ANNUAL REPORT 2011-12

RAJENDRA AGRICULTURAL UNIVERSITY

PUSA (SAMASTIPUR)-848 125

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FOREWORD

I have the pleasure in presenting the Annual Report of the Rajendra Agricultural University, Pusa, Samastipur for the year 2011-12. The University established on 3rd December 1970 has completed 43 years of its existence. When we look back at our achievements, the University has produced competent graduates and post-graduates to be the torch bearers of high professionalism, carried out productive research particularly with regard to development of useful and farm worthy technologies in agriculture and allied sectors together with their dissemination and transfer through development of good rapport and trust with the farmers and other targeted beneficiaries.

The University is offering 5 under-graduate programmes *viz.*, B.Sc. Agriculture, B.Sc. Home science, B. Tech. Agril. Engineering, B.Tech. Biotechnology and B.F.Sc. in Fisheries at two teaching campuses. During the year 143 students were admitted to various under-graduate and 111 to post-graduate programmes in different disciplines. Curricular and extra curricular activities including games and sports, cultural and debating activities were encouraged. Campus interviews were arranged for the placement of students in public sector banks in which about 40 students were selected.

Efforts have been made by the scientists in developing new crop varieties, identifying remunerative cropping systems, generating eco-friendly, cost-effective and on-farm viable technologies with respect to crop improvement, natural resource management, crop protection, social science, post-harvest management and farm mechanization. The University has released four new crop varieties during the year. These include one variety each in turmeric and yam - bean and two in sugarcane crop. Increased emphasis has been laid on the transfer of technology to the farming community through its 11 KVKs and other units by imparting trainings to farmers, farm women, rural youth and to extension functionaries, media visits, field demonstrations and other regular extension activities. University has been able to sensitize various developmental agencies and the policy makers in the state with respect to agricultural production trends and marketing options.

The University has been able to make strides mainly because of the patronage and guidance received from the State Government and Hon'ble Chancellor of RAU, Pusa during the year under report. But without the support of the ICAR and other funding agencies, the development of the University would not have been possible. I express my sincere gratitude to all of them. The guidance and support given by Members of the Board of Management, Senate, Academic Council, Research Council, Extension Council and Board of Studies in implementing teaching, research and extension programmes is gratefully acknowledged. My thanks are due to the Statutory Officers and other staff members for their cooperation and sincere efforts made in the progress of RAU, Pusa.

I thank all the Deans, Directors, Chairman of Departments, University Officers, Programme Coordinators of the KVKs and Head of Research Stations for their help in preparation of the Annual Report. Also, the efforts of Dr. S.P. Singh, Professor-in-charge, Dr. Neeraj Kumar, Assistant Professor and other staff of the Technical Cell for compiling, editing and presentation of the report in the present shape are greatly appreciated.

(R.K. Mittal)
Vice-Chancellor

Pusa
June 27, 2013

EXECUTIVE SUMMARY

Rajendra Agricultural University was established on December 3, 1970 and started functioning from Bihar Veterinary College Campus at Patna. Later on, the headquarters of the University was shifted to Pusa (Samastipur) which happens to be the birth place of agricultural education and research in India. The University continued to develop steadily and proved to one of the main functionaries in the service of farmers through its faculties, colleges and KVKs. The University has six faculties *viz.*, Faculty of Agriculture, Faculty of Agricultural Engineering, Faculty of Basic Sciences & Humanities, Faculty of Home Science, Faculty of Post-graduate Studies and Faculty of Veterinary and Animal Sciences; five colleges, seven research institutes/stations and thirteen Krishi Vigyan Kendras (eleven with RAU and two with NGOs) to fulfill the teaching, research and extension requirements of the State in respect of agriculture, horticulture, veterinary and allied branches. The University is committed to find better ways and means to improve well being of people dependent on agriculture and allied sectors for their livelihood. All endeavors are directed towards ensuring food security, reducing poverty and protecting the environment. The University has made significant contributions in its mandated areas of agricultural education, research and extension during the year 2011-12.

The University has offered under-graduate (UG) programme in 05 disciplines viz. agriculture, agricultural engineering, home science, fisheries and biotechnology, Masters programme in 17 subjects and Ph.D. programme in 9 subjects. During the year, 143 students were admitted in UG and 144 students completed their degree successfully. In post-graduate programme, 111 students were admitted in different subjects and 43 students passed out.

The research experiments were conducted by the scientists on different aspects *viz.*, crop improvement, crop production, crop protection, post-harvest management and in fisheries. The efforts have resulted in the development of new crop varieties and technologies for the benefit of farmers.

In rice agronomy, varietal and cultural management practice trials were conducted. In SRI, conoweeding was found crucial. In crop improvement, new entries were evaluated and significant varietal difference was found among them. In IVT- Boro rice, entry Krishna Hamsa (47 q/ha) was the highest yielder. Brown spot disease in moderate to severe form (15-50%) in rice was recorded. Among insect pests, YSB and rice leaf folder were the dominating pests. Two entries-CR 3005-230-5 and RP Patho-07 were found promising against stem borer. In wheat, varietal performance at different date of sowing under irrigated conditions was evaluated and higher grain yield (57.12 q/ha) was obtained when sown during 12-18 November. Soil samples were also analyzed for presence of nematodes and *Tylenchorhynchus* sp. was the most dominant.

In rabi maize, new entries were evaluated in advance evaluation trials. Dholi center of maize has contributed 33 hybrids for zonal/station trials, 5 hybrids each for IET and AET. The entries were screened against Turcicum leaf blight (TLB) and common rust. Some of the entries were found resistant against TLB. Eighteen entries were also evaluated against climbing cut worm and three entries showed low susceptible reaction. In kharif maize, 15 entries were evaluated and QPM hybrid MHQPM 09-6 developed by Dholi center gave highest yield (101.80 q/ha). Dholi center has also contributed single cross hybrids of early

and medium maturity group for coordinated testing in IET. Entries of different maturity groups were screened against Maydis leaf blight and *Chilo partellus.*

In pulses, chickpea entries were evaluated under germplasm maintenance and International nursery trials. Seeding of chickpea through conventional method recorded significantly higher grain yield. Among weed control treatments, pre-emergence application of pendimethalin @1.0 kg/ha and two hand weeding at 25 and 50 DAS proved equally effective. Altogether 184 new entries were evaluated against wilt (*Fusarium oxysporum*) in sick plots and only three entries viz., GNG 1958, GNG 26054 and JG 63 were found resistant. Among insect pets, the pod borer incidence varied from 12.2-34.1%. Pigeonpea - urdbean intercropping and application of 5 t FYM together with RDF was found an economically viable technology for enhancing the productivity of pigeonpea under north Bihar conditions. Screening of pigeonpea varieties for wilt and sterility mosaic and validation of IPM module in pigeonpea were carried out. Some of the entries showed resistant reaction. In field evaluation of newer insecticides against pod border complex of pigeonpea, indoxacarb 14.5 SC @ 60g ai/ha was found most effective. Out of 18 genotypes screened for resistance against root knot nematode, 8 genotypes have shown moderately resistant reaction. In MULLaRP, 25 entries of lentil, 15 of field pea and 5 of urdbean were tested against standard check. Mungbean variety Meha gave maximum yield followed by SML-668. Promising entries of mungbean and urdbean were screened against yellow mosaic disease and some of the entries were found resistant. In field pea, the stemfly and pod borer incidence varied from 1.1 to 12.0% and 3.7 to 13.4%, respectively. One of the test lines, HFP-547 recorded lower incidence of both stem fly and pod borer.

In oilseed research, selection of new inbred lines of sunflower from different base populations for seed yield and oil content was done. For management of Alternaria leaf spot disease, seed treatment with SAAF @ 3g/kg seed alongwith 2 sprays of tilt @ 0.1% at 30 and 45 DAS was found effective. Studies on the requirement of fertility levels in mustard based cropping system were conducted. Black gram-mustard cropping system with 150 % RDF gave higher seed yield. Line sowing produced higher seed yield in comparison to other cropping practices. Screening of *Brassica* germplasms and breeding material against Alternaria blight and Sclerotinia rot was done. An IDM schedule for Alternaria blight disease and eco-friendly approach for management of mustard aphid was worked out. In potato, experiments were conducted on integrated nutrient management, identification of nitrogen efficient potato cultivars for different zones, water management and shifting of planting date in view of rising temperature.

In onion and garlic, germplasm evaluation was done. Profenophos treatment in onion recorded lowest damage due to trips and highest marketable bulb yield. In tuber crops (other than potato), new entries of sweet potato, colocasia and yam bean were evaluated. Intercropping of ginger with elephant foot yam (1:1) resulted in enhancing growth attributing parameters and corm yield. Planting of 35 cm cutting of sweet potato vine alongwith 2 nodes inside soil gave maximum vine length, no. of leaves/vine and marketable tuber yield. Maximum sprouting (100%) was observed when corms of elephant foot yam were treated with bavistin (0.2%) and stored on soil.

Experiments were conducted for germplasm evaluation in spices *viz.*, coriander, fennel, fenugreek and ginger. In fruits, 105 accessions of banana were maintained at Pusa. In varietal trial of banana, Gandevi selection produced best yield and was at par with Dwarf Cavendish, Jahaji, Poovam and Kothia. In papaya, TFCP 4 strain gave better results in respect of yield and viral infestation. Molecular characterization of Panama wilt pathogen

and PSRV was done. Application of neem oil 1% + acephate 1.5 g/lit followed by dimethoate 0.06% effectively controlled PSRV in papaya. Genotype IIHR-3-18-2 of rose and Prawal cultivar of tuberose were found superior. In sugarcane, advance varietal trials for early and mid-late varieties were conducted and 60885 seedlings were raised from Pusa and Coimbatore crosses. In early group, CoX 03178 recorded significantly higher yield in comparison to standard check BO 130. Intercropping of sugarcane + moongbean M-12 (1:2) gave maximum gross return. Incidence of borer insect pests was recorded in different sugarcane reserved areas of sugar factory and New Area farm. In forage, germplasms of berseem and oat were evaluated. Entry IB7 of berseem recorded highest green fodder yield. In medicinal and aromatic plants, twelve genotypes of Brahmi and eleven of Mandookparni were collected and conserved. The ICM/IDM technology of betelvine cultivation was tested in farmers' field.

Under allied field research, many important studies were carried out. In agro-forestry, performance of promising popular clones under agro-forestry system and of horticultural crops under litchi orchards was evaluated. In water management, experiments were conducted to study response of paddy based cropping system to moisture regimes and irrigation rescheduling of intercrops. Paddy-maize + potato sequence recorded higher rice equivalent yield and wheat + rajma intercrop gave higher wheat equivalent yield. In weed science, studies were conducted on weed management in different cropping systems, long-term trial on tillage in rice-wheat and wheat weed management. In agro-meteorology, phenophase wise temperature and thermal requirement of maize crop was worked out. Neither high nor low temperature during reproductive period was conducive for maize growth. Reassessment of micro nutrients deficiency in three districts namely Patna, Arwal and Kishanganj was done. Soils of these districts were found slightly acidic in reaction and medium to low in organic carbon content. Screening of rice and wheat varieties for Zn and Fe in calciorthents was done. In soil test crop response, nutrient recycling through crop residues was studied and frontline demonstrations under IPMS were conducted. Grain and straw yield of rice increased significantly with increasing level of fertilizers. Assessment of ground water resources for irrigation in southern districts of Bihar has been done. Accumulation of trace metal cations (*viz.*, Zn, Cu, Fe and Mn) in sewage sludge treated soils of Patna by pass areas was found.

Studies on precision farming in litchi, banana, sapota, strawberry and pointed gourd were carried out. Maximum plant growth of sapota tree was recorded with 100% N through drip with mulch. Various farm machines *viz.*, self propelled reaper, rotavator, reaper-cum-binder and maize dehusker-cum-sheller were demonstrated in farmers field. In honey bees and pollinators, pollination studies on brassica, coriander and pigeonpea were conducted. Bee venom and propolis from *Apis mellifera* colonies were extracted. GPS based surface soil samples from Muzaffarpur district were analyzed for fertilizer recommendation to the farmers.

Under non-plan research projects, important findings were also made. Some value added root and tuber products and bamboo based packaging designs for tomatoes were developed. Natural dyes were used for eco-printing on mulberry silk. Standardization of grow out technique of freshwater giant prawn was carried out. In RKVY, production of bio-fertilizer, mushroom and enriched vermin-compost was done. In NAIP, potato seed and vegetable production under three tier system was done. Use of pheromone traps against fruit fly in vegetables (bitter gourd & pointed gourd) and fruits (mango & guava) have been suggested to the farmers. For improving livelihood security, reclamation of salt-affected soils by application of gypsum alongwith organic amendment has been done.

Under crop variety release programme new varieties of turmeric (Rajendra Sonali, yam bean (Rajendra Mishrikand-2) and sugarcane (BO 153 and CoP 2061) were released for cultivation in Bihar.

Krishi Vigyan Kendras of the University have conducted 580 trainings for practicing farmers, rural youth, rural women and extension functionaries on different aspects of natural resource management, horticulture, home science, agriculture engineering and animal sciences. Trainings were also conducted by the units. More than twenty thousand participants were trained. For technology demonstrations to farmers, front-line demonstrations were conducted by KVKs in about 183 ha. On farm trials were also conducted by KVKs for testing technologies. 42 Kisan melas, 81 field-day and 201 Kisan gosthi were organized by KVKs. The Radio and TV talks were delivered by the scientists on various aspects of agriculture, horticulture and animal science for the benefit of farmers. Under seed production programme, breeder, foundation, certified and truthful seed of various crops was produced. Besides, the planting material, fish seed, honey and milk were also produced by KVKs and units.

The University students have participated in annual Inter College games & sports, cultural and debating programmes and NSS activities. They also participated in XIII All India Inter Agricultural Universities Games & Sports Meet 2011-12. Besides, the students participated in NCC activities and two students were awarded 'C' Certificate. To provide an employment opportunity to the students, a training & placement is functioning. During the reported period, 46 students were selected by public sector banks. Educational tours were arranged for under-graduate students.

The University library has purchased 2516 new books in 2011-12 and the total number of books has gone up to 65091. During the year, 130 Indian journals were subscribed. CD ROM Database facility is available in the library. In University Hospital, 4874 patients were treated and 20 patients were recommended for specialized treatment.

RAU, Pusa centre of All India Coordinated Research Project on Soil Test Crop Response got the Chaudhary Devilal AICRP Outstanding award from the Indian Council of Agricultural Research, New Delhi.

Under Human Resource Development, 14 faculty members participated in seminars/symposia/conferences, 13 in short course/trainings/winter school and 22 in workshops/group meetings. The colleges have organized seminars/trainings/workshops.

More than fifty research papers were published in research journals with good impact factors and sixteen research papers were presented in seminars/symposia by the scientists. Besides, a number of books, technical bulletins, leaflets and popular articles have been published.

During the reported year, 32 All India Coordinated Research Projects, 06 Ad-hoc, 03 Foreign aided, 10 GOI, 03 GOB, 12 RKVY and 04 NAIP research projects were functioning in the University.

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1. INTRODUCTION

1.1 BACKGROUND INFORMATION

Rajendra Agricultural University, named after the most illustrious son of the soil, Bharat Ratna Dr. Rajendra Prasad, the first President of India was established on December 3, 1970 and started functioning from Bihar Veterinary College Campus at Patna to give the much needed impetus for agricultural development in the state through education, research and rapid transfer of improved technologies related to crop production and animal management. With the establishment of the University, the three Agricultural Colleges, one each at Sabour, Ranchi and Dholi, two Veterinary Colleges at Patna and Ranchi and Sugarcane Research Institute at Pusa were transferred from the Government to the Rajendra Agricultural University. The four Regional Agricultural Research Institutes, one each at Sabour, Patna, Ranchi and Dholi were also transferred to the University by the Government. The Cattle Farm, Animal Production Research Institute and University Apiary were subsequent additions. In view of the unique possibility of agricultural development in the fertile land of north Bihar, the State Government decided to locate the headquarters of the University at Dholi - Pusa campus. In addition, Kanke (Ranchi) was designated as the main campus for Animal Husbandry and Veterinary Science for developing animal production in the plateau of Chhotanagpur.

In the year 1981, the areas comprising Chhotanagpur and Santhal Parganas were carved out and a separate Agricultural University named as Birsa Agricultural University came into being with headquarters at Ranchi. With the division of the state, the Rajendra Agricultural University was the only agricultural university in Bihar at that time.

The Faculty of Basic Sciences & Humanities was added to Rajendra Agricultural University in the year 1981. In 1982 College of Home Science came into existence. Later on Sanjay Gandhi Institute of Dairy Technology under the Faculty of Veterinary Science was established. The Faculty of Agricultural Engineering at Pusa was a new addition to the academic complex of the University in the year 1983-84. The College of Fisheries under the Faculty of Veterinary Science started functioning from the academic session 1986-87. With the development and strengthening of Departments under World Bank project, the Post Graduate Departments of the Faculty of Agriculture shifted from Dholi to Pusa, the main Campus.

The main Administrative Complex, the University Library, Faculty of Agricultural Engineering, Faculty of Basic Science & Humanities, College of Home Science, Post Graduate Departments of the Faculty of Agriculture, Dairy Farm, Sugarcane Research Institute, Apiary, Sanchar Kendra and University Guest House are located at Pusa. Tirhut College of Agriculture and College of Fisheries are located at Dholi. The Seed Production and Processing Unit of the university is located at Dholi which plays a pivotal role in the production of quality seeds for the state. Subsequently, the University under National Agricultural Research Project established a few research stations, sub-stations, farm science centers, operational research projects and such other wide ranging programmes for the benefit of the rural community.

The Rajendra Agricultural University continued to develop steadily and proved to be one of the main functionaries in the service of farmers through its new faculties, colleges and KVKs in the state. After bifurcation of the University again on 5th August, 2010 and creation of a new agricultural University, Bihar Agricultural University, Sabour (Bhagalpur), Rajendra Agricultural University has now six faculties, five colleges, seven research institutes/stations and thirteen Krishi Vigyan Kendras (eleven with RAU and two with NGOs) to fulfil the teaching, research and extension requirements of Bihar in respect

of agriculture, horticulture, veterinary and allied branches. The operational area of RAU falls under agro-climatic zone-I consisting of East and West Champaran, Siwan, Saran, Gopalganj, Vaishali, Muzaffarpur, Sheohar, Sitamarhi, Darbhanga, Madhubani, Begusarai and Samastipur districts. The remaining districts are placed under the jurisdiction of newly created Bihar Agricultural University, Sabour.

The Rajendra Agricultural University is poised to lay more emphasis on finding better ways and means to improve well being of people dependent on agriculture and allied sectors for their livelihood. All endeavors are directed towards ensuring food security, reducing poverty and protecting the environment. The vision of the University is to become a highly acclaimed, advanced academic institution in the field of agriculture with global standing.

1.2 MANDATE OF THE UNIVERSITY

- To impart education in different branches of agriculture and allied fields of learning which the University may find necessary to include.
- To undertake basic, strategic and applied research for developing technologies to enhance productivity and quality of agricultural and animal produce.
- To disseminate the scientific information to the farmers.
- To plan, organize and conduct "On campus" and "Off campus" training programmes 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.

1.3 LOCATION

The Head quarter of the University is located as Pusa which happens to be the birth place of agricultural education and research in India. It is situated in Samastipur district of Bihar on the Western and Southern bank of river Burhi Gandak. The climate is sub-tropical characterized mainly by hot-dry summer and cool winter. The average annual rainfall is 1260 mm out of which approximately 90 per cent is received from middle of June to middle of October. The period from last week of November to February receives occasional showers. May-June is the hottest months of the year. January is the coldest month with average maximum temperature ranging from 21.4 to 23.7^{0}C and minimum from 8.7 to 8.8^{0}C. Rise in temperature takes places at slow pace from February and picks-up from March and reaches the climax somewhere during May-June.

1.4 HISTORICAL PERSPECTIVE

The name 'Pusa' is a living legend in the world of agricultural science. 'Pusa', a village of British India, in Darbhanga district, Bengal, near the right bank of the 'Burhi Gandak' river has a glorious and scintillating past. Here the real foundation of agriculture development, research and education in the country was laid during the dawn of past century. Improving the agricultural production in India was a concern of the East India

Company. They could foresee a huge prospect in boosting up the company's revenues by raising the agricultural output in the country which was endowed with abundant sunshine, inherently fertile soil and favorable climate capable of producing a large variety of crops round the year. Taking this into consideration many Britishers came to India seeking fortune and became owners of vast chunk of land and found farming as the most lucrative business with hardly any expense on labour. Besides, India was enjoying the world's monopoly of producing indigo dyes produced in and around Pusa. Subsequently, the planters switched on to other cash crops like sugarcane, tobacco, cotton, etc. The reports of Famine Commission laid stress on constructive approach to the Indian agriculture, rather than the existing exploitative policy of extracting everything form the land and people.

The Viceroy and the Governor General of India sent a comprehensive proposal on 4th June 1903 from the Government of Bengal (at that time Bihar and Orissa were part of Bengal Presidency) to the British cabinet for establishing an Agricultural Research institute and College at the Government Estate of Pusa. The approval came in August, 1903 and the Pusa project started getting into action with the joining of Mr. B. Coventry as first Director on April 1, 1904.

The Foundation stone of the proposed Institute was laid on April 1, 1905. The location of the building came to be known as "PUSA", derived from "Phipps of USA". With the establishment of the Institute in 1905, the three Government Expert Scientists of the Imperial Department of Agriculture were transferred to the newly established Agriculture Research Institute to head their respective sections and given the Imperial status like Dr Lefory was given the status of Imperial Entomologist and so on. Additional positions of Agric-Horticulturist and Economic Botanist were also created. A new section of Bacteriology was added to the existing five departments of the Institute in 1907. The grand edifice name of the building "Phipps Laboratory" came up by 1907 after its donor Mr. Henry Phipps. The building was housing the sections of Botany, Chemistry, Mycology, Entomology, Agriculture, Cattle Breeding and Library. In 1911, the Institute was renamed as the "Imperial Institute of Agricultural Research" (IIAR) and later as "Imperial Agricultural Research Institute" (IARI) in 1919.

Devastations came with the great earthquake in January 1934. The ravages of destruction were badly felt at Pusa as well and the worst victim was the massive Phipp's Laboratory. The Government decided to abandon the institute at Pusa and the IARI was shifted to New Delhi in 1936, which is presently known as 'Indian Agricultural Research Institute' and popularly as 'Pusa Institute'. Bihar was forced to loose this great temple of Agricultural Research & Education. The buildings which survived this natural calamity and the land of Pusa Estate was purchased by Government of Bihar at a nominal cost of Rs. 2,05,000/- and the Government of India is still retaining a portion of it to serve as Regional Station of its main institute at New Delhi due to its agro-climatic conditions.

Pusa Estate remained neglected till the dawn of independence. In post independence era, it has undergone a series of changes. The Sugarcane Research Institute of the Government did make significant contributions only after the dawn of independence, although it was established in 1932. The evolution of B.O. varieties of sugarcane, their agronomy and improved sugarcane technology are a few of its achievements having far reaching consequences.

