuna] which on average produced 13.63 q/ha under normal town [Irrigated, Un-irrigated] and late sown [after paddy harvest] conditions. Highest yield of 27.60 q/ha was observed [farmar—Sri Ram Narayan Poddar] sown on 16.10.88 in one ha. area followed by Sri Satya Narayan Singh [27.04 q/ha, date of sowing 27.10.88 : area 0.13 ha.] and Sri Baldev Choudhary [17.00 q/ha date of sowing 26.8.88, area 0.90 haectare].

Dr. M.V. Rao, Special Director General, I. C. A. R., Dr. R. S. Paroda, D. D. G. [Crop Science], Dr. Downey and Dr. P. R. Kumar [Project Co-ordinator R & M] visited the demonstrations.

4. STUDENTS WELFARE

The Directorate of Student's Welfare caters the needs of the students vis-a-vis the policies of the University. The major functions of this Directorate is to inculcate discipline, sportsmanship and develop team sprit among the students so as to make them an ideal citizen. Besides this, the directorate deals with the award of different kind of fellowships, scholarships and assists the students in their placementation of the job market at State and National levels. The Directorate also co-ordinates and looks after the Hostel, Cafeteria, Canteen and other mess facilities of the students in each campus. The Directorate plans and co-ordinates all the extra-curricular activities in all campuses of the University. Following is a brief report on the activities, achievements and future plans of the various wings of the Directorate of Student's Welfare during the year under report.

I. Improvement of infrastructure :

[i] For efficient functioning of the cultural activities at campus, Pusa, necessary Musical Instruments were purchased and old instruments were repaired. White washing and colour printing of Vidyapati Kala Kendra was done.

[ii] Necessary repair and white washing of hostels located at T. C. A., Dholi, B.A.C., Sabour, B.V.C., Patna; S.G.I.D.T., Patna and R.A.U., Pusa were done.

[iii] Every month at least two feature films were screened for entertainment of the students.

[iv] 100 seated hostel was constructed for the S.G.I.D.T. students at Patna during the year under report.

[v] Construction of a new hostel at main campus Pusa was got sanctioned.

[vi] Provision for colour T. V. in place of B. & W., water cooler in the Boy's Hostel, Pusa as well as other hostels are under active consideration.

[vii] In the Home Science hostel, a well furnished common room and an indoor games room were developed. In the remaining room fans were provided. For better illumination tube-lights were provided.

[viii] A proposal was submitted to the Vice-Chancellor for construction of a twelve hundred seated auditorium at the main campus, Pusa.

[ix] A proposal was also submitted to Directorate of Sports and Youth Welfare, Govt. of Bihar for sanctioning the amount to develop infrastructure for indoor and out-door games in the University, as well as, for granting annual grant to manage the regular plays.

[x] For smooth functioning of the extra curricular programme organised at Vidyapati Kala Kendra, Pusa a best quality of curtain and Jhalar, 4 Carpets, 12 Battery were purchased.

[xi] A large number of furnitures previously broken were repaired for Boy's Hostel, R. A. U., Pusa.

II. Hostel and its Management.

The University maintains 13 hostels having two at the main campus, Pusa, two

at T. C. A., Dholi, 4 at B. A. C., Sabour, and 5 at B. V. C., Patna. Two hostels for girl students are maintained, one each at Hd. Qrs. and at B. V. C., Patna respectively. The hostel management and administration was done by Warden & Hostal Superintendents in each campus effectively under the supervision of Assoc Dean-cum-Principal concerned. In each campus, hostel authorities who completed their terms were replaced by new ones. Two hostel Superintendents and a Warden at B. V. C., Patna and one Superintendent and a Warden at S. G. I. D. T., Patna completed their terms and replaced by new ones. The term showed distinct improvement in the hostel management under the leadership of Dean, Agriculture Dr. P. N. Jha who is the Officer-in-Charge of the Boy's Hostel, Pusa. The girls hostel was managed efficiently under the leadership of Dean, College of Home Science, R. A. U., Pusa.

Students were provided with all the necessary amnities including news papers, magazines and indoor games in the hostel in each campus. The T. V. sets were provided in the hostels whenever necessary when students in each hostel witnessed the T. V. programme. The messes, cafeteria and canteen were managed efficently in each campus. The rates of breakfast and meal were quite cheaper as compared to local market despite increasing rates of food commodities.

