# ANNUAL REPORT
# 2005-06


RAJENDRA AGRICULTURAL UNIVERSITY, PUSA
SAMASTIPUR (BIHAR) - 848 125

# CONTENTS

# EXECUTIVE SUMMARY

Rajendra Agricultural University, Pusa has endeavored to retain the past glory of the place which has been the birth place of agricultural education, research and knowledge extension.

The University imparts education in agriculture and allied subjects through its five faculties. Faculty of Agriculture has two colleges - Bihar Agricultural College, Sabour and Tirhut College of Agriculture, Dholi. Post Graduate studies are conducted at the main campus at Pusa. Faculty of Veterinary and Animal Sciences consists of three colleges i.e. Bihar Veterinary College, Patna; Sanjay Gandhi Institute of Dairy Technology, Patna; and College of Fisheries, Dholi. The Faculty of Agricultural Engineering and Faculty of Home Science are located at Pusa. The basic and strategic researches are conducted at Faculty of Basic Sciences and Humanities, Pusa. The Institute of Agri-Business Management which has its maiden opening from the academic session 2006-07 also comes under this faculty. All the five faculties are engaged in education, research and knowledge extension activities.

During the history of past fifteen years (1991-2005), RAU has produced 1136 Graduates, and 951 Post graduates which include 197 Ph. Ds.

Research undertaken in the University covers all economically important crops grown in the state with focus on rice, wheat, maize, vegetables, fruits (mango, banana, litchi, papaya, acid lime, guava etc.) spices (turmeric, ginger, coriander, chilli, garlic, etc.), medicinal and aromatic plants. Besides, agro-forestry, animals (cattle, goats, pigs and poultry), fisheries, farm machines and implements, farming systems and post harvest technology of different crops are also the areas in which research activities are undertaken. The University has developed more than 150 improved varieties, several farm practices and technologies which resulted in increased income even in areas where severe biotic and abiotic constraints impeded production of the crops. RAU has been pioneer in developing hybrid mango, in giving concepts of Rabi Maize and Rabi Arhar which has been widely adopted not only in Bihar but other states also.

All the five wings of Directorate of Extension – Training, Information, Farm advisory service, Agriculture technology Information Center and Krishi Vigyan Kendras, play important roles in the development of the state. Rapid transfer of technology to the farmers is the main objective of the Directorate of Extension Education. It is effectively doing its job by organizing training programmes, conducting field demonstration and organizing Kisan Gosthi, Kisan Mela etc. The directorate is doing commendable service like providing training in diversified farm operations, establishment of vermicompost pits in the villages, providing information to the farmers through Kisan Call Centers of Farm Advisory Services and Agromet Advisory Services etc. With the opening of 10 new KVKs during this year, Bihar has also become the first state in the country to have KVKs in all the districts. This will certainly help in building a closer relationship between the scientists and the farming community. Through monitoring the growth and development of KVKs, the effective mandate of extension activities should be the implementation of the slogan, "*KVK is the engine of growth*".

## 1.1 EDUCATION

### 1.1.1 NUMBER OF STUDENTS PASSED

The number of undergraduate students passed during the academic session 2005-06 is 104 and the number of post graduate students passed is 61.

## 1.1.2 NEW INITIATIVES IN EDUCATION

Several new steps have been taken during 2005-2006 to revamp the undergraduate and postgraduate education system in order to make them competitive and responsive according to the present day need.

### 1.1.2.1 Revision of Course Curricula

The undergraduate curricula and course outlines for five faculties, and post graduate courses have been revised considering the national model, by adding new courses relevant to current needs and making more relevant by the addition of **Rural Agriculture Work Experience (RAWE)** or **in-plant training** to impart entrepreneurial skills and experience of working with farmers.

Introduction of project formulation and appraisal; management, **Plant Health Clinic (PHC)**; participatory rural appraisal (PRA); personality development; development of communication skill, enhancement of analytical ability, industrial attachment; group discussion and presentation; and documentation of work. Ensuring livelihood opportunities through employment generation and increased income through diversification are also given importance. Accordingly **Practical Crop Production (PCP) course have been diversified** to fruit production, vegetable production, floriculture, apiculture and mushroom production and food science. These changes in undergraduate program shall make the graduate more confident.

### 1.1.2.2 Increase in Number of Seats

Keeping in view the state requirements of human resource in agriculture and allied branches number of seats in UG and PG programmes have been doubled from academic session 2006-07 to enable more students to be enrolled to cater the need of food and nutritional security of the increasing population of the state.

**Increased Intake Capacity in Various UG & PG Programmes**

| Subjects | Intake | | |
|---|---|---|---|
| | UG | Master's | Ph.D. |
| Agriculture | 200 | 174 | 47 |
| Veterinary | 120 | 82 | 20 |
| Agricultural Engineering | 50 | 17 | - |
| Home Science | 50 | 12 | - |
| Dairy Technolgy | 50 | - | - |
| Fisheries | 50 | - | - |
| Basic Sciences | - | 10 | 06 |

### 1.1.2.3 New Under Graduate Programs

The University has decided to start several new undergraduate programs.

- **Initiation of Under Graduate degree programme in Food Science and Technology**

  University is going to start an undergraduate degree program in Food Science and technology with intake capacity of 50 students on self financing pattern.

- **Introduction of 4 years B. Tech.( Biotechnology) Degree Programme:**

  With the expertise and infrastructure available in university and the growing demand of Biotechnology in agriculture, Academic Council and Board of Management of RAU, Pusa has approved, a proposal to start four-year degree programme from academic session 2006-07, which will run on self financing pattern.

- **Establishment of a New Horticulture College**

  Keeping in view the vast scope of horticulture in the state and to provide trained manpower in horticulture University has decided to open Nalanda College of Horticulture from the academic session 2006-2007 and it has been inaugurated by Sri Nitish Kumar, Chief Minister, Govt. of Bihar.

- **Establishment of two Agriculture Colleges:**

  For the growing need of trained manpower in agriculture with the changing global scenario and to cater the need to tackle the climatic and ecological variation of each agro climatic zone, two new agriculture college have been proposed one each at Dumraon (Buxar) and Purnea and they are under the active consideration of the Government..

- **Establishment of Education Technology Cell**

  An Education technology Cell has been established at Pusa for monitoring and evaluation and making strategic planning for educational reforms in Bihar.

### 1.1.2.4 New Post Graduate Programs

- **Post Graduate Programme in Agri-Business Management:**

  **MBA( Agribusiness) programme** has been inaugurated by **Hon'ble Chief minister Sri Nitish Kumar** and has started from the academic session 2006-07. The programme will provide trained human resources in agri-business management.

- **Post Graduate program in Biotechnology:**

  To develop trained manpower in specialized fields of biotechnology, Post graduate programme in Bio Technology has been proposed from academic session 2006-2007.

### 1.1.2.5 Short Term Courses Launched

For increasing the availability of trained manpower, certificate courses in Artificial Insemination, Laboratory Technique, Mushroom Production, Computer Application andApparel Designing have been launched which will enhance the skill of students from different educational background for better employment.

### 1.1.2.6 Linkages

RAU has established linkages with IOWA State university, Ames IOWA, USA for cooperation in the fields of: Agriculture and Biosystem Engineering, with International

Rice Research Institute, Philippines for rice research besides Central Institute of Fisheries Education, Mumbai for fisheries education and research and National Mission on Bamboo Applications(Technology Information , Forecasting and Assessment Council, New Delhi) for setting up Model Bamboo Vegetative Propagation Center at Pusa.

## 1.2 RESEARCH ACTIVITIES

Presently there are altogether 39 All India Coordinated Research Projects, 11 Ad-hoc projects, 4 centrally sponsored projects and 3 projects funded by International Agencies. The entire research system is to develop economically viable and location specific technologies in irrigated, rain fed and drought/flood prone areas in order to provide improved farm techniques and livestock management skills.

### 1.2.1 AGRICULTURE

#### 1.2.1.1 Rice

About 1080 germplasms of rice belonging to upland, rainfed, lowland and deep water conditions are being maintained. Aromatic Rice cultures in the pipeline for release are Boro-Basmati RAU-3036 and RAU-3055.

Rajendra Agricultural University has developed several rice varieties e.g. Rajendra Basmati', 'Nati Mahsuri-1',' Rajendra Sweta' and 'Rajendra Kasturi' for different agro ecological conditions of Bihar.

#### 1.2.1.2 Maize

In Maize under co-coordinated trials the different maturity groups of experimental hybrids and composites were tested in 10 Co-ordinated trials along with three QPM and two speciality corn trials during Kharif- 2005.

Under station breeding programme altogether 24 experimental single cross hybrids were evaluated on the basis of superiority of hybrids over best check & promising experimental hybrids for common maize and two promising experimental hybrids for QPM maize have been identified.

#### 1.2.1.3 Oilseeds

Under oilseed development programme, different initial and advance trials of the varieties have been conducted for their maturity, yield content and oil contents. The varieties were also tested for different management practices like crop protection, crop production and use of biofertilizers. In oil seeds improved mustard varieties like 'Rajendra Rai Pichheti', and 'Rajendra Anukul' have been released.

#### 1.2.1.4 Tuber Crops

**RAU is number one in maintaing tuber germplasms in the country.** Altogether 1489 accession of different tuber crops are being maintained at Dholi centre. The center maintained highest number of germplasm in Sweet potato (1166), Yambean (137) Colocasia (75), Elephant foot yam (18). Dioscorea esculenta (10), Fur (12) , Cassava (22) Winged bean(20) , Kanda (25) Coleus (01) ,White yam (02) and Katchu (01). Growing of tuber crops in litchi orchard have been proved practically possible and economically viable.

Elephant foot yam when grown as inter crop in litchi orchard with full recommended dose of fertilizer (80:60:80 NPK/ha) gave highest cornel yield (33.0 t/ha) with net return of Rs. 1, 28,000/ha. Colocasia occupied second position in term of yield and profitability.

**1.2.1.5 Tropical Fruits**

Under tropical fruits a total of 86 banana clones belonging to different genomic groups are being maintained and studied for their economic characters. The promising clones have been tested for different management practices like fertilizer doses, protection against insects and diseases.

Altogether 17 litchi accessions are being maintained in the field gene bank at the centre. In variety evaluation studies where eight varieties were compared and the highest fruit yield was recorded from China trees. The accessions have been tested in different trials of planting density and management of diseases and pests.

**1.2.1.6 Jute**

Fifty accessions each of *C. olitorius* and *C capsularis* germplasm were evaluated for fibre yield, plant height and basal diameter and under *C. capsularis*, OIJ-228, OIJ-816 and OIJ-282 and under *C. olitorius* CEX-47, CIN-283 and CIX-846 have been identified as the best germplasms.

**1.2.1.7 Sugarcane**

New improved sugarcane varieties, namely, "B.O. 139", and "B.O. 147" have been released during the year.

- **BO 139** is an early maturing sugarcane variety with average yield of 84.0 t/ha in plant crop and 74.0 t/ha in ratoon. It produces average sugar yield of 9.80 t/ha and 7.30 t/ha in plant and ratoon crops, respectively with average sucrose percentage of 17.4. The variety is suitable for upland condition. It will prove itself a boon for the sugar factory as well as for cane growers due to its suitability for early crushing and quick early growth.
- **BO147** is a main season maturing sugarcane variety with average yield of 88.5 t/ha in plant crop and 79.5 t/ha in rations. It produces an average sugar yield of 10.20 t/ha and 9.00 t/ha in planting and ratoon crop, respectively with average sucrose percentage of 17.2. As the crops can withstand limited water logging it will prove a suitable variety among main season group both for cane growers and sugar factories

**1.2.1.8 Plant Genetic Recourse management:** Large number (1200) of land races of various crop species/medicinal and aromatic plants including rare land races of rice have been collected and deposited in NBPGR under conservation and management of biodiversity financed by ICAR/NATP.

## 1.3 EXTENSION EDUCATION

Training for field functionaries, farmers, unemployed youths, housewives and others are organized at the University headquarters, other campuses, and KVKs of the University to promote self-employment. Training programmes for farmers/farmwomen are mainly organized at all Krishi Vigyan Kendras on a routine basis. Moreover, various training programmes are organized for updating the scientific knowledge and to improve the technical skill of the officers of different state departments and NGOs. Primarily, trainings are intended to address problems of under-employment, unemployment and malnutrition in rural areas through diversification of agriculture and promotion of horticulture, fisheries, dairy, livestock, poultry, beekeeping, sericulture, mushroom production etc.

Beneficiaries of trainings imparted during the year 2005-06.

| Areas of Training | Beneficiaries | | |
|---|---|---|---|
| | General | SC/ST | Total |
| Crop Production | 10653 | 1619 | 12272 |
| Crop Protection | 5951 | 1058 | 7009 |
| Horticulture | 3347 | 872 | 4219 |
| Animal Science | 1908 | 360 | 2268 |
| Home Science | 1981 | 758 | 2739 |
| Others | 1761 | 804 | 2565 |

### 1.3.1 DEMONSTRATION

- **Frontline Demonstration on Vermi-Compost:** KVKs have demonstrated vermi compost production technology in the project areas. The FLD programmes conducted so far could create a remarkable awareness among the farmers in wide scale diffusion of the technology for independency towards fertilizer and also provide self employment for generating additional income to rural youth.

- **Field Demonstration on Cultivation Of Commercial Flowers:** Under the "Macromode Management Project Development of Commercial Floriculture in Bihar" to increase the area, production and productivity of commercial flowers in Bihar and to improve the economy of farmers demonstrations on cultivation of commercial flowers have been conducted during 2005-06.

**Number of Demonstrations Conducted on Cultivation of Commercial Flowers.**

| District | Marigold | Flower Tuberose | Rose |
|---|---|---|---|
| Samastipur | 85 | 23 | 19 |
| Muzaffarpur | 78 | 10 | 23 |
| Vaishali | 25 | 03 | 01 |
| Motihari | 10 | - | - |
| Bhojpur | 70 | 18 | 17 |

### 1.3.2 UNIVERSITY PUBLICATIONS

University is bringing out various types of publications for disseminating the knowledge up to the farmers for enriching their knowledge. Some of publications are

- Adhunik Kisan Diary
- Krishi Nirdeshika
- RAU News letter
- Adhunika Kisan Patrika
- Bulletins and folders on
  - Package of practices of crops,
  - Livestock production,
  - Fish culture,
  - Bee keeping,
  - Mushroom cultivation, and
  - Poultry

### 1.3.3 FARM ADVISORY SERVICE

The farm Advisory services comprise of scientists visits to villages, farmers visit to Research Station and replies to farmers queries through postal correspondence. A Kisan Call Center has been established at the University headquarters at Pusa. Farmers of the state can have access to the University experts through telephonic link dialing the number 06274 – 241694. Agro met Advisory Services Project (DST,Govt.of India) has achieved success in creating awareness among the farmers about the importance of weather in agricultural decision making.

**Activities of Farm Advisory Service**

| Activities | Number | Beneficiaries |
|---|---|---|
| Kisan Gosthi | 155 | 10143 |
| Field days | 63 | 4272 |
| Scientist visit to farmer's field | 1226 | 7474 |
| Diagnostic service | 197 | 3242 |

### 1.3.4 AGRICULTURAL TECHNOLOGY INFORMATION CENTER

Through this center, the Directorate is serving farming community by providing the most important input i.e. knowledge input along with other inputs such as seeds of different high yielding varieties of various crops, graft & gooties of horticultural crops, fertilizers etc.

This year a demonstration unit on Vermi-composting has also been constructed to make the visiting farmers aware of the benefit of Vermi-compost in maintaining the soil health.

### 1.3.5 KRISHI VIGYAN KENDRA

**Bihar has achieved the target of having one KVK in each district of the state.**

Bihar has created a network of 36 Krishi Vigyan Kendras located in 36 districts spreading over all the three agro-climatic zones of the state.Out of these 36 KVKs, 29 are with RAU and 7 are with NGOs. This year has witnessed a revolutionary progress in the establishment of KVKs in the RAU as with the approval of ICAR 10 new KVKS have been established in the districts of Lakhisarai, Jahanabad, Aurangabad, Gaya, Saran. Gopalganj, East Champaran, Sheohar, Supaul, and Kishanganj. Out of these 10 KVKs, 8 have already started functioning. In rest 2 districts KVKs will start functioning after settlement of site of the KVKs in the districts.

### 1.3.6 AGRI EXPO 2006: AN UNIQUE FEATURE OF KNOWLEDGE AND INFORMATION

Agri Expo 2006 first time in the history of Bihar was organized for four days from 2nd to 5th March, 2006 at RAU, Pusa with 200 stalls to disseminate knowledge and information with ultimate aim to infuse wisdom among the farm families for taking up their cultivation with change mind set in using latest technologies for boosting their agricultural production and realization belief in farming system, market driven diversified approach of cultivation for generating additional income to raise their standard of living to quality of life towards quality of human being. The development agencies of Govt. of India e.g. Coconut

Development Board, Patna; NHB, Patna; and NHRDF, through their exhibits and presentations caught attention of majority of visitors.

- **Four sugar mills, Commercial Banks**(Punjab National Bank, and Syndicate Bank), **Industrial Organizations** (15 of agricultural machineries, 6 of cheese technology, 6 of plant protection, 6 of food industries and 4 of Horticulture) participated in the expo and spread the message of awareness among farmers about various activities run by banks in the favour of farmers and rural masses.

- More than 10,000 farmers from the states of **UP, Jharkhand and also from Nepal** participated in the Agri-Expo 2006.

## 1.4 UNIVERSITY LIBRARY

- Digitization of Ph.D. and M.Sc. (1990 onwards) theses abstracts have been completed during the year and following facilities have been created in the library. University is having the following facilities
- LAN in University Library premises
- Six Computer nodes for surfing internet and CD ROM Databases
- CD ROM Database reference service to readers

## 1.5 WORKSHOPS, SEMINARS, SYMPOSIA HELD

Several Brain Storming Sessions on different crops like, sugarcane, oilseeds, rice, wheat, spices and floriculture, maize, pulses, potato, fruits vegetables, tuber crops and some other aspects like soil science and cropping research system have been organized during the year. In these sessions, several eminent scientists from all over the country had participated. The main objective of organizing such seminars was to retrospect the work done in the past on all the crops and to make strategic planning and prioritizing the future research action plan. With the changing global scenario and the new requirements, it was recommended that some more areas should be brought to the priority areas of research. National Conference on 'Strategic plans for development of horticulture in eastern India' was held for 3 days from 17 to 19 Feb., 2006.

## 1.6 NATIONAL HORTICULTURE MISSION

. Implementation of various NHM programmes by the University is expected to pay rich dividends, as Bihar's rich potentiality has not been exploited fully. The thrust of the programme, is on the development, in mission mode, to ensure adequate, appropriate, timely and concurrent attention to all the links in production and consumption chain, which should maximize the ecological and social benefits, from the investment and promote ecologically sustainable intensification and economically desirable diversification. Accordingly, the programme for development of horticulture has been prepared and following responsibilities have been given to the University.

1. Establishment of Plant Nurseries
2. Strengthening of Existing Tissue Culture Units
3. Vegetable Seed Production
4. Protected Cultivation
5. HRD in horticulture

## 1.7 FIVE MISSIONS OF RAU

After retrospection of the research work done in the past in the Brain Storming Seminars on all the crops and keeping in view the changing global scenario Rajendra Agricultural University has made strategic planning for the future research action plan. It has identified five missions as the thrust areas of research and extension activities.

- **Promoting Apiculture for enhanced production and income generation**
- **Vermicomposting for income generation**
- **Quality Seed Production**
- **Conservation Agriculture**
- **Integrated Farming System**

## 1.8 APPOINTMENTS

University has advertised 340 vacant posts of Junior Scientists, 17 posts of Deans & Directors and one post of Chief medical Officer during the year and efforts are being made to fill up these posts at the earliest.

Chapter 2

# INTRODUCTION

## 2.1 BACKGROUND INFORMATION

Pusa has a great historical importance. The seed of agriculture research and education was sown here, about a century ago, when the then Viceroy and Governor General of Imperial British India had laid the foundation stone of the proposed Agriculture Research Institute on April 1, 1905. The grand edifice name of the building, 'Phipps Laboratory' came up during 1907 which was named after its donor, Mr. Henry Phipps. The institute was renamed as "Imperial Agricultural Research Institute" (IARI) in 1919. It was shifted to New Delhi in 1936 on account of extensive damage to the Phipps Laboratory due to the devastating earthquake of 1934. Pusa is also credited to have first Sugarcane Research Institute, which was established in 1936 and is serving the country even today. Other campus of the university, Agricultural College at Sabour, Bhagalpur was established on 17$^{th}$ August 1908 by Sir Andrew Henderson Leith Freizer, the then Governor of Bihar, Bengal and Orissa. Veterinary College at Pusa was established in 2$^{nd}$ April, 1927. When the need of an Agriculture College was felt in North Bihar the State Government decided to have it at Dholi (Muzaffarpur), a place in the vicinity of Pusa and it was established in 1960. The college was named as 'Tirhut College of Agriculture'. Rajendra Agricultural University, established in December 3, 1970 by reorganizing three Agricultural Colleges at Sabour, Kanke and Dholi, two Veterinary Colleges at Ranchi and Patna, four Regional Agricultural Research Institutes located at Patna, Dholi, Sabour and Kanke and Sugarcane Research Institute, Pusa, the birthplace of agricultural research and education and has played a significant role in enlightenment of people concerned with agriculture.

Later, the University established one college each of Basic Sciences & Humanities, Dairy Technology, Agricultural Engineering, Home Science and Fisheries. The main Administrative Complex, the University Library, the Faculty of Agricultural Engineering, Faculty of Basic Science & Humanities, Faculty of Home Science, Post Graduate Departments of the Faculty of Agriculture, Dairy Farm of the University, Sugarcane Research Institute, University Apiary, Sanchar Kendra, and University Guest House are located at Pusa. The College of Dairy Technology and Bihar Veterinary College are located at Patna and College of Fisheries at Dholi. The Seed Production and Processing Unit of the university is located at Dholi which plays a pivotal role in production of quality seeds for the state.

Subsequently, the University under National Agricultural Research Project established a few research stations, sub-stations, farm science centres, operational research projects and such other wide ranging programmes for the benefit of the rural community. Now, Bihar has the privilege to have one KVK in each district.

## 2.2 MANDATE OF THE UNIVERSITY

- To impart education in different branches of agriculture and allied fields
- To undertake basic, strategic and applied research for developing technologies to enhance productivity and quality of agricultural and animal produce.
- To disseminate scientific information to farmers.
- To plan, organize and conduct *on campus* and *off campus* training programs for different functionaries and clientele in order to develop human resource capability in the field of agriculture.
- To help the state government in supplying breeder seeds towards production and multiplication of foundation and certified seeds.
- To provide consultancy services and expertise in the agricultural research and development to the industries, NGOs and others.
- To serve as a repository of national and international scientific information on various aspects of agricultural and animal production.
- To collaborate with relevant national and international agencies for all round development of agriculture in the state.

## 2.3 FACULTIES OF THE UNIVERSITY

Faculty of Agriculture
Faculty of Veterinary and Animal Science
Faculty of Agriculture Engineering
Faculty of Basic Sciences & Humanities.
Faculty of Home Science
Faculty of Post Graduate Studies

## 2.4 CONSTITUENT UNITS OF THE UNIVERSITY

### 2.4.1 Bihar Agricultural College, Sabour

Bihar Agricultural College, Sabour is one of the six Agricultural Colleges in India established during 1906 to 1910 and has been a premier Institution of agricultural education and research in the country. It was established on 17th Aug.1908.

### 2.4.2 Tirhut College of Agriculture, Dholi

Tirhut College of Agriculture, Dholi was founded on 18th August, 1960 by first chief minister of Bihar Late Dr. Srikrishna Singh. More than four decades have passed after the establishment of the College and during this period notable successes have been achieved in the field of teaching, research and extension.

### 2.4.3 Bihar Veterinary College, Patna

The Bihar Veterinary College, Patna, one of the four pioneer and the oldest veterinary colleges in undivided India was established on 2nd April, 1927. Institution has actively been involved in development of veterinary and animal husbandry through teaching, research and extension.

### 2.4.4 College of Home Science, Pusa

The college of Home Science was established in the year 1982 at Pusa with major objectives to foster the growth, development and well being of individuals, families and

communities. The College of Home Science stands for academic excellence, where young women are equipped to meet successfully the challenges of the family and get opportunity. Besides this, the college has also started vocational courses for 6 months duration in different areas of Home Science

### 2.4.5 College of Agricultural Engineering, Pusa

This college is located at Pusa and was established on 7th December 1983 with the objectives to impart good quality teaching to students for the B.Tech and M.Tech degrees, to conduct basic and applied researches in all the aspects of Agricultural Engineering, to develop suitable technologies for farmers, entrepreneurs, industrialists.

### 2.4.6 Faculty of Basic Sciences & Humanities, Pusa

Faculty of Basic Sciences and Humanities was establishment in Rajendra Agricultural University, Pusa in November 1981 with the objective to strengthen the teaching and research programme in different disciplines of basic sciences so that it can act as a strong supporting programme for the other faculties

### 2.4.7 College of Fisheries, Dholi

The college of fisheries was established on 13th January 1987 at Dholi, Muzaffarpur. This college is creating trained human resource to develop the great potentiality of the fisheries sector in Bihar.

### 2.4.8 Sanjay Gandhi Institute of Dairy Technology, Patna

The Sanjay Gandhi Institute of Dairy Technology was established on 14th December 1980 at Patna for creating human resource in the field of Dairy Technology. The practical aspects of the teaching programme are supported by well equipped laboratories on various aspects of dairy science and technology.