1.5 FACULTIES

- Faculty of Agriculture

  Departments

  - Agronomy
  - Agricultural Economics
  - Agro-forestry
  - Entomology
  - Extension Education
  - Horticulture
  - Nematology
  - Plant Breeding & Genetics
  - Plant Pathology
  - Soil Science
  - Seed Technology

  College

  - Tirhut College of Agriculture, Dholi (Muzaffarpur)

- Faculty of Agricultural Engineering

  Departments

  - Farm Machinery
  - Farm Power and Renewable Energy
  - Irrigation and Drainage Engineering
  - Processing and Food Engineering
  - Soil and Water Conservation Engineering

  College

  - College of Agricultural Engineering

- Faculty of Home Science

  Departments

  - Food and Nutrition
  - Family Resource Management
  - Human Development & Family Studies
  - Home Science Extension & Communication Management
  - Textile & Apparel Designing

  College

  - College of Home Science, Pusa

- ❖ Faculty of Basic Sciences and Humanities

  Departments

  - Agricultural Biotechnology & Molecular Biology
  - Botany and Plant Physiology
  - Biochemistry
  - Microbiology
  - Physics
  - Statistics, Mathematics and Computer Applications
  - Agri-business Management
  - Languages

  College

  - College of Basic Sciences and Humanities, Pusa

- ❖ Faculty of Veterinary and Animal Sciences

  - Animal Production Research Institute

  College

  - College of Fisheries, Dholi (Muzaffarpur)

- ❖ Faculty of Post-graduate Studies

1.6 CONSTITUENT COLLEGES

1.6.1 Tirhut College of Agriculture, Dholi

Tirhut College of Agriculture, Dholi (Muzaffarpur) was established on 18th August, 1960 by first Chief Minister of Bihar, Late Dr. Sri Krishna Singh with the objectives to provide agricultural education to young men and women; to tackle the problems of agriculture through a network of agricultural research and for dissemination of agricultural knowledge / technologies for up-liftment of the farmer's community of the state. TCA Dholi is the only constituent agricultural college of RAU. The students are trained in modern methods of crop improvement, production and protection technologies. The college also encourages the students to participate in extra curricular activities for all round development of their personalities. They are also exposed to Experiential Learning and Rural Agricultural Work Experience programmes in the final year of their graduation. The graduates of this college are engaged in various capacities both in India and abroad and raised the name and fame of this college. During last 51 years of the establishment of this college, notable successes have been achieved in the field of teaching, research and extension.

1.6.2 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 and to demonstrate them. At present the college has five departments namely Farm Machinery, Farm Power & Renewable Energy, Irrigation and Drainage Engineering, Soil and Water Conservation Engineering and Process & Food Engineering.

1.6.3 College of Basic Sciences & Humanities, Pusa

The college of Basic Sciences and Humanities was establishment in Rajendra Agricultural University, Pusa in November, 1981 with objective to expose the students to the subjects of fundamentals of basic sciences and humanities for advancing the frontiers of knowledge. Initially, the college started functioning with Department of Botany and Plant Physiology, Biochemistry, Genetics, Statistics, Mathematics and Computer Application, Microbiology, Languages, Social Sciences, Physics and Chemistry. In year 1990 the humanities component was transferred to Faculty of agriculture and this college was left with eight departments namely Genetics, Botany and Plant Physiology, Biochemistry; Statistics, Mathematics and Computer Application, Microbiology, Chemistry, Physics and Language.

It was further strengthened with the introduction of new degree programmes viz. Four year B.Tech (Biotechnology) programme, DBT sponsored M.Sc. in Agricultural Biotechnology programme, Masters Degree programme in Agri-business Management. These developments necessitated the renaming of Department of Genetics as Department of Agricultural Biotechnology and Molecular Biology in 2008. Post-graduate departments are offering courses leading to award of M.Sc./Ph.D. degree in Agricultural Biotechnology, Plant Physiology, Statistics and MBA (Agribusiness Management). Besides teaching, various departments of the college have been actively involved in research programmes in the areas of plant genetic resource management, hybrid rice research, legume improvement, mushroom production technology, medicinal and aromatic plants and blue green algae (B.G.A.) etc. These projects have been funded by different agencies viz. NATP, ICAR, DBT etc.

1.6.4 College of Fisheries, Dholi

The College of Fisheries was established on 13th January, 1987 at Dholi (Muzaffarpur) with the objectives to produce graduates in fisheries science & technology; to undertake research in the field of fisheries to enhance production of fish and productivity of the water body; to improve quality and acceptability of various value added fishery products and to disseminate relevant scientific advanced technology amongst the farmers. The college is offering four year teaching programme leading to the degree of B.F.Sc. The college has been consistently endeavoring towards popularizing several packages of Fisheries and Aquaculture technologies such as poly-culture of indigenous and exotic carps, induced fish breeding of carps, commercial farming of giant freshwater Prawn, breeding and rearing of aquarium fishes, common fish disease and treatment, preparation of fishery by-products (fish pickles, fish roll, fish papad etc.) through short term training programmes.

1.6.5 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, the college also conducts vocational courses for 6 months duration in different areas of Home Science. The college has five departments namely Home Science Extension & Communication Management, Family Resource Management, Textile and Apparel Designing, Food and Nutrition and Human Development & Family Studies. All departments have well equipped laboratory and the college has a comfortable hostel for the students and trainees.

1.7 ACADEMIC PROGRAMMES

1.7.1 Undergraduate Programme

S.No.	Degree Programme	No. of seats		
		RAU	ICAR	Total
1.	Agriculture (B.Sc. Ag.)	51	09	60
2.	Agricultural Engineering (B.Tech.)	21	04	25
3.	Home Science (B.Sc. H.Sc.)	21	04	25
4.	Fisheries Science (B.F.Sc.)	21	04	25
5.	Biotechnology (B.Tech.)	25	05	30

1.7.2 Master's Programme

S.No.	Discipline	No. of seats			
		RAU (75%)	ICAR (25%)	In-service	Total
1.	Agril. Biotechnology	02	01	01	04
2.	Agril. Economics	06	02	02	10
3.	Agril. Statistics	02	-	01	03
4.	Agronomy	10	04	04	18
5.	Botany & Plant Physiology	03	01	01	05
6.	Entomology	06	02	02	10
7.	Extension Education	05	02	02	09
8.	Extension Education & Communication Management (Home Science)	04	-	-	04
9.	Family Resource Management	02	-	-	02
10.	Food & Nutrition	02	-	-	02
11.	Nematology	01	-	01	02
12.	Plant Breeding & Genetics	09	01	03	13
13.	Plant Pathology	06	02	02	10
14.	Processing & Food Engineering	02	-	01	03
15.	Soil and Water Engineering	03	-	01	04
16.	Soil Science	06	02	01	09
17.	MBA (Agri-Business)	30	-	-	30

Note: In Agril. Biotechnology Programme, 10 candidates are allotted through JNU Entrance Exam.

1.7.3 Ph. D. Programme

S.No.	Discipline	No. of seats			
		RAU (75%)	ICAR (25%)	In-service	Total
1.	Agril. Biotechnology	01	-	01	02
2.	Agril. Economics	01	-	01	02
3.	Agronomy	03	-	02	05
4.	Entomology	02	-	01	03
5.	Extension Education	01	-	01	02
6.	Plant Breeding & Genetics	03	-	02	05
7.	Plant Pathology	02	-	02	04
8.	Plant Physiology	01	-	01	02
9.	Soil Science	03	-	02	05

1.8 ADMISSION IN DIFFERENT PROGRAMMES

1.8.1 Eligibility Requirement for Admission

S.No.	Programme	Eligibility
1.	Under- graduate Programme (Agriculture, Fisheries, Home Science, Agricultural Engineering, & Biotechnology)	Admission on the basis of 10+2 qualification with PCB/PCM through Entrance Examination conducted by Bihar Combined Entrance Examination Board, Patna except in Home Science. For Home Science, the examination is conducted by RAU.
2.	Masters' Programme including MBA (Agri-Business)	Admission through Entrance Examination conducted by RAU with a cut off marks of 50% for general and 45% for SC/ST in addition candidates should possess at least 60% marks in aggregate in Bachelors degree for General & 55% for SC/ST.
3.	Ph. D. Programme	Admission through Entrance Examination conducted by RAU with a cut off marks of 50% for general and 45% for SC/ST in addition candidates should possess at least 65% marks in aggregate in Masters degree for General & 60% for SC/ST.

1.8.2 Admission Procedure & Merit

S.No.	Programme	Admission procedure & Merit		
		The merit list is prepared on the basis of total marks obtained by the candidates in Entrance examination test-cum-academic performance		
1	Master's Programme	Entrance Exam. Test	:	70%
		Undergraduate	:	30%
2.	MBA (Agri-Business)	Entrance Exam. Test	:	60%
		Undergraduate	:	30%
		Group discussion	:	10%
3.	Ph. D.	Entrance Exam. Test	:	70%
		Master's degree	:	30%

1.9 RESEARCH INSTITUTES / STATIONS

- Sugarcane Research Institute, Pusa (Samastipur)
- Animal Production Research Institute, Pusa (Samastipur)
- Regional Research Sub-Station, Madhopur (W. Champaran)
- Banana Research Station, Hajipur (Vaishali)
- Horticultural Research Station, Birauli, Samastipur
- Deep Water Rice Research Station, Biraul (Darbhanga)
- Rice Research Station, Jhanjharpur (Madhubani)

1.10 KRISHI VIGYAN KENDRAS (KVKs)

- Krishi Vigyan Kendra, Khodawandpur (Begusarai)
- Krishi Vigyan Kendra, Saraiya (Muzaffarpur)
- Krishi Vigyan Kendra, Jale (Darbhanga)
- Krishi Vigyan Kendra, Hariharpur (Vaishali)
- Krishi Vigyan Kendra, Bhagwanpur Hat (Siwan)
- Krishi Vigyan Kendra, Madhopur (West Champaran)
- Krishi Vigyan Kendra, Birauli (Samastipur)
- Krishi Vigyan Kendra, Saran
- Krishi Vigyan Kendra, Gopalganj
- Krishi Vigyan Kendra, Piprakothi (East Champaran)
- Krishi Vigyan Kendra, Sheohar
- Krishi Vigyan Kendra, Sitamarhi (with NGO)
- Krishi Vigyan Kendra, Madhubani (with NGO)

2. SALIENT ACHIEVEMENTS

2.1 EDUCATION

2.1.1 Undergraduate Programme

2.1.1.1 Number of students admitted

Name of the College	Degree programme	Male	Female	Total
College of Agril. Engg.	B.Tech. (Agril. Engg.)	17	07	24
College of Basic Sciences	B.Tech. (Biotech.)	12	08	20
TCA Dholi	B.Sc. (Ag.)	28	29	57
COF Dholi	B.F.Sc.	14	06	20
College of Home Science,	B.Sc. (Home Science)	-	22	22
	Total	**71**	**72**	**143**

2.1.1.2 Number of students on roll

Name of the College	Degree progr-amme	Students strength																	
		1st Sem		2nd Sem.		3rd Sem.		4th Sem.		5th Sem.		6th Sem.		7th Sem.		Short Sem.		Total	
		M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
College of Basic. Science	B.Tech. (Biotech.)	-	-	11	8	3	-	-	-	15	7	-	-	12	3	-	-	41	18
College of Agril. Engg.	B.Tech. (Agril. Engg.)	-	-	15	7	19	2	-	-	10	4	-	-	25	4	-	-	69	17
T.C.A., Dholi	B.Sc. (Ag.)	-	-	24	27	23	10	-	-	30	10	-	-	25	16	8	2	110	65
C.O.F. Dholi	B.F.Sc.	-	-	14	4	3	-	-	-	5	3	-	-	23	3	-	-	45	10
College of Home Science	B.Sc. (Home Science)	22		-	-	-	19	-	-	-	20	-	-	-	18	4		-	83

2.1.1.3 Number of students passed out

S.N.	Name of the College	Name of the Degree programme	Number of students		
			Male	Female	Total
1.	College of Agril. Engg.	B.Tech. (Agril. Engg.)	34	02	36
2.	College of Basic Sciences	B.Tech.(Biotechnology)	15	06	21
3.	TCA Dholi	B.Sc. (Ag.)	39	22	61
4.	COF Dholi	B.F.Sc.	20	05	25
5.	College of Home Science, Pusa	B.Sc. (Home Science)	-	01	01

2.1.2 Post Graduate Programme

2.1.2.1 Number of students admitted

S.N.	Department	Master's Degree		Ph.D.	
		Male	Female	Male	Female
1.	ABMB	-	6	1	1
2.	PBG	8	3	3	1
3.	Agronomy	16	4	-	1
4.	Extn. Edn.	2	-	-	1
5.	SMCA	1	1		-
6.	Bot. & Pl.Physiology	2	-	-	-
7.	Entomology	5	5	-	-
8.	Soil Science	6	2	-	-
9.	Plant Pathology	7	1	-	-
10.	Extn. Edn. (HS)	-	1	-	-
11.	Agril. Econ.	2	1	-	-
12.	MBA	9	6	-	-
13.	M.Tech.	6	1	-	-

2.1.2.2 Number of students on roll

Master's Degree programme

S. N.	Discipline	Number of students											
		I Year		II Year		III Year		IV Year		V Year		Total	
		M	F	M	F	M	F	M	F	M	F	M	F
1.	Ento.	5	5	-	-	3	5	-	-	-	-	8	10
2.	Soil Sci.	6	2	-	-	-	-	-	-	-	-	6	2
3.	Agron.	16	4	-	-	3	-	-	-	1	-	20	4
4.	Plant Path.	7	1	-	-	2	1	-	-	-	-	9	2
5.	ABMB	-	6	-	1	5	4	-	1	7	2	12	14
6.	SMCA	1	1	-	-	-	-	-	-	-	-	1	1
7.	Bot. & Pl. Physiology	2	-	-	-	-	-	-	-	-	-	2	-
8.	PBG	8	3	-	-	3	2	-	-	1	-	12	5
9.	Extn.Edn.	2	-	-	-	3	1	1	-	-	-	6	1
10.	Agril.Econ.	2	1	-	-	3	1	-	-	1	-	6	3
11.	MBA	9	4	9	4	-	-	-	-	-	-	18	8
12.	M.Tech.	6	1	3	-	-	-	-	-	-	-	9	1

Ph.D. Degree programme

S. N.	Discipline	Number of students											
		I Year		II Year		III Year		IV Year		V Year		Total	
		M	F	M	F	M	F	M	F	M	F	M	F
1.	ABMB	1	1	-	-	-	2	-	-	-	-	1	3
2.	PBG	3	1	-	-	3	-	-	-	1	1	7	2
3.	Ento.	-	-	-	-	1	-	-	-	3	1	4	1
4.	Agron.	-	1	-	-	-	-	-	-	3	-	3	1
5.	Soil Sci.	-	-	-	-	-	-	-	1	-	-	-	1
6.	Extn.Edn.	-	1	-	-	-	-	-	-	3	-	3	1

2.1.2.3 Number of students passed out

S.N.	Discipline	Master's		Ph.D.	
		M	F	M	F
1.	Extn.Edn.	1	-	1	1
2.	Agron.	3	2	2	-
3.	Soil Sci.	-	-	-	1
4.	PBG	1	1	-	1
5.	Ento.	-	1	-	-
6.	Plant Path.	1	-	-	-
7.	ABMB	1	1	-	-
8.	MBA (2009-10)	12	6	-	-
9.	M.Tech. (2009-10)	1	-	-	-

2.1.3 Thesis Accepted

A. Ph.D.

S. No.	Department	Student	Title of thesis
1.	Extension Education	A.S. Tigga	Livelihood security through NREGA an impact study in Pusa block of Samastipur
2.	Agronomy	Rajan Kumar	Effect of irrigation and mechanical weeding on growth, yield and quality of rice under system of rice intensification
3.	Agril. Econ.	Sandeep Kumar	A micro level study on economics of production and marketing of principal vegetable crops in north Bihar
4.	Entomology	Priti Kumari	Studies on biology and integrated management of Giant African snail, *Achatina fulica* Bowdich (Stylommatophora:Achatinidae)
5.		Sanjay Kr. Sathi	Biology, population dynamics and management of spotted pod borer, *Maruca vitrata* G. on Yam bean (*Pachyrhizus erosus* L.) in Bihar
6.	P.B.G.	Seema Sinha	Generation, mean study of yield components and inheritance pattern of moong bean yellow mosaic virus (MYMV) vigna

B. Master's Degree

S. No.	Department	Student	Title of thesis
1.	Agronomy	Rinki Kumari	Comparative performance of sugarcane varieties under water logged vis-vis upland conditions
2.		Vinit Kr. Singh	Effect of INM on agronomic performance of rice under different cultivation systems
3.		Anoop Kr.Singh	Efficacy of herbicides for controlling weeds in direct seeded rice
4.		Kumari Ranjna Sinha	Integrated weed management in summer maize (*Zea maize* L.)
5.		Shatrughan Kumar	Effect of nitrogen management on growth and yield of transplanted rice (*Oryza sativa*)

6.	Pl. Breeding & Genetics	Kanchan Kumari	Genetic evaluation of rice genotype under aerobic condition
7.		Mukesh Kumar	Studies on variability and associations among quantitative traits in breed wheat (*Triticum aestivum* L.) under late shown condition.
8..	Agri. Biotech & Mol. Bio.	Sunit Kr. Rana	Morpho-cytogenetic characterization and *in vitro* propagation studies on buch (*Acorus calamus* L.)
9.		J.M.Vasantrao	Marker assisted characterization of wheat genotypes in relation to heat tolerance
10.		S.S.Nair	Development of *in vitro* regeneration system and analysis of genetic stability of regenerated plants through molecular marker in pigeon pea (*Cajanus Cajan* L.)
11.	Soil & Water Engg.	Gyan Singh	Effect of fertigation on straw berry
12.	Entomology	Gogate S. Sadanand	Foraging behaviour of honey bees on strawberry, *Fragaria ananasa* Duch.
13.	Nematology	D.R.Ramrao	Management of plant parasitic nematode by using vermi-compost
14.	Pl.Pathology	Manish Kumar	Investigation on compatibility of pesticide and trichoderma with Lens Rhizobium
15.	Soil Science	Kanti Kumari	Phosphorus availability as influenced by phosphate solubilising bacteria and vermin-compost either alone or in combination in calciorthents of Bihar
16.	M.B.A.	Ajit Kumar	Strengthening of value chain for better market of makhana
17.		Rajeev Ranjan	Strengthening of value chain for better market of makhana
18.		Priyanka Parashar	Formation of interest groups/cooperatives for marketing facilitating through self help groups in Supaul district
19.		Satya priya	Studies of commodity procurement centre to aggregate commodity for FCI
20.		Anupma Priyadarshi	SHG/Kisan club based community development through agri-business
21.		Rakesh Kumar	To study Targa opportunity on jute in Katihar district of Bihar
22.		Ela Chandan	To study of integrated water shed management programme
23.		Abhishek Kumar	Studies on cropping pattern of flood prone and water logged area of 18 project villages of disaster risk reduction project in Darbhanga and Madhubani districts
24.		Sharad Kumar	A study of commodity procurement centre to aggregate commodity for FCI and works related to livelihoods
25.		Raj Kumar	A study of commodity procurement centre to aggregate commodity for FCI and works related to livelihoods

26.	Shilpi Sonam	To enhance the livelihood sustainability of the entire Meenapur block of Muzaffarpur district
27.	Binoy Kumar	Studies on value chain for better market of makhana
28.	Shalini	A brief of study of 4 ps in marketing with reference to Sudha milk and its products
29.	Ashutosh Kumar	Trends of agro-chemicals used in litchi in Muzaffarpur district of Bihar
30.	Rajesh Kumar	Strengthening of value chain of makhana with market linkage for better livelihood
31.	Nisha Bharti	Supply chain management at Anand Amul
32.	Neeraj Kumar	Analysing competitors strategy custumer as well as employee satisfaction along with loan utilization by client of Saija Finance Ltd.

2.2 RESEARCH

2.2.1 Crop Research

RICE

Agronomy

- **Nitrogen x Varietal trial :** Significant response to the varying levels of nitrogen was observed upto120 kg/ ha (i.e. 150% of RDN) in long and mid-duration varieties and 100 kg/ ha for short duration varieties under transplanted condition
- **Cultural Management Practices trial to evaluate the principal of SRI and its contribution towards grain yield :** The results revealed that full package of SRI and SRI with only inorganic gave statistically similar yield. Among the components of SRI, conoweeding proved crucial which reduced the yield by 15% followed by 9% due to narrow spacing and 5% due to older seedlings

Plant Breeding

- **AVT-2-E (D.S.) :** Varietal difference was found to be significant and entries. CR 2702 (5654.78 kg/ha), CR 2698 (5365.49 kg/ha) out yielded all three checks significantly.
- **AVT-1 SDW :** Entry OR 2331-14 (4413kg/ha) significantly out yielded all the checks. Next to OR 2331-14 were CR 2547-62-316 (4127 kg/ha) and CR 2652-14 (3524 kg/ha).
- **UVT-6 :** Only one entry TCA 88-1 (3500 kg/ha) was found superior against the best check Jalmagna (2800 kg/ha).

Eastern India Rainfed Lowland Shuttle Breeding Network (EIRLSBN) :

- **OYT-Shallow :** Highest yield (10,000 kg/ha) was recorded by the genotypes OR 2165-5, NDR 8027, NDR 850, RAU 1470-7-1-3-3, RAU 1407-7-1-3-4, RAU 1415-12-7-6-4-3-2, CR 2750-6-2, CR 2646-4 and CR 5480-20. Among the checks, Swarna Sub-1 recorded the highest yield of 8750 kg/ha followed by Rajshree 7500 kg/ha.

IRRI Funded STRASA (Stress tolerance rice for poor framers of South Africa and Asian Countries) Project :

- **PVS Sub mergence :** In mother trial at Pusa and Bangra, var. Dhusrai gave highest yield of 2792 kg/ha & 2200 kg/ha, respectively.
- **PVS Drought :** In mother trial at Pusa, entries RAU 1421-12-7-4-3 (5555.50 kg/ha) and RAU 1415-35-76-9-5-3 (555.56 kg/ ha) were found promising for drought tolerance.
- **PVS Salinity :** Entry Ushar Dhan-3 (67.00 kg/ha) recorded the maximum yield followed by Prabhat (6500 kg/ha) and CSR-13 (6330 kg/ha).
- **Material nominated in different trials from RAU, Pusa**

OYT(Shuttle Breeding)	RAU 1468-3, RAU 1453-12, RAU 1463-15, RAU 1407-7-1-3-1, RAU 1407-7-1-3-1, RAU 1407-7-1-3-2, RAU 1407-7-1-3-3, RAU 1407-7-1-3-4, RAU 1415-12-7-6-4-8-1, RAU 1415-12-7-6-4-3-2, RAU 1415-8-6-4-3-3
NSDWSN(AICRP Rice)	RAU 1415-9, RAU 1415-2-1-3, RAU 1468-3
IVT-SDW(AICRP Rice)	RAU 1472-12, RAU 1472-10
IVT-E(AICRP Rice)	RAU 1397-18-3-7-9-4-7

- **Boro Rice :** Eight entries were tested in IVT- Boro where Krishna Hamsa (47 q/ha) was the highest yielder followed by NP-3114-3 and AR02-0905(43 q/ha).