III. Health Care :

For proper care of Student's health, three consultant Physicians were employed for each institution of the University who performed their duties effectively. At the main campus Pusa, there were a fullfleged hospital with the diagonistic facilities available under the charge of Chief Medical Officer and other medical Officers.

IV. Extra-curricular activities :

The extra-curricular activities mainly consist of sports and games, music and drama, literary and debate, film and photography, N. S. S. & N. C. C. For developing the various extra-curricular activities mentioned above, there is a two tyre system of functioning in the University.

A. Each College has a society for each extra-curricular activity viz.. games and sports, drama and music, literary and debate, film and photographic societies headed by the President from among staff members and assisted by Students Secretary, Assistant Secretary and Class Representative. Each society is responsible for holding regular activities. Inter class competition and annual competition were held to declare college team to participate in inter-college tournament.

B. At University level, each society has get President and Vice-President from among the staff members and this Central body operates under the Chairmanship of Director Student's Welfare. The central body is responsible for holding various inter college competitions, the selection of the University teams and participation of the University teams in the various activities. All India Inter-University Competitions were organised, besides formulation of policies and plans for development of each extra-curricular activities, in the University.

1. **Sports and Games Society : functions & achievements]**

Inter College Tournaments

(a) Inter College Foot Ball Tournament

The Inter College Foot Ball Tournament was held successfully at B. V. C., Patna in the 1st week of October. All the colleges of the University except B. A. C., Sabour participated in the tournament which was inaugrated by Dr. R. N. Singh, Principal. B. V. C., Patna. The T. C. A., Dholi team was winner and C. A. E. Pusa was runner.

(b) Inter College Table Tennis (Men and Women) tournament

The Inter college table tenis [men & women] tournament was organised by T.C.A., Dholi in the month of November. All the colleges of the University participated in the Table Tennis [Men] tournament. In the Men's section, P. G. team was declared winner and T. C. A. teacher was runner. In the Women's Section, College of Home Science team was winner & T. C. A., Dholi girls team was runner. On the basis of the performance of the players in this tournament, the Men and Women University Table Tennis teams were selected. The prizes were distributed by Dr. P. N. Jha, Dean, Agriculture with colourful ceremony.

(c) Inter College Volley Ball Tournament

The Inter College Volley ball tournament was also held at T. C. A, Dholi simultaneously with Inter College T. T. tournament. T.C.A., Dholi was declared winner and P. G. team was runner. In Inter College T. T. tournament, P. G. team was declared winner and T. C. A., Dholi was runner.

(d) Inter College Cricket Tournament

The Inter College Cricket tournament was held at B. A. C., Sabour in the month of December, 1988. T. C. A., Dholi was winner and B. A. C., Sabour emerged runners up in the tournament.

Inter University Tournaments

(i) I. U. Foot Ball Tournament : The University foot ball team participated in the All India East Zone Tournament organised by the Patna University. Our University defeated Indira Gandhi Agril. University, Raipur in the 1st round and its overall performance in the tournament remained quite satisfactory.

(ii) Inter University Table-Tennis Tournament : The East Zone Inter University Table-Tennis [M & W] tournament was held at Magadh University, Gaya. Men and Women team participated in the tournament. The performance of Shri Ram Vinod of our University was quite satisfactory.

2. Literary and Debating Society :

[a] In each campus, the literary and debating events were organised regularly during the session. Each college organised annual competition, and selected college team to participate in the All India Agril. Colleges/Universities competition.

(b) Participation in All India Agricultural College/Univs. Debate Competition :

[i] The All India Agril. College/Universities debate was organised at B. A. C., Sabour on 17-8-88. Sri Vikash Raj, a student of B. A. C., Sabour was declared the best.

[ii] A debate competition was organised by International Univ. Council at

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[ii] A debate competition was organised by International Univ. Council at Delhi in which two students of our University participated.

[iii] The same type of debate competition was organised at Maharashtra on 6-1-89 in which selected students of this University also participated.

[iv] A debate competition was organised in Home Science College, Pusa in which U.G. & P.G. students participated.