## 2.5 DEGREE PROGRAMMES OF THE UNIVERSITY

- **Undergraduate programmes** in the fields of Agriculture, Veterinary Sciences, Home Science, Fisheries, Agricultural Engineering and Dairy Technology.

| Degree | Duration (years) | Intake |
|---|---|---|
| B. Sc. (Ag.) | 4 | 200 |
| B. V. Sc. and A. H. | 5 | 120 |
| B. Sc. (H. Sc.) | 3 | 50 |
| B. Tech. (Ag. Engg.) | 4½ | 50 |
| B.Tech. (D.T.) | 4½ | 50 |
| B. F. Sc. | 4 | 50 |

- **Post Graduate programme in 33 fields** of specialization with a total intake capacity of 304 students.

| Disciplines | Intake capacity |
|---|---|
| Agriculture | 174 |
| Agricultural Engineering | 17 |
| Basic Science & Humanities | 10 |
| Home Science | 12 |
| Veterinary & Animal Science | 82 |

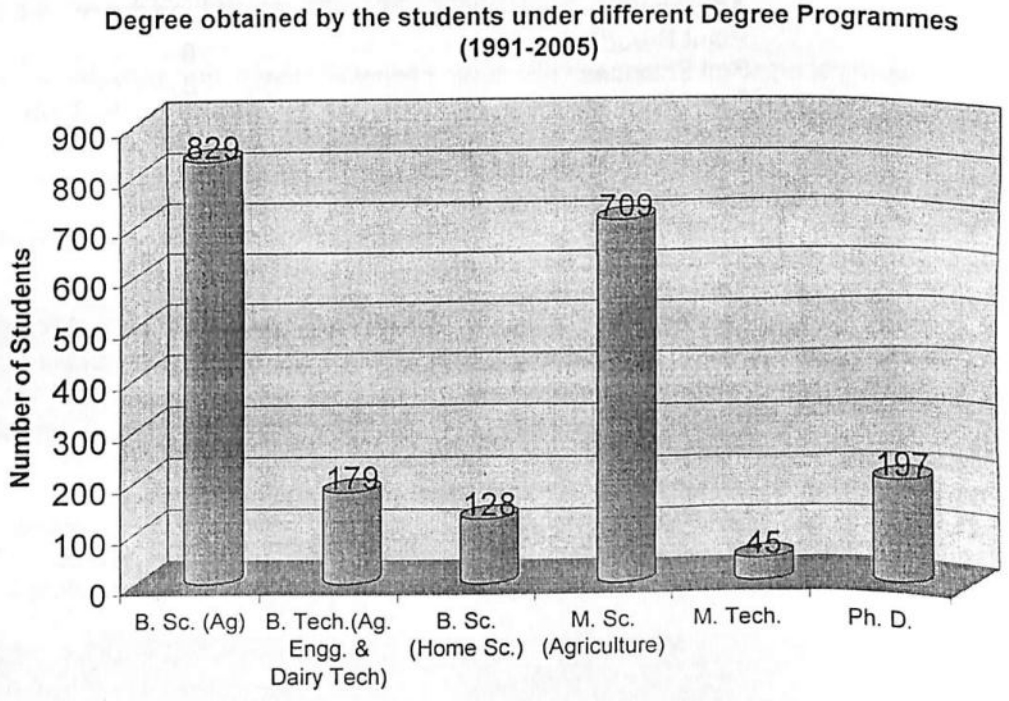
- **Ph.D. programmes** in **17 departments** with a total intake capacity of 73 students.

| Departments | Intake Capacity |
|---|---|
| Agronomy | 8 |
| Plant Breeding | 8 |
| Soil Science | 8 |
| Plant Pathology | 6 |
| Entomology | 5 |
| Agricultural Economics | 3 |
| Extension Education | 3 |
| Horticulture (Pomology) | 3 |
| Horticulture (Olericulture) | 3 |
| Plant Physiology | 3 |
| Genetics | 3 |
| Veterinary Anatomy & Histology | 3 |
| Veterinary Microbiology | 5 |
| Veterinary Parasitology | 3 |
| Animal .Breeding & Genetics | 3 |
| Veterinary Pharmacology | 3 |
| Veterinary Medicine | 3 |

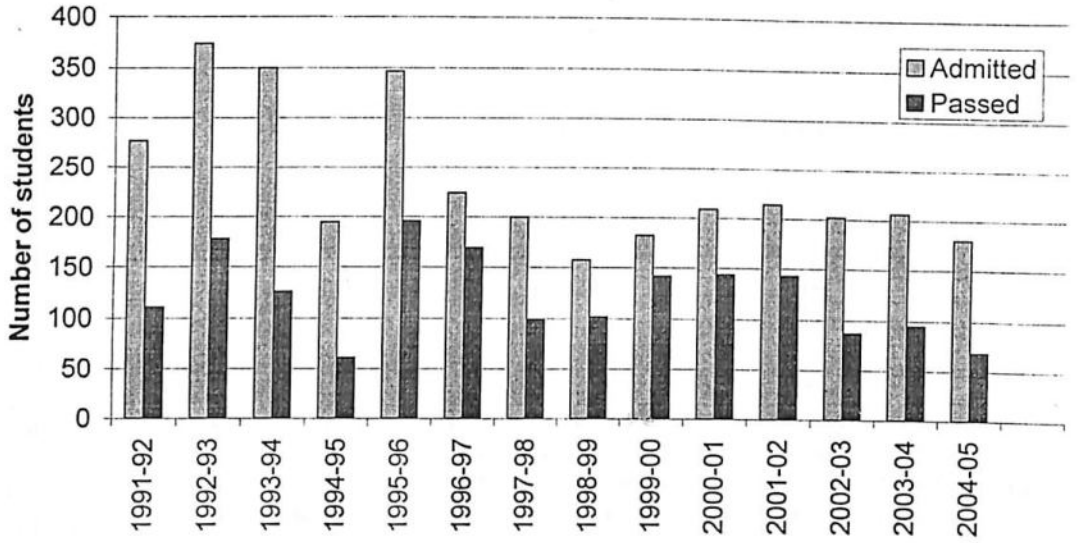
Chapter 3

# PAST ACHIEVEMENTS

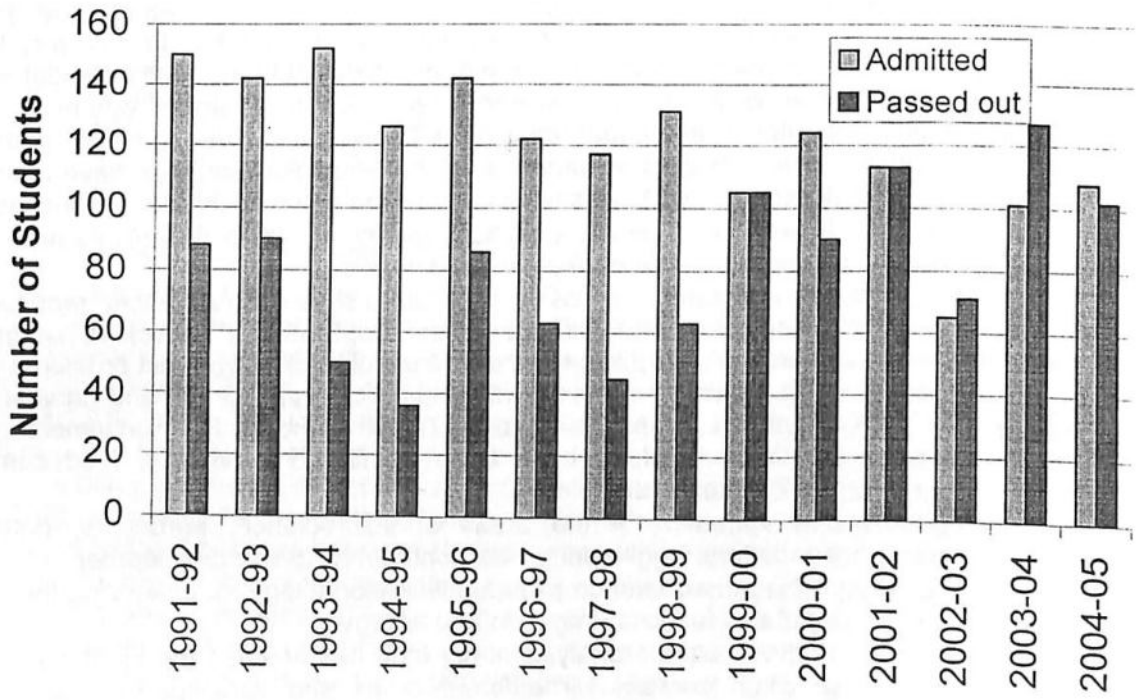
## 3.1 EDUCATION



**Admitted and Passed Out Students in Undergraduate Courses (1991-2005)**




**Admitted and passed out students in Post Graduate courses (1991-2005)**



## 3.2 RESEARCH

- Research undertaken in the University covers all economically important crops grown in the state with focus on rice, wheat, maize, vegetables, fruits (mango, banana, litchi, papaya, acid lime, guava etc.), spices (turmeric, ginger, coriander, chilli, garlic, etc), medicinal and aromatic plants, agro-forestry, animals ( cattle, goats, pigs and poultry); fisheries; farm machines and implements; crop and animal management; farming systems and post-harvest technology of different crops. In that process, the University developed several improved varieties, farm practices and technologies which resulted in increased income even in areas where severe biotic and abiotic constraints impeded production of the crop.
- **The University is pioneer in recommending the cultivation of maize and pigeon pea in *Rabi* season in the country. The technology has been adopted on large scale by the farmers of other states.**
- Various nutritionally superior QPM based preparations viz. infant food, health food etc. have been prepared. QPM based animal feed have also been prepared where pulse as one of the ingredients has been totally replaces by QPM leading to cheaper cost.
- Recently two fine and scented rice varieties namely "Rajendra Kasturi" and "Rajendra Suwasini" were released. Another variety "Rajendra Mahsuri-1" was released to replace "Nata Mahsuri" which has become susceptible to brown plant hopper. It is a semi dwarf variety producing medium slender grain maturing in 140-145 days with an average yield of 5.5. t/ha . One more rice variety named "Rajendra Sweta" was released for its semi-dwarf plant stature and medium slender (fine) "Basmati" type grains. Its yield potential is 4.0-4.5 t/ha with a maturity period of 140-145 days.
- In Oilseeds two superior varieties namely "Rajendra Rai Pichheti" and "Rajendra Anukul" were released. The former has late or very late maturity. Rajendra Anukul matures in 110-115 days and its yield potential is 12-13 q/ha.
- The technology for the boro rice cultivation in areas, otherwise unproductive (water-logged chaur lands), has been possible due to efforts of this university. Four high yielding varieties for this ecological situation have been developed. Recently the University has developed some scented rice varieties too.
- In a bid to conserve genetic diversity, all research stations are maintaining a large number of germplasm of different crops.
- An integrated approach to pest/ disease surveillance/ monitoring, use of biological control and need-based application of pesticides has greatly helped in reducing crop losses and also upsurge of newer pest problems.
- Safe waiting periods between insecticide application and harvest of important vegetable crops have been recommended for consumers' safety. The pesticide residues have been monitored in various food commodes and environmental samples.
- The research in the areas of soil science, agronomy, horticulture and agricultural engineering has contributed to the development of improved soil management and crop- production technology for optimizing the benefits from inputs as fertilizer, irrigation and energy.
- Water –balance analysis in dry land has enabled the identification of suitable growing seasons for different crops and varieties for inter cropping and double- cropping sequences.
- Success has been achieved in the reclamation of saline-alkali soils with chemical and organic amendments, appropriate cropping practices, innovation in sub-surface drainage and agro-forestry programmes.

- Improved agronomic package of practices have been evolved for various cropping system. These practices include better seeding, fertilizer application, irrigation water management, *in situ* moisture conservation, water harvesting and recycling and weed control.
- Research in agricultural engineering has led to the development of farm machinery and power, improved agricultural implements, optimizing energy input in agriculture, post –harvest technology and application of plastic in agriculture. The use of zero tillage machine has been successfully demonstrated for sowing of wheat. The cultivators have started using the machine for sowing wheat after paddy.
- Concerted efforts were made to encourage efficient use of marginal lands and augmentation of biomass production through agro and farm forestry.
- The faculty of Basic Science and Humanities had made a head way towards the development of a hybrid rice variety. Bio-chemical markers for screening pigeonpea varieties have been developed which would enable development of some virus resistant pigeonpea cultivars. Pure culture techniques have also been standardized for brinjal, some tuber crops and maize.
- The scientists of BVC, Patna has prepared nugget from goat meat. A goat farm with several improved breeds has been established at APRI, Pusa. The objective is to produce cross- breed kids having good body weight and meat quality by crossing she –Bengal goat with Beetal/ Jamunapari/ Sanana/ Barabari bucks.
- Causes and suitable treatment of summer infertility in buffaloes, a major problems confronting the livestock owners causing them a great economic loss in terms of calf and milk production, were found out through a series of investigations at BVC, Patna.
- Causes, treatments and preventive measures of some of the new diseases affecting the animals (viz.- Dagnela & Aflotoxicosis) and birds (e.g. infectious bursal diseases) were searched out.
- A pioneer in the field of sugarcane research, the University has evolved a large number of commercial varieties of sugarcane. Some of them such as BO-91, BO-102 & BO-128 have been considered as wonder varieties. BO-102, BO- 128, BO-99 have been found very high in sucrose contents. BO-120 & BO-128 have been found to be suitable for waterlogged areas and making good quality gur. Similarly, variety BO-136 & BO-137 has been found better for main season. BO-128 and CoP-9702 varieties have been identified as salt tolerant . CoP 9206, CoP 9301, CoP 9302 , BO-130 are rich in sucrose content and high yielding. The BO-138 (early group ) and CoP 9702 (mid – early group) varieties have been released for high yield and better sucrose content.BO-139, BO- 147 were also released recently by the University.
- The state of Bihar has monopoly in litchi production. About 70% of the country's production comes from this state. As the shelf life of the litchi fruit is very short at ambient conditions, significant achievement has been made in extending its post-harvest storage life up to 32 days at low temperature. A protocol has also been developed for handling fresh litchis for export.
- Honey yield with the Italian honey bee species is highest in Bihar as compared to any other state of India with a production 40 and 60 kg honey/ hive/year under stationary and migratory bee keeping, respectively.
- In a living repository more than 87 germplasm of medicinal & aromatic plants have been assembled from different parts of the country.
- The soil resources have been systematically surveyed and interpreted for providing land –use maps. As a result of the soil survey work at Bihar Agricultural College, Sabour over the years, reconnaissance soil survey of the entire state of Bihar has been completed and soil maps prepared.

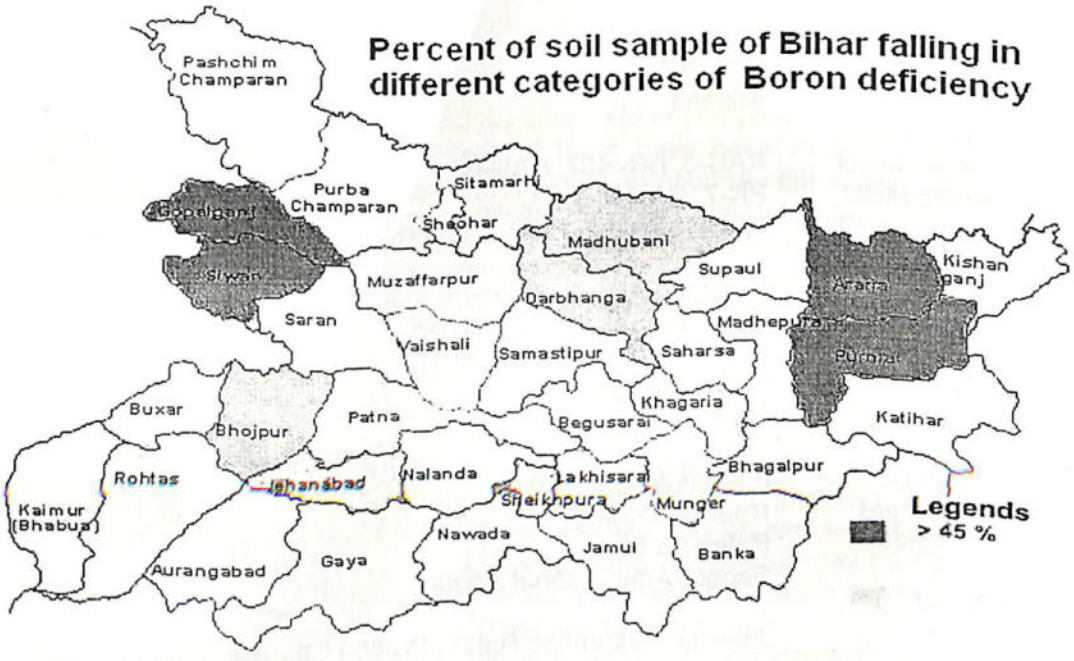
- Most of the soil types in Bihar have become deficient in zinc availability for the growing crops. Basal soil application of 25 kg Zinc sulphate per hectare every year for short duration crops under such situation has been recommended. For rice-wheat cropping system or for long durations crop like sugarcane, however, basal soil application of 50 kg Zinc sulphate per hectare alternate year is recommended. Half of the zinc-sulphate fertilizer can be saved if it is applied in the soil along with 50 q/ha FYM or compost.
- Ten to more than 50% soils of Bihar have been found to be deficient in available sulphur. Intensive cropping cultivation of high yielding crop varieties and application of sulphur free high analysis fertilizers has further aggravated the problem. Soil application of sulphur in the form of phosphogypsum or single super phosphate (SSP) @ 40 kg /ha for short duration crops (Pulses, Oilseeds, etc.), 60 kg per hectare for long duration crops ( sugarcane) every year will take care of sulphur deficiency in soils .
- Soil testing based fertilizer prescription equations has been developed and tested for achieving targeted yields of different crops. The use of this approach not only achieves the target yield of crops but also increases maximum profit and maintains production soil fertility for sustainable.
- Under upland sandy loam soil condition a light irrigation, ten days after planting of potato helps in quick and uniform emergence of the plants. By adopting this practice, an additional yield of 30 q/ha may be obtained. This leads to an additional benefit of Rs. 6000 to 9000 per ha depending upon the market price of Rs. 200 to 300 per quintal of Potato.
- A statistical data analysis software RAUSTAT for Window Version 1.0 is a group of several program files written in Computer language. These program files are written as per the requirement of statistical data analysis needed by the researchers. It is capable of analyzing the experimental observation arising from CRD, RBD, SPD up to 3 factors factorial structure, transformation of data, analysis of co-variance, t, F, Z, Chi Square tests of homogeneity of variances, stability analysis, computation of Mahalanobis $D^2$ for large number of varieties and pooling of results arising form SPD are the advanced features of this software.

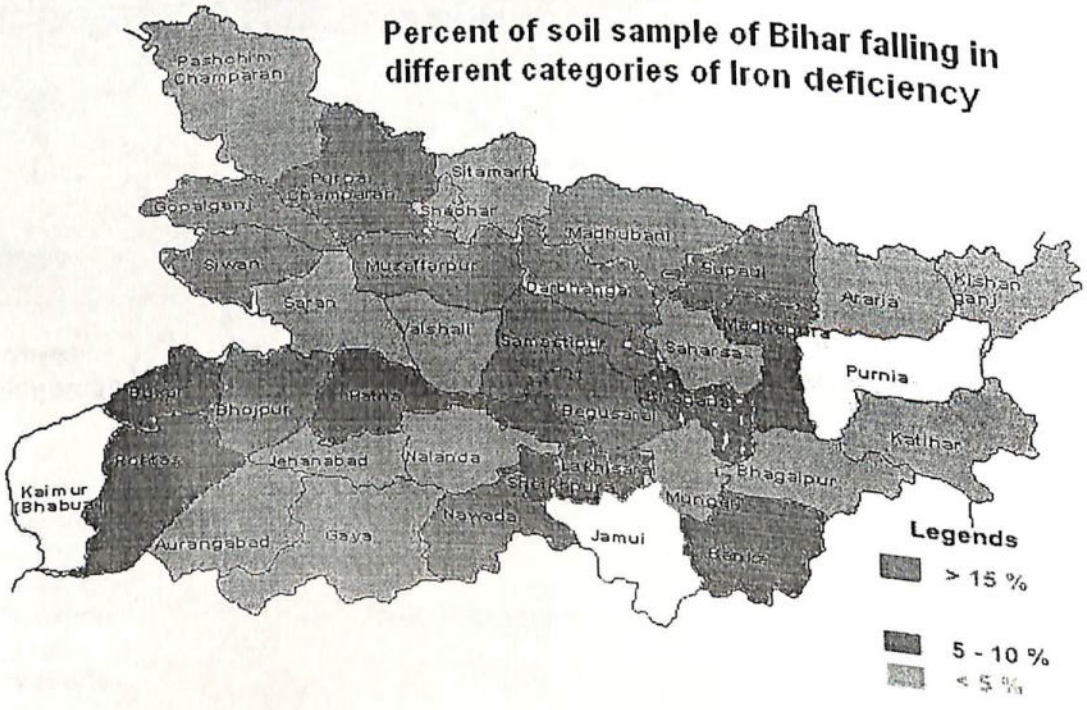
## CROP VARIETIES DEVELOPED BY RAU

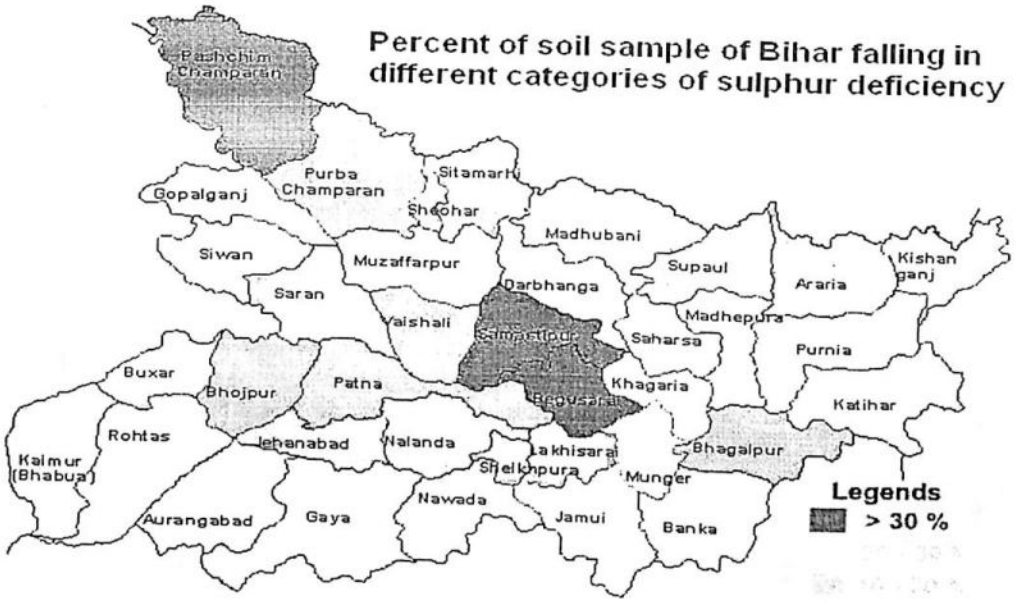
| Crop | *Varieties* |
|---|---|
| **Rice** | Rajshree, Sudha, Janki, Kamini, Turant, Prabhat, Kanak, Vaidehi, Sita, Gautam, Shakuntala, Satyam, Kisori, Richharia, Dhan Laxmi, Santosh, Saroj, Rajendra Kasturi, Rajendra Suwasini, Rajendra Mahsuri-1, Rajendra Sweta |
| **Maize** | Rajendra hybrid-1, Rajendra hybrid-2 , Laxmi composite, Hemant composite, Dewaki composite, Suwan composite, Shaktiman-1, Shaktiman-2, Shaktiman-3, Shaktiman-4, |
| **Wheat** | Rajendra Wheat- 346, Rajendra Wheat-341, Rajendra Wheat -3016 |
| **Sugarcane** | B070, B091, B099, BO102, BO 108, BO 109, BO 110, BO 116, BO 120, BO 128, CoP 9208, CoP 9301, CoP 9302, BO 130, BO 136, BO 137, BO 138, CoP 9702 |
| **Pulses** | |
| Pigeonpea | Bahar, Sarad |
| Moong | Amrit, Sona |
| Green gram | Navin |
| Chickpea | RAU-52, M.G.-2, Rajendra Chana-1, |
| Lentil | Arun |
| **Oilseeds** | |