Plant Pathology

Pusa centre is being considered as a hot spot of Brown spot disease. The next important disease is sheath rot disease. However, false smut is also emerging as minor disease.

- **Host Plant Resistance :** Four National screening nurseries comprising of more than 852 entries of Advance breeding entries, Initial breeding entries and new germplasms were evaluated under artificial conditions at Pusa centre. Many of them found moderately resistant to resistant to Brown spot disease.
- **Disease observation on trap crop :** Date of sowing had marked effect on development of rice diseases. Pankaj was sequentially sown on three dates – early, medium and late. Brown spot disease severity recorded low to moderate (35.0%) in medium sown crop, whereas, the disease severity was severe (75.0%) in late sown crop. Though, Bacterial leaf blight was low (5.0%) in normal sown crop but in early sown and late sown rice crop, the disease severity was 10.0% and 28.5%, respectively. Sheath rot was recorded up to 35% in late sown crop. False smut severity was recorded only 16% in late sown crop.
- **Disease management :** Hexaconazole 5% SC @ 10 ml/l, tricyclazole @ 4 ml/l and three different formulation of pf 1 were tested against Brown spot disease of rice at Pusa centre. The best results were obtained by standard fungicides -hexaconazole 5% (DI-4.5%) & yield (4580 kg/ha) and tricyclazole (DI-4.5%) & yield (4478 kg/ha). Among *Pseudomonas* formulations, seed treatment, seedling root deep, soil application & foliar spray with talc formulation pf 1 (Monas) gave best result in respect to DI (4.8%) and rice yield 4128 kg/ha.
- **Survey:** Production oriented survey was conducted in various districts of Bihar viz., Samastipur, Muzaffarpur and East & West Champaran. Brown spot disease was recorded in moderate to severe form (15-50%). The next important disease was sheath rot (5-25%), BLB disease severity was also observed in moderate form (5-25%). However, False smut disease severity was severe in two varieties up to 50%. Grain discoloration was also recorded up to 15%.

Entomology

- **Monitoring of incidence, build up and outbreaks of insect pests of rice in the region catered by the AICRP centre. Quantification of area and intensity of damage and impact on yield (PSR) :** YSB and rice leaf folder were dominating pests. Incidence of army worm in some of the flood prone areas viz. Jhanjharpur and Biraul of Darbhanga district was noticed.
- **Reaction of promising advanced cultures against insect pests with a view to identify multiple resistant varieties (MRST) :** Two entries - CR 3005-230-5 and RP Patho-07 were found promising against stem borer.
- **Reaction of advanced/initial yield trial entries against insect pests (NSN-2) :** None of the entries was found resistant against stem borer and leaf folder. However out of 563 entries, 25 entries were found promising against stem borer and leaf folder. Promising entries were IET no.22416, 22425, 22436, 21883, 22298, 22300, 22301, 22303, 22309, 22311, 22313, 22317, 22476, 22488, 22489, 22492, 21725, 22637, 22662, 22676, 22684, 22687, 22692, 22813 and 22763.

- **Pest survey report :** The survey was done in the Darbhanga, Jamui, Munger, Muzaffarpur & Samastipur districts where the infestation of stem borer (severe), leaf folder (severe), gundhi bug (moderate), army worm (moderate), BPH/GLH (slight) was observed. In drought affected area, incidence of army worm and in some of the flood prone areas, BPH infestation was recorded. The plant protection measures adopted by the farmers were also recorded. The insecticides used by the farmers were endosulfan 35 EC, imidacloprid 200 SL (20%), carbofuran 3G, phorate 10G, chlorpyriphos 20 EC and methyl parathion 5%.

WHEAT

Plant Breeding

- Late sown trial with 11 (8+3) entries was conducted in which only one entry KYP 522 (37.82 q/ha) significantly out yielded the high yielding check Halna (30.60 q/ha). A trial on late sown condition with 48 entries (43+5) was conducted in which GW 2007-92 (39.68 q/ha) significantly out yielded the superior check Halna (30.68 q/ha). 137 Single plants of F_6 were sown in which 10 pure lines were selected. Subsequently, 167 single plants of F_5 were sown in which only 40 single plants were selected for sowing in F_6. One segregating nursery of F_2 was sown and 46 single plants were selected for F_3 sowing.

Agronomy

- **Performance of wheat varieties at different date of sowing under irrigated conditions:** Wheat grain yield was significantly higher when sown during 12-18th Nov. with an average yield of 57.12 q/ha compared to 53.52 and 55.27 q/ha when sown during 5-11th Nov. and 19-25th Nov., respectively.

Nematology

- 110 Soil samples were analysed for the presence of nematodes. *Tylenchorhynchus* (*T. nudus* + *T. mashoodi*) were the most prominent population followed by *Pratylenchus* sp., *Hoplolaimus indicus, Helichotylenchus* sp. (*H. indicus* + *H. dihystera*) and *Meloidogyne* sp. *Tylenchorhynchus* sp. comprised of 44.53%, *Pratylenchus* sp. 29.08%, *Hoplolaimus indicus* 10.5%, *Helichotylenchus* sp. 8.2% and *Meloidogyne* sp. 3.23% of total nematode species. Under rice-wheat cropping system, there was 239.63% increase in initial nematode population when paddy was cultivated. When wheat was cultivated in field where earlier paddy was taken there was further increase of 51.19% in nematode population over paddy population. Under til-wheat system, there was decrease in nematode population up to 72.38%. However, when wheat was sown in the same plot where earlier til was grown, there was an increase of 289.65% nematode population. It is inferred that til-wheat system is good for reducing the initial nematode population.

RABI MAIZE

Plant Breeding

- In advance evaluation trial 1st year of full season maturity, total 11 entries were evaluated and DMR-411 (best check) gave significantly highest yield of 92.39 q/ha followed by DMR 404 which yielded 90.66 q/ha and was at par with best check. In AET medium and early maturity, total 10 entries were evaluated and DMR 607 gave

significantly highest yield 61.55 q/ha, as compared to the best check DMR-610 (26.94 q/ha). In AET 2nd year of late and medium maturity group, total 12 entries were evaluated and an entry DMR 712 (best check) gave highest yield of 111.59 q/ha followed by DMR 708, which yielded 96.23 q/ha and was at par with best check. In QPM 1-3 trial, 7 entries were evaluated and DMR-14 gave highest yield of 57.08 q/ha followed by DMR 16 (best check) which yielded 55.41 q/ha. Two fresh single cross hybrids were produced in early maturity group, and 3 hybrids of medium maturity groups for initial evaluation trial. Five hybrids were produced, 1 in medium maturity normal maize and 4 QPM medium maturity groups for an advance evaluation trial 1st year.

- **Entries contributed by the Centre:**

Zonal Trials /Station trial	:	33 hybrids
IET	:	5 hybrids
AET	:	5 hybrids

Agronomy

- **Nutrient x Genotype (Full season maturity) :** Among all the 5 extra early maturing genotypes, X7B40 gave significantly higher yield than other genotypes. Among different nutrient levels 200:80:80 (N P K kg/ha) gave significantly higher yield than others.
- **Tillage x Genotype interaction :** Among three varieties, Shaktiman 4 performed significantly better. However bed planting method gave better yield which was at par of with Z.T.
- **Nutrient x Genotype (Medium maturity) :** Among ten genotypes, KMH3712 performed better at all the three nutrients levels. However, 200:80:80 kg/ha level had performed significantly higher than lower nutrients levels.
- **Evaluation of the interactive effect of plant density, geometry (equal spaced and paired rows) and fertility levels on the productivity of late maturity, full season genotypes under irrigated conditions:** Results indicated that in all the three plant geometry and fertilizer levels, the plant density i.e. 75000 plants/ha and fertilizer level (300:100:105) was found to be significantly superior over others.
- **Agro-technique for seed production of inbred parents :** Among all nutrients levels FYM 15 ton/ha + 250:90:90 kg, NPK/ha recorded significantly higher grain yield than other fertility levels.

Plant Pathology

- **Screening of AET entries of different maturity groups against *Turcicum* leaf blight (*H. turcicum*) and common rust (*P. sorghi*) diseases :** Out of 27 entries, 2 entries namely DMR1111 and DMR1112 were found resistant and 5 entries gave moderately resistant reaction against TLB.
- **Screening of IET entries of different maturity groups against TLB (*H. turcicum*) and common rust (*P. sorghi*) diseases :** Out of 65 entries, 17 entries viz. DMR1128, 1129, 1130, 1132, 1133, 134, 1135, 1137, 1139, 1151, 1152, 1166, 1171, 1172, 1175, 1181 and DMR1184 were found resistant.
- **Screening of inbred lines against TLB (*H. turcicum*) and common rust (*P. sorghi*) diseases :** Out of 170 inbred lines, 12 lines namely PFSR/51016-1, LM-5, HKI-141-2, HKI C 321, CML-141, CLQ-RCYQ40, PFSR-R3, PFSR-R9, PFSR-S2, PFSR-S3 SW-930, JCY2-1, JCY2-7, CML-3, CML-323, CM117-3-4-1, CM117-3-4-1-2, CML-33, LTP4 and LM13-3 were found resistant.

Entomology

- **Screening and study of the life history of climbing cut worm under caged condition :** Among the screening trial (Station trial No. 301), a total of 18 entries were evaluated against climbing cut worm and it revealed that three entries showed low susceptible reaction whereas four entries were highly susceptible. In station trial No. 302, 15 entries were evaluated and three entries showed low susceptibility. In the experiment on life history of climbing cut worm under caged condition, the life history is as I.P. 3-4 days, L.P. 3-4 days, P.P. 16-18 days and the total life cycle is 34-42 days.

KHARIF MAIZE

Plant Breeding

- In QPM 1-2 trial, total 15 entries were evaluated, QPM hybrid MHQPM 09-6, an entry from Dholi centre gave highest yield of 101.80 q/ha as compared to HQPM-5 best check which yielded 100.06 q/ha. In sweet corn trial, total 8 entries were evaluated, NSCH-12 gave significantly highest yield of 43.75 q/ha against best check Madhuri which gave a yield of 23.61 q/ha. In Pop corn trial, none of the hybrids was superior than best check Prakash (52.77 q/ha). In station trials, total 33 entries were evaluated for further breeding programme.
- **Dholi centre contributed the following single cross hybrids for coordinated testing in IET :**

  Early maturity : 1 Single cross hybrids
  Medium maturity group : 1 Single cross hybrids

  Five inbred lines maintained and deposited at NBPGR, New Delhi under accession number.

Plant Pathology

- **Screening of germplasm :**

  Out of 60 entries of full seasonal maturity (IET) , 11entries namely, CMH 08-381, CMH 08-381G, CMH 09-464, CMH 10-500, JH 31512, DMH 7705, MCH 45, MCH 46, BIO 9681 and HM 11 were found resistant to Maydis leaf blight (MLB). Out of 57 entries of medium seasonal maturity (IET), 9 entries namely CMH 10-471, CMH 10-474, MM 1108, PFMH 96157, KNMH 40111, KNMH 40112, DMH 117, BIO 9637 and Proline 777 were found resistant to MLB. Out of 20 entries of early seasonal maturity (IET), C MH 10-518 and CMH 10-519 gave resistant reaction against MLB. Out of 12 entries of extra early seasonal maturity (IET) i.e., Vivek Hybrid 9 and Vivek QPM-9 were found resistant to MLB. Out of 39 entries of full seasonal maturity (IET) , 8 entries namely CMH 08-287, CMH 08-337, JH 12108, JH 12157, PMH 1, NMH - 731, NMH - 920 were found to be resistant to MLB. Out of 43 entries of medium seasonal maturity, 5 entries namely, CMH 08-292, CMH 08-350, CMH 08-433, BH 41009 Yuvraj Gold were found resistant to MLB. Out of 29 entries of early seasonal maturity, 3 entries i.e., BIO 605, H 3459 and BIO 9637 were found to be resistant to MLB. Out of 21 entries of extra early seasonal maturity, 1 entry FH 3510 was found resistant to MLB.

Entomology

- **Maize ecosystem management using cowpea:** The per cent plant infestation was recorded lowest in maize+ cowpea+ seed treatment whereas % dead heart maximum in maize + cowpea and the yield was maximum in maize + cowpea + seed treatment.
- **Screening of maize germplasms (Late) against *Chilo partellus:*** Out of 39 entries, JH12157 and NMH-713 showed least susceptible whereas JH 12108 and EHQ-16 showed highly susceptible reaction.
- **Screening of maize germplasms (Early maturing) against *Chilo partellus:*** Out of 29 entries, JH31204, HKH 317, PH 3506 showed least susceptible reaction while X88-5661, JH-3459, HKPSCWP showed highly susceptible reaction.
- **Screening of maize germplasms (Extra early maturing) against *Chilo partellus:*** Out of 21 entries PH-3487, Madhuri showed least reaction while PH 3510, PH3487, KDM 1293 showed highly susceptible reaction.
- **Survey and surveillance of major insects of maize:** In Muzaffarpur, epidemic form of Corn Aphid, *Rhapalosiphum maidis* was observed and the extent of infestation was 40-50 %. In Patna, 10-15 % incidence of termite was observed. Cob worm incidence was reported as 10-15 %.

CHICKPEA

Plant Breeding

❖ **Maintenance of germplasm :**

- **IVT-Desi :** Only one entry, BG 3013 (4189 kg/ha) was found significantly superior to the best check KWR 108 (3779 kg/ha). Six entries viz; RVSSG 4 (3356 kg/ha), GNG 1999 (3307 kg/ha), GNG 1996 (3863 kg/ha), GJG 0810 (3107 kg/ha), NDG 10-11 (3882 kg/ha) and RG 2003-28 (3449 kg/ha) were significantly superior to the check DCP 92-3 (2704 kg/ha).
- **IVT Kabuli :** Six entries viz., GNG 1969 (1673 kg/ha), HK 05-169 (1956 kg/ha), HK 07-227 (1773 kg/ha), IPCK 2006-78 (2842 kg/ha), IPCK 2006-56 (1967 kg/ha) and HK 07-234 (2563 kg/ha) showed significant superiority over the best check BG 1053 (1341 kg/ha).
- **IVT ELSK :** Only two entries exhibited significant superior yield namely HK 06 171 (2117 kg/ha) and HK 06-163 (1443 kg/ha) than the best check KAK 2 (1176 kg/ha).
- **Rice Fallow trial :** Twelve released varieties were tested in rice fallow condition of North Bihar. Three entries viz; JG 16 (1570 kg/ha), Pusa 372 (1409 kg/ha) and Vaibhav (1338 kg/ha) were found most promising in comparison to other test entries.

International Nursery :

- **ICSN Desi :** Twenty one entries were evaluated with BG 256 as check. Maximum yield was obtained by Entry 20 (2481 kg/ha), followed by Ent.14 (2428 kg/ha) and Ent.02 (2333 kg/ha) whereas, BG 256 yielded 1295 kg/ha.
- **ICSN Kabuli :** Twenty one entries were tested having the check KAK 2. Maximum yield was obtained by Ent. 16 (2414 kg/ha), followed by Ent.1 (2171 kg/ha), Ent.4 (1961 kg/ha), Ent.19 (1952 kg/ha) and Ent.02 (1857 kg/ha) whereas, KAK 2 yielded 1402 kg/ha.

- **IIPR Nursery :** Thirty two entries were evaluated including the check BG 256. Maximum yield was obtained by IPC 2009-172 (1792 kg/ha), followed by IPC 2009-182 (1587 kg/ha) and IPC 2008-41 (1408 kg/ha) whereas, BG 256 yielded 1305 kg/ha.
- **Station trial-I :** Twenty four entries were tested including the check BG 256. Three entries namely ICCV 09117 (1709 kg/ha), IPC 2006- 111 (1682 kg/ha), and IPC 2007-87 (1598 kg/ha) were found at par to the check BG 256 (1670 kg/ha).
- **Station trial-II :** Fourteen entries were evaluated including check BG 1053. Four test entries viz. CSJK 41 (1081 kg/ha), HK 95-159 (1042 kg/ha), GNG 1888 (1038 kg/ha) and GLK 26162 (1024 kg/ha) were found at par to check BG 1053 (984 kg/ha).

Agronomy

- **Conservation agriculture practices (Tillage, nutrient and weed management for enhancing chickpea productivity) :** Seeding of chickpea through conventional method recorded significantly higher grain yield (2174 kg/ha) than reduced method of sowing (1883 kg/ha). Application of full dose of NPK + 25 kg $ZnSO_4$ produced similar grain yield (2004 kg/ha) to that of ½ NPK + 5 t compost/ha (2053 kg/ha). Among the weed control treatments, pre-emergence application of pendimethalin @ 1.0 kg/ha and two hand weeding at 25 and 50 DAS proved equally effective for reducing the weed density and producing the grain yield.

Plant Pathology

- Altogether 139 entries and 1 susceptible check JG-62 of different groups of IVT and AVT trials were evaluated against wilt (*Fusarium oxysporum* f. sp. *ciceri*) in sick plot where two entries viz., GNG 1958 & GNG 26054 exhibited resistant reaction against wilt.
- **Identification of races of *Fusarium oxysporum* f. sp. Ciceri :** Thirteen chickpea differentials were evaluated *against F. oxysporum* f. sp. *ciceri* in sick plot. Only one entry JG 63 was found resistant against wilt. Five entries i.e. K 850, L550, IPC 2004-52, JG 2001-12 & KWR-8 showed moderately resistant reaction against wilt.
- **ICRISAT Chickpea Wilt Nursery:** Out of 32 entries evaluated, only 3 entries viz., ICC 5003, ICC 11322, & ICCV 07105 showed moderately resistance reaction against wilt. Leaf spot caused by *Stemphylium sarciniformae* was also noticed at Dholi Farm and the severity ranged between 10-30 % under natural conditions of infection.

Entomology

- **Field evaluation of chickpea entries of AVT-1 & AVT-2 against *Helicoverpa armigera Hb.:*** Among the six entries included in AVT-1 (Desi), AVT-1 (ELSK) and AVT-1 + 2 (Kabuli), when tested together under open field condition, the pod borer incidence ranged from 12.2% in Phule G 0517 to 34.10% in HK 94-134 (Kabuli)..
- **Screening of entries against *Helicoverpa* damage:** Out of the seven chickpea entries, two entries viz., GNG 1488 and BG 1053 recorded lower pod damage as compared to standard check.
- **Survey of pest incidence and associated natural enemies:** A field survey of farmers' field around Darbhanga and Muzaffarpur at podding stage of chickpea crop revealed that mean pod damage due to *Helicoverpa armigera* Hb. ranged from 8.4 to 34.3% under normal to late sown conditions.

Nematology

- Out of 65 genotypes/entries tested for resistance against root-knot nematodes, only one entry, N-5 showed resistant reaction

PIGEONPEA

Agronomy

- Weed free plot although recorded higher grain yield (1587.29 kg/ha) but was found at par with hand weeding twice at 25 and 50 DAS (1521.93), pre-emergence application of pendimethalin + 1 HW at 50 DAS (1456.57 kg/ha) and post-emergence application of imazithapyor @ 75 g/ha + paraquat @ 0.4 kg/ha at 6 WAS (1372.54 kg/ha) recorded significantly higher grain yield than rest of the weed control treatments.
- Pigeonpea+urdbean intercropping system and application of 5 t FYM/ha together with RDF was worked out to be economically viable technology for enhancing the productivity of pigeonpea under north Bihar condition.

Plant Breeding

- In IVT (Late), altogether twenty entries were tested out of which only one entry DA 10-3 (2633 kg/ha) has sown the significant superiority over the check where as two entries DA 10-2 (1578 kg/ha) and DA 10-1 (1494 kg/ha) were found on par to the checks Bahar (1733 kg/ha) and NDA-1 (1661 Kg/ha).
- 32 Experimental hybrids were generated using male sterile lines. Among them, maximum yield was obtained by HY 28A x Bahar (2566 kg/ha), followed by ICP 2043 A x Mal 13 (2420 kg/ha) whereas Bahar yielded (1690 kg/ha).
- 21 Water logging tolerant genotypes were grown. Among them, 5 entries viz. DAW 07-22, DAW 07-54, DAW 07-09, DAW 07-17, and DAW 07-33 were found superior under high moisture condition.

Plant Pathology

Varietal screening for Wilt and Sterility mosaic :

- Out of thirty entries of National Nursery of AVT and IVT, Phule T0012 exhibited resistant reaction (upto 10% wilt) against wilt and NTL 554 showed moderately resistance against sterility mosaic
- Out of twelve entries, KPL 43 and IPA 8F exhibited resistant reaction (0-10% wilt) against wilt. Nine entries *viz.* BRG 3, BSMR 736, BSMR 853, HY-3C, ICPL 87119, IPA8 F, IPA 15F, IPA 16F and IPA204 exhibited resistance against sterility mosaic.
- Out of fifteen entries, ICP 8863 showed resistance against wilt. Three entries BRG 1, Bahar and MAL6 showed resistant reaction against sterility mosaic.
- Out of ten entries of pigeonpea, DA 10-2, DA 10-6 & DA 10-10 exhibited resistant reaction (upto 10%) against wilt where as DA 10-2, DA 10-3, DA 10-5, DA 10-6, DA 10-7 & DA 10-8 showed resistance against sterility mosaic.
- Out of nine entries, IPA 12F & JSA 59 exhibited resistance (0-10%) against wilt.
- Out of three entries of long duration crop, one entry ICP 8863 was found resistant against wilt
- Out of thirty entries of pigeonpea (ICRISAT), ICP 11298, KPBR 20105, ICPL 99010 & ICPL 99046 were resistant against wilt, while rest 25 entries showed resistance to sterility mosaic.

- Out of one hundred eighty one entries (NBPGR) evaluated against sterility mosaic disease, all entries were susceptible to sterility mosaic disease.
- **Monitoring of races of *Fusarium udum*:** Nine pigeonpea differentials were used for identification of race, variant I of *F. udum* was identified at Dholi
- **Epidemiology of sterility mosaic :** The peak period of disease progress was noted between 8-28th Oct., 2010. During this period minimum temperature ranged between 20.3 to 24.0 °C and maximum temperature 31.1 to 33.1 °C. Relative humidity was 92.2 to 97.2% at 7 hr. and 55.7 to 75.5% at 14 hr. with 37.4 mm rainfall in 3 rainy days.
- **Survey of pigeonpea:** The wilt incidence was noted between 5-15 %. Incidence of sterility mosaic was low (2-3%) possibly due to cultivation of Bahar. In pre-rabi pigeonpea, Alternaria leaf blight was more prevalent (20-50%). In addition, Cercospora leaf spot was also noticed in traces on variety Bahar.