3. Music and Drama Society :

Variety entertainment and drama on different occasions were organised by the students in each campus.

4. Film Society :

In each campus, the society organised film-show at regular intervals for entertainment of the students. At main campus, Pusa the film society organised film-shows at intervals of about a fortnight on an average throughout the year.

(v) National Service Scheme (NS) :

In order to develop a sense of responsibility towards the Nation and the people, the National Service Scheme operated among the students. There are six units of National Service Scheme; one each functioning at T.C.A., Dholi; B.A.C., Sabour; B.V.C., Patna, S.G.I.D.T., Patna, College of Home Science, Pusa & College of Agril. Engineering at Pusa.

The N.S.S. volunteers took up different kinds social, cultural and technical works in the nearby adopted villages and imparted training in specific fields. They also participated in free plantation programme.

(vi) National Cadet Corps (N.C.C.) :

In order to develop characters, commandership, the ideal service to the nation and society and capacity for leadership with discipline and nationality in young and energetic students; each campus operates one N. C. C. Unit. Apart from regular parades in which cadets were trained in the relevent course content, they also took active part in Independence and Republic Day Celebrations, Kisan Mela, Official functions of the institutions and participated in certificate 'B' and 'C' examination.

One N.C.S. Unit (Coy) in the University for Girls students at Pusa has been proposed which is under active consideration by the Directorate of N C.C., Bihar.

(vii) Fellowship :

(i) As per norms of University, fellowships and scholarships were sanctioned to the students during the year. Bes des the University fellowship and scholarship, ICAR Junior and Senior scholarship for general students and Post Matric scholarship for SC/ST student were sanctioned & paid to the students.

(ii) Educational Tour : Educational Tour were sanctioned for the B. A. C., Sabour, B.V.C., Patna, S.G.I.D.T., Patna, T.C.A., Dholi and Agril. Engineering students during the year under report.

(viii) Students Guidance and Counselling Cell

Students guidance and placement cell has been established under the Directorate of Student's Welfare. For smooth functioning of this cell, the basic informations were collected from different Agril. Universities of our country and the matter is under processing in the directorate. The cell is properly functioning in achieving its mission.

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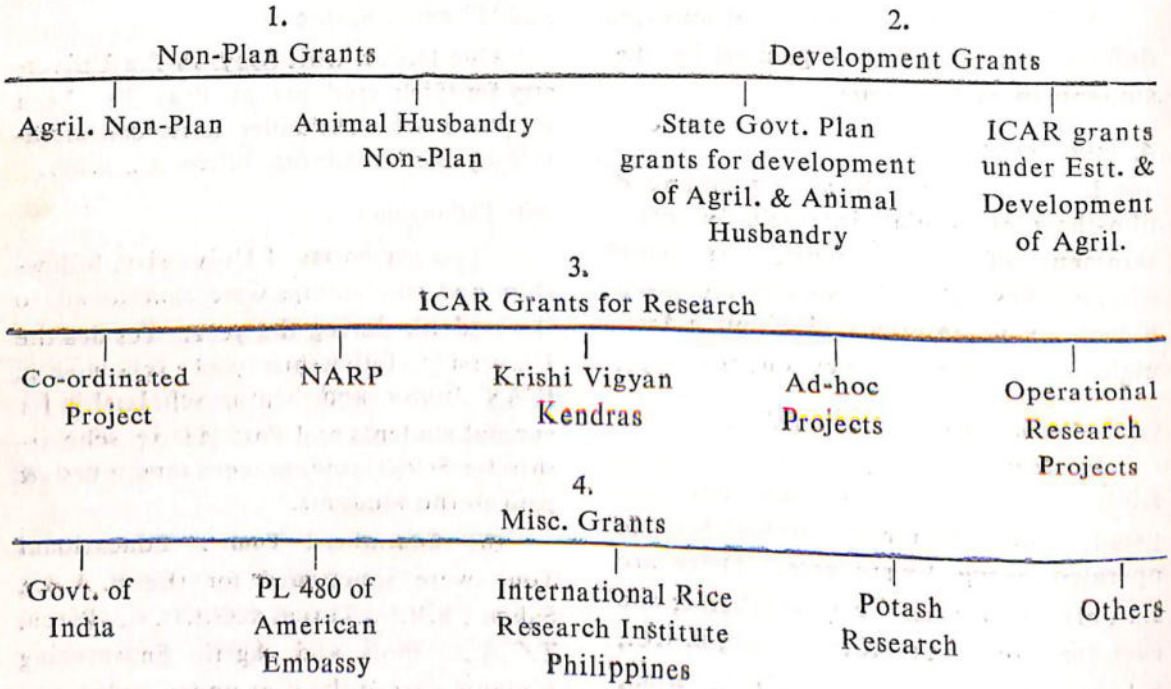
5. FINANCE