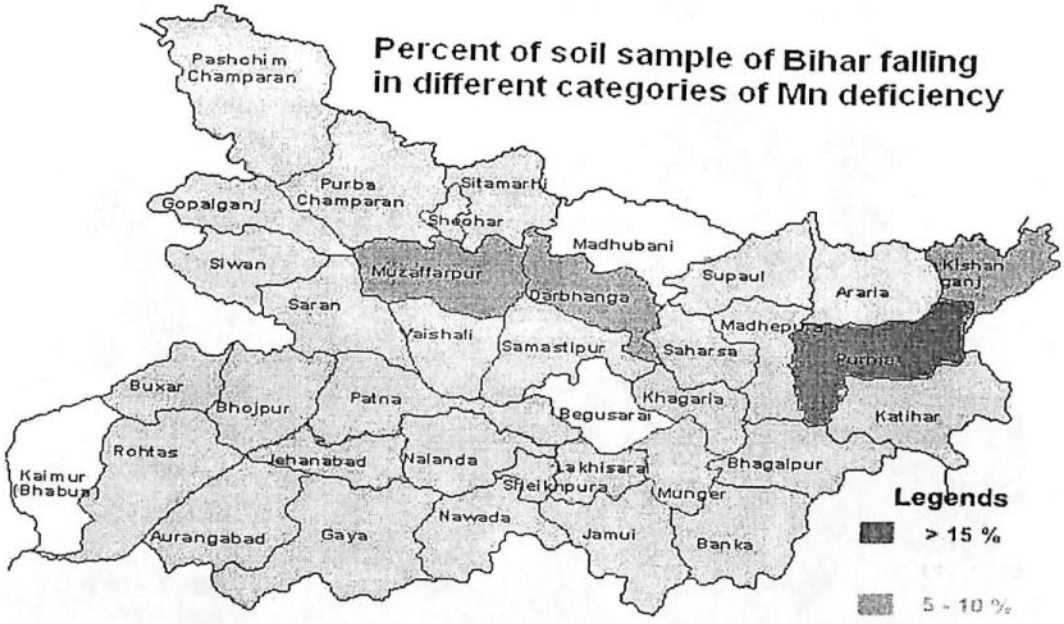
| | |
|---|---|
| Rapeseed | B.R-23, RAU TS-17, RAU TS-1, Dholi composite-940, Dholi composite-9402 Rajendra Rai Pichheti, Rajendra Anukul |
| Yellow mustard | 66-197-3, Rajendra Sarso-1, Swarna |
| Mustard | B R P |
| Groundnut | Kuber |
| Castor | E B 16 A |
| Seasum | Krishna |
| **Small Millet** | |
| Finger Millet | RAU-3, BR- 407, RAU-08 |
| Proso Millet | BR-7, RAU M-5 |
| Barnyard Millet | RAU-1, RAU-2, RAU-3, and RAU-9. |
| **Tuber Crops** | |
| Potato | Rajendra Aloo-1, Rajendra Aloo-2, Rajendra Aloo-3 |
| Sweet Potato | Rajendra Sakarkand ( RS) -5 |
| Yambean | Rajendra Mishrikand (RM-1) |
| Arvi | White Gauriya |
| Elephant Yam | Gajendra |
| **Spices** | |
| Turmeric | Rajendra Sonia- 10 |
| Fenugreek | Rajendra Kranti |
| Coriander | Rajendra Swati |
| Chilli | Sabour Anal, Sabour Angar |
| **Fruits** | |
| Mango | Jawahar, Mahmood Bahar, Prabha Shankar, Sundar Langra, Alfazli, Sabri , Menaka |
| Litchi | Madhu |
| **Vegetables** | |
| Brinjal | Rajendra Annpurna, Rajendra Baigan-2 |
| Parwal | Rajendra Parwal-1 and Rajendra Parval-2 |
| Bottle gourd | Rajendra Chamatkar |
| Sponge gourd | Rajendra Nenua-1 |
| Okra | BBN-57 |
| Jute | Sada pat-1 |

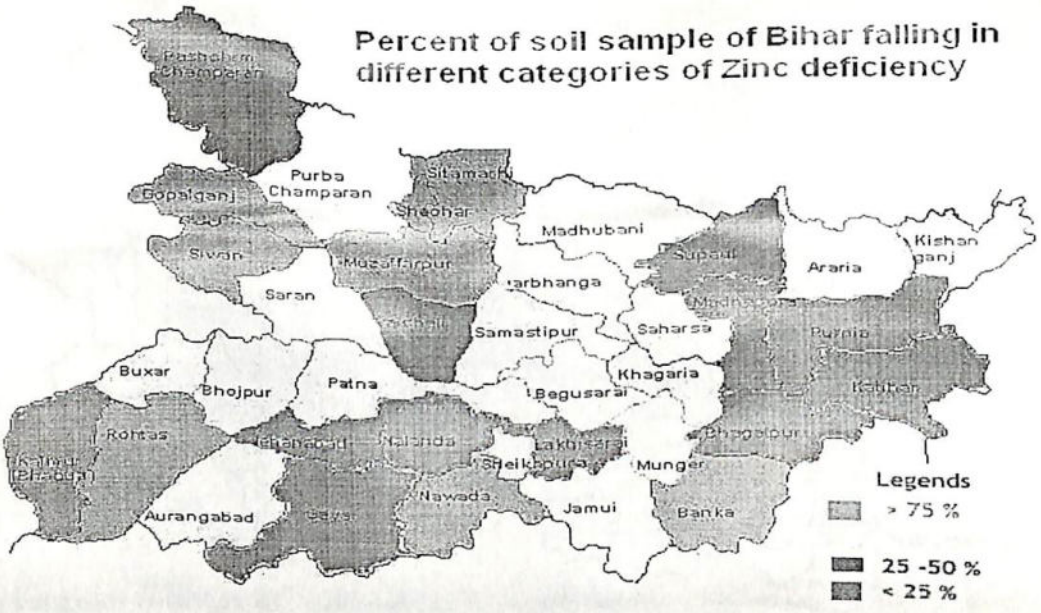
DELINEATION OF SOILS OF BIHAR FOR MICRO AND SECONDARY NUTRIENT STATUS

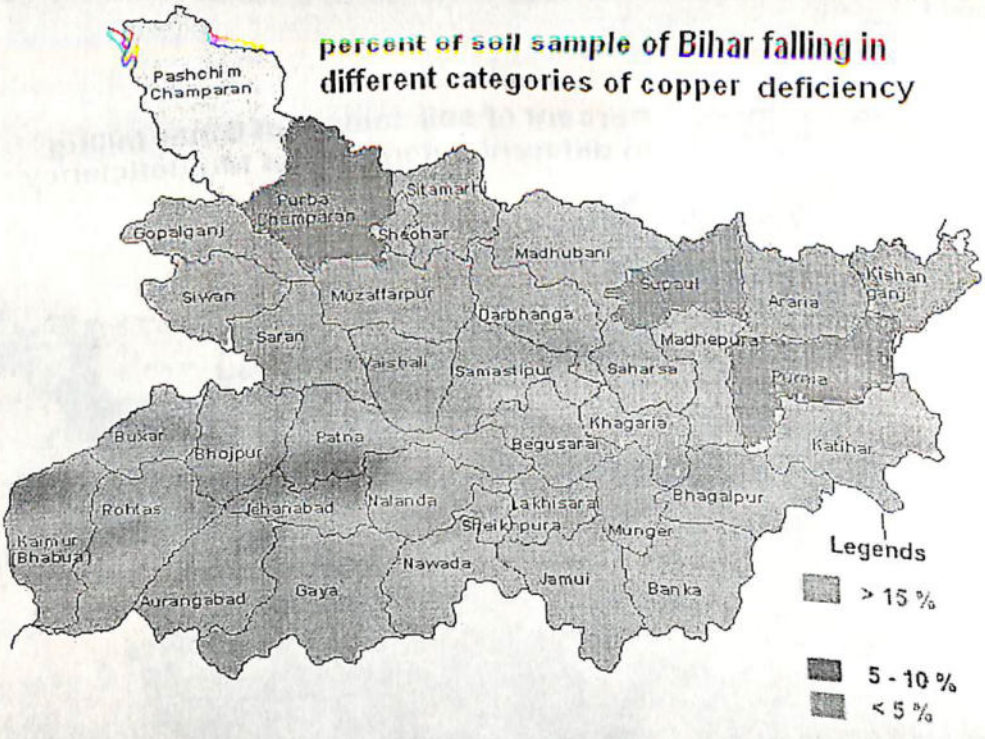



Percent of soil sample of Bihar falling in different categories of sulphur deficiency
Pashchim Champaran
Purba Champaran
Sitamarhi
Gopalganj
Sheohar
Madhubani
Siwan
Muzaffarpur
Supaul
Kishan ganj
Araria
Saran
Darbhanga
Madhepura
Vaishali
Samastipur
Saharsa
Purnia
Buxar
Bhojpur
Patna
Khagaria
Begusarai
Katihar
Rohtas
Jehanabad
Nalanda
Lakhisarai
Bhagalpur
Kaimur (Bhabua)
Sheikhpura
Munger
Nawada
Aurangabad
Gaya
Jamui
Banka
Legends
> 30 %


Percent of soil sample of Bihar falling in different categories of Mn deficiency
Pashchim Champaran
Purba Champaran
Sitamarhi
Gopalganj
Sheohar
Madhubani
Siwan
Muzaffarpur
Supaul
Kishan ganj
Araria
Saran
Darbhanga
Madhepura
Vaishali
Samastipur
Saharsa
Purnia
Buxar
Bhojpur
Patna
Khagaria
Begusarai
Katihar
Rohtas
Jehanabad
Nalanda
Lakhisarai
Bhagalpur
Kaimur (Bhabua)
Sheikhpura
Munger
Nawada
Aurangabad
Gaya
Jamui
Banka
Legends
> 15 %
5 - 10 %




## 3.3 EXTENSION ACTIVITIES

This Directorate was established in the year 1977 as a statutory wing of the University. Prior to this, the State Government controlled the extension activities of the university. The objective behind creation of this Directorate was to establish a close linkage between the technology generation and technology dissemination units and establishment of linkages between State Department of Agriculture, University, ICAR and other Institutes.

All the five wings of Directorate of Extension – Training, Information, Farm advisory service, Agriculture technology Information Center and Krishi Vigyan Kendras, can play important roles in the development of the state. Rapid transfer of technology to the farmers is the main concern of the Directorate of Extension Education. It is effectively

doing its job by way organizing training programmes, conducting field demonstration and organizing Kisan Gosthi, Kisan Mela etc. The directorate is doing commendable service like providing training in diversified farm operations, establishment of vermicompost pits in the villages, providing information to the farmers through Kisan Call Centers of Farm Advisory Services and Agromet Advisory Services etc.

Bihar has also become the first state in the country to have KVKs in all the districts. This will certainly help in building a closer relationship between the scientists and the farming community. Through monitoring the growth and development of KVKs, the effective mandate of extension activities should be the implementation of the slogan, "*KVK is the engine of growth*".

### 3.4 STATUS OF STUDENTS WELFARE AND ACTIVITIES

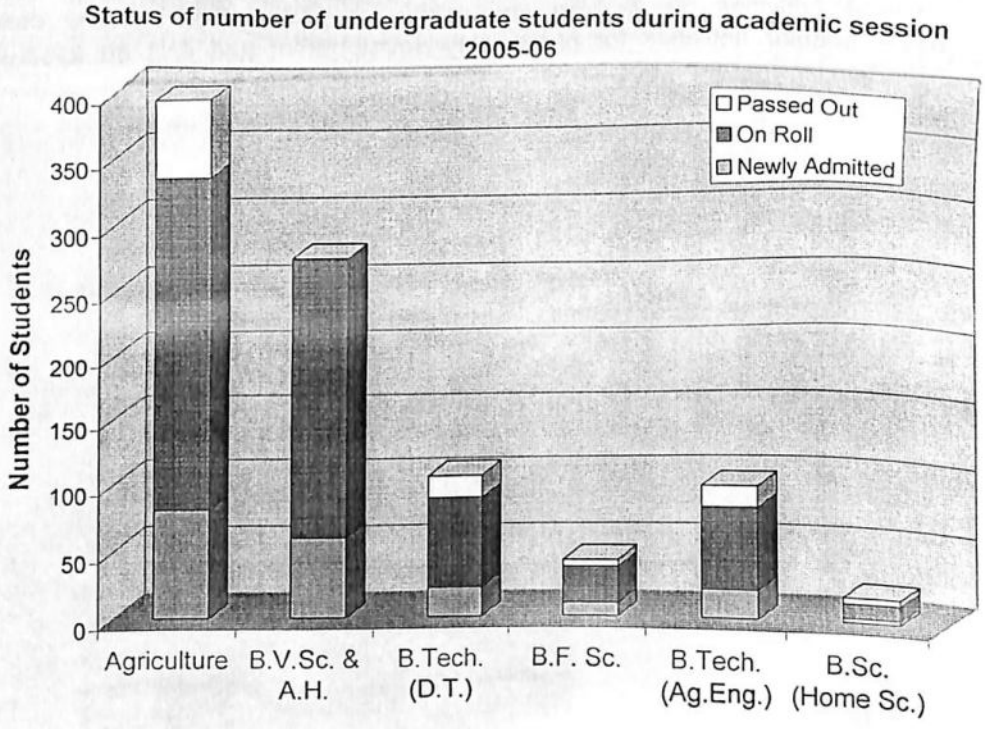
Various societies like, Games & Sports society, Elocution/Debate society, NCC/NSS section and Cultural society are essential activities in every educational institution that inculcate team spirit and competitiveness among students besides physical and mental development. Annual sports meets are regularly organized in the university and the students are participating at the national level. But, Debate Competitions and Cultural Activities are lacking among the students which are the essential part of extracurricular activities for personality development and it is an essential criteria for selection by the corporate sectors.

Chapter 4

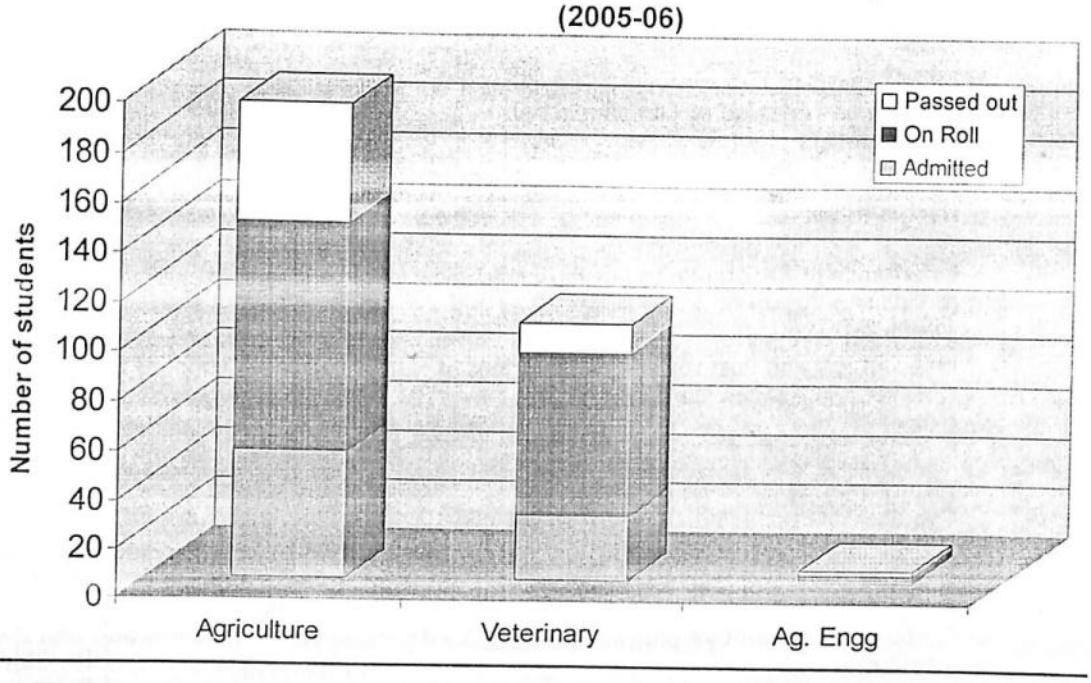
# SALIENT ACHIEVEMENTS DURING 2005-06

## 4.1 EDUCATION

### 4.1.1 UNDER GRADUATE AND POST GRADUATE STUDENTS PASSED DURING ACADEMIC SESSION 2005-06



Post Graduate students admitted, on roll and passed out (2005-06)




## 4.1.2 THESES SUBMITTED

### 4.1.2.2 Ph.D Theses

| Title of Thesis | Author | Major Advisor |
|---|---|---|
| **Agriculture Economics** | | |
| Indian Agricultural Exports during Post Liberalization Period - Direction, Composition and Diversification | Upendra Kumar | Dr. B. N. Verma |
| A Study on Social and Human Development Aspects of Poverty in North Bihar: A Micro Level Analysis | Veena Kumari | Dr. R. K. P. Singh |
| **Agronomy** | | |
| Effect of Transplanting Time and Nitrogen Level on performance of Low Land Rice (*Oryza sativa* L.) under Delayed Condition | Manoj Kumar | Dr. S. J. Singh |
| Effect of Tillage and Irrigation on Soil-Water-Plant Relationship and Productivity of Winter Maize in North Bihar | Sanjeev Kumar | Dr. V. P. Singh |
| Response of Seed Cane to Levels and Time of Nitrogen and Potassium Application | Virendra Kumar Gupta | Dr. V.P. Singh |

**Extension Education**

| | | |
|---|---|---|
| Effectiveness of Entrepreneurial Development Training on Behavioural Components of Entrepreneurs | Reeta Singh | Dr. Madan Singh |

**Horticulture**

| | | |
|---|---|---|
| Inheritance of Resistance to Powdery Mildew (*Erysiphe polygoni* DC.) and Heterosis in Pea (*Pisum sativum* L.) | Sunita Kushwah | Dr. M. M. Pujari |
| Effect of Pre and Post Harvest Applications of certain Chemicals on Shelf Life of Litchi Var. China | Rajan Kumar | Dr. V. S. Brahmachari |

**Plant Breeding**

| | | |
|---|---|---|
| Genetics of Yield Components and Photosensitivity in Rainfed Lowland Indica Rice (*Oryza Sativa* L) | Ramesh Kumar | Dr. P. B. Jha |
| Characterization of Cytoplasmic influence in hybrid rice | Nilanjaya | Dr. Rajendra Prasad |

**Plant Pathology**

| | | |
|---|---|---|
| Integrated management of Maydis leaf blight of maize (*Zea mays* L.). | Annapurna Kumari | Dr. M. M. Jha. |

**Soil Science**

| | | |
|---|---|---|
| Characterization of soils of Chandan River System (Watershed) | Ajit Kumar pandey | Dr. S. N. Prasad |

### 4.1.2.3 M.Sc. Theses

| Title of Thesis | Author | Major Advisor |
|---|---|---|
| **Agriculture Economics** | | |
| A Study on Rationale of Resource Use Efficiency in Wheat and Winter Maize Production in Khagaria District | Rakesh Kumar Singh | Dr. R. R. Mishra |
| Economic Analysis of Total Factor Productivity of Rice and Its Determinants in Bihar | Shailendra Kumar | Dr. D. K. Sinha |

Agronomy

| | | |
|---|---|---|
| Effect of Fertility and Weed Management on the Yield of Wheat (*Triticum aestivum* L) | Shambal Chandra Prakash | Dr. I. B. Pandey |
| Response of Wheat (*Triticum aestivum* L.) Genotypes to Sowing Dates under Irrigated Condition | Niranjan Kumar | Dr. N. K. Choudhary |
| Integrated Nutrient Management on Yield and Quality of Sugarcane (*Saccharum officinarum* L.) | Sanjeet Kumar | Dr. Devendra Singh |
| Integrated Nutrient Management in Potato (*Solanum tuberosum* L.) | Niraj Kumar | Dr. Gokulesh Jha |
| Response of Rice Varieties to Nitrogen Levels under Rainfed Upland Conditions | Vikas Kumar | Dr. S. K. Choudhary |
| Studies on the Economic Feasibility and Production Potential of Intercropping in Rabi Maize | Amrendra Kumar | Dr. K. K. Sinha |
| Effect of Methods of Sowing and Levels of Fertilizer on Growth, Yield and Quality of Wheat | Manohar Kumar | Dr. N. K. Choudhary |
| Response of fine aromatic rice (*Oryza sativa* L.) to moisture regimes and NPK levels. | Pankaj Kumar | Dr. Vinod Kumar |
| Effect of sowing dates on growth and yield of newly released wheat varieties under irrigated condition of north Bihar. | Manoj Kumar | Dr. I. B. Pandey |

Entomology

| | | |
|---|---|---|
| Biology and Management of Maize Stem Borer *Chilo partellus* Swinhoe in Bihar | Md. Jawed Idris | Dr. P. P. Singh |
| Foraging Activity of Honeybees on Summer Cucurbits | Ranjeet Kumar | Dr. Baleshwar Singh |
| Bioefficacy and Residue Studies of Some newer Insecticides in Okra, *Abelmoschus esculentus* (L.) Moench | Kumari Mitali Lal | Dr. S. P. Singh |
| Studies on Species Composition of Stem Borer and Leaf Folder in the Rice Ecosystems of Bihar | Chandeshwar Prasad Rai | Dr. A. K. Misra |

Extension Education

| | | |
|---|---|---|
| Adoption Behaviour of Farmers towards Rice Production Technology in Deep Water Situation of Madhubani District of Bihar | Arun Kumar Paswan | Dr. Madan Singh |
| Training Needs of Turmeric Growers: A Study of North Bihar | Anil Kumar | Dr. Ashok K. Singh |
| Adoption Behaviour of Chilli Growers in Vaishali District | Kumar Gautam | Dr. Madan Singh |
| Knowledge Gap and Training Needs of Banana Grower's of Bhagalpur District | Anil Paswan | Dr. K. K. Sinha |
| Adoption behaviour of summer moong growers - a study in Darbhanga district. | Kaushal Kishore Sharma | Dr. A. K. Singh |

Horticulture

| | | |
|---|---|---|
| Heterosis in Tomato *(Lycopersicon esculentum* Mill.) | Vinit Kumar Chaudhary | Dr. D. N. Choudhary |
| Studies on the Response of Hybrid and Non Hybrid Okra *(Abelmoschus esculentus* (L.) Moench.) to Levels of Fertilizers | Uma Kant Singh | Dr. R. R. Singh |
| Effect of Triacontanol and Urea on Yield and Quality of Guava *(Psidium Guajava* L.) Cv. Allahabad Safeda | Shailendra Kumar Singh | Dr. U. S. Jaiswal |
| Studies on Genetic Variability and Path analysis in Tomato (*Lycopersicon esculentum* Mill.) | Amit Ranjan | Dr. D. N. Chaudhary |
| Evaluation of Some Late Mango Varieties | Bisliwamitra Sinha | Dr. Naresh Kumar |
| Effect of pre and post-harvest application of various chemicals on shelf life of guava fruit (*Psidium guajava* L.) var. Allahabad Safeda. | Priya Ranjan | Dr. U. S. Jaiswal |
| Effect of different chemicals on shelf-life of Mango Cv. Langra | Manoj Kumar | Dr. U. S. Jaiswal |

Plant Breeding

| | | |
|---|---|---|
| Gene Effects for Quality Protein Content and other Quantitative Traits in "Quality Protein Maize" (QPM) *(Zea mays* L.) | Ravikant | Dr. Rajendra Prasad |
| Variability Studies in Sunflower *(Helianthus Annuus* L.) Germplasm | Sulakshna Kumari | Dr. Anil Pandey |
| Choice of Parents and Crosses in Hybrid Maize Breeding | Niraj Kumar | Dr. P. K. Singh |
| Choice of Clones in Early Clonal Generations in Sugarcane *(Saccharum complex hybrids)* Breeding | Chandrakant | Dr. P. K. Singh |
| Combining Ability Analysis of Newly Developed Yellow Inbred Lines of Maize *(Zea Mays* L.) | Ashok Kumar Sinha | Dr. P. K. Singh |
| Index Selection in Intervarietal Crosses of Sugarcane (*Saccharum complex* L.) | Ramsevak Sahu | Dr. S. S. Pandey |
| Genetic Study of Quality Traits of Indigenous Aromatic Short Grain Rice (*Oryza sativa* L.) | Md. Mateen Ashraf | Dr. S. B. Mishra |
| Genetic variability and interrelationship between yield and its components in Prosomillet (*Panicum Miliaceum* L.) | Agendra Kumar | Dr. R. S. Rai |

Plant Pathology

| | | |
|---|---|---|
| Studies on Paddy Straw Mushroom | Vedratna Kumar | Dr. Dayaram |
| Investigations on Fruit rot of Banana *(Musa* Spp.) | Chandrashekhar Azad | Dr. Sanjay K. Singh |
| Maydis Leaf Blight of Maize in Relation to Stresses | Avadh Kumar Patel | Dr. M. M. Jha |
| Studies on Anthracnose Disease of Betel Vine *(Piper betle* L.) caused by *Colletotrichum* spp. | Sunil Kumar | Dr. B. P. Yadav |
| Studies on Leaf Blight of Colocasia [*Colocasia esculenta* (L.) Schott.] Incited By *Phytophthora colocasiae* (L.) Rac. and it's Management. | Manoj Kumar Yadav | Dr. B. P. Yadav |
| Studies on the management of late blight of potato caused by *Phytophthora infestansl (Mont.)* de Bary. | Neelima | Dr. M. M. Jha |
| Studies on mass multiplication and formulation of *Trichoderma viride*. | Ranavay Kumar | Dr. J. P. Upadhyay |

**Soil Science**

| | | |
|---|---|---|
| Availability and Distribution of Applied Potassium under Different Nutrient Management Practices in Rice-Wheat Cropping System | Madhavi Kumari | Dr. R. Prasad |
| Studies on Microbial Activities and Micronutrient Availability in a Long Term Experiment on Crop Residue and Zinc Application under Rice-Wheat System | Rakesh Kumar Prasad | Dr. K. Mandal |
| Effect of Sewage Sludge on Sorption and Kinetics of Desorption of Cadmium in Calcareous Soils | Shiva Nath Suman | Dr. S. K. Thakur |
| Mulching in relation to phosphorus nutrition in autumn planted sugarcane. | Vinay Kumar | Dr. M. Kumar |

**Farm machinery**

| | | |
|---|---|---|
| Performance Evaluation of Different Types of Paddy Transplanters and Seeders for Sowing of Paddy | Sanjay Kumar | Dr. A. K. Sinha |

**Soil & Water Engineering**

| | | |
|---|---|---|
| Evaluation of Composite Effect of Drip Irrigation and Mulching on Banana Crop | Ravi Ranjan Kumar | Dr. R. Suresh |

**SMCA**

| | | |
|---|---|---|
| Forecasting Wheat (*Triticum aestivum* L.) Yield using Biometrical Characters along with Farmer's Appraisal | Rajiv Kumar | Dr. R. C. Bharati |

**BioChemistry**

| | | |
|---|---|---|
| Biochemical Studies on the Nutritional Quality and Biodegrading Efficiency of *Pleurotus florida* Grown on Wheat Straw | Jitendra Nath Thakur | Mr. A. A. Daudi |
| A Comparative Study of Nutritive Value of *Pleurotus Spp.* and their Biodegrading Efficiency on Paddy Straw | Sanjeev Kumar | Dr. N. Prasad |

**Genetics**

| | | |
|---|---|---|
| Characterization and Evaluation of Rice Germplasm | Madhu Rani Bharati | Dr. V. K. Sharma |
| Improvement of Oyster Mushroom *(Pleurotus* Species) through Hybridization | Krishna Kumar Singh | Dr. M. Kumar |

| | | |
|---|---|---|
| Evaluation of Isocytoplasmic Restorers for Wild Abortive Rice Cytoplasm | Narendra Kumar | Dr. V. K. Sharma |

**H.Sc Extension**

| | | |
|---|---|---|
| Impact of Apicultural Training Programme on Rural Women | Anuradha Ranjan Kumari | Dr. Meera Singh |
| A Comparative Study of Indigenous Products on Blood Parameters of Selected Diabetic Subjects | Kumari Rashmi | Dr. Mukul Sinha |
| Nutritional Status of Pregnant Women in Relation to Anthropometric Indices of New-Born Babies | Basanti Kumari | Dr. Mukul Sinha |

## 4.1.3 V$^{th}$ CONVOCATION

Fifth convocation of the University was held on March 20, 2006 in the premises of Sugarcane Research Institute., Pusa (Samastipur) Dr. Mangla Rai, Secretary, DARE & D.G., I.C.A.R. was the Chief Guest on the occasion and delivered convocation address.In this Convocation degree certificates were conferred upon to the students who have graduated and Post-graduated from the University between. 01.06.2001 to 17.03.2006

**Number of Recipients of Degree Certificates**

| Degree Programmes | Number of students |
|---|---|
| B.Sc. (Agriculture) | 99 |
| B.V.Sc. & A.H | 92 |
| B. Tech (Dairy Technology.) | 44 |
| B.F.Sc. | 12 |
| B. Tech (Agricultural Engineering) | 31 |
| B.Sc. (Home Science.) | 06 |
| M.Sc.(Agriculture.) | 148 |
| M.V.Sc. | 68 |
| M. Tech ( Agricultural Engineering) | 08 |
| Ph.D. | 48 |
| **Total** | **556** |

- In the Convocation the University honored Dr. Mangla Rai, Secretary, Department of Agriculture Research & Education and Director General, Indian Council of Agricultural Research, New Delhi with Honorary degree of Doctor of Philosophy.
- The Chief Guest Dr. M. Rai, Department of Agriculture, Research & Education and Director-General, Indian Council of Agricultural Research, New Delhi conferred Gold Medal along with Gold Medal Certificates to 19 students of the University for their excellent academic achievements.