Entomology

- **Validation of IPM module in late pigeonpea :** Trial on validation and economics of IPM modules with pigeonpea cv. NDA-1 intercropped with maize cv. Laxmi yielded variable results. The highest C:B ratio (1:3.4) was obtained with IPM module in which pigeonpea was sown on ridges after seed treatments with Trichoderma @ 4 gm + Vitavax @ 2 gm/kg seed, installation of bird percher @ 50/ha 1st round of spraying with indoxacarb 14.5Sc (60 g a.i./ha) at 25% flowering followed by 2nd spraying with dimethoate 30 EC (350 g a.i./ha) at 50% podding.
- **Evaluation of newer insecticides against pod borers of pigeonpea :** In the 2nd year trial on field evaluation of newer insecticides against pod borer complex of pigeonpea cv. Bahar, indoxacab 14.5 SC @ 60 g a.i./ha proved most effective against pod fly by recording lowest pod damage (16.3%) followed by flubendiamide 20 WG @ 5.0 C and endosulfan 35 EC (700 g a.i./ha) with relatively less pod damage (19.4 to 19.8%) as compared to untreated control (46.8%). Against *Heliothis* infestation, all the insecticide were found significantly superior to untreated control. Of these, flubendiamide 20 WG (5.0 g a.i./ha) proved most effective against this pest by recording lowest pod damage (6.8%) followed by spinosad 45 SC (73.0 g a.i./ha). Emamectin benzoate (11.0 g a.i./ha) and indoxacarb 14.5 SC (60 g a.i./ha) recorded relatively low pod damage (10.7 to 11.2%) as compared to untreated control (32.8%).
- **Evaluation of different microbials against *H. armigera* on pigeonpea :** Among the treatments, NSKE (5.0%) proved better than others by recording relatively low pod damage (32.9%) as compared to untreated control (51.2%). Against pod borer (*Heliothis*), DOR Bt. formulation (1.5 kg/ha) recorded lowest pod borer damage (17.7%) followed by *B. bassiana* DOR SC formulation (300 mg/l) and commercial *B. bassiana* WP(1.5 kg/ha) with mean pod borer damage around 18.7 and 19.6%, respectively as compared to untreated control (37.4%).

Nematology

- **Preliminary evaluation of early, medium and long duration lines/cultivars of pigeonpea against root-knot nematodes, *Meloidogyne incognita* :** Out of 9 entries screened for resistance against *Meloidogyne incognita*, three entries namely GT 101, AL 201 and PA 382 have shown moderately resistant reaction.
- **Evaluation of germplasm of pigeonpea for resistance against root-knot nematodes under pot conditions :** Out of 18 (eighteen) genotypes screened for resistance against *Meloidogyne incognita*, 8 genotypes namely, IPA 1F, IPA 2F, IPA 3F, IPA 5F, IPA 10F, IPA 12F, IPA 17F and IPA 18F have shown moderately resistant.

MULLaRP

Plant Breeding

- **AVT 2+19 (Lentil) :** Fifteen entries were evaluated in RBD with local check Arun. Three entries viz; IPL 318 (2402 kg/ha), PL-097 (2297 kg/ha) and IPL 319 (2157 kg/ha) were significantly superiority over check Arun (1079 kg/ha).
- **Station trial (Lentil) :** Ten entries were tested including local check Arun. Only two entries namely DL 10-7 (1310 kg/ha) and DL 10-10 (1208 kg/ha) were found at par to the check Arun (1246 kg/ha).
- **IVT tall (Field pea) :** Fifteen entries were tested in RBD with Rachana as check. Only two entrri HFP 554 (1422 kg/ha) and RFP 2009-1 (1234 kg/ha) were found *significantly superior to check Rachana (1076 kg/ha).*
- **AVT Urdbean :** Out of 5 entries tested, only one entry KU 11-648 (1131 kg/ha) has shown significant superiority over check Pant U 31 (991 kg/ha).

Agronomy

- Among the weed control treatment, hand weeding at 25 DAS (2459 kg/ha) and imazethapyr @ 50 g a.i./ha applied at 30 DAS (2392 kg/ha) being at par proved significantly superior to weedy check (2020 kg/ha) and pendimethalin @ 1 kg a.i./ha (2176 kg/ha).
- Mungbean variety Meha yielded maximum (898 kg/ha) followed by SML-668 (883 kg/ha) and PDM 139 (773 kg/ha) and all these significantly out yielded the variety HUM 12 (639 kg/ha) and Pusa Vishal (588 kg/ha).

Nematology

- **Lentil :** Out of 54 entries, only 17 entries revealed moderately resistant reaction.
- **Mungbean :** Out of 10 entries screened for resistance against *M. incognita*, 6 entries namely, IPM 2k-14-9, IPM 05-2-8, IPM -06-5, NDM 11-5, IPM 99-1-6 and MH-421 were found moderately resistant
- **Urdbean :** Out of 13 entries of urdbean screened for resistance against *M. incognita*, 7 entries namely, KU 327, KUG 386, NDU-11-100, KUG 384, KUG 397, IPU 09-7 and NDU 11-40 were found moderately resistant.

Plant Pathology

- **AVT1 and AVT 2 entries against yellow mosaic disease (Mungbean) :** Out of twenty seven promising entries of moongbean, only one entry IPM 05-2-8 was found resistant to the disease.
- **AVT1 and IVT entries against yellow mosaic disease (Urdbean) :** Out of seventeen entries of urdbean, seven entries IPM 10-16, KU- 327, IPU-09-1, NDU 11-100, KUG 11-40, NDU-1 and Pant U 31 were found resistant to the disease.
- **AVT of mungbean :** Out of 31 mungbean entries, eleven entries viz. GM-06-08, IPM-0209-3, MH-729, MH-709, MH-2-15, IPM-2K14-9, RMG-975, TMB-17, Pusa-0672, MH-2-15 and CO-5 were resistant to MYMV
- **AVT of urdbean :** Out of 39 entries, 24 viz., NDU-10-52, UH-7-13, KU-010-1, UH-04-4, 5B-121-36, KU-99-26, KUG-531, UH-07-17, UH-07-6, KUG-540, IPU-09-16, RUG-10, KU-99-19, NDU-09-15, IPU-08-2, PU-08-5, NDU-10-50, IPU-06-2,

IPU-07-3, IPU-09-18, IPU-02-33, IPU-02-43, KU-96-3 and Uttara recorded resistant reaction against YMV.

- Thirty four entries and one susceptible check NP 29 of different groups of IVT and AVT trials of field pea were screened against powdery mildew. Powdery mildew was recorded only in susceptible check NP 29 (50%)

Entomology

- **Screening of field pea germplasms to identify resistant donors against stem fly & pod borer :** Among 41 germplasm lines of field pea, the stem fly and pod borer incidence varied from 1.1 to 12.0% and 3.7 to 13.40%, respectively. Some of the lines like HFP-716 (1.1%), Pant-P 137, VL 54, KPMR-913, HFP-530 and KPMR-885 (2.3 to 2.7%) were found promising lines against stem fly. In case of pod borer, some lines of field pea like IPFD-10-12, HFP-8909, IPFD-09-2 and HFP-4 recorded significantly lower pest infestation (3.7 to 4.8%). One of the test lines HFP-547 recorded moderately lower incidence of both stem fly (3.8%) and pod borer (5.0%).

SMALL MILLETS

Plant Breeding

- In station trial of finger millet, two genotypes ST-12 (34.19) &ST-19 (32.50) recorded good yield in comparison to local control (29.26 q/ha) where as in foxtail millet, one genotype FST16 (24.0 q/ha) was good yielder in comparison to local control(15.37 q/ha) and in barnyard millet, two genotypes, BST-9 (21.50 q/ha) and BST-10 (29.56 q/ha) gave higher yield than local control(14.26 q/ha).

SUNFLOWER

Plant Breeding

- **Selection of new inbreeds from different base population for seed yield and oil content :** Out of 72 entries, 31 accessions from S_3 and 15 accessions from S_4 generation were evaluated. TCA-09-10-3-1(37 g/p) from S_3 and GP-16-17-1-1(50 g/p) were selected for population development based on uniform plant height and days to 50% flowering.
- **Initial Advance Hybrid Trials (IAHT) :** Among 14 hybrids, IAHT-07 (21.32 q/ha) gave higher yield followed by IAHT-05, IAHT-13 (18.69 q/ha) and IAHT-12 (17.62 q/ha).

Agronomy

- **Comparative assessment of yield gain from sunflower hybrids over varieties in relation to fertilizer input :** Application of 150% RDF recorded significantly higher seed of sunflower than the lower levels of fertilizer. Amongst the genotypes, Arjun Super-48 (SSH-48) gave significantly higher seed yield than other composite and hybrids varieties.

Plant Pathology

- **Screening of entries of coordinated trial :** Two entries viz. IAHT 06, 09 were rated as highly resistant, nine entries namely IAHT 01, 02, 03, 04, 07, 08, 12, 13, 14 rated as resistant where as 3 entries viz. IAHT-05, 10, 11 rated as moderately resistant against *Alternaria* leaf spot disease.

- **Management of Alternaria leaf spot of sunflower :** The disease severity of Alternaria leaf spot was significantly low (2.50%) with highest seed yield (1580 kg/ha) and highest B.C. ratio (1.76) in treatment with seed treatment with SAAF @ 3 g/kg seed along with 2 sprays of ilt @ 0.1% at 30 and 45 DAS.

SESAME

Plant Breeding

- **Genetic resource management :** 100 germplasm were evaluated. differences were found among the entries for seed yield (g/plant) and contributing characters. Entry S-0579 (60.3 g/plant) was found higher seed yielder followed by NIC-161115 (60.0 g/plant), MT-67-25, NIC-8286 (55 g/plant). The three entries NIC-8390, SI-553 and KMR-112 failed.

RAPESEED-MUSTARD

Agronomy

- **Studies on the requirement of fertility levels in mustard based cropping system :** Significantly higher seed yield (1923 kg/ha) was found at 150% of RDF/ha than all other fertility levels and followed by 125%, 100% and 75% of RDF in decreasing order. Higher mean seed yield (1851 kg/ha) was found under black gram-mustard cropping system which was significantly superior than the other cropping systems.
- **Performance of mustard in rice sequence under utera cropping :** Line sowing produced significantly higher mustard seed yield (1156 kg/ha) than other cropping practices. Similarly, nitrogen @ 80 kg/ha produced significantly higher seed yield over other levels of nitrogen.
- **Herbicidal control of weeds in mustard :** Highest mean mustard seed yield (1934 kg/ha) was recorded under weed free condition which was significantly superior to other treatments except isoproturon @ 1.0 kg a.i./ha (P.E.), oxyfluorfen (Goal) @ 0.15 kg a.i./ha (P.E.) and clodinafop (Topik) @ 0.06 kg a.i./ha (20-25 DAS) which were at par.
- **Temporal adjustment for higher mustard productivity in changing climate scenario :** The significantly higher seed yield (1692 kg/ha) was found under second date of sowing (22.10.10) than all other dates of sowing and followed by third, fourth and first dates of sowing in descending order. Higher mean seed yield (1651 kg/ha) was recorded by Rajendra Sufalam and followed by Varuna, Rajendra Anukool and Pusa Bold. Highest mean seed yield (1880 kg/ha) was recorded by Rajendra Sufalam at second date of sowing as a result of interaction.
- **Performance of promising mustard entries under different fertility levels (normal mustard under irrigated condition) :** Higher mean seed yield (1808 kg/ha) was recorded by Ag-35 at 150% of RDF as a result of interaction.

Plant Pathology

- **Screening of *Brassica* germplasm and breeding materials against different diseases under natural conditions :** Among 53 entries, 2 entries, namely DRMR, IJ20 (18.4%) and RMM-09-1 (23.9) were found moderately resistant against Alternaria blight at pod stage.

- **Screening of *Brassica* germplasm and breeding materials against Sclerotinia rot under artificial inoculation :** Out of 53 entries, none was found resistant against Sclerotinia rot.
- **Uniform Disease Nursery (UDN) trial for major disease of rapeseed- mustard :** Among 40 entries, 4 entries viz. DRMR-270(21.1%), DLSC-1(21.1%), DRMR 261 (23.9%) and EC 3992992 (25%) were found moderately resistant at pod stage.
- **National Disease Nursery (NDN) trial for AB :** Among 21 entries, 2 entries namely EC-399299 (22.2%) and EC-339000 (23.9%) were found moderately resistant at pod stage.
- **Integrated Disease Management of Alternaria blight :** Lowest PDI of 26.6% with second highest yield was recorded in seed treatment with mixture of ipridione + carbendazim (1:1) @ 2 g/kg seed followed by 2 foliar sprays of carbendazim + mancozeb @ 0.2% followed by soil application of $ZnSo_4$ @ 15 kg/ha+ Borax @ 10 kg/ha + Sulphur @ 20 kg/ha + 2 foliar sprays of carbendazim + mancozeb @ 0.2% with 28.9%, PDI and highest seed yield 1192 kg/ha.
- **Management of Alternaria blight disease of Indian mustard using micro-nutrients :** Lowest PDI (32.6%) with 11.56 q/ha seed yield was recorded with foliar spray of mancozeb @ 0.2%) followed by soil application of $ZnSo_4$ @ 15 kg/ha + Borax @ 10 kg/ha + Sulphur @ 20 kg/ha with highest seed yield of 11.65 q/ha and 38.5%.

Entomology

- **Eco-friendly approach for the management of mustard aphid :** The highest reduction(68.1%) of aphid population was observed under the treatments - *Verticillium lecanii* followed by *Azadirachtin* 1500 PPM @ 4 ml/l. This was closely followed by the treatment of *Azadirachtin* 1500 ppm @ 4 ml/l alone (51.5%) and the seed yield was also very high in both the cases (13.2 q/ha and 12.8 q/ha, respectively).

POTATO

Plant Breeding

- In a trial with old early maturing hybrid, Hybrid J/99-242, 60 days crop, was best with 0.39 t/ha higher tuber over best check var. K. Pukhraj (10.81 t/ha).

Agronomy

- **Organic fertilizer based potato production :** Application of inorganic RDF gave higher yield of potato which was closely at par to FYM applied on nitrogen basis of RDF. Application of crop residue + Azotobactor + PSB + Trichoderma + FYM 20 t/ha and C.R. + Azo + PSB + Trichoderma + Vermicompost 5 t/ha yielded lower than both the above treatments.
- **Integrated nutrient management of potato based cropping system :** Application of FYM @ 20 t/ha + 100% RDF recorded significantly higher yield of potato tuber. Reduction in RDF dose resulted in low yield of potato.
- **Identification of nitrogen efficient potato cultivars for different zones :** Varieties K. Arun x N_{180} recorded 16.85 t/ha tuber yield which was at par to K. Pukhraj x N_{180}. However, K Arun and K. Pukhraj recorded maximum net return at N_{180} level.

- **Water management in potato under low water availability conditions :** Significantly higher total yield of tuber (24.20 t/ha) was recorded at irrigation at 20 mm CPE x mulch and this was found to be more remunerative.
- **Studies on shift of planting dates in view of the rising temperature and correlation of yield with temperature :** Significantly higher potato tuber yield was recorded under D_1 (26.11.2010) sown crop. D_1 gave 24.29 and 23.27 t/ha with K. Pushkar and K. Arun, respectively. Sowing after 6.12.2010 resulted in negative net return.

ONION & GARLIC

Plant Breeding

- **Advance Varietals Trial (AVT) of onion :** Among, 22 onion germplasms evaluated, germplasm BRBO1016 (347.24 q/ha), BRBO1005 (332.20 q/ha), BRBO031 (331.38 q/ha), BO1004 (328.96 q/ha), BRBO-1015 (327.18 q/ha) BRBO026 (324.39 q/ha) & BRBO 1011 (320.59 q/ha) were found significantly superior over check variety A (302.48 q/ha).
- **Garlic germplasm evaluation trial :** Out of 21 germplasms evaluated , RAU-G-16 (82.30 q/ha), RAU-G-12(82.15 q/ha) and RAU-G-5(80.21 q/ha) were found at par with the national check G-323(80.87q/ha).

Agronomy

- **Weed management studies in onion :** Among all the weed control treatments, oxyflurofen 25.5% recorded significantly higher total yield over rest of the treatments.

Entomology

- **Population dynamics of onion thrips and its seasonal incidence :** Among the 6 planting dates, thrips population ranged between 4.52-14.05 thrips/plant, highest being in 1st January planting and the lowest in 1st November planting. In protected plots, number of thrips never crossed 2/plant. Highest marketable yield (343.10 q/ha) was obtained in 1st December planting while marketable yield loss was the highest (51.56%) in 15th January planting and the lowest in 1st November planting with 22.79%.
- When seasonal maintenance of thrips trial was examined in 47 week, thrips population was low initially and started increasing from 9th week that falls in the February month and reached to 26.73/plant in 11th week that falls in the 2nd week of march and remain high up to 12th week. The thrips population decreased to 8.79/plant by 19th week.
- **Evaluation of some botanicals and bio- pesticides against onion thrips :** Among all the treatments, profenophos recorded the lowest number of thrips in all five sprays. Among the other treatment, thrips population was significantly lower in neem crude oil sprayed plots in all five sprays followed by spinosad. Damage rating ranged 0.79-3.95, lowest in profenophos and the highest in control. Marketable bulb yield was highest with profenophos (32.65 t/ha) followed by spinosad (31.73 t/ha). Control plots recorded 26.33 t/ha.

TUBER CROPS (OTHER THAN POTATO)

Plant Breeding

- **Collection, maintenance and evaluation of germplasms :** Altogether (1377) accessions of eight tuber crops (other than potato) are being maintained at Dholi. The centre maintained highest number of accessions of sweet potato (1102), yam bean (144), winged bean (20) as compared to other centres. Out of 1377 accessions, 996 accessions got the IC No. 592303 -593298 by NBPGR, New Delhi.
- **Uniform Regional Trial on sweet potato :** Out of eight entries, only three entries viz., S-1-60 (24.86 t/ha), CO-3-4 (17.60 t/ha) and SV-71 (16.90 t/ha) were higher yielder in respect of marketable yield as well as harvest index 82.25, 80.90 and 72.22 per cent, respectively over the national check Sree Arun (913.30 t/ha and 52.38%).
- **MLT on orange fleshed sweet potato :** Among all five entries only one entry i.e., 440038 (15.52 t/ha) performed better on the basis of mean yield at four locations followed by Cross-4 (14.22 t/ha).
- **Improvements through poly cross method of breeding for making site specific selection of sweet potato :** Among eight entries, the maximum seed was obtained in DOP-92-48 (25 seed) followed by Kishan (23 seed), DOP-92-1 (22 seed) and DOP-93-19 (14 seed).
- **Uniform Regional Trial on colocasia (Taro) :** None of the entry was found superior than the national check Sree Kiran (21.66 t/ha) while three entries namely, AAU col-46 (21.66 t/ha), AAU col-32 (21.66 t/ha) and Sree Rasmi (18.66 t/ha) were at par to check.
- **Improvement Programme on yam bean through breeding :** Out of twenty eight crosses, two crosses namely, DPH-70/ DPH-9 and DPH-70/L No. 3 had produced 20 seed each followed by DPH-70/ DL-28 and DPH-9/ DL-28 (16 seed each).
- **Uniform Regional Trial on lesser yam :** In this trial only one entry i.e., DE-11 was found significantly superior in respect to tubers yield (14.58 t/ha) and number of marketable tuber (12.80 cm/tuber) over national check.
- **Intercropping of spices crops in elephant foot yam :** Growing of elephant foot yam + ginger at 1:1 ratio was found most suitable combination for enhancing growth attributing parameters and corn yield (56.67 t/ha).
- **Effect of vine length and no. of nodes on growth & yield of sweet potato :** Planting of 35 cm cutting of vine along with 2 nodes inside the soil, gave maximum vine length, no. of leaves/vine & marketable tuber yield (17.82 t/ha) as compared to other treatments.

Plant Pathology

- **Screening of germplasms :** Among ten colocasia lines, three entries viz., C-2-92, C-32 and C-6 recorded lower level of disease incidence (12.5-13.4%) and intensity (7.3-8.6%) of Phytophthora leaf blight and graded as moderately resistant as against resistant variety Muktakeshi. Amongst eight entries of colocasia, lowest disease incidence (13.3%) of Phytophthora leaf blight was recorded with AAU col-46 followed by AAU col-38 (14.7%) and Sree Reshmi (16%) while Halkesu suffered most (21.3%).
- **Evaluation of storage conditions and fungicide treatment for storing seed corms of elephant foot yam :** Among different treatments, lowest moisture loss (14%), maximum sprouting (100%) and no rotting was observed when corm was treated with bavistin (0.2%) and stored on soil.

Entomology

- **Screening of orange fleshed sweet potato (OFSP) entries under MLT :** Among five OFSP entries, 440127 recorded significantly lowest mean per cent tuber infestation (0.50%) at all locations followed by 440038 (7.3%) as against local check i.e. Cross-4 (16.7%).
- **Screening of anthocyanin sweet potato entries against sweet potato weevil :** Pooled mean of three years data clearly revealed that among twenty one anthocyanin rich sweet potato entries, X-24 recorded lowest tuber infestation (7.6%) and highest marketable tuber yield (15.2 t/ha).
- **Management of sweet potato weevil through intercrops :** Among different intercrops under test, sweet potato + coriander (1:1) recorded lowest tuber infestation (9.1%) and gave highest marketable tuber yield (17.8 t/ha) which was at par with same treatment at 2:1 ratio (10.7% and 16.1 t/ha, tuber infestation and marketable tuber yield, respectively) and foliar spray of dimethoate @ 0.05% (8.7% and 18.2 t/ha, tuber infestation & marketable tuber yield, respectively) as against 17.4 per cent tuber infestation and 12.6 t/ha tuber yield in sole crop.
- **Evaluation of biopesticides against pest of national importance :** Pooled mean of two years data revealed that among various formulations of tuber crops, yam bean seed extract (YBSE) at 5 and 2 per cent proved most efficacious in minimizing aphid population (20.3, 25.2 and 25.4, 29.4/plant) at 3 and 10 days after first spray as against foliar spray of dimethoate (16.9 & 19.2 aphid/plant).
- **Management of yam bean pod borer :** Pooled mean of two years data revealed that among various treatments yam bean seed extract (5%) and tobacco decoction (3%) proved most efficacious in minimizing borer population (2.9 & 3.1/flower shoot, respectively).
- **Screening of yam bean genotypes against pod borer (*Maruca vitrata*) :** Pooled mean of two years data revealed that out of 140 genotypes tested, 40 genotypes were identified as highly resistant. Lowest flower infestation 7.83 and 8.0% were recorded with DPH-85 and DPH-83, respectively as against 36.50% in local check Deshi
- **Survey of pests of tuber crops :** Newly planted sweet potato crop was found to be attacked by termite (40.0 to 41.7%) at Madhuban village of East Champaran. February planted sweet potato crop was found to be more infested by sweet potato weevil (14.6-30.4%) as compared to September planted crop (11.2-24.0%). The flowers and pods of yam bean crop were found to be attacked by pod borer to the tune of 31.0-50.7 and 32.2%, respectively.