The resources of the Rajendra Agricultural University mainly consists of the followings for successful maintenance and development of its institutions and activities :

1. Agril. Non-Plan,
2. Animal Husbandry Non-Plan,
3. Agril. Plan,
4. ICAR Research Scheme,
5. Misc. Schemes.

For the schemes falling under serial 1 to 3 above, the University gets yearly grants from the State Government. For schemes under serial 4, grants from ICAR on 75% and 100% basis; and for schemes under serial 5, grants from different agencies on 100% basis are received. This will be clear from the following tables :



1. Non-Plan (Ag. & A. H.) :

Out of this grants; the University incurs expenditure on education, research, administration and extension activities every year.

2. Agril. Plan :

The State Government releases each year Plan grant for development of teaching, research and extension activities. From this grant, the University opens new Deptts., faculties and strengthens the old departments with men and materials; and constructs buildings for colleges, hostels, laboratories and residential purposes as approved by the State Govt. Further, the Indian Council of Agril. Research (ICAR) also provides assistance for development of this University in different spheres on such items as approved by the I. C. A. R.

3. I.C.A.R. Research Schemes :

The Indian Council of Agricultural Research is the other major organisation, which undertakes the responsibility for providing special assistance to the University mainly for the research activities under the following nomenclature :

1. Co-ordinated Research Project,
2. National Agril. Research Project (NARP),
3. Krishi Vigyan Kendras (KVK),
4. Ad-hoc Research Projects.
5. Operational Research Projects (ORP).

These projects are financed by the I. C. A. R. on 75 % and 100 % basis.

4. Misc. Schemes :

There are few other schemes which are financed by different agencies for a particular nature of research work. Amongst them the followings are the major funding agencies :

1. PL-480 of American Embassy,
2. Govt. of India,
3. International Rice Research Institute, Philippines.
4. Potash Research.

Abstract of Receipts and Expenditure for the year 1987-88.

The datailed statement of receipts and expenditure are given below, which represents the true picture of the financial position of the University :

(a) Abstract of Expenditure for the year 1987-88 (Rs. in Laks) :

Items	Non-plan	Plan	ICAR	Misc. Scheme	ICAR Dev. grant Plan	Suspense	Total

(b) Abstract of grants-in-aid received and University own receipt during 1987-88 (Rs. in Lakhs)

Non-Plan (State)	Plan (State)	ICAR (including Plan)	Misc. Grants	Interest S.T.D.R. from Banks	Univ. receipt.	Total
536.50	224.00	249.83	115.77	19.74	90.34	1236.18

(c) Abstract of Expenditure to be incurred during 1988-89 (Rs. in Lakhs)

	Actual 1987-88	Budget Estimate 1988-89	Revised Estimates 1988-89
1. Agril. Non-Plan	697.32	1239.02	1348.82
2. Agril. Plan	246.87	409.00	366.20
3. ICAR Esstt. & Dev. grants	17.16	45.50	87.83
4. ICAR scheme	142.75	184.84	206.81
5. Misc. scheme	34.21	17.20	35.12
6. Suspense	76.22	68.30	53.50
	Total—1214.53	1963.86	2098.28

General : Financial affairs of the University is managed by the Comptroller; and the accounts of the University and its Units are regularly audited at periodical intervals by the Internal Auditors of the University and annually by the Auditors of the Accountant General, Bihar.

3. Short duration, high yielding turmeric Variety R.H. – 10

4. Fourth batch Mali Trainees receiving certificate and kit bag
Agricultural Production commissioner Bihar Mr. Ardnaresh w