**The Gold Medal (back log) award Ceremony**: It was held on 26th of January, 2006,on the occasion of Republic Day in the Flax House. Hon'ble Vice-Chancellor, Dr. H.P. Singh, conferred the "Gold Medal" and "Gold Medal Certificates" to 64 candidates.

### 4.1.4 NEW INITIATIVES IN EDUCATION

Recently several new steps have been taken to revamp the undergraduate and postgraduate education system according to the present day need.

#### 4.1.4.1 REVISION OF COURSE CURRICULA

The undergraduate curricula and course outlines for five faculties, and post graduate courses have been revised considering the national model. These curricula were modified in 2006, by adding new courses relevant to current needs and making more relevant by the addition of **Rural Agriculture Work Experience (RAWE)** or **in-plant training** to impart entrepreneurial skills and experience of working with farmers.

Introduction of project formulation and appraisal; management, **Plant Health Clinic (PHC)**; participatory rural appraisal (PRA); personality development; development of communication skill, enhancement of analytical ability, industrial attachment; group discussion and presentation; and documentation of work. Ensuring livelihood opportunities through employment generation and increased income through diversification are also given importance. Accordingly **practical crop production (PCP)** course have been diversified to fruit production, vegetable production, floriculture, apiculture and mushroom production and food science. These changes in undergraduate program shall make the graduate more confident.

#### 4.1.4.2 INCREASE IN NUMBER OF SEATS

Number of seats in UG and PG programmes have been doubled from academic session 2006-07 to enable more students to be enrolled to cater the need of food and nutritional security of the increasing population.

#### 4.1.4.3 NEW UNDER GRADUATE PROGRAMS

The University has decided to start several new undergraduate programs.

- **Initiation of Under Graduate degree programme in Food Science and Technology**

  University is going to start an undergraduate degree program in Food Science and technology with intake capacity of 50 students on self financing pattern.

- **Introduction of 4 years B. Tech.( Biotechnology) Degree Programme:**

  With the expertise and infrastructure available in university and the growing demand of Biotechnology in agriculture, Academic Council and Board of Management of RAU, Pusa has approved, a proposal to start four-year degree programme from academic session 2006-07, which will run on self financing pattern.

- **Establishment of a New Horticulture College**

  To provide trained manpower in horticulture University has decided to open one Horticulture college at Nalanda from the academic session 2005-2006..

- **Establishment of two Agriculture Colleges**:

  For the growing need of trained manpower in agriculture with the changing global scenario and to cater the need to tackle the climatic and ecological variation of each agro climatic zone, two new agriculture college have been proposed one each at Dumraon (Buxar) and Purnea.

- **Establishment of Education Technology Cell**

  An Education technology Cell has been established at Pusa for monitoring and evaluation and making strategic planning for educational reforms in Bihar.

4.1.4.4 NEW POST GRADUATE PROGRAMS:

- **Post Graduate Programme in Agri-Business Management**:

  **MBA( Agribusiness) programme** has been inaugurated by **Hon'ble Chief minister Sri Nitish Kumar** and has started from the academic session 2006-07. The programme will provide trained human resources in agri-business management.

- **Post Graduate program in Biotechnology**:

  To develop trained manpower in specialized fields of biotechnology, Post graduate programme in Bio Technology has been proposed from next academic session.

4.1.4.5 SHORT TERM COURSES LAUNCHED

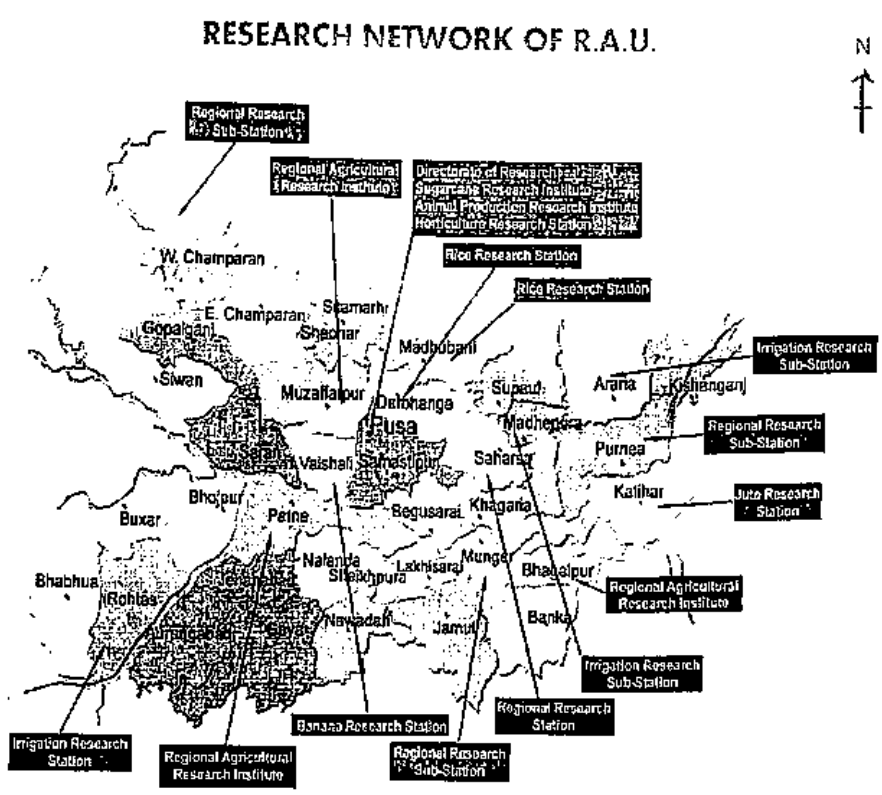
For increasing the availability of trained manpower, certificate courses have been launched which will enhance the skill of students from different educational background for better employment. The University has started the following Certificate Courses for benefits of the unemployed youth of the State from the academic session 2006-07.

**Certificate courses of various durations**

| Name of the Certificate Course | Duration (Months) | No of Seats |
|---|---|---|
| Artificial Insemination | 6 | 20 |
| Laboratory Technique | 6 | 15 |
| Mushroom Production | 6 | 20 |
| Computer Application | 6 | 25 |
| Apparel Designing | 3 | 20 |

## 4.2 RESEARCH

The University is implementing its research mandate through a number of coordinated and ad-hoc research projects sponsored by various Government and non-government organizations. University is having a strong network of research stations / substations / institutes spread all over Bihar.




### 4.2.1 AGRICULTURE

#### 4. 2.1.1 RICE

Following technologies have been developed / opted for betterment of farmers of north Bihar based upon research / training acquired at the different levels.

**Client oriented rice Breeding Technology**

This approach has practical implication. 10-12 Genotypes developed at research centre are put under on-farm testing which differ in plant height, maturity, grain quality etc. Evaluation of these materials are done by scientists as well as farmers independently. Based on farmers and scientist choice the best 3-4 entries are selected and put under Front Line Demonstration on large scale along with local checks. Field days are organized to motivate the farmers to see the performance of new culture and to adopt them if suits their ecology. **SANTOSH** is one of the variety which has been

developed through this process. The article published on Santosh variety in IRRN 28 (2), 2003 has won the best article award in plant breeding category .

## Boro rice Production Technology

Boro rice technology refers to an agricultural package of practices to successfully grow rice during winter season where farmers can not grow wheat and others rabi crops due to excess of moisture during Nov.–Dec. It is basically aimed at increasing productivity of water logged waste land. Rice varieties grown in boro season should have cold tolerance at seedling stage and tolerance to high temperature at flowering stage. Seedling is raised before onset of winter and transplanted when temperature become favorable.

Different breeding approaches were under taken to develop boro varieties having desirable traits with yield potential. A large number of germplasm and Breeding materials have been tested. One of them EMS induced mutant of Rasi, namely, PSRM-1-16-4B-11 was identified and after evaluation in state trials, on- farm trials, co-ordinated trials and under front line demonstration it was released as Gautam. Presently, it is an national check in All India Co-ordinated boro trials. Subsequently Richharia, Dhanlaxmi and Saroj have been released for both kharif and boro season. Due to development of these varieties a large area of unproductive, water logged lands have come under cultivation of boro rice.

## New culture identified for Boro season

### RAU 1397-18-3-7-9-4-2

Priority has been given to develop quality grain with aroma for boro rice varieties. One of the culture RAU 1397-18-3-7-9-4-2 has been identified as long slender grain with good amount of aroma which matures in 115-120 days in kharif and has been derived from IR 36/Type-3 cross combination . It is cold tolerant at seedling stage and most suitable for Boro-season.

### RAU-1-16-48-11

One culture PSRM-1-16-48-11 has been identified which is semi dwarf plant height, long slender grain type and mature in 125-130 days in kharif. It is cold tolerant at seedling stage and most suitable for boro season

## Varieties Promoted

### Genotypes promoted in national Co-ordinated trials during Kharif 2006

| Genotypes | Pedigree | Yield | Duration | Trials |
|---|---|---|---|---|
| RAU 1428-3-5-9-4-2 | Sita/Type 3 | 45 | 105 | IVT-E |
| RAU 1397-18-3-7-9-4-2 | IR36/Type3 | 45 | 110 | IVT-E |
| RAU-1-16-48 | Mutant | 44 | 120 | IVT-IM |
| RAU 1338-55-1-9 | Purple/Rajshree | 50 | 145 | IVT-SDW |
| TCA 88-82 | PLS | 40 | Photosensitive | IVT-SDW |

### 4.2.1.2 MAIZE

**Germplasm Collection, Evaluation and maintenance**

Germpasms of following maturity groups are being maintained for future breeding programs.

**Germplasms of different Maturity Groups**

| Kernel Colour | Maturity group | No. of Germplasm |
|---|---|---|
| Yellow Colour | Early | 34 |
| | Medium | 18 |
| | Late | 54 |
| | **Sub-total** | **106** |
| White Colour | Early | 9 |
| | Medium | 21 |
| | Late | 45 |
| | **Sub-total** | **75** |
| | **Total** | **181** |

**Varieties Identified: Single Cross Hybrid- MHO 3-2**

An early maturing single cross hybrid has been exploited by using inbred line Pop. 65-S7 as a female and Pop 147 (Y)-S6 as a male parent. The plant of this Hybrid is of medium structure (69 cm), thick, sturdy, less leaf and resistant to lodging. The leaves are narrow and dark green. Each plant bear usually one big cob well filled having good husk cover. The hybrid may yield about 50 q/ha in Kharif season while 80 q/ha during Rabi season. It matures within 80 days in Kharif season and 12-135 days in Rabi season. It has a good level of resistance against downy mildew, leaf blight and rust. Grains are bold, orange yellow and sweet in taste. It is suitable for intercropping and high plant density planting system both in Kharif and Rabi season.

**Varieties Promoted**

| Experimental Hybrid | Stage | Zone |
|---|---|---|
| MHO 5-3 | AET 1st year | 3 & 5 |
| MHO 5-4 | AET 1st year | 1, 4 & 5 |
| MHO 5-5 | AET 1st year | 5 |
| MHO 3-2 | AET 2nd year | 3, 4 & 5 |
| MHQPM 05-1 | AET 1st year | 5 |
| MHQPM 05-2 | AET 1st year | 5 |
| MHQPM 05-3 | AET 1st year | 2 & 5 |
| MHQPM 05-4 | IET | All Zones |
| MHQPM 05-8 | IET | All Zones |
| MHQPM 05-9 | IET | All Zones |
| MHO 5-11 | IET | All Zones |
| MHO 5-13 | IET | All Zones |

**Resistant Lines Identified**

| Disease | Hybrids | Composite |
|---|---|---|
| Maydis leaf blight | RH-1 | Suwan |
| | RH-2 | Dewaki |
| | SH-1 | Pusa Comp. II |
| Pest Stalk rot | SM-1 | Laxmi |
| | SM-2 | Dewaki |
| | SM-3 | Suwan |
| | SM-4 | Suwan |
| | SM-1 | Shaktiman-1 |
| Turcicum leaf blight | SM-4 | Dewaki |
| | SM-3 | Laxmi |

## Maize Products Developed By RAU

- Maize is being utilized in human food in the form of popped maize, roasted cob, maize chura, dalia, sattu and roti in Bihar. These products are generally used by whole families. Maize products are not specifically prepared for the consumption by vulnerable groups' i.e. pre school children, pregnant and lactating women and elderly persons.
- Generally, the consumption of maize in daily routine diets has gone down in Bihar, even in lower strata of families. Now-a-days, maize products are being consumed to change the taste by most of the families. The reason for not using maize in daily diet is its hardness and lower self life of maize flour.
- Utilisation of maize in form of health mix, laddo and toffee is increasing in the area where training was imparted by the University.

A total of six products were developed by RAU Pusa center. These products are ***bun, ladoo, rusk, papad, chatani powder, biscuits.***

### 4.2.1.3 PULSES

**Germplasm Collections**

| Crop | No. of new collections |
|---|---|
| Pigenpea | 20 |
| Chickpea | 19 |
| Lentil | 07 |
| Lathyrus | 10 |

**Important Findings**

(i) Application of micronutrients like iron and boron has increased the yield of pre-rabi pigeonpea Cv. Sharad.

(ii) Pre-sowing seed soaking for 8 h accelerated seedling emergence in chickpea.

(iii) Seed rate and manurial requirements of bold seeded lentil cv. DPL-15 determined.

(iv) Sowing time and seed rate requirements of extra early field pea cv. DDR-23 determined for agro-climatic zone I of Bihar.

(v) More efficient strains of *Rhizobium* for BNF in pigeonpea (DH-19 & CC-1), lentil (L-2 & DL-11), urd bean (U-5 & U-1) identified.

(vi) Two *Rhizobial* strains viz., PH9022 and CRR-6 identified as more efficient one for higher nodulation and yield enhancement in pigeonpea Cv. Bahar.

(vii) Co-inoculation of *Rhiozbium*, PSB & PGPR in lentil seeds as a low cost technology has been developed for enhancing the crop yield.

(viii) Newer insecticides like Spinosad 45SC (50 g a.i./ha) followed by Novaluron 10EC (75 g a.i./ha) identified as alternative to endosulfan 35EC (2 l/ha) for suppressing pod borer infestation in pigeonpea.

(ix) Seed treatment with dimethoate 30 EC (8 ml/kg seeds) or spraying of thiomethoxam 70 WS (25.0 g a.i./ha) at one week after germination or profenophos 50 EC (1.5 l/ha) at 15 DAS proved effective in reducing stem fly incidence in field peas.

(x) Seed treatment with dimethoate 30 EC (5 ml/kg seed) followed by one spraying of triazophos (0.04%) at pod initiation stage reduced yield loss due to insect infestation in urd bean by 77 per cent.

(xi) High volume spray of NSKE (5.0%) or low volume spray of it (10.0%) found equally effective in reducing pod borer damage in chickpea.

(xii) Newer insecticides like Novaluron 10 EC (100 g a.i./ha) and Spinosad 45 EC (60 g a.i./ha) emerged as alternative of endosulfan 35 EC (350 g a.i./ha) in reducing pod borer damage and increasing yield in chickpea.

**Promising Genotypes Identified**

| Crop | | Promising genotypes |
|---|---|---|
| Pigeonpea | : | NDA 03-7 (Kharif)<br>IPA 204 (Pre-rabi) |
| Chickpea | : | BG256/CNG469, IPC 2003-7, ICP 1997-72, ICPK 1999-18, ICP 2000-52, ICCV-04108, ICCC-37, ICCV-04101 (Deshi type) for normal sowing in Zone I.<br>NDG 4-39, CSJ-253 and BGM 552 (Deshi) for late sowing in rice fallows.<br>CSJ-416 (Bold type) under normal sown condition.<br>CSJK-18 (Kabuli type) for normal sown condition |
| Lentil | : | IPL-211, L4548 (small seeded) |
| Field peas | : | IPF 04-26, HFP01-10, VL45 (Tall type)<br>Pant P-31, NDDP-4-20, HUDP-27 (Dwarf type) |

**Resistant Lines Identified**

| Crop | Diseases/Root knot nematode | No. of resistant lines |
|---|---|---|
| Pigeonpea | Wilt | 11 |
| | Sterility Mosaic | 05 |
| Chickpea | Wilt | 16 |
| | Root-knot nematode | 03 |
| Lentil | Rust | 05 |
| | Root-knot nematode | 12 |
| Field peas | Root-knot nematode | 05 |
| Rajmash | White mold | 01 |
| | Root-knot nematode | 02 |
| Mung bean | Root-knot nematode | 01 |

**4.2.1.4 OILSEEDS**

**Germplasm Collection & Maintenance**

| Oilseeds crop species | Number of Accessions |
|---|---|
| Mustard ( *B. juncea*) | 390 |
| Toria (*B. campestris* var. toria) | 84 |
| Yellow sarson (*B. rapa* syn campestris var yellow sarson) | 174 |
| Brown sarson (*B. campestris* var. brown sarson) | 41 |
| Gobhi sarson (*B. napus* ) | 17 |
| Karan Rai (B. carinata) | 06 |
| Taramira (Eruea sativa) | 02 |
| Tournifortii (B. tournifortii) | 01 |
| Linseed (Linum usitatissimum) | 47 |
| **Total** | **762** |

**Technology generated**

- Cultivation of late sown mustard in Rice-Fallow/Flood affected/Tail-end canal/minimal irrigation facility areas to replace low productivity late-sown, less profitable and more input-requiring wheat areas (after late maturity paddy crop harvest).
- The key component of technology is seed. During 2005-06 sufficient quantity of nucleus & breeder seed has been produced.

| Crop | Variety | Production ( kg) |
|---|---|---|
| **A. Kharif** | | |
| Sesame | Krishna | 162.0 |
| Sunflower | Hybrid KBSH-1 | 16.0 |
| **B. Rabi – R&M, Linseed & Sunflower** | | |
| Toria | RAUTS-17 | 68.0 |
| Yellow sarson | Rajendra Sarson-1, Swarna, 66-197-3 | 178.0 |
| Mustard (LS) | Rajendra Rai Pichheti, Rajendra Anukool & R. Sufalam | 98.0 |
| Linseed Seed type | Subhra, Garima, Shekhar & T397 | 125.0 |
| Linseed (Seed + Fibre)Dual purpose | Rashmi, Parvati & Meera | 25.0 |
| Sunflower composite | Morden and Peredovik | 98.0 |
| | **Total** | 913.0 |

**Variety in Pipeline to be Released : 2006**

**RAURDL-02-01**

- Very promising for Eastern India (National Zone V) and Bihar under late sown-irrigated system for Rice-Fallow and flood prone areas (Mid November- Mid December). Conditions after late maturity paddy harvest or after reciting flood waters.
- Average yield 1631 kg $ha^{-1}$ (2005-06) potential yield 2250 kg $ha^{-1}$., Average maturity 108 days (3 to 4 days earlier than Varuna), basal branched, attractive plant type with full of bold and more number of total siliqua per plant, bold seeded type (Av. 6.0 g) which maintains their boldness under later sowing dates.
- Better tolerance to stag head and downy mildew than Varuna.
- Farmers are very much attracted towards its performance, plant type, bold seeds and plasticity for late sowing dates.
- Under real farm situation, in FLDs it has high average yield level of 163 kg/ha with 64 per cent yield advantage over farmers practice and attractive remunerative average benefit to the tune of Rs. 13000/ha with a maximum net monitory returns upto Rs. 20,000/ha and Incremental benefit cost ratio upto 7.2 (average IBCR 4.7) (Photo Plate No 1)

**Varieties Promoted : Toria**

- Two advanced station materials, namely RAU DT 01-02 and RAU DT 01-03 have been found > 15% superior in yield over best check RAUTS-17 and from AVST (Toria).
- On the basis of two years testing entered into national level evaluation in IVT (Toria Timely sown-Rainfed) 2006-07: AICRP National Multi location trial

**Important Findings**

***Initial Advanced Varietal Trial (IAVT) Entries 13 Coded IAVT-1 to IAVT-13***

- IAVT 11 (1111.1 kg/ha) was highest and at par in yield to IAVT 2 (1089.7 kg/ha) and IAVT-7 (1004.3 kg/ha)
- These medium flowering – medium maturity entries were having medium large head diameter.
- IAVT -7 (38%), followed by IAVT 2 (37.6%) and IAVT – 11 (37%) were the highest oil possessing entries.

***Initial Hybrid Trial (VHT) Hybrids: 18 (coded IH 660 to IH 677)***

- IH 663 (1923.2 kg/ha) was highest and at par in yield to IH 673 (174.5 kg/ha) and these two were significantly superior to all other hybrids in yield.
- IH 663 was tallest (160 cm) and largest capitulum bearing (Head diameter 16.05 cm) hybrid.
- IH 673 was highest in Oil content (34.2%) whereas IH 663 was having medium oil content (34.2%)

***Advanced Hybrid Trial (AHT) : Hybrids 7 coded (AH 01 to AH 07)***

- AH 02 significantly out yielded (1837.6 kg/ha) followed by AH – 04 (1794.9 kg/ha) and AH07 (1688 kg/ha).
- AH 02 belonged to medium flowering medium maturity medium bold seeded with medium sized capitulum.
- AH 02 were highest in Oil content (41%).

***Response of Sunflower to Bio-Fertilizers.***

Fourth year of Trial (2002-03 to 2005 – 06 continued).

- Except 2002-03 for all the years $T_7$, $T_8$, $T_9$, $T_{10}$, $T_{11}$ & $T_3$ Treatments recorded at par yield to each other.
- 50% N and Seed Treatment with Azospirillum and Azotobactor combined or alone gave good yield of sunflower and *40 – 50% saving of Nitrogenous fertilizers.*
- Seed yield (Kg/ha): the highest seed yield was obtained in the treatment of 50% N and Azosprillum and Azotobacter seed treatment.

***Fertilizer requirement of Advanced Sunflower Lines Varieties: Coded 3 (V1, V2& V3) Fertilizer Dose 50% RDF; 100% RDF, 150% RDF (Three)***

- Coded variety $V_3$ at RDF (60 N: 90 $P_2O_5$: 40 $K_2O$ ) recorded highest ( 1068 kg ./ha) yield level.
- Fertilizer differences were significant but varietals differences and Interaction fertilizer Dose x Var. was found non-significant.

***Resistant lines***

- Alternaria Blight resistant genotypes were IAVT-3 & AH 01 whereas IAVT 6 and IH 662 were moderately resistant.
- None of the entries were found resistant against Jassids as well as head caterpillar ( *Helicoverpa armigera).*

**4.2.1.5 VEGETABLES**

Twenty experiments on Vegetables were conducted at Sabour. Out of twenty trials there were seven varietals, six of hybrid, there were two of disease management and five of insect-pest management trials.