CORIANDER

- **Genetic resources :** Out of one hundred forty three germplasms, only fourteen line gave the maximum yield (1.35 kg to 1.15 kg/5.4 m^2) as compared to high yielding variety Rajendra Swati (0.85 kg/5.4 m^2) and Pant Haritima (0.90 kg/5.4 m^2). Among the promising accessions RD-420 and RD-395 gave the maximum yield (1.35 kg/5.4 m^2) followed by RD-387, RD-400 and Jco-32 i.e., (1.20 kg/5.4 m^2).

FENNEL

- **Co-ordinated Varietal Trial on fennel (CVT) :** Entries FNL-43(1791.67 kg/ha) and FNL-41 (1333.33 kg/ha) gave significantly higher yield as compared to local check variety Rajendra Saurabh.

FENUGREEK

- **Initial Evaluation Trial on fenugreek (IET) :** Three entries namely RM-188(2.12 t/ha), RM-194 (1.18 t/ha) and RM-197 produced significantly higher yield as compared to check variety Hisar Sonali and Rajendra Kanti.

GINGER

- **Genetic resource:**Forty seven accessions of ginger are being maintained. Accession RG-3 was found superior & gave higher yield of 10.90 kg/7.2 m^2 over Nadia (check) which yielded 6.50 kg/7.2 m^2. However, in case of turmeric 98 accession are being maintained. Out of ninety eight accessions, fourteen accessions gave higher yield (38.5 to 28.50 kg/7.2 m^2) as compared to check variety Rajendra Sonia (25.0 kg/7.2 m^2).
- **Initial Evaluation Trial on ginger (IET) :** Among eight promising entries, six entries were found significantly superior with respect to yield over check variety Nadia. Highest yield was recorded in RG-32 (17.20 t/ha) over control (9.55 t/ha).
- **Effect of micro-nutrients :** Among four micro-nutrients like zinc sulphate, ferrous sulphate, copper sulphate and manganese sulphate, ferrous sulphate produced significantly higher yield (1.64 t/ha) as compared to other micro-nutrients. Among three doses of micro-nutrients like zero level (0), 25 kg/ha and 0.5% foliar spray at 45 and 60 days after sowing, soil application of micro-nutrients @ 25 kg/ha gave significantly higher yield (1.75 t/ha) as compared to zero level and foliar spray.
- **Nutrient supplementation through organic manure for growth & yield of ginger :** Among eight treatments, integrated nutrient management (FYM-30 t/ha, N:P:K:: 80:50:80 kg/ha) followed by application of FYM @ 20 t/ha gave significantly higher yield i.e., 17.85 t/ha & 15.15 t/ha, respectively.

TURMERIC

- **Effect of micro-nutrients on turmeric :** Four micro-nutrients viz.; $ZnSO_4$, $MnSO_4$, $FeSO_4$ & Borax were applied separately as basal dose as well as foliar. Among micronutrients, $FeSO_4$ as basal was found superior and gave higher yield of 55.22 t/ha. So far methods of application of micro-nutrients is concerned basal application @ 25 kg/ha of micro-nutrients gave higher yield of 56.33 t/ha as compared to foliar application.

Plant Pathology

- **Survey & identification of disease causing organism in coriander :** Coriander field survey in Samastipur and Muzaffarpur districts revealed that incidence of stem gall disease ranged from 30-55% with mean disease incidence of 40%.
- **Survey :** In course of survey in Samastipur district, the incidence of Bacterial wilt of ginger was registered in range of 11.11 to 45.56% and Soft rot disease from 5 to 14.44%. The crop was also found to be infected with Leaf spot disease with 4.44 to 15% incidence. Turmeric crop was found to be affected by Colletotrichum and Taphrina leaf spot in Vaishali district of Bihar. The incidence of Colletorichum leaf spot was found in the range of 47.22 to 58.34%. The Taphrina leaf spot incidence ranged from 22.22 to 36.11%.
- **Screening of turmeric germplasm against foliar diseases :** Out of 98 germplasm of turmeric, 53 germplasms were found to be resistant to Taphrina leaf spot whereas, 20 germplasms were found to be resistant to Colletotrichum leaf spot.

- **Screening of coriander germplasm against disease :** Out of 143 germplasms, 45 germplasms were found highly resistant against stem gall disease under natural conditions with Rajendra Swati as susceptible check.
- **Management of stem gall disease of coriander :** After 1st year of experimentation, highest yield of 2.28 t/ha with lowest PDI of 15.00% was recorded in treatment, seed treated with propiconazole (@ 0.20%) + spray at 45, 60 & 75 DAP (@ 0.20%). This was followed by the treatment- seed treated with hexaconazole (@ 0.20%) + spray at 45, 60 & 75 DAP (@ 0.20%) with PDI (21.67%).

FRUITS

- **Banana :** A total of 105 accessions were maintained in the field gene bank at Pusa. In a varietal trial conducted with nine banana varieties, Gandevi Selection produced the best yield in the R2 crop cycle. However, four other varieties namely Dwarf Cavendish, Jahaji, Poovan and Kothia (Check) also produced fruit yield at par with Gandevi Selection. In a variety evaluation trial with 5 strains namely FHIA 03, FHIA-23, Robusta, Kachkel and Kothia, the best performance was recorded from FHIA -23, FHIA-3 and Robusta were statistically at par in respect to bunch weight and yield/ha. In irrigation trial with 5 levels of irrigation ranging from 50 to 80% replenishment of Pan Evaporation, the best result was obtained with 80% ER applied throughout the crop cycle. Water application restricted to 50% ER in second growth stage resulted in 26% decline in fruit yield. In an experiment laid out with objective to develop an organic nutrient schedule for banana, the best results were obtained when 15 kg FYM + 1.875 kg neem cake + 7.5 kg vermicompost + 2.625 kg wood ash was applied per plant to supply 300 g N, 131 g P_2O_5, 300 g K_2O. In evaluation of different varieties of banana for fiber extraction, NaOH 1.0% gave the best recovery of fibre in both the varieties i.e. Kothia and Alpan.
- **Papaya :** Among the four newly evolved promising strains of papaya TFCP 4 gave better results but it was not significantly different from the local check "Pusa Dwarf" with regard to yield and viral infestation. In a trial conducted with four bio-fertilizers namely Arbuscular Mycorhyza (AM), PSB, Azospirillum, *Trichoderma harzianum* in different combinations with 50, 75 and 100% RDF, the results revealed 25% saving in the RDF with use of 4 bio-fertilizers.
- In order to assess the impact of climate change on performance of papaya, weather parameters were correlated with papaya yield. Analysis did not reveal any distinct impact of change in climate on the performance of papaya under north Bihar agro-ecological situations.

Plant Pathology

BANANA

- **Roving survey :** The important diseases observed during the roving survey in Bihar were Panama wilt, leaf spot, rhizome rot and BBTV. Malbhog (AAB) is at the verge of extinction due to Panama wilt with more than 60 percent incidence. All tall types including Alpan (Mysore group) & Kothia (Blugoe) were found affected by Panama wilt and its incidence varied from 6 to 26%. Intensity of leaf spot varied between 2 and 5% and BBTV disease from 3 to 12%.
- **Molecular characterization of Panama wilt pathogen :** The wilt affected samples (Alpan AAB, Mysore group) were earlier sent to NRC, Trichy where Foc was isolated and characterized. The pathogen was identified as Foc and surprisingly this was found to be reacting with any nit- M testers. Hence at present it is kept as

- **Management of Panama wilt** : Use of disease free suckers after dipping in 0.2% carbendazim for 45 minutes followed by soil drenching with carbendazim (0.2%) at 5th, 7th, and 9th months after planting can be recommended for adoption by farmers. However, bio-control agent i.e. *Trichoderma viride* @ 10 g/sucker three times used as soil application was also found highly effective and causes marked suppression of Panama wilt and may be included in integrated crop and diseases management schedule.

PAPAYA

- **Survey** : PRSV has been identified as a major threat of papaya production imposing severe restriction on expansion area under this crop in Bihar.
- **Varietal screening** : Out of 11 papaya varieties, Pusa Dwarf gave the best yield. In the second year due to heavy PRSV infection the varieties produced lower yields ranging from 5.33 to 12.39 kg/plant. All varieties were found to be highly susceptible to PRSV.
- **Management of PSRV** : The most effective treatment was application of neem oil 1% + acephate 1.5 g/litre with least disease incidence (20% and 60%, respectively at 60 and 150 DAP). This was followed by application of dimethoate 0.06% with 25% and 70% PRSV incidence while the untreated (control) plants registered 75% and 100% incidence, respectively at 60 and 150 DAP.
- **Molecular biology of PSRV** : The complete genome sequence of virus associated with papaya ring spot disease from Pusa, Bihar was conducted in collaboration with IIHR, Bangalore and found that the virus was PRSV and genetically similar to PRSV isolates from other location in the country with 82-89% and 90-93% overall sequence identity with other isolates at the nucleotide and amino acid level, respectively.
- **Molecular biology of leaf curl virus** : Samples of leaf curl virus disease of papaya collected from Pusa, Bihar was subjected to complete DNA (genome) sequence in collaboration to IIHR, Bangalore and found that the disease was associated with more than two begomoviruses.

FLORICULTURE

- **Rose** : Out of five genotypes of rose tested for their performance, genotype IIHR-3-18-2 excelled others with respect to floral characters and yield.
- **Tuberose** : Considering plants vegetative growth, floral characters and bulb or bulb let quality "Prawal" cultivar was observed to be superior in respect to vegetative characters. Hybrid–I with markedly longer duration of flowering, spike length, rachises length, length of florets, diameter of florets ,diameter of cut spike, weight of individual florets, weight of florets and no. of spike plots was found to be superior to the others strain.
- **Effect of chemicals on weed control in gladiolus:** Pre-emergence application of pendimethalin @ 0.75 kg a.i./ha; or atrazin @ 1.5 kg a.i./ha or metribuzin @ 0.25 kg a.i./ha produced results comparable to the weed-free check.

SUGARCANE

Plant Breeding

- In Advance Varietal Trial (early), CoP 05436 (74.20 t/ha, 61.82 t/ha) recorded higher yield in both plant and ratoon which was at par to the best standard BO 130 (68.50 t/ha and 58.05 t/ha). With regard to CCS (t/ha), the variety CoP 05436 (9.21 t/ha) recorded

highest CCS t/ha followed by best standard BO130 (8.61 t/ha) in plant while in ratoon CoSe 05451 registered highest sugar yield (7.18 t/ha) followed by BO130 (7.16 t/ha).

- In Advance Varietal Trial (mid late), CoP 05437 (78.40 t/ha, 71.03 t/ha) recorded higher yield both in plant and ratoon followed by CoSe 05452 (71.36 t/ha, 60.75 t/ha) while the best standard CoP 9301 recorded 74.25 t/ha and 60.75 t/ha in plant and ratoon, respectively.
- Altogether, 60885 seedlings were raised from Pusa and Coimbatore Crosses, GC'S, PC'S and FC'S. Number of clones selected and planted in CG_1, CG_2 and CG_3 were 636,145 and 33, respectively.

Agronomy

- On the basis of three years experimentation, in early group COX 03178 (90.85 t/ha) recorded significantly higher yield than Std. BO 130 (76.8 t/ha). There were no marked differences in their juice quality. In the mid late group, COX 03708 (112.2 t/ha), XO 3661 (95.3 t/ha) and COXO 3595 (95.28 t/ha) being statistically at par significantly out yielded Std. BO 137 (82.5 t/ha). However, varietal differences in sucrose % in juice, the variety COXO 3080 recorded the higher sucrose % in juice (17.68 t/ha).
- *In intercropping of mungbean/urdbean with spring planted sugarcane trial, sugarcane + mungbean M-12 (1:2) gave maximum gross return (Rs. 154648.00/ha) than sole sugarcane (Rs. 146698.00/ha).*
- *In weed control trial all the methods of weed control practices, significantly decreased* number of weeds and recorded significantly higher cane yield than unweeded control. Among them application of atrazine @ 2 kg a.i./ha (PE) + dicamba 1.0 kg/ha at 75 DAP (80.9 t/ha) and atrazine @ 2 kg a.i./ha (PE) followed by 2,4-D 1 kg a.i./ha at 60 DAP (75.0 t/ha) proved most effective.

Entomology

- **Survey:** Incidence of root borer (*Emmalocera depressella* Swinh.) and shoot borer (*Chilo infuscatellus* Snell) varied from 10.0% to 13% while in case of top borer (*Scripophaga excerptalis* WIK.) incidence was recorded form 15.0% to 21.0% and the stalk borer (*Chilo aurciulius* Dudgn.) incidence was recorded 4.0% to 7.0% in different sugarcane reserved areas of sugar factory and New Area farm.
- **Varietal trial:** In 3rd year varietal trial, 12 genotypes of different maturity groups were screened against different borers during 2010-11. The maximum 5.7% incidence of shoot/root borer was observed in variety COX 03080 whereas 18.86% incidence was recorded in variety CoX - 03073. The natural incidence of stalk borer was also observed below 4.38%. 1st generation of top borer started in last week of March, 2nd generation in 1st week of May, 3rd generation in last week of June, 4th generation in 1st week of August and 5th generation was observed in mid September during crop season 2010-11 at New Area farm. The experiments on population dynamics of sugarcane borer, viz., Early shoot, top and stalk borer were conducted through pheromone trap at New Area farm. The maximum number of shoot, top and stalk borer moths trapped were 10.25, 18.30 and 7.5 during the month of June, Aug. and July 2010, respectively. The 1st appearance of *Stenobracon deesae* and *Cotesia flavipes* was recorded in the month of May, 2010 in the surrounding area of sugarcane at New Area farm. The maximum parasitization of *S. deesae* and *C. flavipes* was 13.0% and 10.0%, respectively in the month of Sept. 2010, whereas *R. scirpophagae* was 6.5% in the month of Oct., 2010.

FORAGE CROPS

- **IVT Berseem** : Among eight berseem genotypes evaluated, entry IB7 recorded highest green fodder yield (369 q/ha) followed by IB8 (350 q/ha) and IB4 (341 q/ha). IB7 was significantly superior over rest of the entries.
- **IVT Oat** : Out of fifteen entries of oat, entries IOS-10, IOS-19 and IOS-20 recorded the maximum green fodder yield of 633 q/ha and it was closely followed by IOS-1, IOS-9, IOS-12 and IOS-14 (616 q/ha).
- **AVT-1 Oat** : Entry AOSI-12 produced highest green fodder yield of 683 q/ha out of eleven entries evaluated and it was followed by AOSI-2 (666 q/ha) and AOSI-15 (650 q/ha).
- **AVT-2 Oat** : Eight entries were evaluated. Entry AOS2-10 recorded highest green fodder yield of 344 q/ha and it was followed by AOS2-11 (325 q/ha) and AOS2-7 (316 q/ha).
- **IVT Oat (Multi-cut)** : Out of ten entries of multi-cut oat, entry IOM-1 produced highest green fodder yield of 500 q/ha and it was closely followed by IOM-4, IOM-5, IOM-6, IOM-7 and IOM-11 each at 483 q/ha green fodder.

MEDICINAL & AROMATIC PLANTS AND BETELVINE

Brahmi (*Bacopa monnieri*)

- Twelve genotypes of Brahmi (*Bacopa monnieri*), obtained from various part of the state were collected and conserved. Among them collection RAU - BM-11 was found better in respect of fresh weight as well as dry weight. Two other stains RAU- BM-12 and RAU-BM-10 were also found promising.
- Experiment on performance of date of planting and number of node per cutting of *Bacopa monnieri* indicated that the crop planted in middle of July with 4-nodes per cutting produced highest fresh herbage yield (285.18 q/ha).

Mandookparni (*Centella asiatica*)

- Eleven collections of Mandookparni (*Centella asiatica*) were made from various part of the state and are being characterized. Among them collection, RAU - CA-11 (*Megha Ballabh*) was found better in respect of fresh weight as well as dry weight.
- Centella planted in the middle of July with 4-nodes per cutting recorded maximum fresh herbage yield (105.49 q/ha). The crop planted earlier (May-June) showed significantly lower yield.

Plant Pathology

- **Mandookparni and Pipali:** Mandookparni (*Centella asiatica*) showed serious incidence of stolon rot caused by *Fusarium* sp. with maximum severity of 3.0 at 0-4 scale under sick soil condition .The disease first appeared during rainy season (July-September). The crop –Pipali (*Piper logum*) was found to be affected by leaf spot with minor incidence. The symptom first appeared in the month of July-August, 2011.A fungus was isolated from the affected portion, purified and the pathogenicity (Koch's postulate) was established. The microscopic study showed that the fungus was identical to *Diplodia* sp.
- **Study on integrated management of Stolon rot of Mandookparni caused by *Fusarium* sp.:** The result of experiment conducted for the 1st year indicated that soil drenching with carbendazim was highly effective in checking the stolon rot with least disease severity of 0.75 on 0-4 scale. The treatment with biocontrol agents i.e. *Trichoderma viride* and *Pseudomonas fluorescens* when used individually or in combination were also found to suppress the stolon rot significantly, however the

combination of biocontrol agents proved superior to individual biocontrol agent in term of disease suppression and herbage yield. The yield data indicate that the soil treatment with carbendazim@0.1% produced highest herbage yield (14.3 q/ha).

- **Impact of integrated crop management (INM+ IDM) on crop performance of betel vine in farmers' field in Bihar:** The ICM/IDM technology of betelvine cultivation, developed by center, was tested in 20 farmers' field at 5-different locations in 4- different districts- Samastipur, Vaishali, Darbhanga and Begusarai of Bihar. The crop performance under ICM/IDM practice was found superior at all locations with maximum marketable yield (32.8 lakh leaves /ha) and quite less disease incidence in Darbhanga district.

Entomology

- **Collection, cataloguing, identification and seasonal variation of insect pests associated with the medicinal and aromatic plants:** The crop *Centella asiatica* was observed free from any insect pest but the crop *Bacopa monnieri* was found to be infested with grasshopper during the months of July to Nov. 2011. Besides this, one jassid species (Hemiptera, Cicadellidae) was also observed sucking plant sap. Tulsi, was observed heavily infested with a lace bug, *Cochlochila bullita* (Hemiptera: Tingidae) during month of Oct. to Mid Jan.
- **Identification of natural enemy:** One natural enemy i.e. ladybird beetle was found associated with the Kalmegh during the months of July to Oct. 2011. However, the crop was free from any pest infestation.

Nematology

- **Pre and post monsoon survey of aromatic plants:** Pre and Post monsoon surveys of Aromatic plants namely lemon grass, *Cymbopogan flexuosus* and Palmarosa, *Cymbopogan martini* indicated predominant population of phytonematode genera viz. Spiral nematode, *Helicotylenchus*, Lesion nematode, *Pratylenchus* and Stunt Nematode, *Tylenchorhynchus.*

2.2.2 Allied Field Research

AGROFORESTRY

- **Comparative performance of promising poplar clones under agroforestry system:** Volume of the different poplar clones followed the following order: L-52 (0.466 m^3)>PP-5 (0.440 m^3) >L-49 (0.424 m^3) >Uday (0.404 m^3) >G-48 (0.311 m^3) >L-188 (0.288 m^3). Maximum grain yield of wheat (*Triticum aestivum*) (var. PBW 343) was recorded under L-188 (15.8 q /ha) followed by G-48 (15.0 q /ha). A slight decrease in pH and EC was recorded under the poplar plantations of different clones. Organic carbon was maximum under L-52 clones.
- **Performance of horticultural crops under litchi (*Litchi chinensis*) orchard:** The intercrops grown in 5-year-old litchi orchard were turmeric, ginger, ol and arbi. The results indicated that the production of fruits significantly increased due to intercrops and it was maximum in litchi in association with turmeric (6.0 t/ha) followed by ginger (5.2 t/ha), arbi (4.9 t/ha) and ol (4.6 t/ha).
- **Aonla based agri-horticultural system:** The intercrops grown in 6 years old aonla orchard were turmeric, ginger and arbi. The results indicated that the production of fruits significantly increased due to intercrops and it was maximum in aonla in association with turmeric (14.00 t/ha) followed by ginger (12.60 t/ha) and arbi (12.22 t/ha).

- **Simarauba based agroforestry system:** Yield of green gram in the interspaces of the 7-year-old simarauba plantation varied from 2.30 to 4.30 q /ha showing increasing trend with the increasing levels of the NPK fertilizers. But the difference in yield due to doses of NPK fertilizers at 100 and 150% did not show any marked increase. Percentage reduction in yield ranged between 29.8 and 35.2 as compared to the yield obtained in open area without plantation.
- **Growth, volume, biomass production and carbon sequestration in different multipurpose tree plantations of 23-year-old:** Timber volume of the different MPTS followed the following decreasing order: White Siris (2.241 m^3) > Arjun (1.308 m^3) > Eucalyptus (1.324 m^3) > Chah (0.866 m^3) > Chakundi (0.793 m^3) > Karanj (0.432 m^3) > Mahogony (0.419 m^3) > Teak (0.274 m^3). Timber biomass was also maximum in *A. procera* (12.28 q /tree) followed by *E. tereticornis* (9.19 q /tree). Carbon storage on the individual tree basis was recorded highest in White Siris (5.49 q/tree) followed by *Eucalyptus* (4.23 q/tree) and Arjuna (4.11 q/tree). On the other hand, considering the density of the plantation on per hectare basis, it was maximum in *Eucalyptus* (499.1 t/ha) followed by Chah (292.2 t/ha).

WATER MANAGEMENT

- **On farm water management:** In Barkagaon sub-distributory of Gandak command, the improved water management practices for wheat were tested against the farmer's own practice after harvest of rice. The yield in study block (3 irrigations at 25, 65 and 95 DAS of 6 cm. depth by border method of irrigation with 75 % cut-off) ranged between 36.48 to 42.53 q/ha with a mean of 39.58 q/ha whereas in farmer's own practices (Control -3 irrigations of 8 cm. depth each by flood method) the yield was only between 31.40 to 37.85 q/ha with an average yield of 34.69 q/ha. The water-use efficiency was higher (219.89 kg/ha-cm) in study block whereas in the control block, it was only 144.54 kg/ha-cm.
- Under OFWM activities in Barkagaon sub-distributory of Gandak Command, it was found that improved water management practices for rice under SRI consist of 3 days drying after disappearance of 2.5 cm of ponded water. The WUE was also higher in the SRI (199.83 kg/ha-cm) as compared to 101.88 kg/ha-cm in the control.
- **Study of response of different paddy based cropping system to moisture regimes:** Paddy-maize+potato sequence recorded significantly higher rice equivalent yield and net return as compared to paddy-rai-moong and paddy-wheat-moong and was at par with paddy- potato-moong. There was also no significant difference in between paddy-wheat-moong and paddy-rai-moong. rice equivalent yield, water-use-efficiency and net return increased significantly with increasing level of irrigation from 0.8 to 1.2 IW/CPE ratio.
- **Enhancing water productivity in rice fields:** Rice equivalent yield and net return decreased significantly with increasing CPE from 40 mm to 50 mm but there was no significant difference between irrigation regimes 30 mm and 40 mm. The lowest water productivity was recorded with irrigation regime I_1 (30 mm CPE) followed by I_2 (40 mm CPE) and I_3 (50 mm CPE).
- **Irrigation scheduling of inter-crops on raised beds:** The results revealed that wheat + rajma intercrop resulted in higher wheat equivalent yield as compared to those of both rajma and wheat sole. There was significant difference in wheat equivalent yield between wheat rajma intercrop grown in ratio 1:2 and 2:2. The highest wheat equivalent yield (48.96) was recorded with wheat-rajma intercrop grown in 1:2 ratio.

agement practices on weed density,weed ***and economics of direct seeded rice:*** *Under the weed* management methods, significantly lowest weed count and weed dry weight were recorded in weed free condition followed by Sesbania (broad cast + 2, 4-D@ 0.5 kg/ha at 30 DAS) and butachlor + one hand weeding. The highest weed control efficiency (79.88%) was recorded by weed free treatment followed by Sesbania (broadcast) + 2, 4-D 0.5 kg/ha at 30 DAS.

- **Effect of rice establishment techniques under different weed management practices:** The lowest weed count ($6.10/m^2$) and weed biomass ($6.04\ g/m^2$) were observed by transplanted rice followed by SRI and drum seeded rice methods. Among different weed control methods, the lowest weed count ($4.63/m^2$) and weed biomass ($4.21 g/m^2$) were recorded under 2 hand weeding which was at par with pyrazosulfuron + mechanical weeding.
- **Weed management in maize-lentil cropping system:** The application of atrazine 0.75 kg/ha (PE) *fb* 2, 4-D 0.5 kg/ha was found effective for reducing weed count and weed dry weight which was significantly superior over all other treatments while statistically at par with mechanical weeding twice.
- **Long term trial on tillage in rice-wheat cropping system:** The lowest weed count and weed dry wt. and highest grain and straw yield were observed under CT-ZT treatment which was superior over ZT-CT and CT-CT in all respect except in terms of weed count & weed dry wt. while it was statistically at par with ZT-ZT.
- **Long term trial on weed management in wheat:** Minimum weed population and weed dry wt. and maximum grain yield were recorded under mechanical weeding. Maximum grain yield and lowest weed count & weed dry weight was recorded in mechanical weeding treatment which were significantly superior to other treatments except isoproturon 0.75 kg/ha (tank mix 0.1% surfactant).
- **Weed management in lentil:** All the weed management treatments were effective to minimize the weed control, weed dry wt. and maximize the grain yield of lentil. The application of pendimethalin 0.75 kg/ha fb manual weeding was most effective for reducing weed count and weed dry weight which was significantly superior over alone application of pendimethalin or weedy check.
- **Efficacy of herbicide to control the weeds in rajmash**: Maximum grain and straw yield, 21.9 q/ha and 21.4 q/ha, respectively and lowest weed population and dry wt. were recorded with two hand weeding at 30 & 50 DAS which was statically at par with application of pendimethalin @ 1 kg/ha PE .
- **Efficacy of carfentrazone and pinoxaden with & without surfactant against grasses and BLW in wheat:** Weed free treatment had recorded significantly lowest weed count and weed dry weight over all other treatments, while in terms of grain yield it remained statistically at par with pinoxaden + carfentrazone –ethyl (50+20 g/ha) and significantly superior over rest of the treatments.

Sowing Window	Temperature (°C)	
	50% earhead at maturity	Mean Temp (°C)

AGROMETEOROGICAL RESEARCH & SERVICES

- Out of the four sowing dates of wheat crop(25th Nov, 5th Dec, 15th Dec & 25th Dec), the highest heat use efficiency (3.19 kg/ha/°C) was associated with 5th December sown crop. Among the varieties (HD 2824, K-307, CBW 38, HD 2733), HD 2824 recorded highest heat use efficiency (2.84 kg/ha/°C) followed by HD 2733.
- Phenophase wise temperature & thermal requirements of maize crop were worked out and it was observed that neither high nor low temperature during reproductive period was conducive for maize growth. A temperature of around 26.5-27.5°C during reproductive period was most congenial for highest yield. The highest heat use efficiency was recorded in the crop sown on 20th November and the lowest by 31st October.
- Rainfall climatology of Gaya district was developed. Weekly, monthly, annual characteristics of rainfall and probabilities of weekly rainfall at different limits (10 mm, 20, 30 mm and 40 mm) were worked out. Dry and wet spell sequences and monsoon characteristics were also worked out. The length of growing period has been worked out as 183 days.
- **Crop phenology & weather relationship:** At maturity, 31st May seeded crop accumulated highest heat units (2584°C day) followed by 14th June seeded crop. The lowest heat unit accumulation at maturity was reported in the case of 12th July sown crop. The variety Rajendra Kasturi recorded highest thermal time and heat unit accumulations and the lowest was reported in case of the variety R. Bhagwati. 31st May seeded crop recorded highest grain yield (48.15 q/ha), which was at par with 14th June seeded crop. The crop sown 12th July recorded lowest grain yield (35.89 q/ha).Among the varieties, R. Bhagwati recorded highest grain yield (47.7 q/ha), which was at par with R. Suhashini. The variety R. Kasturi recorded significantly lowest grain yield (35.80 q/ha).
- **Effect of rainfall and temperature on rice growth & yield:**

Sowing Window	Temperature (°C)		Rainfall (mm) reproductive period	Unfilled grains (%)	Yield (kg/ha)
	50% earhead at maturity	Mean Temp (°C)			
31 May	31.5-24.2	27.9	194.5	20.8	47.88
14 June	32.7-23.8	26.1	62.0	19.0	44.05
28 June	31.2-20.7	23.6	59.6	26.0	40.21
12 July	32.5-20.5	23.3	52.4	28.1	31.03

- **Agro-climatic resource characterization:** Monsoon characteristics across four blocks namely Asthawan, Biharsarif, Noorsarai and Rahui of the district were worked out. Agricultural drought was also characterized.

- **Monsoon rainfall characteristics**

Particulars	Asthawan	Biharsarif	Noorsarai	Rahui
Mean Start (Met Week)	26.0	25.4	25.7	26.0
Mean End (Met Week)	39.6	39.3	39.1	39.6
Mean Duration (days)	97	94	95	95
Annual/Monsoon Rainfall (mm)	ARF=884.7 (42) MRF=773.4 (35)	ARF=926.1(45) MRF=808.2(37)	ARF=823.9(41) MRF=732.0(34)	ARF=771.1(39) MRF=689.9(33)

25 Met week :18-24 June, 39 Met week: 24-30 September
26 Met week: 25-1 July, 40 Met week: 1-7 October

- **Weather forecast & Agro-advisory:** The weather advisories were prepared on regular basis and disseminated to the farming community through print and electronic media and also through personal contact. Large numbers of farmers from across the villages of north Bihar districts are using this mode for accessing weather based information. Farmers are reporting large benefits by following the advices due to satisfactory accuracy level of weather forecast issued from this centre.

MICRO AND SECONDARY NUTRIENTS AND POLLUTANT ELEMENTS IN SOILS AND PLANTS

- **Reassessment of micro nutrients deficiency in soils of Bihar:** Three districts viz., Patna, Arwal and Kishanganj were surveyed. The soils of Patna were slight acidic (med. value 6.74) in reaction and medium to low in organic carbon content (av. 0.56%). Zn, Cu, Fe & Mn content varied from 0.20 to 4.8, 1.06 to 9.11, 1.21 to 76.9, and 2.15 to 27.2 ppm with a mean value of 0.86, 4.07, 19.1 and 14.6 ppm, respectively. Among mineral nutrients, highest deficiency was observed in zinc (58.7%), followed by sulphur (54.8%) and boron (46.2). Iron and manganese deficiency were found to the extent of 12.5 and 11.1 percent, respectively.
- The soils of Arwal were slight acidic (med. value 6.11) in reaction and medium to low in organic carbon content (av. 0.57%). Available P2O5 and K2O were found to be in sufficient range. Zn, Cu, Fe & Mn content varied from 0.16 to 5.12, 0.01 to 10.3, 5.94 to 34.7, and 1.45 to 28.9 ppm with a mean value of 0.84, 2.56, 22.7.1 and 14.5 ppm, respectively. The extent of sulphur deficiency was maximum (84.7%) followed by zinc (64.6%) and boron (19.4%).
- Kishanganj district soils were generally acidic in reaction, medium to low in both organic carbon content (av. 0.53%) and potash content (av. 270.3 kg/ha). Zn, Cu, Fe & Mn content varied from 0.19 to 5.27, 0.75 to 10.11, 17.95 to 718.50, and 0.28 to 153.88 with a mean value of 1.04, 3.61, 176.13 and 21.78, respectively. More than 50% of soils were deficient in organic carbon. Among mineral nutrients, highest deficiency was observed in sulphur (86%), followed by Zn (45.2%), Potash (19.5%) and Mn (5.9). No deficiency of Cu & Fe was recorded. The intensity of deficiency was found to be maximum for S (63%) followed by Zn (33%) and Mn (4%).
- **Screening of rice and wheat variety for Zn and Fe in calciorthents:** Under different treatments of zinc, the grain yield of different cultivars of wheat varied from 26.4 to 42.9 q/ha, while, under different treatments of iron, the grain yield of different cultivars of wheat varied from 26.9 to 43.6 q/ha.

- **Solubility of zypmite and its utility as a source of sulphur:** The effect of sulphur application through zypmite on bulbs of onion was significant. The highest bulb yield (267 q /ha) was obtained with 40 kg /ha S which was at par with yield of sulphur dose of 30 kg/ ha.
- **Effect of changing cropping pattern and management practices on yield trend and micronutrients status of soil:** The results of 79th crop rice under rice-wheat-sorghum (RWS) and mustard and moong under rice – mustard – moong (RMM) rotation indicated that increasing fertility levels increased the grain and straw yields of rice from 18.3 q/ha to 42.0 q/ha and 27.7 q/ha to 64.2 q/ha, respectively in RWS while in RMM the grain and straw of rice varied from 15.8 q/ha to 39.7 q/ha and 22.8 q/ha to 52.0 q/ha, respectively. The results indicate that Zn + OM superimposition was best treatment in sustaining higher yield production.
- **Optimizing zinc levels and crop residue management under rice-wheat cropping system:** The grain and straw yield of 35th crop wheat varied from 39.0 q/ha to 43.7 q/ha and 54.8 q/ha to 61.3 q/ha, respectively. Increasing the levels of crop residue increased the grain and straw yields significantly from 38.9 q/ha to 44.6 q/ha and 54.5 q/ha to 62.5 q/ha, respectively. Application of Zn tended to increase grain and straw yields indicating solubilization of Zn to 1st crop in latter stages also..
- **Screening of rice and wheat variety for Zn in calciorthents:** Based on efficiency index and efficiency cultivars, Swarna, Janki, Kishori and Sugandha were found to be efficient cultivars i.e. these varieties have inherent capacity to extract more zinc from soil and hence are suited for zinc deficient soils while varieties Rajshree, Basmati, Satyam, Radhá, Sita and Jeerawati were found to be inefficient
- **Effect of vermicompost, sulphur and NPK on *kharif* onion (var. *Agrifound Dark red*) bulb yield in sulphur deficient soil:** The highest onion bulb yield was recorded in vermicompost @ 1 t/ha + S 60 kg/ha + 150% NPK (231.6 q/ha) and lowest in V_0 S_0 NPK 100% (164.5 q/ha).

SOIL TEST CROP RESPONSE

- **Nutrient recycling through crop residues:** Grain and straw yield of rice (46th crops) increased significantly with increasing levels of fertilizers up to 100% NPK. However, grain and straw yield at 150 % NPK were at par with 100 % NPK. The results suggested that compost + crop residues could save 50 % recommended dose of NPK *i.e.* 60 kg N, 30 kg P_2O_5 and 20 kg K_2O/ha. The compost, crop residues and compost + crop residues increased the grain yield of rice 15.68, 10.14 and 30.17 %, respectively and that of straw yield 4.24, 6.56 and 11.19 %, respectively.
- **Front line demonstration on:**

  Rice under IPNS: The per cent deviation between yield target and actual yield were + 0.60 to + 8.87 and response varied from 8.56 to 26.52 kg grain / kg nutrient. The benefit per Rupee investment on fertilizer varied from 6.07 to 15.15. The response of rice (kg/kg nutrients) to STCR calibrated fertilizers (12.23 to 20.29) increased further under IPNS (13.64 to 26.52) at 35 and 45 q/ha yields targets

  Sesame under IPNS: The per cent deviation between actual yield obtained and yield target of sesame ranged from -8.11 to + 15.75 which was under reasonable limit. The response of sesame to total nutrient application based on STCR ranged from 3.04 to 5.98 kg grain/kg nutrients. Net profit due to STCR calibrated dose varied from Rs. 14,384 to Rs. 26,883 / ha with yield target of 8 to 12 q/ha. The net profit (Rs. 23,287 to Rs. 26,883) at 12 q/ha of yield target were highest but benefit per Rs. investment on fertilizer were lower than yield target 8 q/ha, 10 q/ha and GRD.

Pigeonpea under IPNS: The per cent deviation between yield target and actual yield were + 5.27 to + 13.83 and response varied from 19.33 to 33.53 kg grain/kg nutrient. The benefit per rupee investment on fertilizer varied from 36.60 to 53.89. It was also observed that response of pigeonpea to STCR calibrated fertilizer doses (19.33 to 28.00 kg/kg nutrients), net profit (Rs. 43,860 to Rs. 64,380). The response of pigeonpea (kg/kg nutrients) to STCR calibrated fertilizers (19.33 to 23.58) increased further under IPNS (22.83 to 28.00) at 20 and 25 q/ha yields targets.

Wheat under IPNS: The per cent deviation between actual yields obtained and yield target of wheat ranged from –7.38 to + 12.50 which is within reasonable limit. The response of wheat to total nutrient application based on STCR ranged from 11.00 to 19.83 kg grain/kg nutrients which were higher than FP (8.47 to 13.06) and GRD (9.16 to 12.45). Net profit due to STCR calibrated dose varied from Rs. 24, 080 to Rs.38,864 /ha with yield target to 35 to 40 q/ha, which were higher than FP (Rs. 17,080 to 26,320) and GRD (Rs. 22,568 to 30,688).

Winter maize under IPNS: The per cent deviation in yield target and actual yield were - 3.18 to + 5.59 and response ratios varied from 15.97 to 39.22 kg grain / kg nutrient. The net profit (Rs. 41,454 to 65,072) was higher when fertilizer was used based on STCR with or without IPNS than GRD (Rs. 48,167 to 51,107) and FP (Rs. 34,202 to 41,797). However, the benefit per rupees investment on fertilizer was higher in FP and GRD than STCR recommendation.

Mustard: The per cent deviation between yield target and actual yield obtained of mustard varied from – 7.99 to + 9.09 and response ratios were at yield target of 20 to 25 q/ha (18.75 to 26.15) were higher than GRD (15.75 to 21.35) and FP (11.85 – 14.00), however, it was less than FP & GRD at higher target of mustard production in two trials. Similarly, higher net profit (Rs. 23, 865 to Rs. 34,965 /ha) was obtained with STCR recommendation than farmer's practice (Rs. 10,175 to 12,488) and GRD (Rs. 17,390 to 26,085).

Linseed under IPNS: The percent deviation between target and actual yield varied from – 4.35 to + 4.19 and the response yard stick of linseed in STCR calibrated fertilizer application were higher (8.84 to 13.33) than of FP (11.60) and GRD (8.06). The benefit per rupees investment on fertilizer at 8 and 10 q/ha were also higher in STCR recommendation (11.62 to 18.82) than FP (14.78) and GRD (10.74).

Lentil : The results indicated that the response yard stick of lentil in STCR calibrated fertilizer application were higher (16.00 to 19.15) at lower target than that of GRD (14.25). Net profit was also higher at 20 q/ha under with or without IPNS (Rs. 17,179 to Rs. 30,599) than FP (Rs. 7,937 to 11,527) and GRD (Rs. 14,224 to 14,486).

Potato: The per cent deviation in yield target and actual yield obtained were – 5.82 to + 11.76 and response ratios in STCR calibrated fertilizer varied from 23.69 to 88.58 kg tuber / kg nutrient higher than of FP (30.50 to 41.48) and GRD (34.03 to 38.25). The net profit (Rs39,700 to 74,440) was higher when fertilizer was used based on STCR with or without IPNS than GRD (Rs. 46,280 to 52,020) and FP (Rs. 31,720 to 43,140).

- **Basic data and targeted yield equations for rice under rice- wheat cropping system under rain-fed and IPNS condition**:

Complex experiment on rice: Fertilizer recommendation schedule indicated that 95 kg N, 42 kg P and 42 kg K/ha are required to produce 35 q/ha rice grain in a soil having 250 kg N, 10 kg P and 120 kg K/ha, respectively whereas 145 kg N, 57 kg P and 61 kg K/ha are required to produce 45 q/ha of rice grain at the same fertility level. The application of 1 t/ha FYM could save about 3 kg N, 1 kg P_2O_5 and 2 kg K_2O/ha.

Complex experiment on wheat: Fertilizer recommendation schedule indicated that 107 kg N, 40 kg P and 22 kg K/ha are required to produce 35 q/ha wheat grain in a soil

having 250 kg N, 10 kg P and 120 kg K/ha, respectively whereas 147 kg N, 48 kg P and 31 kg K/ha are required to produce 40 q/ha of wheat grain at the same fertility level. The application of 1 t/ha FYM could save about 4 kg N, 0.5 kg P_2O_5 and 1 kg K_2O/ha.

- **Basic data and targetted yield equations for rice under rice- winter maize cropping system under IPNS condition**

  Complex experiment on winter maize: Fertilizer recommendation schedule indicated that 150 kg N, 32 kg P and 42 kg K/ha are required to produce 60 q/ha maize grain in a soil having 250 kg N, 10 kg P and 120 kg K/ha, respectively whereas 232 kg N, 47 kg P and 66 kg K/ha are required to produce 80 q/ha of maize grain at the same fertility level. The application of 1 t/ha FYM could save about 4 kg N, 1 kg P_2O_5 and 1 kg K_2O/ha.

- **Basic data and targetted yield equations for rice under rice- potato**

  Complex experiment on potato: Fertilizer recommendation schedule indicated that 150 kg N, 53 kg P and 70 kg K/ha are required to produce 250 q/ha potato tuber in a soil having 250 kg N, 10 kg P and 120 kg K/ha, respectively whereas 241 kg N, 80 kg P and 108 kg K/ha are required to produce 350 q/ha of potato tuber at the same fertility level. The application of 1 t/ha FYM could save about 3 kg N, 1 kg P_2O_5 and 2 kg K_2O/ha.

- **Basic data and targetted yield equations for rice under rice- mustard**

  Complex experiment on mustard: Fertilizer recommendation schedule indicated that 47 kg N, 18 kg P and 30 kg K/ha are required to produce 15 q/ha Mustard grain in a soil having 250 kg N, 10 kg P and 120 kg K/ha, respectively whereas 79 kg N, 29 kg P_2O_5 and 44 kg K_2O/ha are required to produce 20 q/ha of mustard grain at the same fertility level. This shows that application of 1 t/ha Mustard oil cake could save about 15 kg N, 4 kg P_2O_5 and 6 kg K_2O/ha.

GROUND WATER UTILIZATION

- **Evaluation of water productivity of crops in Pusa block of Samastipur:** The study was carried out for wheat crop in the field of selected farmers. The water productivity values for gross inflow varied from 0.67 kg/m^3 to 0.91 kg/m^3 for HD-2733 variety of wheat with an average value of 0.79 kg/m^3. The value of irrigation water productivity ranged from 0.75 kg/m^3 to 1.09 kg/m^3 for HD2733 variety of wheat with an average value of 0.91 kg/m^3. The average depth of irrigation water applied was 41.54 cm and average crop evapo-transpiration was 32.09 cm during the crop period. The analysis suggests that there is significant scope for increasing water productivity by increasing yield through both better water and other input management practices.
- **Assessment of G.W. resources:** Assessment of G.W. resources for irrigation in southern districts of Bihar has been taken up. The total annual ground water recharge for Bhojpur and Buxar districts was 65905 ha-m and 50707 ha-m, respectively. The ground water draft for all uses is 23261 ha-m for Bhojpur district and 15941 ha-m for Buxar district. The net annual replenishable ground water resource is worked out to be 65905 ha-m for Bhojpur and 50707 ha-m for Buxar. The net annual ground water available for future irrigation development is 36773 ha-m for Bhojpur and 30962 ha-m for Buxar district. The stage of ground water development is 35.23% for Bhojpur district, 31.43% for Buxar district. According to definitions used by CGWB both selected districts fall in safe category.
- **Study on ground water pollution from different sources:** Based on the experimental data it was observed that there is accumulation of trace metal cations (viz. Zn, Cu, Fe

and Mn) in sewage sludge treated soils of Patna by-pass area. It was also observed that soils nearest to the discharge point contained appreciably high amount of these metal cations as compared to distant point. The study also revealed that leafy vegetable and root crops contained higher amount of trace metal cations as compared other vegetable crops.

PRECISION FARMING DEVELOPMENT

- **Fertigation studies on high density litchi planting with and without plastic mulch:** Yield per plant was considerably increased to 19.85 kg /plant with fertigation of 100% N + mulch which was 32.33 % more in comparison to control tree. The yield under control tree was 15.00 kg/plant. Fruit cracking was reduced to the level of 2.68 % with 100% N through fertigation along with mulch.

- **Precision farming in banana with drip irrigation, fertigation, mulch and vermi composting :** The highest yield (94.52 t/ha) was found in treatment (application of vermi compost + 0.8V water + mulch) at plant geometry of 2m x 1.5m. But the maximum bunch weight (29.85 kg/bunch) was recorded at 2m x 2m plant geometry. However, in closer plant geometry (2m X1.5m) the incidence of scaring beetle was observed in banana crop.

- **Effect of fertigation, mulch and poly tunnel on yield, harvesting period and shelf life of pointed gourd:** On application of poly tunnel with drip irrigation and mulch, the first picking of fruits was 15-26 days earlier in comparison to open field condition with flood irrigation. The highest fruit weight (46.20g) was found in Swarn Rekha, followed by Swarn Alaukik (42.38g) and Santoshwa (28.05g). The yield was 40.0, 36.80 and 15.85 t/ha, respectively in Swarn Rekha, Swarn Alaukik and Santoshwa with the application of drip irrigation + mulch+ polytunnel. The longest shelf life was recorded in the fruits of Swarn Alaukik. Overall, the mulch was found very effective in improving shelf life of pointed gourd fruits.

- **Strawberry cultivation using plasticulture technology in agro climate of Bihar:** The varieties- Festival and Sweet charlies were tested under poly tunnel, mulch and drip irrigation treatments with two fertility levels. Very significant effect on yield and fruit quality was noticed due to application of polytunnel and mulch in Festival variety. Earliest flowering, fruiting and highest yield (21.60t/ha) was recorded in treatment poly tunnel + mulch +120% RDF.

- **Varietal evaluation of gerbera under poly house and open condition:** Total six varieties of gerbera were tested under poly house and in open condition. Inside poly house, early flowering was recorded as compared to open field condition. The flower quality in terms of disc diameter, stalk length and vase life was also found better in poly house to that of open condition. Amongst different varieties, the Palm Beach was found earliest flowering, but longest vase life was recorded in Esmara.