**Varieital trial:**

- Raj. Baigan-II variety of Brinjal long group, produced the highest yield of 276.04 q /ha.
- DBR-8 variety of Brinjal round group, recorded the highest yield (296.26 q /ha).
- In Dolichus bean, HADB-3 variety produced the highest yield of 86.53 q/ha.

- Sponge gourd variety KSG-14 gave the highest yield (113.13 q/ha) which was similar to Rajendra Nenua-1 (110.33 q/ha).
- In Brinjal hybrid long group, BSS-513 produced maximum yield of 348.23 q/ha. which was at par to ARBH-201 (335.21 q/ha) & Pusa Hy.-5 (310.08 q/ha).
- In hybrid Brinjal round group, Pusa Hybrid-6 produced the highest yield of 346.87 q/ha which was alike to HABH-17 (318.45 q/ha).
- Ridge gourd hybrid BSS-580 noticed the yield of 91.51 q/ha.

**Disease management:**

- In resistant varietals trial on Bhindi against Y.V.M.V. Pb-266 and NOH-303 were rated as resistant having less than 10% disease intensity at 90 DAS and yielding. 80.5 and 78.6 q/ha, respectively.
- Integrated management of soil borne diseases of Brinjal trial revealed that Green manuring + Neem cake + Trichoderma viride were most effective recording minimum incidence of 3.5 percent and maximum yield of 274.60 q/ha.

**Insect Pest management:**

- In seed treatment against pest complex of Bhindi trial, seed treatment with Imidacloprid @ 2.0 g/kg recorded lowest Jassids population (4.27/3 leaves), shoots (6.22 %) and fruits (7.32%) with highest yield (81.52 Q/ha).
- Sex pheromone based IPM technology for Brinjal shoot and fruit borer trial revealed that the damage of shoots and fruits was less than 10% as compared to control 15.2% shoots and 26.3 % fruits.

## 4.2.1.6 FRUITS

### 4..2.1.6.1 TROPICAL FRUITS

**Germplasm collection**

A total of 92 Banana clones belonging to different genomic groups were maintained and studied for their economic characters. Six new accessions (one belonging to AAA and five of AAB genomic group of banana) were added this year AAA groups were Basrai, Robusta Lakatan and Pedalse Hanuman.

**Technology Generated**

On the basis of consistent yield performance for 3 crop cycles two banana strains FHIA1 and FHIA 3 were found fit for commercial adoption and recommended to the growers.

**Varieties Identified**

AC-93-1, FHIA-1, FHIA-23 of banana have been identified very promising on the basis of fruit yield and quality.

**Varieties Promoted**

Basrai, Lacaton, Kasturi, Vellary, Poyo, P.Hanuman, S.Harichhal, Robusta, Ardhapuri, Bankel, Kachkel, Nendran, Kothia, Monthan, Ney-vanana Muthia and Gauria

**Resistant Lines Identified**

FHIA-1, Basrai, Robusta, Grand Naine varieties of banana were found resistant against *Fusarium* wilt.

**Other Findings**

- In a plant density trial plant densities ranging from 4629 to 7500 plant /ha were

tried. Results indicated that planting three suckers per pit at 1.8 m x 3.6 m distance was better as compared to other densities like 5001 and 7500 plants/ha.

- In Papaya some bio-fertilizers viz., *Azospirillum, Tricoderma harzianum,* VAM and PSB were used with 100 per cent recommended dose of NPK and 25 and 50 per cent reduction in the recommended dose of fertilizers (RDF). The results indicated that bio-fertilizers had positive influence on fruiting and yield of papaya plants. 25 per cent reduction in the recommended (NPK) dose produced at par results with full dose of NPK when the four bio-fertilizers were used with RDF.
- In Bihar, diseases like Citrus canker, Twig blight were observed in Citrus orchards of all age groups, while gummosis was encountered mostly in old orchard. In few orchards fruit cracking due to severe canker was also observed. Sudden drying type of symptom due to *Colletotrichum gloeosporioides* was also observed in poorly managed orchards.
- In Vaishali belt of Bihar mainly tall banana are grown which suffered from Panama wilt, Bunchy top, Leaf spot and Anthracnose. Heart rot of banana is emerging as a serious problem, which caused total loss in some localities. In Koshi belt bunchy top and leaf spot were major problems because of Dwarf Cavendish bananas are grown. In Samastipur, Rhizome rot disease was observed in newly establish orchards in the last week of July.
- Among Papaya diseases Papaya ring spot virus disease is becoming a limiting factor throughout the state. Its incidence varied from 60-100 per cent. Leaf curl disease was considered as second important disease. Damping off, collar rot, fruit rot were also encountered frequently throughout the state.
- In Bihar incidence of. Scarring beetle, *Basilepta subcostatum* was observed to be maximum during second fortnight of September_and minimum during second fortnight of December.

#### 4.2.1.6.2 SUBTROPICAL FRUITS

**Germplasm Collection**

Altogether 17 Litchi accessions were maintained in the field gene bank at the centre. In variety evaluation studies where eight varieties were compared and the highest fruit yield was recorded from China trees. All cultivars except Late Bedana were *at par* with China, the highest yielder. Late Bedana yielded about 50% of the established cultivars like China and Shahi.

**Other Findings**

- In plant density trial, five densities ranging from 100 to 222 plants/ha were compared with different planting geometry. Results indicated progressive increase in yield with increase in plant density per unit area. Double hedge row planting with 222 plants/ha produced 44% higher yield than the control in 17th year of planting.
- In tree training experiment on Litchi cv. China, the impact of training was noticed only when central leader trees were compared with modified leader trees. When compared with the control, all treatments were found statistically at par.
- Pruning 50 cm or 75 cm twigs with fruit bunches at harvesting adversely affected next year' s fruiting. There was significant reduction in yield as compared to the control where < 30 cm branch was pruned with the fruit bunch. Removal of new vegetative flushes in Nov- Dec. did not help in improving yield in any treatment.
- Irrigation and sprinkling of water had significant impact on reducing fruit cracking in Shahi litchi in comparison to the unirrigated control. Keeping orchard soil near field capacity and maintaining atmospheric humidity between 46 and 50% reduced the cracking up to 8% as against 22 % in the control.

- Application of bio-fertilizers had significant effect on tree height and canopy spread. The effect on fruit yield was not statistically significant. However, application of biofertilizers along with 50 kg FYM compensated for 50 % reduction in quantity of N, P and K applied through inorganic fertilizers.
- Litchi leaf roller *(Pletypeplus aprobola* Meyr.), Fruit borer *(Canopomorpha cramerella/Canopomorpha sinensis)* and Erinose mite *(Aceria litchi)* were identified as major litchi pests in Samastipur, Vaishali and Muzaffarpur districts.Insecticide Carbaryl 0.1% (two sprays at 10 days interval starting from 1st May) produced the best results and minimised infestation of fruits up to 17.0% fruits.
- Pruning of infested Litchi leaves and shoots and destruction by brining in June and August, Castor Cake (4Kg) + Neem Cake (1 Kg) application at root zone and spraying of kelthane @ 0.05% at the time of new flush (Sept.-Oct.) gave the best management of Litchi mite, *A. litchi* Keiffer.

### 4.2.1.7 SPICES

#### 4.2.1.7.1 Germplasm Collection

***Ginger***

Forty three germplasms of ginger were tested for selecting promising line in respect of yield. Out of forty two germplasms, RG-5 produced maximum yield of 17.0 Kg/7.2 $m^2$ of fresh rhizome yield followed by RG-25 (16.50 Kg/7.2 $m^2$) during 2005-06. The yield of gemplasm varied from 0.50 Kg (RG-13) to 17.00 Kg (RG-5) in the area of 7.2 $m^2$.

**Performance of Ginger Germplasm**

| Germplasm | Yield (Kg / 7.2 $m^2$) |
|---|---|
| RG-5 | 17.0 |
| RG-25 | 16.5 |
| RG-36 | 16.0 |
| RG-29 | 15.0 |

***Turmeric***

Eighty five germplasms of turmeric were tested for selecting promising lines in respect of yield. Out of eighty five RH-50 out yield 35.80 Kg/7.2$m^2$ followed by RH-5 and RH-9/90 (32.0 Kg/7.2 $m^2$). The yield of Germplasm varied from 6 Kg (TU-1 & Doogirala) to 35.80 Kg (RH-50) in the area of 7.2 $m^2$.

**Out yielding Turmeric Germplasm accessions**

| Germplasm | Yield (Kg/ 7.2 $m^2$) |
|---|---|
| RH-50 | 35.80 |
| RH-5 | 32.00 |
| RH-9/90 | 32.00 |
| RH-406 | 31.00 |
| RH-13/90 | 29.00 |
| RH-9/80 | 28.00 |
| RH7/80 | 28.00 |
| G.L. PURAM | 28.00 |
| RH-80 | 27.00 |

Coriander

Eighty five germplasms of coriander were tested for selecting promising line in respect of yield. Out of eighty five Germplasm, RD-366 was given maximum yield 0.67 Kg/3m$^2$ followed by RD-365(0.65 Kg/3m$^2$). However, four accession were recorded maximum yield during 2005-06. The yield of Germplasm varied from 0.17 Kg(JCO-75 & JCO-62) to 0.67 Kg/m$^2$ (RD-366).

**Out Yielding Coriander germplasm accession**

| Germplasm | Yield (Kg)in 3m$^2$ |
|---|---|
| **RD-366** | **0.67** |
| **RD-365** | **0.65** |
| **RD-373** | **0.62** |
| **RD-154** | **0.60** |

***Fenugreek***

One hundred nine accession were tested for selecting promising line in respect of yield. Out of one hundred nine accession, RM-70 & RM-187 produced the maximum grain yield of fenugreek 1.40 Kg in 6.0 m$^2$ followed by RM-18 (1.38 Kg/6m$^2$) during 2005-06. The yield of Germplasm varied from 0.15 (Kasuri methi) to 1.40 Kg/6m$^2$ (RM-70 & RM-187)

**Out Yielding Fenugreek Germplasms**

| Germplasm | Yield (Kg/6.0 m$^2$) |
|---|---|
| RM-70 | 1.40 |
| RM-187 | 1.40 |
| RM-18 | 1.38 |
| RM-186 | 1.35 |
| RM-188 | 1.30 |
| RM-185 | 1.28 |
| RM-28 | 1.20 |
| RM-27 | 1.18 |
| RM-2 | 1.10 |

***Fennel***

Thirty one accessions of fennel were evaluated in 3.0 m x 1.8 m plot size in each accession regarding yield during 2005-06. The seed yield of germplasms ranged from 0.30 Kg (RF-4) to 0.97 Kg (RF-34) in 5.4 m$^2$ or per plot. On the basis of yield performance, out of thirty one Germplasm, only eight Germplasm gave the maximum yield which is presented in table. Accession namely RF-34 gave the maximum yield (0.97 Kg/4.5m$^2$) followed by RF-20 & RF-25 (0.95 kg/4.5 m$^2$)

Out Yielding Fennel Germplasms

| Germplasm | Yield (Kg/4.5 $m^2$) |
|---|---|
| RF-34 | 0.97 |
| RF-20 | 0.95 |
| RF-18 | 0.95 |
| RF-38 | 0.94 |
| RF-21 | 0.90 |
| RF-28 | 0.90 |
| RF-29 | 0.88 |
| RF-27 | 0.87 |

4.2.1.7.2 Technology Generated

***Ginger***

**Effect of Different organic inputs in Ginger:** Soil application of organic input F.Y.M. @ 330 q/ha + Ponagmia oil cake @25 q/ha + Neem oil Cake @ 25 q/ha + Neem oil cake @25 q/ha + Stermeal @25 q/ha + Rock phosphate @25 q/ha + Wood Ash @ 25q/ha gave the maximum plant height number of tillers per plant and fresh rhizome yield (20.09 t/ha) and inorganic input. This dose of organic input has been recommended for getting higher yield through Nadia variety.

**Effect of micro-nutrient on Ginger:** It Soil is deficient from micro-nutrient. Soil application of Zinc sulphate @ 25 Kg/ha, Borex @ 10.0 Kg/ha and foliar application of ferrous Sulphate @ 1.0 percent at 60 and 90 DAS were Significantly increased the number of tillers per plant and fresh yield (31.39 t/ha) in comparison to other dose of micro –nutrient.

***Turmeric***

**Effect of raised and flat bed on Turmeric yield :**

The raised bed method produced significantly more yield as compared to sowing on flat bed. Sowing on raised bed gave 17.20 per cent more yield as compare to sowing on flat bed.

**Varieties Identified for release**

| Crop | Identified accession | Proposed Name |
|---|---|---|
| Fennel | RF-17 | Rajendra Saurabh |
| Omum | RA-9 | Rajendra Mani |
| Nigella | RN-18 | Rajendra Shyama |
| Kasuri Methi | R.K.M.-1 | Rajendra Abha |
| Turmeric | RH-5 | Rajendra Sonali |

**Varieties Promoted**

| Crop | Variety | Area Covered (%) |
|---|---|---|
| Turmeric | Rajendra Sonia | 60-70% |
| | Rajendra Sonali (R.H.5) | 30-40% |
| Coriander | Rajendra Swati | 30 |
| | Pant Harima | 50 |
| Fenugreek | Rajendra Kanti | 40-50 |
| Nigella | Rajendra Shyama | 35 |
| Fennel | Rajendra Saurabh | 10 |

**Resistant line-Identified :**

**Turmeric :** RH-13/90, RH-9/90 and RH-50
**Ginger :** RG-25, RG-18
**Coriander** : RD-154, RD-366
**Fennel :** RF-18, RF-21, RF-31
**Fenugreek :** RM-18, RM-28, RM-70

4.2.1.8 TUBER CROPS (OTHER THAN POTATO)

**Collection, Maintenance and Evaluation of Germplasms at Dholi.**

Altogether, 1489 accessions of twelve different tuber crops (other than potato) are being maintained at Dholi Centre of All India Coordinated Research Project on Tuber Crops. As compared to other centers of AICRP on Tuber crops, Dholi Centre has maintained highest number of accessions of sweet potato (1166), yambean (137), winged bean (20) and Dioscorea (10).

**RAU Number One in India**

| Crop | No. of germplasm Dholi | India | % of total in other center | Rank |
|---|---|---|---|---|
| Sweet Potato *(Ipomia batata)* | 1166 | 2005 | 58.15 | 1st |
| Arvi *(Colocasia esculenta var.esculenta)* | 75 | 217 | 34.56 | 1st |
| Yam bean *Pachyrhizus erosus)* | 137 | 204 | 67.2 | 1st |
| Winged bean *(Psophocarpus tetragonulobus)* | 20 | 20 | 100.0 | 1st |
| Elephant Foot Yam *(Amorphophallus paeoniitolus)* | 18 | 184 | 9.78 | 4th |
| Suthani *(Dioscorea esculenta)* | 10 | 32 | 31.25 | 1st |
| Fur (*Diascoria alata*) | 12 | | | |
| Casava (*Manihot esculenta*) | 22 | - | - | |
| Kanda (*Colocassia esculanta* var. antiquorum) | 25 | | | |
| Coleus (*Coleus barbatus*) | 01 | | | |
| Katchu | 01 | | | |
| White Yam (*Diascoria Rotundata*) | 02 | | | |

Out of 1166 accessions in sweet potato, 469 were characterized and I.C.nos. obtained from NBPGR .

**Varieties identified**

| Crop | Germplasm |
|---|---|
| Yambean | DPH- 43, DPH -5, DPH -82, White flower,DPH -88, DPH -78,DPH -70, White flower × Deshi, DPH -9,DPH -21 |

**Germplasm promoted under Uniform Regional Trial (URT)**

| Crop | Germplasm |
|---|---|
| Yambean | DPH – 9 ,DPH -70, DPH -88, W.F.×Deshi |

**Germplasm Promoted under Multilocation Trial (MLT)**

| Crop | Germplasm |
|---|---|
| Sweet potato | DOP 92-93 and DOP 93-19 |

**4.2.1.8.1 SWEET POTATO**

**Out Yielding Orange Fleshed Sweet Potato (IET)**

Out of 17 entries, DOP-92-93 generated at Dholi Centre recorded significantly highest tuber yield (17.7 t $ha^{-1}$) followed by S-594 (13.6 t $ha^{-1}$). The entries ST-14, CIPSWA-2, 187017 and 420027 recorded lowest tuber yield ranging from 2.4 to 3.3 t $ha^{-1}$.The mean (%) tuber infestation due to weevil ranged from 3.2 to 15.0 percent with minimum and maximum being in SV-98 and X-24, respectively.

| Entries | Marketable tuber yield (t $ha^{-1}$) | Sweet Potato weevil affected tuber( % ) |
|---|---|---|
| 187017 | 3.3 | 9.1 |
| 420027 | 3.3 | 9.1 |
| **S-594** | **13.6** | **3.7** |
| SV-362-7 | 7.5 | 4.0 |
| CIPSWA-2 | 3.1 | 9.7 |
| ST-14 | 2.4 | - |
| X-24 | 8.0 | 15.0 |
| **DOP-92-93** | **17.7** | **6.8** |

**Enhanced tuber yield of sweet potato due to biofertilizer**

Application of 2/3 dose of N (40 kg/ha) alongwith 2kg *Azospirillum* $ha^{-1}$ as vine dipping and 10 kg *Azospirillum* $ha^{-1}$ as soil application recorded maximum tuber yield 30.5 t $ha^{-1}$ . All the treatments were found better than absolute control (13.0 t $ha^{-1}$) except the treatment application of *Azospirillum* without fertilizer (14.7 t $ha^{-1}$) and the treatment of P and K without *Azospirillum* (15.2 t $ha^{-1}$).

Effect of bio-fertilizer on tuber yield of sweet potato

| Treatment | Tuber yield (t $ha^{-1}$) |
|---|---|
| 1/3 Recommended Dose of N+2 kg *Azospirillum* $ha^{-1}$ as vine dipping + 10kg *Azospirillum* $ha^{-1}$ as soil application | 28.2 |
| 2/3 Recommended Dose of N+2kg *Azospirillum* $ha^{-1}$ as vine dipping + 10kg *Azospirillum* $ha^{-1}$ as soil application | 30.5 |
| Without *Azospirillum* (only P and K) | 15.2 |
| Without fertilizer (only *Azospirillum*) | 14.7 |
| Absolute control | 13.0 |

**IPM package against sweet potato weevil**

The on farm trials on IPM against sweet potato weevil were conducted at three different location viz., Dholi, Neemopur and Kalyanpur. Pheromone traps were installed at all locations right from the time of planting of sweet potato (var. Cross-4) and continued for at least one fortnight after harvest. Maximum healthy tuber yield was recorded at all the location in IPM treated plot (30.0, 27.5 and 25.0 t $ha^{-1}$) as compared to chemical and control plot. IPM package recorded maximum healthy tuber yield (27.5 t $ha^{-1}$) than chemical control (26.3 t $ha^{-1}$) and untreated control (16.7 t $ha^{-1}$).Maximum tuber infestation was recorded in untreated control (5.2 t $ha^{-1}$). The number of male weevil trapped during crop period varied from 2870 to 3660.

**Effect of IPM package on yield of sweet potato**

| Treatments/Locations | Marketable tuber yield (t $ha^{-1}$) | Infested tuber yield (t $ha^{-1}$) | No. of male weevil trapped |
|---|---|---|---|
| **Dholi** | | | |
| IPM package | 30.0 | 2.9 | 3660 |
| Chemical control | 28.0 | 3.5 | |
| Control | 17.3 | 5.3 | |
| **Neemopur** | | | |
| IPM package | 27.5 | 3.3 | 3010 |
| Chemical control | 26.9 | 3.0 | |
| Control | 16.9 | 4.8 | |
| **Kalyanpur** | | | |
| IPM package | 25.0 | 4.5 | 2870 |
| Chemical control | 24.0 | 4.0 | |
| Control | 16.0 | 5.5 | |
| **Mean** | | | |
| IPM package | 27.5 | 3.6 | |
| Chemical control | 26.3 | 3.5 | |
| Control | 16.7 | 5.2 | |

#### 4.2.1.8.2 AMORPHOPHALLUS

**Uniform Regional Trial**

Four entries were evaluated along with a local check (Gajendra) under URT. The entry Gajendra recorded highest mean corm yield 38.1 t $ha^{-1}$ which was statistically on par with NDA-5 and BCA-1. NDA -9 recorded lowest corm yield (22.9 t $ha^{-1}$).

**Performance of Amorphophallus entries under URT**

| Entries | Corm yield (t $ha^{-1}$) |
|---|---|
| NDA-5 | 36.3 |
| NDA-4 | 28.5 |
| NDA-9 | 22.9 |
| BCA-1 | 34.0 |
| Gajendra (C) | 38.1 |

**Mulching – a substitute of chemical weed management in Amorphophallus**
**Influence of weed management on corm yield of elephant foot yam at Dholi during 2005-06.**

Mulching with sesame leaves at the time of planting gave highest corm yield (40.6 t $ha^{-1}$) followed by black polythene mulch (34.8 t $ha^{-1}$) and hand weeding at 30 and 70 DAP (34.0 t ha $^{-1}$). The lowest corm yield (25.5 t $ha^{-1}$) was recorded in roundup (1 kg a.i.$ha^{-1}$ ) treated plots which was at par with unweeded control (28.0 t $ha^{-1}$).

| Treatmemt | Corn yield (t $ha^{-1}$) |
|---|---|
| Pendimethaline @ 1kg a.i. $ha^{-1}$ | 31.1 |
| Roundup @ 1kg a.i. $ha^{-1}$ | 25.5 |
| Hand weeding at 30&70 DAP | 34.0 |
| Black polythene mulch at the time of planting | 34.8 |
| Sesame leaves mulch at the time of planting | 40.6 |
| Control (Unweeded) | 28.0 |

**Effect of organic sources of fertilizers/nutrients on corm yield of elephant foot yam**

Application of FYM (10 t/ha) + mustard cake (0.5 kg/pit) recorded significantly highest corm yield (40.2 t/ha) which was at par with vermicompost 200 kg/ha + 50% recommended dose of NPK (39.4 t/ha) followed by paddy husk @ 0.5 kg/pit + 75% of recommended dose of NPK and mustard cake @ 0.5 kg/pit) + 50% of recommended dose. The lowest yield of 26.1 t/ha was recorded by application of paddy straw @ 1 kg/pit) + 75% of recommended dose of NPK.

| Treatment | Corm yield (t ha$^{-1}$) |
|---|---|
| Paddy straw (1 kg/pit) + 75% of recommended dose of NPK | 26.1 |
| Paddy husk (0.5 kg/pit) + 75% of recommended dose of NPK | 36.2 |
| Mustard cake (0.5 kg/pit) + 50% of recommended dose of NPK | 35.6 |
| Chopped banana petiole (0.5 kg/pit) + 75% of recommended dose of NPK | 29.7 |
| FYM (10 t/ha) + mustard cake (0.5 kg/pit) | 40.2 |
| FYM (10 t/ha) + neem cake (0.5 kg/pit) | 31.5 |
| Recommended dose of NPK @ 100 : 50 : 100 kg/ha | 29. |

**4.2.1.8.3 YAMBEAN**

**Evaluation of yambean accessions**

Eleven yambean cultivars were evaluated for their tuber yield along with check RM-1. Amongst the entry DPH-70 recorded highest tuber yield (38.9 t ha$^{-1}$) which was statistically at par with WF x Deshi (37.6 t ha$^{-1}$) as against released variety RM-1 (32.5 t ha$^{-1}$). The entry DPH-5 recorded lowest mean tuber yield (26.3 t ha$^{-1}$).

**Performance of yambean accession**

| Accessions | Tuber Yield (t ha$^{-1}$) |
|---|---|
| DPH-43 | 27.2 |
| DPH-5 | 26.3 |
| DPH-82 | 27.7 |
| White Flower | 31.9 |
| DPH-88 | 35.4 |
| DPH-78 | 29.6 |
| DPH-70 | 38.9 |
| W.F.xDeshi | 37.6 |
| DPH-9 | 30.7 |
| DPH-21 | 27.7 |
| RM-1 (C) | 32.5 |

**Field efficacy of commonly available insecticides and neem products against pod borer (*Maruca vitrata* )on yambean**

Monocrotophos (0.04%) recorded the lowest pod infestation (6.7%) as against 22.2 per cent in untreated control. Performance of dimethoate, deltamethrin, caldan and metasystox at their respective dose were found better in reducing borer infestation (8.5 to 9.3%).

All the tested insecticides, irrespective of their doses were significantly superior to untreated control in enhancing seed yield. Among the different treatments monocrotophos (0.04%) gave the highest seed yield (1.10 t $ha^{-1}$) which was statistically at par with caldan, metasystox, dimethoate, deltamethrin and endosulfan (1.05-0.85 t $ha^{-1}$) as against untreated control (0.58 t $ha^{-1}$). Spraying of neem gold also showed better performance in reducing borer incidence (11.6%) and increasing seed yield (0.78 t $ha^{-1}$).