FIM

- **Self-propelled reaper:** This machine was demonstrated in farmer's field of Muzaffarpur, Sitamarhi, Madhubani and Samastipur districts in 19.37 ha with satisfactory working performance. Actual field capacity and field efficiency was 0.24 ha/h and 80 %, respectively. Cost of harvesting by this machine was Rs.605.00/ha whereas cost of harvesting by sickle was found to be Rs. 3750/ha. There was maximum saving of Rs. 2245/ha and Rs. 3694/ha by the use of machine over conventional method of harvesting by sickle in 2011-12.

- **TNAU make light weight low land paddy drum seeder:** Fibre made paddy seeder was used for direct seeding of paddy in flood prone area of Madhubani in the field of 12 farmers in total 7.10 ha area. Pre-germinated seeds were used for direct sowing in

well puddled soil. The seed rate was achieved 32-35 kg/ha and field capacity & field efficiency of paddy drum seeder were found to be 0.33 ha/h and 78%, respectively. There was an increase in yield of paddy approximately in the range of 15–35 % at optimum seed rate 30-40 kg/ha with the local paddy variety.

- **Zero till seed drill:** Zero till drill machine was demonstrated in 7.0 ha for sowing wheat under soil moisture range of 20%-30% db in farmer's field in Sitamarhi district. The field capacity and field efficiency of machine were 0.65 ha/h and 84%, respectively. The average seed and fertilizer rates were 125 kg/ha and 150 kg/ha respectively. The cost of operation of machine was found Rs. 870/ha against Rs. 1490/ha as the cost of sowing and broadcasting of fertilizer with farmer's practice.
- **Rotavator:**The rotavators with L and J-shaped blades were demonstrated in farmer's field in Muzaffarpur, Sitamarhi and Madhubani districts in total area of 12.8, 6.7 and 38.4 ha, respectively. Rotavator with L-shaped blade was found very much effective for seed-bed preparation in sandy loam soil under single pass. However, in clay soil double pass with rotavator provided optimum pulverization.
- **Reaper-cum-binder:** The demonstrations were conducted in farmer's field in wheat crop in Muzaffarpur, Sitamarhi and Madhubani districts in 24 ha. The average cost of operation of machine alongwith the cost of twine was calculated to be Rs. 1525/ha (cost of twins taken as Rs. 450/bundle) as compared to the average cost of operation of self propelled reaper varied between Rs. 450-600/ha for two makes i.e. Chinese and Greeves make. There was a saving of Rs. 2225/ha in case of reaper-cum-binder over farmers practice of manual harvesting. However, the same was Rs. 3300-3150/ha with self propelled reapers. The average field capacity of reaper-cum-binder was found to be 0.40-0.45 ha/h against 0.16 – 0.20 ha/h in case of self propelled reapers. The reaper-cum-binder registered highest field efficiency i.e. 79% during demonstration, however the same was 68-72% in case of self propelled reapers. The output capacity of the reaper-cum-binder was found to be 2.0 – 3.0 ha/day (eight working hour) whereas the same was 1.0 – 1.25 ha/day in case of self propelled reaper.
- **Tractor drawn reaper:** The tractor drawn reaper was demonstrated in wheat crop in village Uttara, Andauli and Muradpur of Madhubani and Sitamarhi districts respectively in total 7.45 ha area. The field capacity and field efficiency of this machine was found to be 0.24 ha/h and 60%, respectively. The cost of use of reaper was found to be Rs. 350/h and Rs. 1450/ha approximately (with 35 Massey Ferguson make tractor). There was a saving of Rs. 2300/ha with the use of tractor drawn reaper as compared to farmer's practice of manual harvesting.
- **Maize dehusker-cum-sheller:** The maize dehusker-cum-sheller was demonstrated in village Sujawalpur of Muzaffarpur district for 45 hours. The output capacity of the machine was found in the range 5.45-6.32 q/hr of grain. The cleaning efficiency at 20-22% grain moisture was found 94.6% and threshing efficiency was 92%. Fuel consumption of machine with 30hp MF tractor was reported to be 1.0-1.2 l/hr at optimum feed rate of cob being 1165-1256 q/hr.
- **Effect of variation in speed of operation of bed planter for sowing pigeonpea under bed as well as flat planting:-** Raised bed seed-cum-fertilizer planter was evaluated for performance for planting pigeonpea and was calibrated at speed fertilizer rate of 22.29 kg/ha and 106 kg/ha, showing field capacity and field efficiency at forward speed of 2.5 km/h as 0.253 ha/h and 67.4%, whereas at 3.0 km/h and 3.5 km/h, these were 0.287 ha/h, 63.7% and 0.318 ha/h, 60.5%, respectively. Maximum cost of use of machine under bed planting system was Rs. 1624.2/ha and Rs. 1147.2/ha under flat planting system.

HONEY BEES AND POLLINATORS

- **Effect of different artificial diets during dearth period**: The artificial diet comprising of soybean flour (25 g) + yeast (10 g) + pollen (15 g) + skimmed milk powder (5 g) + honey (22.5 g) + sugar (22.5 g) was best suited for colony development during dearth period.
- **Pollinator fauna complex:** Among the pollinator fauna other than honey bees, five, nine and six species of insects visited the pigeon pea, brassica and coriander bloom, respectively. Among these, syrphid flies were prominent pollinators of these crops.
- **Pollination studies on *Brassica* (cv Varuna), coriander (cv Rajendra Swati), and pigeonpea (cv Bahar):** Duration of foraging increased with progress of flowering and *A. mellifera* was dominant visitor followed by *A. dorsata* and *A. florea* on all three crops. However, foraging rate of honey bees at different hours on different dates showed that maximum foraging rate was of *A. florea* followed by *A. mellifera* and *A. dorsata*. The foraging speed of honey bees on the blooms of these crops revealed that *A. dorsata* spent maximum time followed by *A. mellifera* and minimum by *A. florea*. In Brassica, yield was highest in open pollinated (OP) (13.92 q/ha) followed by bee pollinated (BP) (12.24 q/ha) and lowest in pollinator excluded (PE) (11.00 q/ha).
- **Extraction of bee venom from *Apis mellifera* colonies:** The data recorded in January-February indicated that 42.56 mg bee venom was obtained by collecting thrice, 25.62 mg when collected twice and 14.71 mg when collected once from one colony of *Apis mellifera*.
- **Production of propolis from *Apis mellifera* colonies:** Maximum propolis was extracted in the month of rainy seasons, i.e. September (51.37 g), August (36.67 g) and October (36.20 g) and lowest in the month on May (6.72 g). Among the different methods of propolis collection, maximum production was obtained in scrapping (33.18 g) followed by plastic net placed on stick (24.34 g) and lowest in plastic net placed on bottom board (14.82 g).
- **Survey of bee diseases and enemies**: About 43 apiaries having more than 50 colonies were surveyed and status of bee diseases and enemies were assessed. Wasps were observed as major problems in beekeepers apiaries during the month May to October, 2010. Among mites, *Tropilaelaps clarae* was found in all the apiaries surveyed while *Varroa destructor* was observed in the apiaries those were migrated to Rajasthan and Uttar Pradesh. Nosema disease caused by protozoan parasite was also prevalent in the apiaries.

NATIONAL SEED PRODUCTION

Seed Production Research:

- **Micro nutrient management on quality seed production:** The basal and foliar application of zinc significantly influenced yield and yield attributing characters in paddy variety MTU-1001.The traits like no. of tillers, no of branches/panicle, 500-seed wt., germination %& vigour index were significantly influenced by basal as well as foliar application of zinc whereas seed yield, no. of seeds/panicle & plant height were significantly influenced only by basal application of zinc.
- **Standardization of spacing and fertilizer for enhancing seed yield and quality in sweet corn (maize):** The spacing of 60 x 20 cm recorded significantly higher raw seed yield (2.60 kg/ net plot) and graded seed yield (2.21 kg/net plot). Fertilizer application of 150:75:45 kg/ha recorded highest raw seed yield (2.51 kg/net plot) and graded seed yield (2.20 kg/net plot). Ridge method of planting was observed superior over flat method of planting for all the characters except days to 50% flowering and vigour index. Interaction of spacing, fertilizer and method of planting showed that 60X20 cm,

HONEY BEES AND POLLINATORS

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150:75:45 kg NPK/ha and ridge planting had significantly higher raw seed yield (3.15 kg/net plot), graded seed yield (2.66 kg/net plot), no. of seeds / cob (260.40), 500-seed wt (101.10g), cob length (14.16 cm) & plant ht (164.74 cm)

- **Grow out test of wheat:** Out of 8 varieties of wheat, 7 varieties met the MSCS % of foundation seed (0.5%) but the variety HD-2733 was found to be having off-type (0.11%) more than MSCS %.
- **Micronutrient management in quality seed production in wheat:** The raw seed yield, graded seed yield, 1000-seed weight and panicle length were found to be significantly influenced by basal application of zinc where as no. of tillers and no. of seeds / panicle were observed to be significantly influenced by basal as well as foliar application of zinc. Significant increase in raw seed yield and graded seed yield was due to gradual increase in basal application of zinc up to 50 kg/ha only. Vigour index and 1000 seed wt. did not show significant effect where as germination percent is significantly higher in PBW-373 and DBW- 14 in FIRBS system and for NW-2036 conventional system. Seed yield of PBW-373 and DBW-14 was similar in conventional & FIRBS, however, NW-2036 showed significantly high grain yield in conventional system.
- **Demonstration of priming technology through farmer's participation:-** Experiment was conducted at farmer's field in Lautan village covering 0.8 ha using appropriate priming treatment (16-18 h hydration). Observation showed about 12.8 % increase in final plant population and 18.2 % increase in seed yield.

MUSHROOM RESEARCH

- 16 Germplasm were collected i.e. *Pleurotus spp. (3), Ganoderma (2), Polyperus (3), Mycenia (2), Valvarialla (2), Agariicus (1), Iermitromyces (2) Calocybe indica (1).* Among *Pleurotus* strains, PL 06 gave higher yield i.e. 92.33 kg/q substrates followed by PL 01. Out of *8 Agaricus bisporus strains* (AbL 01-ABL 08), ABL 04 (16.80 kg) gave higher yield followed by ABL 01(15.48 kg).
- **Evaluation of *Pleurotus* spp. for yield potential under Bihar condition**: Five *P. florida* strains (P1, P2, P3, P4, P5) and five *Pleurotus sajorcaju* strains (P6, P7, P8, P9 and P10) where evaluated for their yield potential under Bihar condition. Result indicated that P5 *Pleurotus florida* gave highest yield i.e. 84 kg yield/100 kg substrate followed by P4 (80.30 kg/100kg substrate) among *P. florida* strains. However P9 (82.4 kg/100 kg substrate) and P6 (80.50 kg /100 kg substrate) were adjudged best among *Pleurotus sajorcaju* strains.

GPS–GIS BASED MODEL SOIL FERTILITY MAPS FOR SELECTED DISTRICTS FOR PRECISE FERTILIZER RECOMMENDATION TO THE FARMERS OF INDIA

- 1020 GPS based surface soil samples of 10 percent randomly selected villages from each block of Muzaffarpur districts were collected and analysed. The range and mean of pH, EC, Organic Carbon (%), avail N (kg/ha), avail P (kg/ha) avail K (kg/ha) Fe (ppm), Cu (ppm), Zn (ppm) and Mn (ppm) were 6.75 to 10.33, 0.09 to 1.72 (0.36), 0.05 to 1.225 (0.367), 67 to 588 (254), 0.98 to 79.75 (14.31), 44 to 844 (161), 0.508 to 61.480 (18.219), 0.146 to 20.720 (2.755), 0.06 to 12.590 (2.209) and 0.736 to 14.620 (9.452). Fertility index with regards to N, P and K were 1.49, 1.74 and 1.8 which indicated that fertility with regards to N was low; P and K were medium from lower side. 15% Samples were found deficient in Zn where as only 6% samples were found deficient in Fe. In general, samples were sufficient in Mn and Cu.

PROCESSING AND FOOD ENGINEERING

- **Processing of elephant foot yam (Ol) for value addition:-** Based on maximum average scores for different quality attributes, the best sample was found as chips prepared after blanching with 0.5% KMS and dried at 70°C drying air temperature. The maximum average scores for colour, texture, taste, appearance and overall acceptability were found as 7.6, 7.2, 6.9, 7.3 and 7.2 for yam chips. Thus, the prepared dehydrated yam slices as well as yam chips were of very good quality and could be stored for 4 months in polythelene pack (200 gauge). The production cost of 1 kg of yam chips was worked out as Rs. 131.00 excluding packaging cost.
- **Development of process technology for dried carrot cubes:-** Carrot cubes of 7.5 mm each side were prepared with finger chipser. Minimum drying period was found to be 6.0 h at 70^0C under blanched condition (86.24 to 5.51 % wb) and maximum drying period was 10.0 h at 50^0C under un-blanched condition (87.63 to 5.92 %).

2.2.3 Non-Plan Project Research

Evaluation of Substrate Based Microbial Biofilm for Carp Production in Pond Aquaculture System

- Quantity of different substrates viz., sugarcane bagasse, paddy straw, bamboo poles and manures has been optimized. It was found that requirement of sugarcane bagasse was @ 24 kg/0.01 ha, paddy straw @ 22 kg/0.01 ha and bamboo sticks @ 300 no. (approx 1.5 cm diameter & 2 m length) to generate desired biofilms per unit area. It was concluded that with the addition of sugarcane bagasse and paddy straw along with cattle dung, there was a sharp reduction in dissolved oxygen and it was below 3.0 mg/l in the treatments during the first week. Since these substrates results in a sharp decline in dissolved oxygen level initially, it should be pre-stocked in separate pond at least for a week.

Standardization of Grow Out Technique of Freshwater Giant Prawn *Macrobrachium Rosenbergii* in the Ponds of North Bihar

- Initial feeding to the fresh water giant prawn was done @ 5% body wt. with wheat bran, oil cake and molluscan meat only. The growth was observed to be very slow during the initial two months then gradually it grew faster and attained a wt. up to 68.26 gm., as in the pond no. 5 within a period of 4 months. During the last culture period (July, 2010 to Jan., 2011) mass mortality was experienced with the fall of temp below 18^0 C. To overcome the winter shock, 1000 no. of PL 30-40 are being stocked in a separate pond with a water exchange facility @ 50% /day to observe the effect on survival rate.

Assessing the Extent, Distribution & Reaction of Arsenic in Soil and Water, Its Impact on Crops in Some Affected Districts of Bihar

- About 95% water samples from Vidyapati Nagar, Mohinuddin Nagar and Pusa have recorded arsenic content, most samples having arsenic content in the range 0.01 – 0.05 ppm by Arsenic test kit (Hi-media). The water samples of Pusa tested by arsenic anhydride generation unit recorded 1.3 ppb (min.) to 73.7 ppb (max.).

Exploration of Mycofloral Diversity for Salutary Fungi

- **Evaluation of fungal population & diversity:** Fungal population /diversity were evaluated under zero tillage rice (ZTR), zero tillage wheat, conventional tillage wheat and non cereal crop and found that the rhizosphere of non cereal crop (turmeric, patharchata etc) harbored higher population and diverse range of fungal population as

compared to that of rice & wheat under zero tillage & conventional tillage condition. The resident population of non cereal rhizosphere seems to have soil pH neutralizing capacity resulting in higher organic carbon, available P & K in the rhizosphere .

- **Beneficial aspect of resident mycoflora from different ecosystem:** Various specious of fungi *i.e. Trichoderma virens, T. harzianum* and *Aspergillus niger* (obtained from rice-wheat & stress cropping system) were found to be compatible with vermicompost, mustard cake, neem cake etc. The metabolites of these isolates were found to suppress yellow vein mosaic of okra. The soil treatment with *Trichoderma* spp. & their metabolites improved the growth of papaya. Various isolates of *T. virens, T. viride, A. niger* etc were found to utilize various weeds such as congress grass, bhang, wild tobacco as the substeratous for their multiplication.

Eco-Friendly Management of Diseases of Tomato and Chilli

- **Effect of plant products on diseases of tomato and chilli :**

  Alternaria solani **:** Garlic extract produced maximum (99.92%) inhibition of conidial germination of *Alternaria solani.*

  Fusarium oxysporium **:** Barhmi buti extract produced maximum (100%) inhibition of conidial germination of *Fusarium oxysporium.*

  Colletotrichum capsici **:** Neem produced maximum (99.89%) inhibition of conidial germination of *Colletotrichum capsci.*

Effect of Homoeopathic Drugs on Per Cent Conidial Germination and Inhibition of Conidial Germination of *Alternaria Solani* Causing Early Blight of Tomato

- Maximum inhibition (66.9%) was recorded with Tecurium marum venim 30 followed by Bryonia alba 200 and Thuja decidonfolis 200. Drugs such as Arsenicum album 200, Uranium nitricum 30, Thuja deciddonfalis 30, Allium cepa 30, Belladona 200, Drosera rotundifolia 30, Natrum sulphuricum 30 & 200 enhanced the conidial germination.

Development of Packaging Technology for Fresh Fruits

- Bamboo based packaging designs / prototypes were made. Different concepts of packaging tomatoes have been developed. Minimum loss of 5.48 % was observed in tomatoes transported in egg trays in carton. A new commercial fruit and vegetable grading machine of 500 kg/h capacity was purchased and installed.

Value Addition and Product Diversification in Root & Tuber Crops for Nutritional Security

- Some value added root and tuber products like sweet potato chips, sweet potato flour, sweet potato noodles, sweet potato based fasting food, Instant soup mix (sweet potato based), Sweet potato pickles (sweet), sweet potato pickles, sweet potato jam, sweet potato papad, sweet potato jam and yam pickles were developed.

Commercial Utilization of Natural Dyes

- Mordant concentration was standardized and the best mordant concentration was selected on the basis of colour strength (k/S value). 6% Concentration of dye was used. The recipe of *Alum paste* (Alum- 15g, Water 100ml and thickening agent (Sago 10g) and *Ferrous sulphate paste* ($FeSo_4$ - 2g, water 100ml and thickening agent (Sago)) were standardized after trial for value addition through eco-printing on mulberry silk. The fabrics agitated continuously for 10 minutes during washing gave better results. Block printing designs with sago as thickening agents had very sharp outlines and colour obtained was also very bright. Pre-mandating method was found to be best for printing process. Degumming of silk by boiling in soap solution for half an hour gave brighter shades as compared to degummed silk in luke warm water for 2 minutes.

Maintenance and Strengthening of Nursery of Medicinal and Aromatic Plants

- **Effect of aqueous extracts of kalmegh and ashwagandha leaves on germination and seedling growth of mung (*Vigna radiate*) :** *Andrographis paniculata* and *Withania sominfera* showed inhibitory effect on sugar and protein and stimulatory effect on amino acid content of mung seedlings. The results indicated that the allelopathic effect of leaf extract of *andrographis paniculata* was maximum in terms of most of the physiological and biochemical parameters.

Development of Sugarcane Varieties for Durable Resistance against Red Rot

- 12 Isolates of red rot were collected, purified and maintained and sprayed over the juvenile seedlings of 10 different crosses at 45 days stage . About 10-15% mortality was observed. The resistant seedlings of different crosses were transplanted in first and then in second ground nursery. 1765 seedlings of different crosses are available in the second ground nursery for further evaluation under natural condition.

PGPR Mediated Induced Systemic Resistance- An Approach to Eco-friendly Management of Bacterial Wilt of Tomato

- **Isolation of PGPR strains:** Isolated strain obtained by serial dilution method from soil samples of Kalyanpur (TCA 1 KL & TCA 5 KL), Pilkhi (TCA 7 PL), Motipur (TCA 4 MT), Chicknota (TCA 2 CK & TCA 3 CK), Kanti (TCA 6 KT) and Mirapur (TCA 8 MR), were found to produce siderophores, which qualify them as PGPR.
- **Selections of potential PGPR strains:** *In vitro* antibiosis study done on isolated PGPR strain and the pathogen, *R. solanacearum*, based on the highest zone of inhibition produced by the PGPR strain against the pathogen, strain designated as TCA 5 (KL) is selected as potential PGPR strain for further study to see its efficacy against the pathogen under pot culture condition.

2.2.4 RKVY Research

Production of Bio – Fertilizer for Nutrient Availability & Crop Production

- 80 Nodule samples were collected from the different blocks of Lakhisarai and Munger district, out of which 45 nodule samples were screened on the basis of morphological appearance and were cultured on YEMA media. The biochemical characterization of the pure cultures was done and 30 isolates were assessed for their efficiency by acetylene reduction techniques. 26 Isolates of *Bacillus and Pseudomonas sp.* were assessed for their phosphate and zinc solubilising efficiency. *Bacillus* was observed more efficient in phosphate solubilising efficiency as compared to *Pseudomonas.* In a pot experiment, the significant influence of Rhizobium and PSB was observed on the yield attributing characters and yield of chickpea and lentil. Similarly the soil application of *Azotobacter* also significantly influenced the yield of wheat recording increased yield of legume crops by 10 to 15% and in wheat by 20%.

Mushroom Productions

- A total of 39 manospores (Psc- 12, Pf- 16 and Pd- 10) were isolated and purified out of 472 crosses (Psc x Pd- 120, Psc x Pf-192 and Pfx Pd-160). Only 11 successful crosses were obtained (Psc x Pd- 3, Pf x Pd – 3 and Psc x Pf-5). Button and Oyster mushroom production units were developed in three new sites. Composting of 10 quintal straw was started and spawning was done on 15th Nov. 2011.

Commercial Production of Enriched Vermicompost

- Out of three ecological species of earthworms, the ***epigeics*** in particular and ***anecics*** in general have largely been harnessed for the use in the vermicomposting processes. Compost becomes ready in 60-80 days.

2.2.5 NAIP Research

Sustainable Livelihood Improvement through Need Based Integrated Farming System Models in Disadvantaged Districts of Bihar (Samastipur)

- Three hectare Mann at Kalwara of Rosera block was converted into fish pond by making two dams on two sides with outlet-inlet facility. There were 52 beneficiaries out of 3 ha pond. Total 6 ha land in all was used. Remaining 3 ha land on upper side of pond is used for IFS. Introduction for suitable sugarcane high yielding varieties such as Bo-147, Cop 9702, Colk97184 for seed production. High density mango orchard has been established in Kalwara of Rosera cluster.
- **Potato seed production:** Breeder seeds of potato varieties Kufari Kanchan, K. Pukhraj, K. jyoti were grown in Rosera and Pusa cluster involving 5 groups of total 72 farmers. The average cost benefit ratiowere 1:3 which was superior to traditional cultivation (1:2).
- **Vegetable grown under three tier system:** High value vegetable cultivation under three tier system was introduced at Bahadarpur and Thara of Pusa Cluster. Under this system 3 models were introduced.

  Model- I : With the help of bamboo & thin nylon string celing/roof was prepared in 0.2 ha which was used as three tier for spread of bitter gourd (Var. Palee). For middle tier cowpea (Pusa Komal) was sown. For lower tier elephant foot yam bean was sown. The BC ratio came to 1:3.78 for this model. Also this model gave 288.32% increase in income over one tier system of vegetable cultivation.