**Relative efficacy of synthetic insecticides and neem products as foliar spray against pod borer infestation on yambean**

| Treatments | Pod infestation (%) | Grain yield (t $ha^{-1}$) |
|---|---|---|
| Endosulfan (0.07%) | 12.0 | 0.85 |
| Metasystox (0.05%) | 9.3 | 1.02 |
| Monocrotophos (0.04%) | 6.7 | 1.10 |
| Deltamethrin (0.002%) | 8.9 | 0.89 |
| Dimethoate (0.03%) | 8.5 | 0.90 |
| Caldan (0.2%) | 8.9 | 1.05 |
| Neem gold (5%) | 11.6 | 0.78 |
| Untreated control | 22.2 | 0.58 |

**Intercropping of tuber crops in litchi orchard**

Tuber crops intercropping in litchi orchard have been found practically possible and economically viable. Four tuber crops (sweet potato, elephant foot yam, colocasia and turmeric) were grown as inter corps in litchi orchard with two levels of fertilizers i.e. half of recommended dose and full dose of fertilizers. The tuber crops viz; elephant foot yam in litchi orchard with full dose of fertilizer (80:60:80 kg $ha^{-1}$) recorded highest yield (32.3 t $ha^{-1}$) with net return of Rs. 1, 26,000 $ha^{-1}$. Elephant foot yam with half recommended dose (40 : 30 : 40 kg $ha^{-1}$) also gave higher yield (26.2 t $ha^{-1}$) with net return of Rs. 94,000 $ha^{-1}$. Colocasia was found to be the next best to elephant foot yam in terms of profitability (Rs. 32750 $ha^{-1}$) than turmeric and sweet potato.

**Multiplication and distribution of seed / planting material**

| Crop | Varieties | Quantity of planting material distributed (kg) | No. of farmers benefited |
|---|---|---|---|
| Sweet potato | RS-92, Cross-4, Sree Bhadra, RS-5, RS-47 | 170 | 18 |
| Elephant foot yam | Gajendra | 800 | 4 (KVKs) + 12 (Farmers) |
| Colocasia | White Gauria | 450 | 12 |
| Cassava | Sree Jaya | 200 cuttings | 25 |
| Dioscorea | | 300 | 12 |

### 4.2.1.9 SMALL MILLETS

**FINGER MILLET ( *Elucine coracana L.):***

- In IVT coordinated trial, genotype IVT-5 recorded the highest grain yield ( 22.53 q/ha) followed by IVT. 26 (21.48 q/ha) with the maturity period of 93 and 10 days respectively.
- In AVT genotype Avtem -2 gave highest ( 26.73 q/ha) grain yield followed by Avtem 7 (20.68 q/ha) with the maturity period of 93 and 89 days respectively where as check variety produced only ( 6.5 q/ha) grain yield with 80 days maturity period.
- In white seeded Ragi none of the genotype was superior than VL - 149. In the station trial of ragi Rajendra Marua -4 gave higher grain yield (1509 kg/ha) followed by genotype Sitamarhi ( 1480 kg/ha) in 86 and 81 days only.

**FOXTAIL MILLET (*Setaria italica*):** Foxtail millet AVT, Among 20 entries tested FAVT -7 produced highest grain yield (12.96 q/ha) with 80 days maturity periods.
In the station trial of Setaria RAU-2 and RAU-9 genotype were found superior than check variety PS 4.

**BARNYARD MILLET ( *Echinochloa frumentacii*):** BAVT 15 recorded highest grain yield 21.91 q/ha with the maturity period of 65 days only out of 25 tested entries.

- **Two entries of Ragi, 3 entries of Prosomillet, two entries of Setaria and one entry of Barnyard millet have been promoted to coordinated trials.**

### 4.2.1.10 JUTE & ALLIED FIBRE

**Crop Improvement**

***Evaluation of Jute Germplasm:*** Fifty accessions each of *C. olitorius and* C capsularis germplasm were evaluated for fibre yield, plant height and basal diameter in comparision to best check. The best germplasm identified under C. Capsularis, OIJ-228, OIJ-816 and OIJ-282 were the best germplasms and under C. Olitorius CEX-47, CIN-283 and CIX-846 were the best germplasms.

IET with olitorius Jute for higher yield: twenty varieties were tested including the checks. The best varieties identified were SKH-9 (32.40 q/ha), CO-306 (31.63 q/ha ) & CO -303 (30.67 q/ha). The best check was JRO-524 (26.04 q/ha)
The best germplasms identified are
C. capsularis: OIJ – 228, OIJ – 816 and OIJ – 282
C. Olitorious: CEX – 47, CIN – 283 and CIX – 846

| Trial | Best varieties identified<br>Germplasm / Variety | Yield (q ha$^{-1}$) |
|---|---|---|
| IET (Olitorious) | SKH – 9 | 32.40 |
| | CO – 306 | 31.63 |
| | CO – 303 | 30.67 |
| AVT (Olitorious) | JRO – 524 (Check) | 26.04 |
| | JRO – 2003 | 25.04 |
| | BCO – 100 | 24.06 |
| | JRO – 2003 G | 23.65 |
| AVT (Capsularis) | JRO – 524 (Check) | 20.50 |
| | C- 526 | 26.71 |
| | JRC – 2003 | 25.66 |
| | JRC – 698 (Check) | 19.76 |

### 4.2.1.11 SUGARCANE RESEARCH INSTITUTE

**TWO IMPROVED SUGARCANE VARIETIES RELEASED**

- **BO 139**, an early maturing sugarcane variety, characterized by straight, flat cylindrical ivory green to pale green, medium to long thick internode, medium width leaves with spreading carriage and profuse deciduous spines on leaf sheath. A progeny of cross BO109 x BO 43. Its average yield is 84.0 t/ha in plant crop while 74.0 t/ha in ratoon. It produces average sugar yield of 9.80 t/ha and 7.30 t/ha in plant and ratoon crops respectively with average sucrose percentage of 17.4. The variety is suitable for upland condition. It will prove itself a boon for the sugar factory as well as for cane growers due to its suitability for early crushing and quick early growth.

- **BO147**, a main season maturing sugarcane variety, characterized by straight, ivory green to light purple green cylindrical, long medium thick internode, narrow to medium broad green leaves with semi spreading carriage with two denotoid auricles. It is a progeny of self of BO110 Its average yield is 88.5 t/ha in plant crop while 79.5 t/ha in rations. It produces an average sugar yield of 10.20 t/ha and 9.00 t/ha in first year planting and ratoon crop respectively with average sucrose percent of 17.2.. As the crops can with stand limited water logging it will prove a suitable variety among main season group both for cane growers and sugar factories.

### 4.2.1.12 WEED CONTROL

**A new weed record of Bihar:**

A new weed, *Thithonia divaricata* belonging to family Asteraceae was observed as road side weed in North Bihar. The plant was a tall, semi woody shrub growing to a height of 2.0 to 7.0 meter. The weed posses thickened stem at the base serving as hard rhizomatous portion, which facilitate re-growth of the weed very fast during the monsoon. It attained flowering during November and under go in senescence during February-March months. In the month of May-June, the aerial part of the plant became dry. The flower was bright yellow resembling Niger flower.

**Allelopathic control of *Parthenium hysterophorus* by *Xanthium strumarium*:**

The leaf extract of *Xanthium strumarium with the concentration of* 10,20,30,40 and 50 per cent showed visual phytotoxicity at 1.0, 2.0, 5.0, 6.0 and 10.0 respectively at the seedling stage and 0, 1.0, 2.0, 4.0, 6.0, 9.0 and 10.0 respectively at the juvenile stage and 0,0,1.0, 2.0 and 6.0 ,respectively at the flowering stage of *Parthenium hysterophorus* .Whereas, Glyphosate at 1.0 kg/ha , 1.5 kg/ha and 2.0 kg/ha showed complete scorching at seedling juvenile and flowering stages, respectively. Scorching on Parthenium may be due to presence of allelochemicals/ biochemicals in the leaves of *Xanthium strumarium*.

**Weeds as organic source in transplanted rice:**

Among organic sources *Echchorinia* 2.5 t/ha + FYM 5 t/ha recorded significantly higher grain and straw yield of rice followed by Parthenium 2.5 t/ha + FYM 5 t/ha and Echchorinia 2.5 t/ha + Poultry litter 1 t/ha. Application of Poultry manure or Vermicompost with *Parthenium* or *Echchornia* proved to be better than no organic manure application. *Echchornia or Parthenium* either alone or in combination with other organic sources can be used as bio-nutrient sources.

### 4.2.1.13 WATER MANAGEMENT

**Response of maize-based inter-crops to irrigation -**

Maize + potato inter crop were found superior than all other inter crops viz. maize_+ rajmash, maize + toria, and maize sole. Irrigation with IW/CPE ratio of 1.0 has proved beneficial, in which 4-5 irrigation were applied @ 6 cm each.

**Effect of irrigation & inter-crops on maize equivalent yield** (q/ha)

| IW/CPE ratio | Inter-cropping system | | | | |
|---|---|---|---|---|---|
| | Maize sole | Maize + Potato | Maize + Rajmash | Maize + Toria | Mean |
| 0.6 | 51.01 | 121.23 | 58.93 | 55.94 | 71.78 |
| 0.8 | 58.71 | 133.64 | 71.26 | 57.80 | 80.35 |
| 1.0 | 69.14 | 138.49 | 82.10 | 55.78 | 86.38 |
| 1.2 | 72.21 | 139.73 | 83.64 | 61.87 | 89.36 |
| Mean | 62.77 | 133.27 | 73.98 | 57.84 | |

### 4.2.1.14 MEDICINAL AND AROMATIC PLANTS

**Optimization of plant population and number of annual cuts on herbage yield in lemon grass ( Cymbopogon flexuosus):**

In the third year of planting, the crop gave a maximum herbage yield of 242 q/ha with 40 x 60 cm intra-spacing and four annual cuttings. The yield was 17.3% more than that obtained in three cutting only, and 11.5% more than the average herbage yield of 40 x 40 cm spacing.

**Effect of dates of planting and harvesting on foliage yield of Kalmegh (Andrographis paniculate):**

In the experiment conducted to determine the foliage yield of Kalmegh at monthly intervals, twenty two days old seedlings were transplanted in the field at monthly intervals in June, July and August and harvested in September, October and November. Herbage yield of 1.82 kg/$m^2$ was maximum for July transplanted, October harvested crop in open sunlight conditions while the crop transplanted under partial shade in July and August peaked in December ( 1.67 kg/ $m^2$ and 1.58 kg/ $m^2$) respectively.

### 4.2.1.15 AGRO FORESTRY

**Germplasm collection**

Mahogani, Sagwan, Chah, Jatropha, Arjun, Karanja, Kadamb, Bakain, Neem, Green Semel, Desi Semal, Toon, Eucalyptus, Augast, Safed Siris, Kala Siris, Shisham, Kala Shisham, Akashmuni, Jamun, Goldmohar, Katchnar, Amaltas, Chakundi, Subabool, Babool, Shimarobba, Jackfruit, Sindur, Shammi, Khajur, Bahera, Barhar, Gamhar, Poplar (*Populus deltoides*) clones ($G_3$, $G_{48}$, PH-2, PH-4, PH-5, PH-6, PH-8, PH-9, PH-10, PH13, L-14, L-34, A-2, Udai, Pant Poplar-5, L-49, L-52, L-188), Bamboo Species (*Bambusa balcoa, Dendrocalamus strictus, Dendrocalamus hamiltonii, Bambusa tulda, Bambusa nutans, Bambusa bambos*).

**Comparative performance of promising Poplar clones under agro forestry system:**

Growth performance of two-year-old plantations of six promising poplar (*Populus deltoids*) clones procured from Pantnagar revealed that height was maximum in L-52 (5.57 m) followed by PP-5 (4.86 m), L-188 (4.50 m), G-48 (4.40 m), Udai (4.26 m) and L-49

(4.16 m). Diameter at breast height (dbh) was also superior in L-52 (7.62 cm) followed by PP-5 (5.57 cm) and the lowest by G-48 (3.25 cm).

**Effect of sulphur application on the survival and growth performance of Jatropha curcus:**

Data on survival, height and collar diameter of 1.5-year-old Jatropha as affected by six levels of sulphur viz.; 0, 20, 40, 60, 80 and 100 kg $ha^{-1}$ showed that there was 93% (100 kg S $ha^{-1}$) to 100% (40 kg S $ha^{-1}$) survival. Height and collar diameter varied from 1.00 m (0 kg S $ha^{-1}$) to 1.39 m (40 kg S $ha^{-1}$) and 5.46 cm (0 kg S $ha^{-1}$) to 6.83(40 kg S $ha^{-1}$), respectively. Both the growth parameters showed the increasing trend up to the level of 40 kg S $ha^{-1}$ and after that they started to decrease.

**Improvement of Development of Jatropha and Karanj based Agro forestry System in Wasteland Development of Bihar:**

- Among the Jatropha accessions the best performance with maximum germination percentage and poor performance with minimum germination percentage was recorded 45.0 in $T_6$ (RJ-H7 Ganjam Rahuri, Maharastra) and 1.67 in $T_7$ (PKVJ-DHWI Jalana, Maharastra), respectively. The maximum and minimum height (cm), diameter (cm) and number of leaves was recorded 28.63, 2.10, 24.67 and 18.93, 1.26, 11.00 and 0.33 respectively.
- Among the Karanj accessions the best performance with maximum germination percentage and poor performance with minimum germination percentage was recorded 71.67 in $T_1$ (RAK-22) and 1.67 in $T_3$ (Bihapur) respectively. The maximum minimum height (m) Dbh (cm), number of branch and sub-branch, number of fruiting branch, number of flowering branch and number of fruits of the plus trees varied from 4.55-6.14, 23.0-34.0, 2-4, 21-30, 5-8, 2-12, 7-38 respectively.

**4.2.1.16 AGRO METERIOLOGY**

Under response of rice varieties transplanted on different dates, the period required for different phenophases, maturity & grain yield decreased with subsequent delay in planting time. The crop planted on June 06 produced the maximum grain yield while minimum grain yield was associated with the crop planted on Aug.05. Among the varieties, Rajendra Mansuri produced the highest grain yield followed by Nata Mansuri & Rajendra Shweta.

**4.2.1.17 SOIL SCIENCE**

**4.2.1.17.1 SOIL TEST CROP RESPONSE CORRELATION**

- Crop residues could substitute compost @ 10t/ha in rice-wheat cropping sequence. Compost + crop residues could also save 50% recommended dose of NPK i.e. 50 kg N, 30 kg $P_2O_5$ and 20 kg $K_2O$ /ha in each crop rice and wheat. Balanced use of NPK fertilizer maintained the fertility status of soil whereas organics (compost, crop residues and compost + crop residues) improve it.
- The basic data such as nutrient requirement to produce one quintal of rice grain, fertilizer use efficiencies, contribution from soil available nutrients and contribution from poultry manure were generated and **targeted yield equations for rice** have ben developed.
- Experiments and laboratory analysis were completed to develop basic data, **targeted yield equations and fertilizer recommendations schedule for turmeric.**
- Results of 16 follow-up trials, 6 on brinjal, 1 on lady's finger and 4 on rice under IPNS, and 5 on sesame without IPNS conducted at farmers' field revealed that per

cent deviation between actual yield obtained and yield target of crops under study were found ± 12.00 which is under reasonable limit. Economic analysis revealed that fertilizer application with or without IPNS based on STCR recommendations is more economical than any other fertilizer recommendations.

### 4.2.1.17.2 MICRO AND SECONDARY NUTRIENTS AND POLLUTANT ELEMENTS IN SOIL AND PLANTS

**Effect of changing cropping pattern and management practices on yield trend and micronutrients status of soil**

The results of 61st crop rice under rice-wheat–sorghum and rice- mustard –moong rotation indicated an increase in yield with increasing fertility levels. The superimposition of some treatments in soil was able to maintain the crop yield at higher level over control. The highest yield was recorded in treatment receiving 10 kg Zn+10 t FYM/ha to alternate year. This treatment also enhanced the organic carbon and available Zn content of soil. Since application alone once in two cycles was also effective. The per cent increase in cumulative yield up to 61st crop at all fertility levels over control was found to be higher in case of former rotation than latter one. The cumulative micronutrients uptake was higher in R-W –S than R-M-M rotation.

**Optimizing zinc levels and crop residue management under rice-wheat system for sustaining crop productivity**

The yield of 23rd crop rice under rice-wheat rotation indicates still some response to Zn when applied along with crop residue. The effect of increasing crop residue levels was statistically superior over control. Crop residue @ 50% applied with starter dose of Zn @ 10 kg Zn/ha to first crop only was able to support Zn nutrition and produced higher yield. However, the highest yield of rice grain and straw was recorded at 100% crop residue level with starter dose of 10 kg Zn/ha applied initially with first crop. The rate of decomposition was also increased which was found due to enrichment in organic carbon content and microbial population as a result of crop residue incorporation.

**Effect of green manuring and FYM on micro- and secondary nutrients availability to crops**

The result of 11th crop rice under rice-wheat system indicated that the highest grain yield response was recorded in treatment receiving green gram as green manuring + 5 t/ha FYM every year. The effect of green manuring with dhaincha was superior among green manuring crop. There was also marked build up in available Zn in soil due to green manuring treatments which reached to above sufficiency level.

**Nutrient indexing of crop and soil in agro-ecosystems:**

The grain and straw yields of rice crop at 20 PBMS varied greatly depending on the fertility status of soil as well as management practices adopted by farmers. The grain yield varied widely from one site to another. The effect of organic manure addition was apparent on yield and micronutrient buildup in soil.

**Reassessment of micro- and secondary nutrient deficient /sufficient areas in soils of Bihar**

Nearly 800 soil and plant samples were collected from 6 districts of Bihar. The soil samples were analysed for available B and S which varied from 0.08 to 3.56 and 2.35 to 354.66 ppm, respectively..

**Relative efficacy of Granubor and Borax as a source of Boron**

Different levels of B were applied through Granubor and Borax as basal application. Granubor @ 50% was also applied along with FYM. The residual effect of

treatments indicated that at higher level the residual effect of Borax was superior to Granubor in enhancing rice yield. At 125% level the extent of response was up to 50% when applied through borax. Foliar application of granubor was not effective. Application of granubor (50% ) in conjoint with FYM was more effective.

### 4.2.1.18 CROPPING SYSTEM RESEARCH

**Diversification of existing rice-wheat cropping system:**

Among the fourteen rice based cropping system tested, rice – potato - onion+ maize (cob) gave the highest Rice Equivalent Yield (REY) of 333.8 q/ha followed by rice-potato – onion (310.72 q/ha) and rice- garlic – maize (280.53 q/ha). However, rice- garlic-onion was identified as the most remunerative cropping system with net return of Rs. 95, 716.00/ha.

**Development of organic farming package for system based high value crops (Basmati rice – potato- onion):**

First year data revealed that application of 100% recommended dose of nutrients through inorganic fertilizers produced the highest REY (226.09 q/ha) and net monetary return of Rs. 82,045.00/ha, followed by the treatment receiving 50% NPK through fertilizers having corresponding value of 219.79 q/ha and Rs. 75,531.00/ha. Application of 100% recommended dose of nutrients through organic sources recorded the lowest productivity and profitability.

**Integrated nutrient management in rice-wheat cropping system:**

Application of moderate doses of FYM ( 40 to 80 q/ha) , wheat straw (30 to 60 q/ha) and green manuring with *Sesbania aculeata* (47 to 94 q/ha) in rice can reduce the recommended dose of inorganic fertilizers from 25 to 50% to maintain their productivity , soil health and sustainability in rice –wheat system.

### 4.2.1.19 SEED TECHNOLOGY

**Seed Production**

**Grow out test**

Seven breeder seed lots of rice varieties with their standard sample were subjected to grow out test to ascertain their genetic purity. No off type plant were observed in three varieties ( i.e. Sugandha, Pusa-834 & Pusa 677). In four other var. ( Turanta, Sita, Rajshree, Prabhat).,the % off type varied from 0.07 to 0.09

**Seed Physiology**

**To standardize the method of estimating seed vigor in Paddy**

Twelve seed lots of four Paddy varieties ( Rajshree, Prabhat, Sita, Gautam) were used in laboratory. The seed vigour of Rajshree var. with lot no. 7 was highest among all the seed lot of same var. as well as in case of other varieties. The data shows that the sample having maximum first count & seedling length was good indicator of field emergence.

**To identify the variety with early seedling vigour suitable for Aerobic rice cultivation**

The results of all 7 varieties. of rice tested for early seedling vigour shows that the speed of germination was good indicator of field emergence. The maximum field emergence was observed in variety Sita (24 .00) where as it was minimum in Sugandha (18.30).

### 4.2.1.20 FOOD SCIENCE AND TECHNOLOGY

**Use of Cape gooseberry for making squash, RTS and Jam**

Fruit contains higher T S S (12.5 B), Vit. C (5 mg/100 g), pulp and acidity (0.2%). They maintain their TSS and Vit. C even after six months of preparation, though the flavor of RTS had slightly deteriorated even with highest B:C ratio 1:3.1.

**Utilization of Guava Waste for Making Vinegar**

The guava waste initially contains TSS (5.7'B), acidity (0.31%) and Vit.C (36 mg/100 g. of pulp). Acidity increased to 2.7% only after six months of storage.

**Utilization of Water Chestnut (Singhara) as Dried Nut and Flour**

Powders were used to prepare halwa with the ratio of 25%, 75% and 100% Singhara flour mixed with wheat flour. Wheat flour alone was also used as a check. The crispiness, flavour and taste were found superior with 100% and 75% Singhara flour in comparison to other ratio with wheat flour for high nutritive value.

## 4.2.2 AGRICULTURAL ENGINEERING

### 4.2.2.1 POST HARVEST TECHNOLOGY

**Evaluation of optimum sieve size and type of grading screen for grading Maize seeds**

Experiments were conducted for grading of maize seeds of five varieties ( Laxmi, Deoki, Suwan, Shaktiman-1, Kargil) using Lab. model of two screen cleaner-cum-grader (AGROSAW) with the fixed top screen size of 10.00 mm round hole sieve and four variable bottom screen sizes of 6.5, 7.,5, 8.5, 9.5 mm round hole sieves at three different feed rates (79.8, 88.1 and 98.5 kg/h).

- The overall maximum machine capacity 87.96 kg/h with the maximum per cent seed recovery 97.56 % for Laxmi variety.
- The optimum sieve size for grading maize seed was found to be 6.5 mm round hole with 79.8 kg/h feed rate.

**Evaluation of Process Variables for Seed Processing of different Maize Varieties:**

- Maximum recovery of grade III seeds (79.52 % for Kargil) among all fractions followed by grade II seeds (54.84% for Laxmi and light seeds (46.76 % for Shaktiman-1) in that order in all varieties.

**ORP on Agro-Processing Centre:**

- CIAE pedal-cum-power operated cleaner tested for cleaning and grading of wheat (1744), pigeon pea grains ( Sharad ) and maize grains ( Shaktiman-1 and Kargil) at different feed rates manually ( Pedal operated ) as well as with electric motor ( Power operated).
- Physical properties (1000 seed mass, moisture content, length, breadth thickness, GMD, sphericity) were also measured for uncleaned/ un-graded seeds and cleaned / graded seeds.
- Effect of different feed rates (4/3 levels ) and motor speed ( 2 levels ) was seen on percent recovery of different fractions after cleaning/ grading, machine capacity and specific energy consumption.

**Evaluation of Process Variables for Seed Processing of different Paddy Varieties:**

- Experiments was conducted for grading and separation of paddy seeds of three varieties ( Kishori, Prabhat and Rajshree ) using Lab. model of two screen cleaner-cum- -grader and specific gravity separator ( AGROSAW).

- Maximum seed recovery as 86.945 % for Kishori, 91.685 % for Prabhat, and 96.933 % for Rajshree variety of paddy seed during grading.
- Maximum recovery of grade II seed (46.98% for Kishori) ,Grade III seed (86.16% for Kishori ) and Light seeds ( 10.48% for Rajshree ) during specific gravity separation.

### 4.2.2.2 IRRIGATION & DRAINAGE ENGINEERING

**Ground Water Recharge Estimation for Muzaffarpur District.**

| | |
|---|---|
| Recharge during Monsoon season | 85349 ha-m |
| Recharge during non-monsoon season | 18152 ha-m |
| Recharge contribution due to floods | 5649 ha-m |
| The total annual recharge | 109150 ha-m |
| Ground water balance of the area | 57488.9 ha-m |
| Stage of Development | 38% |

**Survey of Pumping sets used for irrigation in Samastipur district:**

- Two villages from each of 17 blocks of the district were surveyed.
- Altogether 769 farmers who own 790 pumps were contacted.
- About 38% of pumps were of 'Bharat make' followed by 26% 'Kirloskar' and 6% 'Usha'.
- Rest of the 30% pumping sets were of various makes
- Majority of the farmers are using 5 HP diesel engine operated pumping sets.
- About 9% by engine rating less that 5 HP and about 14% engine rated above 5 HP are being used.

**Assessment of ground water pollution from different sources:**

- High concentration of $Ca^{++}$ + $Mg^{++}$ (15.6) and (11.5 me/L) was observed in Barauni industrial area.
- Waste water from Barauni, Samastipur, Muzaffarpur and Patna Districts were selected for sampling. pH, EC, $Ca^{++}$ $Mg^{++}$, $Na^{+}$, $CO_3^{--}$ + $HCO_3^{-}$ ,$C1^{-}$ and SAR were evaluated. It showed high content of $Cl^{-}$ (10.5 me/L) indicating unsuitability for irrigation.
- At Patna the values of pH, EC, $Na^{+}$, $Ca^{++}$ + $Mg^{++}$,$CO_3^{--}$ + H $CO_3^{-}$, $Cl^{-}$ and SAR were found to be within permissible limits.
- Water samples of Dairy farm, Pusa , Samastipur showed high contents of EC ( 2.7 $dSm^{-1}$), $Ca^{++}$ + $Mg^{++}$ ( 17.3 meq/L) and $Cl^{-}$ (10.8 meq/L) content.
- At Muzaffarpur the parameters like Na, $Ca^{++}$ + $Mg^{++}$, $CO_3^{--}$ + $HCO_3^{-}$ and $Cl^{-}$ were found to be within permissible ranges for irrigation water.

### 4.2.2.3 SOIL & WATER CONSERVATION ENGINEERING

- Amongst different treatments of fertigation without mulch, the treatment F1 (100% fertigation) was found better resulting highest vegetative growth and yield (78.62t/ha). The yield of intercrop cowpea was found to the tune of 13.06 t/ha which is 17.03 per cent higher over control.
- In case of fertigation with mulch, the treatment F5 (100% fertigation + mulch) resulted the yield 79.64 t/ha which is 21.04 per cent higher over control.

### 4.2.3 BASIC SCIENCES RESEARCH

**Conservation of Germplasms**

- Large number (1200) of land races of various crop species/medicinal and aromatic plants including rare land races of rice have been collected and deposited in NBPGR under conservation and management of biodiversity.
- Identified genetically diverse entries through evaluating 140 rice accessories for developing a core collection of entries in early, medium and late maturity groups.

**Pre Breeding for Genetic Enhancement of Rabi Pigeon Pea**

- Genotypes RAUP-3, RAUP-15, RAUP-10, RAUP-2, VKS/SCC-10/57, IC-274730, VKS/SCC-12/19, RAUP-34, Pusa-9, Bahar and Muzaffarpur local were tolerant to cold and showed high rate of biomass accumulation in early growth stage have been identified as potential donors for these traits.
- *RAUP-14, RAUP-34, VKS/SCC-2/8,* Pusa-(B)-35 and ICPL-7 have been identified as tolerant to pod borers. ICPL-7 and *Pusa-(B)-0137 showed lowest* (25% and 27% respectively) pod fly infestation
- Five entries namely RAUP-32 and RAUP-34, Pusa-(B)0137, Pusa (B)-0136 and ICPW-98008 were identified as resistant to *Alternaria* blight. 25 entries showed moderately resistant reaction, sixty-one entries showed moderately susceptible reaction and twenty-one entries were susceptible. None of the entries showed highly susceptible reaction. The disease intensity in control var. Bahar was 53%.

**Biochemical change during Alternaria infestation in Pigeon pea:**

- Biochemical change during *Alternaria* infestation was studied in leaves of susceptible and resistant cultivar for total soluble protein and phenol, and peroxidase activities.
- The healthy leaves of susceptible cultivars contained more soluble protein than the resistant cultivar.
- The peroxidase activity in susceptible was much lower than resistant, following infection by A. *tenussima*.
- Maximum phenol content was noticed in diseased middle leaves followed by lower diseased leaves of resistant cultivars.
- Resistant line contained more phenol than susceptible one in both healthy and diseased tissues.
- Identified biochemical markers for identifying water logging tolerance maize germplasm.
- Higher activity of enzyme like SOD, ADH, Alanine amino transferase, peroxidase and catalase are associated with water logging tolerance.
- Traditional varieties like *Desla brown* was highly equipped with these enzymes and thus have better tolerance to water logging.
- Identified some isozyme markers for characterization of genotypes.
- These isozyme markers are being used for cultivars characterization, identification of intespecific hybrids between *Atylosia platycaropus* and *Cajanus cajan*,
- Testing the genetic purity of tissue culture plants.

**Inter specific Hybridization in Cajanus Sp.:**

- Inter specific Hybridization program was undertaken to develop interspecific hybrids between *C.platycarpus* and *C.cajan* and *Cajanus cajanifolia* and *Cajanus cajan*.
- Immature pods obtained from cross *Cajanus platycarpus* and *Cajanus* were harvested and immature ovule from these crosses were obtained and cultured *in*

*vitro* on MS basal medium supplemented with 0.5 mg L-1 NAA and 0.5 mg $L^{-1}$ BAP.

- Only four out of the eleven responded to *in vitro* culture and converted into plantlet. Plantlets were transferred to pot.
- Leaves from this plantlet were used to test the hybridity through isozyme pattern of peroxidase.

**Embryo and ovule culture of *Cajanus cajan* and *C platycarpus* genotypes:**

- Immature embryos and ovules of different genotypes of *Cajanus cajan* and *C. platycarpus* were cultured on MS basal medium supplemented with different concentrations and combinations of NAA and BAP.
- Callusing was observed on all the six media, while rhizogenesis and caulogenesis on M1 (MS+NAA 0.1 mg L-1+BAP 1.0 mg L-1) and M3 (MS+NAA 0.5 mg L-1+BAP 0.5 mg L-1) and rarely on M5 (MS+NAA 2.0 mg L-1+BAP 1.0 mg L-1) media.
- Medium M1 was the best for callus formation, rhizogenesis and caulogenesis in case of embryo culture and for caulogenesis in case of ovule culture.
- Medium M3 was the best for callus formation and rhizogenesis in case of ovule culture.
- Among the genotypes of *C. cajan,* G2 (Bahar) and *C. platycarpus,* G4 (BHU-1) gave the best tissue culture responses.
- The work showed the possibility of using embryo and ovule culture for rescuing the hybrids of interspecific crosses of the two species of *Cajanus.*

**Intervarietal Hybridization:**

- Hybridization program was also undertaken between selected donors *i.e.* RAUP-32 and RAUP-34 and different promising germplasm /varieties like Bahar, Pusa-9, Muzaffarpur-Local, UPAS-120 .
- F1 seeds were obtained only from ten crosses.

**Conversion of elite boro lines into cytosterile lines**

- The back crossed progenies were further backcrossed to convert elite lines, such as, Dhanlaxmi, Gautam and Richharia into cms lines
- Using 'Wild abortive' and 'Kalinga 1' cytoplasmic sources as the donor of male sterility inducing cytoplasm, the elite boro lines are being converted into cms lines.

**Purification of restorers**

- Elite lines Prabhat, Pusa 1107, RAU 1411-10, PSRM 1-16-48-1, RAU 1411-4, RAU 1345-1-2, RAU1400 and Pusa 1040 have been identified as fertility restores of WA-cytosterility in rice with the potential for their utilization in the development of hybrid boro rice.
- The testcrosses involving different WA-cms lines and these restorer lines have exhibited effective fertility restoration.
- These elite lines, which have been identified as restorers were retested for their restoration potential on individual plant basis.

**Development of isocytoplasmic restorer lines**

- Twenty promising isocytoplasmic restorer lines were evaluated for floral and agronomic characteristics.
- These lines developed from crosses involving non-allelic restorers.
- Ten promising lines identified for further evaluation of their restoration potential.

**Maintenance of A, B, R and elite boro lines**

- Elite lines, B and R lines were maintained and evaluated in respective nurseries.
- Cytosterile lines (A lines) were maintained by hand pollination and also by using clonal method.

**Evaluation of isocytoplasmic restorers for wild abortive rice cytoplasm**

- Variation in floral and agro morphological characters was studied to quantify the differentiation among twenty isocytoplasmic restorer breeding lines of rice
- Significant differences existed in respect of each of the fifteen floral and agromorhological characters studied.
- Exploitable genotypic variability was found for grain number, panicle number, spikelet number, spikelet fertility, panicle density, and grain yield per plant.
- Frequency of Stained round fertile(SRF) category of pollens was remarkably high in all the restorers.
- Ample morphotype diversity and differentiation among the lines was observed.
- Distribution pattern of entries into clusters was not necessarily related with parentage of the lines.
- Ten lines appeared to be promising for deriving potential restorers to be utilized in the development of three line hybrids using WA-cms lines.

## 4.3 EXTENSION ACTIVITIES

### 4.3.1 TRAINING

Training for field functionaries, farmers, unemployed youths, housewives and others are organized at the University headquarters and other campuses of the University to promote self-employment. However, training programmes for farmers/farmwomen are mainly organized at all Krishi Vigyan Kendras on a routine basis. Moreover, various training programmes are organized for updating the scientific knowledge and to improve the technical skill of the officers of different state departments and NGOs. Primarily, trainings are intended to address problems of under-employment, unemployment and malnutrition in rural areas through diversification of agriculture and promotion of horticulture, fisheries, dairy, livestock, poultry, beekeeping, sericulture, mushroom production etc.

**TRAINING ON MICRO IRRIGATION**

The farmers training under precision Farming Development Centre (PFDC) financed by NCPAH, Ministry of Agriculture, New Delhi was organized by the Department of Soil & Water Conservation Engineering at KVK Sabour (Bhagalpur) on 12-13 & 14-15$^{th}$ December, 2005. The main focus of training was on micro-irrigation (drip and micro sprinkler system), its use, system components & their installation, cost of cultivation and benefits. The use of poly houses, its types, construction and benefits were also covered.

**TRAINING ON RABI VEGETABLE PRODUCTION**

A three day training programme on rabi vegetable production was organized from 28 to 30$^{th}$ September, 2005 at KVK Sabour (Bhagalpur). One hundred farmers participated in the programme.

**TRAINING ON COMMERCIAL FLOWERS**

Two training programmes on commercial flowers production were organized at Pusa campus under the NHB project "Development of floriculture industry in Bihar through demonstration and training on new technology". Twenty five candidates attended each training.

Theme of the training was to create awareness among the farmers about importance, use and scope of floriculture. Besides, new improved technologies regarding production of important commercial flowers (rose, gladiolus, tuberose, marigold, chrysthenum, gerbera, jasmine, etc.), their post harvest technology and marketing were also discussed. Training was practical oriented.

**Beneficiaries of training imparted during the year 2005-06.**

| Areas of Training | Beneficiaries | | |
|---|---|---|---|
| | General | SC/ST | Total |
| Crop Production | 10653 | 1619 | 12272 |
| Crop Protection | 5951 | 1058 | 7009 |
| Horticulture | 3347 | 872 | 4219 |
| Animal Science | 1908 | 360 | 2268 |
| Home Science | 1981 | 758 | 2739 |
| Others | 1761 | 804 | 2565 |

Other Sponsored Training Programmes during the year 2005-06

| Areas of Training | No. of trainings | Beneficiaries |
|---|---|---|
| Mushroom Cultivation | 02 | 53 |
| Medicinal Plants | 02 | 36 |
| Honey Production | 10 | 370 |

### 4.3.2 DEMONSTRATION

**FRONTLINE DEMONSTRATION ON VERMI-COMPOST**

KVKs have demonstrated vermi-compost production technology in the project areas. The FLD programmes conducted in the project area. The FLD programmes conducted so far could create a remarkable awareness among the farmers in wide scale diffusion of the technology for independency towards fertilizer and also provide self employment for generating additional income to rural youth.

**FIELD DEMONSTRATION ON CULTIVATION OF COMMERCIAL FLOWERS**

Under the "Macromode Management Project Development of Commercial Floriculture in Bihar" to increase the area, production and productivity of commercial flowers in Bihar and to improve the economy of farmers demonstrations were conducted during 2005-06.

Number of Demonstrations Conducted on cultivation of Commercial Flowers

| District | Flower | | |
|---|---|---|---|
| | Marigold | Tuberose | Rose |
| **Samastipur** | 85 | 23 | 19 |
| **Muzaffarpur** | 78 | 10 | 23 |
| **Vaishali** | 25 | 03 | 01 |
| **Motihari** | 10 | - | - |
| **Bhojpur** | 70 | 18 | 17 |

### 4.3.3 UNIVERSITY PUBLICATIONS

- Adhunik Kisan Diary
- Krishi Nirdeshika
- RAU News letter
- Adhunika Kisan Patrika
- Bulletins and folders on
  - Package of practices of crops,
  - Livestock production,
  - Fish culture,
  - Bee keeping,
  - Mushroom cultivation, and
  - Poultry

### 4.3.4 FARM ADVISORY SERVICE

The farm Advisory services comprise of scientists visits to villages, farmers visit to Research Station and replies to farmers queries through postal correspondence. A Kisan Call Center has been established at the University headquarters at Pusa. Farmers of the state can have access to the University experts through telephonic link dialing the number 06274 – 241694. Agro met Advisory Services Project (DST,Govt.of India) has achieved

success in creating awareness among the farmers about the importance of weather in agricultural decision making. Meteorological data recorded at Pusa Agro met Observatory are sent to Mausam Bhawan on regular basis. On every Tuesday and Friday medium range weather forecast form National Center for Medium Range Weather Forecasting, Noida are received and in anticipation of weather forecasts, Agro met Advisory bulletins are prepared on the recommendation from various subject matter specialist/scientist of the university. These advisory bulletins are them sent to the farming community through mass media and also through personal contacts for their day-to day agricultural decision making. Feedbacks are collected from farmers for economic impact analysis and to know from them how much economic benefit they get by following our weather forecast based agro-met advisory. Verification and reliability of forecast using actual weather observations of local agro met observatory are carried out on seasonal basis and are reported to National Center for Medium Range Weather Forecasting, Noida. Besides, weather reports particularly during inclement weather situation are prepared to meet the needs of media and other agencies.

**Activities of Farm Advisory Service**

| Activities | Number | Beneficiaries |
|---|---|---|
| Kisan Gosthi | 155 | 10143 |
| Field days | 63 | 4272 |
| Scientist visit to farmer's field | 1226 | 7474 |
| Diagnostic service | 197 | 3242 |

### 4.3.5 AGRICULTURAL TECHNOLOGY INFORMATION CENTER

The establishment of Agricultural Technology Information Center (ATIC) has provided a mechanism beyond individual units of research institution in contributing towards the dissemination of information. This has served as a single window system with an objective to help the farmers and other stakeholders both to provide solutions to their problems and make available all technological information along with technology products for their transfer and use.

Through this center, the Directorate is serving farming community by providing the most important input i.e. knowledge input along with other inputs such as seeds of different high yielding varieties of various crops, graft & gooties of horticultural crops, fertilizers etc.

This year a demonstration unit on Vermi-composting has also been constructed to make the visiting farmers aware of the benefit of Vermi-compost in maintaining the soil health.

### 4.3.6 KRISHI VIGYAN KENDRA

Bihar has achieved the target of having one KVK in each district of the state.


**Krishi Vigyan Kendras under R.A.U.in Bihar**

In an information age, the role of appropriate information package and its dissemination assumes a portal role. It is not only important to generate information but also to see that the required information are delivered to the end users at the earliest and that too without any dissemination loss. Krishi Vigyan Kendra is a front line extension system and a lighthouse for the farming community fulfilling this need. It works upon the principles of "learning by doing and seeing is believing".

The Directorate of Extension Education has created a network of 29 such Krishi Vigyan Kendras located in 29 districts spreading over all the three agro-climatic zones of the state.

This year has witnessed a revolutionary progress in the establishment of the new KVK as 10 new KVKs were established in the districts of Lakhisarai, Jahanabad, Aurangabad, Gaya, Saran. Gopalganj, East Champaran, Sheohar, Supaul, and Kishanganj

### 4.3.7 AGRI EXPO 2006: AN UNIQUE FEATURE OF KNOWLEDGE AND INFORMATION

Agri Expo 2006 first time in the history of Bihar was organized for four days(2-5 March), at RAU, Pusa with 200 stalls to disseminate knowledge and information with ultimate aim to infuse wisdom among the farm families for taking up their cultivation with change mind set in using latest technologies for boosting their agricultural production, and realization belief in farming system, market driven diversified approach of cultivation for generating additional income to raise their standard of living to quality of life towards quality of human being.

- The development agencies of Govt. of India e.g. Coconut Development Board, Patna; NHB, Patna; and NHRDF, through their exhibits and presentations caught attention of majority of visitors.
- **Development agencies** of Govt. of Bihar such as Aids control Board, Information and public relation department, Information Division, Department of Agriculture, Patna, Jila Sacharta Samiti, Samastipur and Atma, Madhubani were successful in spreading awareness among people through their depictions.

- **Four sugar mills** like New Swadeshi Sugar Mill, Narkatiaganj; Vishnu Sugar Factory, Gopalganj; Riga Sugar Mill; Hariharpur Sugar factory and Sugarcane Department, Govt. of Bihar; displayed the developments of Sugarcane and Sugarcane Industries in the Bihar.
- **Commercial Banks** like Punjab National Bank, and Syndicate Bank participated in the expo and spread the message of awareness among farmers about various activities run by banks in the favour of farmers and rural masses.
- **Industrial Organizations** participated in expo (15 ofagricultural machineries, 6 of cheese technology, 6 of plant protection, 6 of food industries and 4 of Horticulture related industries).
- **Small scale agricultural business units** developed on the basis of their training at Rajendra Agricultural University, such as Mushroom, Madhubani paintings, honey, and Medicinal & Aromatic plants,
- Large Number of farmers from the states of **UP, Jharkhand and** also **from** the **country of Nepal** participated in the Agri-Expo
- . Bumper sale of 1500 Adhunik Kisan Diary
- **Kisan gosthi** was organized every day in the fair, in which farmers were made aware of knowledge management of new technologies developed in agriculture,.
- **NHB sponsored special seminar cum workshop** was organized for two days on the vegetable production technology,.
- **Special workshops** were organized on the organic agriculture, medicinal & aromatic plants, mushroom production, and sugarcane production to enhance the farmers awareness on latest dimensions of agriculture.
- **Quiz contest** was organized to assess the level of awareness of the farmer participants and the best ones were suitably awarded to encourage him and also to create an environment of creativity and competitiveness among all other participants..
- **Animal shows and Animal health camp** were organized in which 400 animals like cow, buffalo, heifer, goat, duck, dog, rabbit, hen and horses were brought for participation
- **Horticulture show** was also organized to highlight the technologies and management practices
- Books on agriculture such as "**Adhunik Krishi Nirdeshika**","**Dhaan ki kheti"** and "**Krishi Darpan"** were released during *Agri-Expo,2006.*
- Entertainment cultural show on the theme of Agriculture development during Agri-Expo was organized on all the days.

**4.3.8 Kisan Mela**

- State Level Kisan Mela were organized at Araria, Motihari, Paharpur and Baraka Gaon
- 12 district level Kisan Mela were organized
- University participated in the Agro-expo fair at New Delhi
- University participated in the Regional Agricultural fair for eastern region organized at BCKV, West Bengal.

**4.3.9 Other Significant Achievements**

- Director General of ICAR and Minister of Agriculture, Government of Bihar visited one of the KVK at Birauli where they laid the foundation stone of Kisan Hostel and Administrative Building respectively
- KVKs have taken a lead in dissemination of technology related to Vermi-composting in whole of the state within five years of time . A total of 373 vermi compost units have been established by the KVKs of RAU.

- University has taken a lead in seed production programme through KVKs by adopting seed village concept. The programme is successfully running in many of the krishi vigyan kendras .
- Government of India, in recognition of the contribution of KVKs in the area of seed production, has sanctioned a sum of Rs 32 lakh for implementation of seed village scheme in 16 KVKs.

- Development of technology for extraction of fiber from banana waste has created job opportunity for unemployed / underutilized rural women. As a result various decorative items are being produced and sold in the market.
- After being trained by the KVK, the farm women are getting more income through manufacturing and marketing of readymade garments and other handicraft materials.
- Training in the filed of bee-keeping , mushroom production, medicinal plants and floriculture has helped unemployed rural youths in establishing viable small entrepreneurs gaining economic returns .
- Formation and operation of self-help group (SHGs) through KVKs has empowered the rural women raising their social status.

Chapter 5

# STUDENTS' WELFARE ACTIVITIES

## 5.1 SPORTS AND GAMES ACTIVITIES

### 5.1.1 RAU-INTER COLLEGE TOURNAMENT

During the year 2005-06, the Sports and Games Society of this University successfully organized an Inter College Volleyball (Boys), Table Tennis and Athletic Meet (Boys and Girls separately) at 'sports complex' at Pusa from 8-10th February 2006.

**Results of Inter College Volleyball and Table Tennis. Tournament**

| Event | Team | Runner up | Winner |
|---|---|---|---|
| Volleyball (Boys) | T.C.A., Dholi | - | Winner |
| | B.V.C., Patna | Runner up | - |
| Table Tennis (Boys) | B.A.C., Sabour | - | Winner |
| | C.A.E., Pusa | Runner up | - |
| Table Tennis (Girls) | B.A.C., Sabour | - | Winner |
| | T.C.A., Dholi | Runner up | - |

**Medals tally of different colleges on the basis of individual performance of players in Athletic Meet**

| College | Gold | Silver | Bronze | Total |
|---|---|---|---|---|
| T.C.A., Dholi | 9 | 3 | 6 | 18 |
| B.A.C., Sabour | 4 | 6 | 3 | 13 |
| C.A.E., Pusa | 3 | 1 | 3 | 7 |
| C.O.F., Dholi | 2 | 0 | 1 | 3 |
| P.G. Pusa | 1 | 4 | 1 | 6 |
| S.G.I.D.T., Patna | 1 | 2 | 1 | 4 |
| C.H.Sc., Pusa | 0 | 2 | 2 | 4 |
| B.V.C., Patna | 0 | 1 | 2 | 3 |

### 5.1.2 Participation at National Level

University team participated in Volleyball, Table Tennis and Athletics in 7th All India Inter Agricultural University Sports and Games Meet held at Maharana Pratap University of Agriculture and Technology, Udaipur (Rajasthan) from 23-27 February2006.

## 5.2 LITERARY AND DEBATING ACTIVITIES

The society is organizing various activities to develop students creative zeal and providing a platform to develop their personality.

- **I32nd Kamal Nayan Bajaj Memorial Elocution Contest:** College team selection rounds were conducted at T.C.A., Dholi, College of Home Science Pusa and C.A.E., Pusa. Two best speakers from each colleges participated in final selection round at University level. Nidhi Kumari of T.C.A., Dholi was selected as the best

speaker and represented University at Shiksha Mandal Wardha and got appreciation (9-10 January, 2006).

- A group of nine girl students, namely Anita Kumari, Poonam, Madhu, Nidhi, Varsha Pradeep, Reena Kumari, Shobha Kumari, Dipti and Kumari Minakshi of T.C.A., Dholi got certificate of appreciation as announced by Hon'ble Vice-Chancellor, R.A.U., Bihar, Pusa for presentation of Welcome Song and National Anthem in ISOPOM sponsored training programme (August 4-6, 2005).
- **World Food Day (October 16, 2005):** Various activities have been organized to celebrate the day. The theme of 2005 was "Agriculture and Inter-cultural Dialogue".
- **Elocution Contest:** Organized on topic "Self-sufficiency in Food and Sustainable Food Security–Indian Perspective". 13 students from various Colleges/Departments of University have participated in the contest. Nidhi Kumari of T.C.A., Dholi won first position whereas second and third positions were secured by Mukesh Kumar Singh (Plant Breeding Department) and Deepak Kumar (C.A.E., Pusa).
- **Essay Competition:** On topic "Role of Traditional systems in Modern Agriculture". 21 students from different Colleges/ Departments of R.A.U., Bihar participated and T.C.A., Dholi. Students won all the prizes : First by Varsha Pradeep, Second by Bandana and Third by Nidhi Kumari .

## 5.3 N.C.C.

The 6/12 Coy NCC Unit of RAU is running with strength of 55 Cadets and one NCC officer. This is the only youth organization of the University which Develops Character, Comradeship, the ideal of service and capacity for leadership in youth and energetic students providing opportunity for the cadets to participate in various activities and training instructed to it. Apart from regular parades in which cadets were trained in the relevant course content. They also took active part in the following activities.

1. Independent day celebration
2. Republic day celebration
3. NCC day celebration
4. Kisan Mela
5. Other different occasions/functions of the University.

During the reported year the NCC cadets have participated in various actions as stated above.

The students of the each and every post-graduate and under-graduates programmes under the RAU Headquarter and its constituent colleges have been provided Hostel accommodation with cafeteria and mess facilities. During the reported year cleaning work around the Hostels as well as roping of trees have been made.

## 5.4 N.S.S. ACTIVITIES

(i) U.G. and P.G. student's conducted and helped in Polio drive.
(ii) U.G. and P.G. students helped in Aids awareness programme.

## 5.5 CULTURAL SOCIETY

Various cultural programmes were arranged by students during important occasions like college foundation day and others in various colleges of the University.

Fellowship/Scholarship Award to the Students

As per provisions made under regulation about 32 students have been awarded merit scholarship and 60 students awarded merit-cum-means scholarship in the undergraduate programmes and the postgraduate programme 27 students have been awarded junior fellowship and 26 students have been awarded senior fellowship under 75% quota of the total intake capacity.

## 5.6 EDUCATIONAL TOUR

The students of T.C.A., Dholi/S.G.I.D.T./B.V.C., Patna/College of Home Science and B.A.C., Sabour have been sanctioned study tour/educational tour during the reported.

## 5.7 STUDENT COUNCELLING AND PLACEMENT CELL

The campus interview for appointment of graduates/postgraduate/ Ph.D. students have been organized during the reported year on the basis of interview.

(i) Eicher Tractors Ltd., Patna had selected 4 Ag. Engg. Students.
(ii) State Bank of India selected 10 students for the post of Marketing Officer.
(iii) Three students were selected for Marketing Officer by Bangalore Horticulture.
(iv) United Phosphorus Ltd., Patna has selected 9 Agriculture student's for Market Development Officer.
(v) Apart from this many students have gone in various Nationalized Banks, Food Corporation of India and other Government and Private Organizations.

# DIRECTORATE OF ADMINISTRATION

## 6.1 ADVERTISEMENT

The advertisement for filling up of 220 vacant posts of Assistant Professor-cum-Junior Scientist and 62 posts of Training Associates have been made vide Advt. No.01/2006 dated 22.02.06 and advertisement for 120 posts of Junior Scientist-cum-Assistant Professor have also been made under reservation category vide Advt. No.02/2006 dated 27.03.06. Similarly, 17 vacant posts of Deans and Directors ,one post of C.M.O and one post of Security Officer have been advertised vide Advt. No.03/2006

## 6.2 RESERVATION ROSTER

Reservation roster of Non-teaching staff of different units for 156 posts have already been submitted to the Deptt. of Agriculture, Govt. of Bihar for clearance. National commission for Scheduled caste, Govt. of Bihar has visited the University and reviewed the implementation of reservation policy for SC & ST.

## 6.3 APPOINTMENTS

16 appointments on IIIrd & IVth grade have been made in compliance of the Hon'ble High Court, Patna. Process for appointments on remaining posts of 35% and 65% quota is being initiated on the directive of the Hon'ble Governor-cum-Chancellor, Universities of Bihar. Three persons on Class-IV posts have been appointed on compassionate ground.

## 6.4 INTERVIEW

Interview for the posts of Photographer-cum-Artist, X-ray technician and Talkie Operator have been conducted during the period in compliance of the Hon'ble High Court, Patna.

## 6.5 PROMOTION

Some pending cases of promotion under C.A.S. of Scientists/Teachers have been cleared. 98 Technical Staff and 113 Non-teaching staff have been given benefit of A.C.P.

## 6.6 CONTRACTUAL ENGAGEMENT OF TEACHERS AND OFFICERS IN THE UNIVERSITY

Due to acute shortage of Faculty members in different Colleges and Departments, eleven retired teachers/scientists have been appointed on contractual basis.

## 6.7 AWARDS

The following Scientists were awarded on the eve of 15th August,2005 for their excellent work in their respective field.

1. Dr. Devendra Singh
   Officer I/C, Farm,Pusa
2. Dr. S.P.Singh,
   Sr. Scientist(Tuber),TCA,Dholi
3. Dr. Usha Singh,

Sr.Scientist,College of Home Science

- Dr. Arunima Kumari, Associate .Professor, College of Home Science, RAU, Pusa won young Scientist Award by the Society of Mobilization for sustainable Development at IVRI, Izatnagar in a national Seminar on Entrepreneurship Development for Livelihood Security Experience, Prospects and Strategies for Rural India held from 29th Nov. to Ist Dec.,2005.

- Dr. Birendra Kumar, Jr. Scientist-cum-Assistant Professor, Plant Pathology, Sugarcane Research Institute, Pusa was awarded "Crop Research Award -2004 by Agricultural Research Information Center, Hissar (Haryana )

- Dr. R.K.Sohane, T.O.,K.V.K., Birauli was awarded Swami Sahaja Nand Saraswati Extension Society/ Worker award for the year 2003-2004 by the ICAR .

- Dr. M.N.Jha, H.O.D., Microbiology, Faculty of .Basic Sciences & Humanities, Pusa was awarded by the Univ. during Golden Jubilee Celebration of Academic Council for his excellence in research .

Sri Anil Kumar, a Ph.D. Scholar, Department of Horticulture ( Pomology) of Bihar Agril.College,Sabour was awarded for Jawaharlal Nehru Scholarship for doctoral studies by the Jawaharlal Nehru Memorial fund, New Delhi.

# ANNUAL ACCOUNT FOR THE YEAR 2004-2005

(Rs. In Lakh)

| Budget Head | Receipts | Expenditure |
|---|---|---|
| Opening balance of the Year | 1529.61 | |
| Non Plan | 3845.84 | 3845.93 |
| Plan | 740.29 | 608.33 |
| All India Coordinated Research Projects, Adhoc Projects & ICAR Development grant | 749.76 | 625.25 |
| Krishi Vigyan Kendras | 697.67 | 493.22 |
| National Agriculture Technology Project | | 64.82 |
| GOI Projects | 121.90 | 127.29 |
| Macro Mode Projects | 381.28 | 43.33 |
| Other projects | 108.70 | 35.81 |
| Revolving fund | 188.82 | 171.48 |
| Students Fund | 15.32 | 11.70 |
| Group Insurance Scheme | 77.26 | 40.34 |
| University Internal Receipts | 111.42 | 5.79 |
| Remitance | | 310.20 |
| Closing Balance of the Year | | 2184.38 |
| **TOTAL** | **8567.87** | **8567.87** |

Chapter 8

# LINKAGES

- Rajendra Agricultural University, Pusa has signed an MOU on March 13, 2006 with **IOWA State university, Ames IOWA, USA** for cooperation in the fields of: **Agriculture and Biosystem Engineering:** Under this collaboration IOWA State University and Rajendra Agricultural university, Pusa will jointly develop projects/programmes and improve their capabilities to serve their respective clientele in India an USA.
    - **Long and Short term exchange of faculty and staffs:** It has been agreed to pursue mutural interest in the areas of long and short term exchange of faculty and staffs; programmes related to research; teaching in the field of agriculture and allied sciences.
    - **Exchange Programme of the students:** It will also provide opportunities to the students of both the universities to pursue their study at the partner institutions. All activities to be implemented jointly by both the universities.
- Linkages have been established with **International Rice Research Institute, Philippines** for rice research.
- Collaboration with **Central Institute of Fisheries Education, Mumbai** has been made for the exchange of faculty and students between the two institutes.
- Collaboration with **National Mission on Bamboo Applications**(Technology Information , Forecasting and Assessment Council, New Delhi) for setting up Model Bamboo Vegetative Propagation Center at Pusa.

Chapter 9

# WORKSHOPS, SEMINARS, SYMPOSIA HELD

## 9.1 BRAIN STORMING SEMINARS

A series of *Brain Storming Seminars* on different crops like, sugarcane, oilseeds, rice, wheat, spices and floriculture, maize, pulses, potato, fruits vegetables, tuber crops and some other aspects like soil science and cropping research system were organized during the period 23rd December, 2005 to 28th February, 2006. In these seminars several eminent scientists from all over the country had participated. The main objective of organizing such seminars was to retrospect the work done in the past on all the crops and to make strategic planning and prioritizing the future research action plan. With the changing global scenario and the new requirements, it was recommended that some more areas should be brought to the priority areas of research.

## 9.2 AWARENESS SEMINAR ON INTELLECTUAL PROPERTY RIGHT:

An awareness seminar on Intellectual Property Rights was organized at flex house as well as Auditorium of Sanchar Kendra, from 3rd to 4th December, 2005 in commemoration of the 35th celebration of establishment of RAU, Pusa.

## 9.3 STAKEHOLDER WORKSHOP FOR COMPETITIVE AGRICULTURAL EDUCATION

A stakeholder workshop for Competitive Agriculture education was held on February 10, 2006 in which stress was laid on designing of the surses for competitive agriculture as per tomorrows needs. It is a prerequisite for the students to be marketable.

## 9.4 NATIONAL CONFERENCE ON STRATEGIC PLANS FOR DEVELOPMENT OF HORTICULTURE

Hon'ble Agriculture Minister, Govt. of Bihar, Sri Narendra Singh inaugurated 3 day (17 to 19 February, 2006) National Conference on "Strategic Plans for Augmenting Development of Horticulture in Eastern India". The conference was quite successful. The focus of the conference was to sensitize scientists, policy makers, bureaucrats, extension workers, public and private agencies and NGOs. Nearly 200 participants across the country from different organizations like NHB, APEDA, Coconut Development Board.

## 9.5 SEMINAR ON AGRICULTURAL RENEWALS AND FARMERS

A seminar on "Agricultural Renewals and Farmers" was held at Pusa on March 29, 2006. The Chief Guest of the occasion Padma Bhusan Dr. R. B. Singh, member, National Commission on farmers highlighted the facts that Bihar has been the center of culture of agriculture as well as mother of all cultures. He stressed upon sensitization of total machinery in agriculture, unflinching dedication of scientists for raising the lowest human capital index for agriculture *nirman* of Bihar it was indicated to contemplate as to how to increase th technology delivery rate and technology absorption capacity of the farmers. He also stressed the need of new cost effective technologies.

Chapter 10

# PARTICIPATION OF SCIENTISTS IN CONFERENCES, SEMINARS, SYMPOSIA

- Drs. Hari Chand, M.L. Agarwal and R. Singh, attended National Seminar on "Prospects of royal jelly production in Bihar" on **24-26., 2006**
- Drs. D.K. Das and A.K. Chakraborty attended Annual Workshop of AICRP on Agroforestry (ICAR) held at Central Soil Salinity Research Institute, Karnal (Haryana) from 20-22 August, '05
- Drs .R.N.Sharma, N.K.Singh, B.Rai, A.K.Mishra and S.K.Choudhary attended Annual Rice Group Meeting/ Workshop of All India Coordinated Reserch Project on Rice held at Banglore from 9-13 April, 2005
- Dr. V. Kumar attended National Symposium on Efficient Water Management for Eco-friendly, Sustainable and Profitable Agriculture at IARI, New Delhi from December 1-3, 2005
- Dr. B. Kumar attended 2nd Global Conference on Plant Heath-Global Wealth held at Maharana Pratap University of Agriculture and Technology, Udaipur (Rajsthan) from 25 –29 November, 2005
- Dr. B. Kumar Attended National Symposium on Emerging Plant Diseases, Their Diagnosis and Management held at University of North Bengal, Siliguri. (W.B.) from January 31-February2, 2006
- Dr. S.B. Mishra, attended Annual Group Meeting of Rabi Pulse held at Ramkrisha Mission Kolkata from 8-11 Sept.,2005.
- Dr. U. Mukherjee attended National Conference on "Strategic Plans for Augmenting development of Horticulture in Eastern India" held at R.A.U. Pusa from 17-19 Feb., 2006.
- Dr. Anil Pandey attended International Conference on Social Science Perspectives in Agricultural Research and Development at VARDAN-IFPRI-ISEE New Delhi, India from 15-18 Feb.,2006)
- Dr. Anil Pandey attended UGC Sponsored National Seminar on Resource Management for Sustainable Agriculture (RMSA) **2005**
- Drs. S.S. Pandey, Mukesh Kumar and Harendra Singh attended Group meeting held at U.P.C.S.R., Shajhanpur (U.P.) from 27-29 October, 2005.
- Dr. D. Prasad attended Annual Group Meeting of AICRP on Weed Control held at OUAT, Bhubaneshwar, from 25 – 28 April, 2005.
- Dr.Ranjan Laik attended National convention on Knowledge Driven Agriculture Technology : management of Change held at New Delhi from 22-24 March, 2006.
- Dr.P.K.Ray Attended International Conference on Plasticulture and Precision Farming held at New Delhi from Nov. 17-21,2005.
- Dr.P.K.Ray attended International Education Meet at Kochi (Kerala) from Feb. 05-07, 2006 –organized by Cochin Univ. of Science and Technology, Kochi.
- Dr.P.K.Ray Attended workshop on "Strategic Plans of National Horticulture Mission" at Indira Gandhi Planetarium, Patna, organized by Department of Agriculture, Govt. of Bihar, Patna on May 11,2005.
- Dr.P.K.Ray Attended National Conference on "Strategic Plans for Augmenting Development of Horticulture in Eastern India" at RAU, Pusa from 17- 19 Feb., 2006.
- Drs. A. K. P. Singh, V. Kumar and S. K. Jain attended Biennial Scientist meet (workshop) of AICRP on water management held at Kerela Agricultural University, Trisur (Chalakudy Centre) from May 24-27, 2005

- Dr. S.K. Singh attended National Seminar on strategic plans for Augmenting Development of Horticulture in Eastern India" at RAU Pusa from 17-19 February 2006.
- Dr. M. Srivastava attended "Training workshop on assessment of post harvest losses under AICRP on PHT" held at Y.S. Parmar University of Horticulture & Forestry, Nauni, Solan (H. P.) from 1-3 June, 2005.
- Dr. M. Srivastava attended East Zone review meeting for assessment of post harvest losses under AICRP on PHT held at West Bengal University of Animal Sciences & Fisheries, Kolkata from 28-29 November, 2005.

Chapter 11

# PUBLICATIONS

## 11.1 Books / Book Chapters


Agarwal, M.L. (2006). Indian Dacini (Diptera:Tephritidae) and their management. In: *Integrated Pest Management and Biocontrol.* S.C. Dwivedi and Nalini Dwivedi (eds.). Pointers Publ., Jaipur, pp. 353-373.

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Mishra, A.K. (2006) Approaches of crop pest management: a prospective, RAU, 3 Decades of Achievement. (Eds) P.K. Roy, AP Singh, A.K. Mishra and S.K. Singh pp 91-93.

Mitra, S.K. and P.K. Ray (2005) Propagation, In *Litchi and Longan*: Botany, Production and Uses (Eds- Menzel, C.M and Waite, G.K.) CABI Publishing, Wallingford (U.K.) pp.35-48.

Singh, I. P., R. Singh and D.K.Choudhary (2005). Modern Beekeeping Technique. RAU, Pusa. 103pp.


## 11.2 Research Papers


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Chaturvedi O. P. and D. K. Das (2005). Energy dynamics in *Populus deltoides* $G_3$ Marsh agroforestry systems in eastern India. *Biomass and Bioenergy* **29**: 93-101.

Chaturvedi, O. P., D. K. Das and Rajeev Kumar (2005). A comparative study of the rooting depth of four agroforestry tree species inter-planted on boundary of wheat crop field in Bihar. *International Journal of Ecology and Environmental Science* **31 (1)**: 49-52.

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Choudhary S.K. (2005). Effect of relative proportion of fertility on performance of maize + berseem intercropping system. *Forage Research* **30(1)**:22-24.

Choudhary, S. and Dayaram(2005). Evaluation of different pleurotus spp., substrates and on supplements on yield performance foe oyster mushroom, cultivation in Bihar. *RAU Journal of Research*. 15: 1-4.

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Chapter 12

# DISTINGUISHED DIGNITORIES AT PUSA

**Dr. Mangala Rai,** Secretary DARE, GOI and DG, ICAR, New Delhi on 20th march, 2006
**Sri Narendra Singh,** Hon'ble Minister of Agriculture, Govt. Of Bihar on16-17 February, 2006
**Sri Nitish Mishra,** Minister of State, Sugarcane, Govt. of Bihar visited Pusa on 21st February, 2006.
**Dr. K. L. Chadha,** Ex. DDG (Horticulture), ICAR, New Delhi

**Dr. M. J. Khan,** Editor, Agriculture Today, New Delhi
**Dr. A. Ahmed,** Ex DDG (Education), ICAR, New Delhi
**Dr. A.K. Sikka,** Director, ICAR, ICER, Patna
**Dr. Arvind Kumar,** Director, NRC, Bharatpur, Rajasthan.
**Dr. Dilip Kumar,** Director, CIFE (ICAR) Mumbai
**Dr. M. C. Diwakar,** Director, Directorate of Rice Development, Government of India.
**Dr. Nagendra Sharma,** Vice Chancellor, Shere-Kashmir University of Agriculture and Technology, Jammu
**Dr. R. B. Singh** (Padma Bhusan), Member, National Commision on Farmers
**Sri R. G. Agarwal,** Chairman, Dhanuka Group , India.
**Dr. R. P. Roy Sharma,** Ex Vice Chancelor, Birsa Agricultural University, Kanke, Ranchi.
**Sri S. K. Gupjutin,** Chairman, Floresence Flower, Bangalore
**Dr. S. N. Pandey,** Director CPRI, Shimla (Himachal Pradesh)
**Dr. S. N. Puri,** Vice Chancellor, Vice-Chancellor, central Agricultural University, Manipur, Imphal
**Sri S. S. Mehta,** President, Aonla Groups Association of India
**Dr. T. C. Thakur,** Professor Farm Machinery and Power Engineering, G. B. Pant University of Agriculture and Technology, Pantnagar
**Dr. T. S. Pawar,** BARC, Trombay

Chapter 13

# FIVE MISSION OF RAU FOR ENHANCED FARM INCOME

Based upon the discussions during Brain Storming Seminar, Rajendra Agricultural University, Pusa has made a strategic planning and identified five missions as the thrust areas.

## 13.1 PROMOTION OF APICULTURE FOR ENHANCED PRODUCTION AND INCOME

Honey yield with the Italian honeybee species is the highest in Bihar as compared to other states with a production rate of 40 and 60 kg honey/ hive/year under stationary and migratory bee keeping respectively. Litchi honey has become famous abroad. Altogether 215 colonies of *Apis mellifera* were maintained at the AICRP (Honeybee), Pusa centre and placed at two locations. All the colonies were inspected regularly at weekly intervals and colony performance was recorded. About 16.0 quintals litchi, 7.0 quintal mustard and 3.5 quintal jamun raw honey was extracted. .Beside, 194 bee colonies (4 frames) were distributed to the 97 beginners under Macro Mode Management Project on Beekeeping after successful completion of training programme at the AICRP (HB) centre during 2004-05 from the existing strength/stock of the colonies. Several technologies have been generated at this institute regarding breeding of *Apis mellifera* Linn. for honey production; colony requirement per hectare for proper pollination in litchi; production of propolis from *Apis mellifera* colonies; effect of different artificial diets during dearth period on colony development; infestation of *Tropilaelaps clarae* in colonies during dearth period

## 13.2 VERMICOMPOSTING FOR INCOME GENERATION:

The university has already started working for stting up of Vermicompost Pits in each farm of the state. Krishi Vigyan Kendras have been given the responsibility for vermicomposting in the villages. There is a need to speed up the activity in due course of time.

## 13.3 QUALITY SEED PRODUCTION:

RAU is capable of producing the entire quantity of breeder seed and about 20% of foundation seed of different crops required in the state. Beside this, the university is also producing some quantity of certified/TL seed of different crops. Under Directorate of Seed and Farms of RAU various seed projects like state plan-strengthening seed production programme, MMP, ISO PoM and Mega Seed Project of ICAR are implemented through various funding agencies. With the funds available in these project the university has developed and strengthened the different infrastructural facilities for seed production, storage, processing and marketing. At present the seed processing facilities are available at DSF, Directorate of Seed & Farms, TCA Campus Dholi, BAC Sabour, IRS, Bikramganj and KVK, Harnaut, Nalanda. Due to these efforts the seed production capabilities of RAU increased four to five times in last four years as presented graphically.

Besides the above efforts launched by the University to fulfill the requirement of quantity seeds, the University is under process to launch **Pusa Beej Association** with the partnership with Govt. of Bihar and Seed Growers. Pusa Beej Association will harness the capabilities of the farmers through participatory seed production, **'Seed Village concept'** under the supervision of KVKs in different agro-ecological regions of the state. Farm_Advisory and sale centre_has been launched at each KVK by the RAU to provide the agricultural inputs and timely advice of various farm operations. Besides the

seed of Agricultural crops, the plant materials like grafts, gooties, seedlings etc. of fruits, trees/flower/forest trees and the quality seed of vegetables, spices, fodder crops are also being produced and sold to the farmers.

## 13.4 CONSERVATION AGRICULTURE

Since RCT is an improved agricultural technology and is the based upon cultivation of the crops which are widely grown by the farmers, the technology can become very useful for global soil carbon sequestration with its wide proliferation. Rajendra Agricultural University aims to replace many conventional agricultural practices, recognizing that they are major causes of land degradation. Multiple benefits in terms of the land, water and the environment with strong social benefits are gained through the implementation of CA. The university has already achieved laser leveler for leveling the land for higher productivity.

## 13.5 INTEGRATED FARMING SYSTEMS:

Also some model farms of different size should be developed so that there should be an assured income from the farm. For this diversification of the farm and integrated farming can play important roles. The assured farm income is more important for small farms. So, there is a need to generate marketable surplus from small size of holdings.

# APPENDIX

## 14.1 ALL INDIA COORDINATED RESEARCH PROJECTS IN OPERATION

| S. No. | Title of Project | Principal Investigator |
|---|---|---|
| | **Faculty of Agriculture , Pusa** | |
| 1. | AICRP on Honey Bee Research and Training | Dr. R. Singh |
| 2. | AICRP on Pesticide Residue | Dr. S. P. Singh |
| 3. | All India Networking Project on Betelvine | Dr. B. P. Yadav |
| 4. | AICRP on Soil Test Correlation Response | Dr. J. Prasad |
| 5. | AICRP on Micronutrients in Soils and Plants | Dr. A.P. Singh |
| 6. | AICRP on Rice | Dr. N.K. Singh |
| 7. | AICRP on Agro forestry | Dr. D.K. Das |
| 8. | AICRP on Agro meteorology | Dr. I. B. Pandey |
| 9. | AICRP on Water Management | Dr. A. K. P. Singh |
| 10. | AICRP on Experiments on Cultivators Field | Dr. N. K. Choudhary |
| 11. | AICRP on Tropical Fruits | Dr. P.K. Ray |
| | **College of Agricultural Engineering, Pusa** | |
| 12. | AICRP on Post Harvest Technology (P.H.T.) | Dr. M. Shrivastava |
| 13. | AICRP on Farm Implements & Machinery (FIM) | Dr. A. P. Mishra |
| 14. | AICRP on Ground Water Utilization | Dr. S. K. Jain |
| | **Sugarcane Research Institute, Pusa** | |
| 15. | AICRP on Sugarcane | Dr. K. D. N. Singh |
| | **Directorate of Research, Pusa** | |
| 16. | AICRP on Weed Control | Dr. S. J. Singh |
| | **Tirhut College of Agriculture, Dholi** | |
| 17. | AICRP on Seed Technology | Dr. S. K. Varshney |
| 18. | AICRP on Maize | Dr. M. M. Jha |
| 19. | AICRP on MULLARP | Dr. R. P. Yadav |
| 20. | AICRP on Pigeon pea | Dr. R. P. Yadav |
| 21. | AICRP on Chickpea | Dr. R. P. Yadav |
| 22. | AICRP on Small Millet | Dr. R. S. Rai |
| 23. | AICRP on Tuber Crop | Dr. C. P. Singh |
| 24. | AICRP on Potato | Dr. L. M. Yadav |

| S. No. | Title of Project | Principal Investigator |
|---|---|---|
| 25. | AICRP on Spices | Dr. S.P.Singh |
| 26. | AICRP on Rapeseed & Mustard | Dr. R. K. Akhauri |
| 27. | AICRP on Sunflower | Dr. R. K. Akhauri |
| | **Directorate of Seeds & Farms, Dholi** | |
| 28. | AICRP on Seed | Dr. S.K. Varshney |
| | **Bihar Agriculture College, Dholi** | |
| 29. | AICRP on Wheat | Dr. R. N. Sharma |
| 30. | AICRP on Rice | Dr. R. N. Sharma |
| 31. | AICRP on Cropping System Research | Dr. R. P. Sharma |
| 32. | AICRP on Sub-Tropical Fruits | Dr. Jayant Singh |
| 33. | AICRP on Vegetable | Dr. D. N. Choudhary |
| | **Agricultural Research Institute, Patna** | |
| 34. | AICRP on Rice | Dr. V. N. Sahay |
| 35. | AICRP on Chickpea, PRC, Mokama | Dr. Pawan Kumar |
| 36. | AICRP on Castor, Mokama | Dr. Pawan Kumar |
| | **Bihar Veterinary College, Patna** | |
| 37. | AICRP on FMD | Dr. S.P.Verma |
| 38. | AICRP on Improvement of Feed Resources and Nutrient Utilization in Raising Animal Production. | Dr. C. Singh |
| | **Regional Research Station, Agwanpur** | |
| 39. | All India Networking Project on Jute & Allied Fibers | Dr. M. Rahman |

## 14.2 CENTRALLY SPONSORED PROJECTS

| S. No. | Title of The Project | Principal Investigator |
|---|---|---|
| 1. | Agromet. Advisory Service | Dr. I. B. Pandey |
| 2. | Precision Farming Development Centre | Dr. R. Suresh |
| 3. | Development of Medicinal and Aromatic Plants | Dr. J. K. Handoo |
| 4. | Development of Spices | Dr. S. P. Singh |

## 14.3 AD-HOC PROJECTS UNDER OPERATION

| S. N. | Title of the Project | Principal Investigator |
|---|---|---|
| 1. | Popularization of extra short duration Mungbean cultivars for poverty Alleviation and Improved Nutrition in Bihar and Rajasthan, India Bases on Panjab Mode AVRDC-The World Vegetable Centre. | Dr. Ravi Nandan |
| 2 | Adhoc scheme entitled "Developing cropping systems for enhanced production of quality fodder in flood prone areas of Gangetic basin in Bihar" | Dr. R. R. .Sharma |
| 3 | Adhoc Scheme entitled "Augmentation of Pig fertility with boor semen following batch farrowing | Dr. R. P. Pandey |
| 4. | National Network on Integrated Development of Jetropha and Karanja financed by NOVOD | Dr. M. S. Ali |
| 5. | Survey of Street Food, Indigenous & Imported Food Products and Consumers - under World Bank assisted capacity building project. | Dr. Meera Singh |
| 6 | Networking project on wilt crops under pigeonpea | Dr. J.P.Upadhyay |
| 7 | Network Project for Management of Alternaria blight in Brassica Juncea and Vegetable crops | Dr. Ravi Nandan, |
| 8 | Effect of Distillery Effluent on Soil, Crop and Ground Water | Dr. M. Alam |
| 9 | Adhoc Project on "A study on the economic of production and marketing of improvement Medicinal & Aromatic plants in Bihar" | Dr. Om Prakash |
| 10 | Centrally sponsored scheme- "National Horticulture Mission for 2005-06 | Dr. R.A. Choudhary |
| 11 | Project on "Seed Production in Agricultural Crops and Fisheries" for the period of two years (2005-06 to 2006-07) of the X-Plan (2002 -03 to 2006-07) | Dr. S. K. Varshney, |

## 14.4 STATE / INTERNATIONAL LEVEL PROJECTS

| S. N. | Title of The Project | Principal Investigator |
|---|---|---|
| 1. | United States Agency for International Development (USAID) Project on Accelerating the tillage revolution in Indus-Ganges Basin by CYMMIT | Dr. Umesh Singh |
| 2. | International Fund for Agriculture Development (Funded by IRRI-IFAD) | Dr. A. K. Singh |
| 3. | NOVOD Board Sponsored Project on "National Network on Integrated Development of Jatropha & Karanja" | Dr. M.S. Ali |