  Model- II : For upper tier Pointed gourd (cultivar Dandrai) was sown which yielded 195 q/ha. For middle tier early sown cucumber (var Kareena) was sown which yielded 135 q/ha. Okra (var Parbhani kranti) was sown in lower tier which yielded 113 q/ha. The B.C. ratio came to 1:3.22 with 97.07% increase in income over one tier.

  Model III : For upper tier Pointed gourd (cultivar-Dandrai) was sown which yielded 203q/ha. Okra was sown as middle tier, which yielded 121 q/ha. Lower tier was occupied by Amranthus which was cut only once yielding 77 q/ha. B.C ratio was 1:2.53 with percent increase over one tier of 54.73 per cent.
- **Introduction of high value crops in a crop cycle:** Total eight crops in 11.2 ha were introduced in existing cereal-cereal system to fetch high income. The important crops were turmeric, elephant foot yam, potato, cucumber, muskmelon, bitter gourd, bottle gourd, pointed gourd, okra and pea.
- **Use of pheromone trap:** Pheromone trap against fruit fly as an IPM intervention is now used by NAIP & nearby surrounding farmers in pointed gourd and bitter gourd as well as in mango and guava orchards which saves Rs. 3000/- acre by avoiding use of pesticides. It is also eco-friendly.
- **Empowering resources poor farming community for enabling sustainable livelihood security activities-Introduction of mushroom production** : Number of mushroom production interest group increased from 20 to 58 in Thara, 22 to 82 in Bahadurpur. Also each family produced oyster into 50 bag of 3 kg straw each per month. This enhanced the oyster yield not only in the adopted village but also in nearby area. Net income by selling oyster to one women reached to Rs. 3150/months showing increase 215% over 2009-2010. Employment generation in form of mandays was 120 due to button mushroom in three months. One spawn lab was established by FIG women leader at village Bahadurpur.

Improving Livelihood Security in Salt-affected Watersheds of Muzaffarpur and Sheohar Districts of Bihar

- The salt-affected area (45 ha) has been accomplished under reclamation by the application of gypsum@ 4-8 t/ha along with organic amendments dhaincha as green manuring @ 20 kg/ha & its incorporation at 45-50 DAS prior to rice cultivation, which has resulted in increasing in productivity of rice and wheat by 22.2 to 27.8%, besides improving soil health from pH 8.3-9.2 to 8.1-8.5 and EC-2.3-5.8 to 1.8-5.2 d Sm^{-1}.
- In Sheohar district, the initial soil analysis revealed that this area was switching towards salinity soil. Adoption of suitable intercropping in autumn planted sugarcane (coriander and radish) and spring planted sugarcane (moong) was done which fetched the higher profitability due to increase in system productivity.
- HYV's of rice (Swarna sub-1, Rajendra Bhagwati, Rajshree), wheat (PBW-343, HD-2733, HD-2824, DBW-14) toria (RAU-TS-17) and moong (SML-668) which were not in existence earlier were brought in cultivation through participatory seed production programme and their cultivation had showed high impact in the project area.

Understanding the Mechanism of Variation in Status of a Few Nutritionally Important Micronutrients in Some Important Food Crops and the Mechanism of Micronutrient in Plant Parts

- Application of iron significantly increased the mean grain yield from 46.0 to 52.4 q /ha under different treatments. There was maximum increase in grain yield in genotype Shaktiman-3 (13.7 q /ha) and least in Hemant 2.3 q/ ha. On the basis of iron index efficiency and iron efficiency, 24 maize genotypes has been classified into efficient and inefficient. Out of 24 maize genotypes screened under iron stress condition; Swan, Dewki, Hemant, Lowa, CM-600, Pop-64, RHM-1, M-7 has been rated as efficient maize genotypes while Lakshmi, Shaktiman-1, Shaktiman-3, Shaktiman-4, MSO3-7, 2004-Dholi-M and Pant 7421 rated as inefficient maize genotypes.

2.2.6 Crop Varieties Released

TURMERIC

- **Rajendra Sonali (R.H.-5):** Suitable for upland, sandy loam with wider adaptability in Bihar, yield of fresh rhizome -450-500 q/ha and processed rhizome – 81-90 q/ha. Maturity- 190-200 days (Early). Resistant to leaf blotch, leaf spot and tolerant to shoot borer. Dry recovery is 18.0% with 5.3-6.5 % curcumin.

YAM BEAN

- **Rajendra Mishrikand 2:** Suitable for plains of North Bihar, yield-350-400 q/ha. Maturity – 100-110 days (Tuber) and 180-200 days (Seed). Deep bulking, tolerant to pod borer and mosaic, more nutritive & high content of sugar, fibre, carbohydrates and excellent in taste.

SUGARCANE

- **B.O. 153** (BO 131 Self): Suitable for early crushing and agro climatic situation of Bihar, yield- 87.0 t/ha. Average sugar recovery 11.0%. Resistant to red rot and moderately resistant to wilt & smut.
- **CoP 2061** (CoLK 8102 X HR 83/65): Suitable for mid late crushing and agro climatic situation of Bihar, yield- 98.0 t/ha. Average sugar recovery 10.8%. Most suited to rice-sugarcane-sugarcane (ratoon) –mung cropping system. It is resistant to red rot & smut and moderately resistant to wilt.

2.3 EXTENSION

2.3. 1 Trainings Conducted by Units

	Title of the event	Date & ve
		RAU, Pusa

2.3 EXTENSION

2.3. 1 Trainings Conducted by Units

Name of unit	Training programme	Title of the event	Date & venue	Number of participants
Honey bee	6-days (Self financed)	Beekeeping	RAU, Pusa	130
	2-days (NAIP)	Beekeeping	RAU, Pusa	40
	1-day (SMS)	Beekeeping	RAU, Pusa	175
Soil Science	Farmer's Training	Production procedure of vermicompost and its importance in INM	RAU, Pusa	282
Agromet	Training	Farmer awareness programme on climate change	KVK, Jehanabad	125
H. Sc.	ICDS Training	Induction training of lady supervisors	RAU, Pusa	387
CoF, Dholi	Farmer's Training	Fish culture and managament	CoF, Dholi	134
TCA, Dholi	Farmer's Training	Tuber crops/ oilseeds	Dholi	125
CAE, Pusa	Farmer's Training	Micro-irrigation/ Implements	KVKs	909

2.3.2 Trainings Conducted by KVKs

Name of training	Type of training	No of trainings	No. of participants		
			Male	Female	Total
1. KVK, Begusarai	PF, RY, EF	41	3072	116	3188
a. Natural Resources	PF, RY, EF	27	774	41	815
b. Crop Protection	PF and RY	19	486	43	529
c. Fisheries & A. H	PF, RY & EF	24	-	675	675
d. Home Science	PF , RY, EF	21	717	51	768
e. Horticulture		16	428	4	432
2. KVK, Darbhanga	PF, R W, EF	13	331	4	335
a Natural Resources	PF, EF, RY, RW	06	-	191	191
b Crop Protection	PF, R Y	40	1095	54	1149
c Home Science	PF, R Y, EF	5	97	28	125
d Horticulture	PF, RW				
e Fisheries & Animal Sc.		57	1209	172	1381
3. East Champaran	PF, R Y, EF, RW	26	481	106	587
a Natural Resources	PF, R Y, EF, RW	24	-	465	465
b Crop Protection	PF, R Y, EF, RW	34	592	131	723
c Home Science	PF, R Y, EF, RW				
d Agril. Engg.		86	4054	82	4136
4. KVK, Gopalganj	PF, R Y, EF	16		287	287
a Natural Resources	PF, R Y	39	1078	12	1090
b Home Science	PF, EF, RY	33	546	16	562
c Horticulture	PF, EF, RY	53	564	19	583
d Animal Science	PF, R Y				
e Agril. Engg.					

PF = Practicing Farmers, RY = Rural Youth, RW = Rural Women & EF = Extension Functionaries

2.3.3 Front Line Demonstrations Conducted by KVKs

	Technology demonstrated	Area (ha)	No. of beneficiaries	Crop	Impact of demonstration
KVK, Begusarai					
A	Varietal (HD-2733)	03	07	Wheat	23.5% increase in yield over check
B	Varietal (QPM-1)	4.5	10	Maize	28.1% increase in yield over check
C	Varietal (R. Suflam)	05	09	Mustard	29.7% increase in yield over check
D	Varietal (Pusa Vishal)	1.5	13	Moong	33.8% increase in yield over check
KVK, Darbhanga					
A	Varietal (Swarna Sub-1 / Rajendra Sweta))	10	20	Paddy	Adoption of technology by 20% farmers
B	Varietal (Pusa-9)	05	10	Arhar	Suitable for up land area
KVK, E. Champaran					
A	Varietal (Prabhat)	03	03	Paddy	10.3 -20% increase in yield over local check
B	Varietal (Kasturi)	03	03	Paddy	
C	Varietal (R. Bhagwati)	04	04	Paddy	
D	Varietal (S. sub-1)	02	02	Paddy	
E	Varietal (Subhasini)	01	01	Paddy	
F	Varietal (Shaktiman-4)	25	25	Maize	14.3% increase in yield over check
KVK, Gopalganj					
A	Varietal (PBW-373)	08	20	Wheat	20-22% increase in wheat yield over local check
B	Varietal (HD-2824)	05	05	Wheat	
C	Varietal (PBW-343)	05	05	Wheat	
D	Varietal (Pusa Vishal)	04	10	Moong	21.3% increase in yield
E	Varietal (R. Bhagwati)	08	16	Paddy	The yield increase by 36.6% over local check was highly encouraging.
KVK, Muzaffarpur					
A	Varietal (Pant-4/HUM-16 and SML-668)	06	14	Moong	51% increase in yield in demo plot by
B	Varietal (Swarna Sub-1)	06	15	Paddy	38% increase in yield
KVK, Sheohar					
A	ICM (Seed)	05	16	Mustard	24.7% increase in yield
B	ICM (Seed)	03	12	Arhar	Demonstration yield was 13.6 q/ha as compared to local check (10.5 q/ha)
C	ICM (Seed) Biofertilizer and pesticide	10	34	Summer moong	27.3% increase in yield over check
KVK, Vaishali					
A	Varietal (Shaktiman-4)	10	30	Maize	Demonstration yield was 51.6 q/ha as compared to 39 q/ha in local check

B	Varietal (R. Suflam)	10	20	Mustard	Demonstration yield was 19. 8 q/ha as compared to 13.5 q/ha in local check
C.	Varietal (DBW-39)	02	05	Wheat	-
D.	Varietal (PBW-343 and HD-2733)	3.8	11	Wheat	Demonstration yield in HD-2733 was 46 q/ha as compared to 32 q/ha in local check
KVK, W. Champaran					
A	Varietal (YAS-66-197-3)	1.0	03	Yellow Sarso	36.6% increase in yield over check
B	Varietal (RAUTS-17)	04	11	Tori	22.5% increase in yield over check
C	Varietal (R.Suflam)	08	20	Rai	26.3% increase in yield over check
D	Varietal (HUL-57)	2.25	08	Lentil	27.1% increase in yield over check
E	Varietal (HD-2824)	02	05	Wheat	23.4% increase in yield over check
F	Varietal (HD-2733)	1.2	05	Wheat	27.6% increase in yield over check
G	Varietal (PBW-343)	0.8	02	Wheat	14.0% increase in yield over check
KVK, Samastipur					
A	Varietal (Narendra Arhar-1)	02	07	Arhar	25% increase in yield over local check
B	Varietal (Pusa-9)	02	05	Arhar	
C	Varietal (K-307)	2.5	08	Wheat	25% increase in yield over check
D	Varietal (N-53)	01	10	Onion	22% increase in yield over check
E	Varietal (CH-86)	02	10	Tomato	15% increase in yield over check
F	Varietal (Rajendra Mishrikand)	0.25	05	Mishrikand	Higher yield
G	Varietal (Japani Safed)	02	10	Radish	15% increase in yield over check

2.3.4 On Farm Trials Conducted at KVKs

Technology tested	No. of Trials	Crop	Result	Feed back
1. KVK, Begusarai				
1. SRI method of raising paddy crop under varying age of seedlings	07	Paddy	Results of the trial showed that SRI along with 14 days seedlings significantly enhanced the effective tillers / hill (29.4), yield (65.4 q/ha) and net return (Rs.26890./ ha) over SRI along with 21 days seedlings with effective tillers/hill (23.1), yield (54.2 q/ha) net return of rupees 17930/ha.	Yield stagnation of paddy
2. Efficacy of different formulation and combination of herbicides in Paddy field.	12	Paddy	Results of the trial revealed that pretilachlor 50 EC (0.75) a.i. kg/ha) + ethoxysulfuron (a.i. 100 g/ha) was markedly reduced DM of motha m2 (1.6 g) and DM of total weeds m2 (2.6 g) and enhanced the effective tillers/hill (21.2), yield (49.2 q/ha) and Net Return (20370 Rs./ha) over pretilachlor 50 EC (0.75 kg/ ha) + One hand weeding after 30 days with DM of motha m2 (3.6 g) and effective tillers / hill (18.4), yield (44.7 q/ha) and net return (17190 Rs / ha).	Manual weeding is labour intensive and costly
3.IPM- Different mode of application of pesticides	08	Paddy	Seedling treatment by bavistin @ 0.1%+ spray the infection zone of paddy by bavistin @ 0.1% recorded 100% disease control over the check and markedly higher yield (43.50 q/ha) and net return (23610 Rs./ha) over seedling treatment by bavistin @ 0.1%	Non reaching of fungicides in infection zone
4. Integrated management of Foot & root rot of papaya	08	Papaya	Seedling treatment by Ridomil @ 0.25 % + drenching of Blitox 50 @ 0.4 % after one month of transplantation + application of Blitox 50 fortnightly @ 3 gm per plant mix with vermin compost over the check and markedly higher yield (1015.5 q/ha) and net return (890500 Rs./ha) over the treatment named Ridomil @ 0.25 % + drenching of Blitox 50 @ 0.4 % after one month of transplantation.	Confusion about causal agent of the disease
2. KVK, East Champaran				
1 Effect of polsphorous and Bio fertilizer on growth and yield of Moong bean	-	Moong bean	Recommended dose of fertilizer and seed inoculation with Rhizobiuim culture gave maximum yield of moong bean (11.6 q/ha), with net return of Rs. 34100.00 over farmers practice	Poor yield of moong bean & non use of fertilizers
2.Management of Phytophthora blight of potato	-	Potato	Minimum severity of Phytophthora blight i.e. 18.64 % and maximum tuber yield ie 210.0 q/ha was recorded when the tubers were treated with Indofil M 45 @ 0.2 % and two foliar spray 1st with Indofil M – 45 and 2nd with Ridomil MZ @ 2.0 gm / l water. The BC ratio was 1:2.48.	Low yield due to severe attack of disease

3.Assessment on yield of wheat by different methods of sowing		Wheat	Zero tillage machine sowing of wheat resulted lowest cost of cultivation and maximum benefit Rs. 20000.00. The BC ratio was 2.25.	Delayed sowing of wheat
3. KVK, Gopalganj				
1. Comparative studies on the performance of different planting methods on yield of sugarcane for irrigated autumn season	07	Sugarcane	Ring method sowing of sugarcane recorded higher germination (59.85%), plant population (93.76%), plant height (270 cm) and maximum yield (89.2 tons/ha) with BC ratio of 5.78 and proved of better than the other methods	Ring method was reported for higher germination and yield
4. KVK, Muzaffarpur				
1.Supplementation of grind yellow maize in feed		Yellow maize as food supplement	The result indicated that gross cost of production in farmers practice is higher than other two parameters. supplementation of grind maize in feed was found beneficial and profitable.	Recommended yellow maize as food supplement
2. INM through bio fertilizer (Azotobacter and PSB) in wheat		Wheat	Application of bio fertilizer i.e. (Azotobacter and PSB) in wheat crop @ 200 gm/kg of seed increased yield from 30.26q/ha to 33.69 q/ha which was 8.06 and 11.33 percent higher than farmers practice. The highest net return (Rs. 27728 /ha) and B:C ratio (13.18) was found under 90:40:040 + Azotobacter followed by 90:60::40 + Azotobacter and farmer's practice.	Indiscriminate use of fertilizer
5. KVK, Sheohar				
1. Selection of suitable variety of wheat under late sown condition	10	Wheat	Wheat variety K-107 was found highest yielder (42.5 q/ha) in irrigated medium land than DBW-14 and PBW-373	Low yield due to late sown
2. Selection of suitable variety of Moong against yellow mosaic virus.	10	Summer Moong	Variety TBM – 37 performed well in comparison of Pusa Vishal & HUM – 16 in terms of yield q/ha, Percentage increase in yield & BC ratio	Low yield due to disease
6. KVK, West Champaran				
1. Assessment of bag feeding method in carp fish farming pond	08	Fish	15 Bag per ha of pond had realized highest yield (21.60 q/ha) and highest net return of Rs. 115500 as compared to five bag per ha over farmers practice	Moderate yield of fishes in ponds

7. KVK, Vaishali				
1. Effect of growth regulator on growth and yield of brinjal.	05	Brinjal	Application of NAA@50 ppm at the time of first flowering on brinjal plants followed by 3 spraying at 15 days interval resulted in maximum number of fruits/plant (13.8), maximum fruit weight(182.7g) and highest yield (465.4q/ha)with a net profit of Rs. 157297.00 and BC ratio of 3.0 followed by spray of NAA 40 ppm at the time of first flowering and 3 sprays at 15 days interval where the net profit was 130907.00 with B:C ratio of 2.7 as compared to farmers practice where no growth regulator was applied.	Reduced yield due to excessive flower and fruit drop in brinjal
2. Performance of SRI on yield attributes and yield of paddy	07	Paddy	SRI method of rice planting was found beneficial in respect of higher no. of tillers /hill, highest yield and maximum net return.	Climate change has laid erratic monsoon leading to dry spells or water stagnation.
8. KVK, Samastipur				
Management of fruit fly in bitter gourd. .	10	Bitter gourd	Fruit damage by fruit fly in bitter gourd was minimum in T.O-3 which resulted maximum yield (139.6 q/ha) with net profit of Rs. 116950.00 and ratio of 3.03	Fruit fly damage was a serious problem in the bitter gourd.

2.3.5 Farmer's Club Established

Krishi Vigyan Kendra, Saraiya, Muzaffarpur has established 7 Jaiv Gram/ Kisan Club/ Seed Grower Club.

2.3.6 Kisan Mela/Field Day/Kisan Gosthi Organized

Name of the KVK	Kisan Mela		Field Day		Kisan Gosthi	
	Number	No. of Participants	Number	No. of Participants	Number	No. of Participants
Begusarai	06	3550	06	210	11	-
Darbhanga	04	-	02	-	09	1075
E. Champaran	03	2260	03	140	22	1746
Gopalganj	05	537	02	146	14	-
Muzaffarpur	04	-	03	58	26	2370
Samastipur	02	1100	03	91	08	395
Seohar	02	-	06	119	12	1145
Siwan	-	-	12	520	71	15362
Vaishali	12	1332	-	-	21	895
W.Champaran	-	-	11	398	07	1725
Saran	04	5150	33	1171		

2.3.7 Other Extension Activities

Name of the KVKs	Diagnostic Visit		News Paper Coverage	Advisory service	Extn. Literature/Popular article	Exposure visit	Work shop	
	Farmers visit to KVK	Scientist visit to farmers field					No.	Participants
Begusarai	84	133		469	02			
Darbhanga	623	56	21	428				
E. Champaran	1562	184		50				
Gopalganj	733	132	06	500		01	01	64
Muzaffarpur	1062	89	71	586	11		09	-
Samastipur	781	228	126	-	100		-	-
Seohar	1651	115	36	467	21	04	04	-
Siwan	2620	110	47	134	6000	-	-	-
Vaishali	587	231		5552	03			
West Champaran	1567	167	48	2109	12			
Saran	448	237				02	01	200

2.3.8 Radio & TV Talks

Sl. No.	Name of Scientist	Topic	Date	Radio/TV talk	Name of Radio/TV Station
1.	Dr. S.P. Singh	Scientific cultivation of fenugreek & fennel	Nov., 2011	TV talk	Doordarshan, Patna
2.	Dr. S.P. Singh	Scientific cultivation of turmeric & ginger	May, 2011	Radio talk	AIR, Patna
3.	Dr. S.P. Singh	Inter cultural operation on standing rabi spices	Jan., 2012	TV talk	Doordarshan, Patna
4.	Dr. A.K. Mishra	1.Disease management on rabi spices	Jan., 2012	TV talk	E-TV, Bihar
5.	Dr. L.M. Yadav	Subjee moter kee unnat kishme, khet ke taiyari, khad, urwark evam phasal lagana	30.08.2011	TV talk	Doordarshan, Patna
6.	Dr. L.M. Yadav	Aaloo kee unnat kishme khet ke taiyari, khad evam urwarak tatha phasal lagana	25.09.2011	TV talk	Doordarshan, Muzaffarpur
7.	Dr. L.M. Yadav	Kaddu vargiya subjion kee unnat kheti	28.02.2012	TV talk	Doordarshan, Muzaffarpur
8.	Dr. L.M. Yadav	Bhindi kee unnat prabhed, khad evam urwarak, khet kee taiyari evam booai	30.01.2012	TV talk	Doordarshan, Muzaffarpur
9.	Dr. Harendra Singh	Basant kalin ikh ki kheti	03.05.2011	TV talk	Doordarsan, Muzaffarpur
10.	Dr. Harendra Singh	Ikh ki dekh-bhal	19.08.2011	Radio talk	AIR, Darbhanga

2.4 SEED PRODUCTION

2.4.1 Seed Produced by Units

Name of Unit	Crop	Variety	Quantity (q)			
			Breeder	Foundation	Certified	T/L
Deptt. of Horticulture, T.C.A., Dholi	Spices	Rhizome Seed Spices				65t 10q
AICRPs in Dholi	Toria	RAUTS-17	39.0	-	-	-
	Yellow sarson	66-197-3	19.0	-	-	-
	Mustard	Rajendra Suflam	93.0	-	-	-
		Rajendra Anukool	18.0	-	-	-
		Varuna	26.0	-	-	-
		Pusa Bold	20.0	-	-	-
	Linseed (Seed Type)	Shekhar	24.0	-	-	-
		Garima	78.0	-	-	-
		Shubhra	93.0			
	DPL	Meera	33.0	-	-	-
	Sunflower	KBSH-1	-	--	35.00	-
		CMS-17A	0.5			
		CMS-17B	0.5			
		RHA-6D-1	2.0			
	Sesame	Krishna	25.0	-	-	-
		Pragati	8.0	-	-	-
Dholi, Kothi Farm	Paddy	Rajshree	-	104.40		
		MTU – 1010	-	72.90		
		Prabhat	-	97.25		
	Arhar	Bahar	13.30	20.55		
		NDA – 1	10.20	8.80		
	Moong	SML – 668	7.43	-		
		HUM – 16		-		
		PDM – 39		-		
		Meha	-	-		
	Urd	PU – 31	0.20	-		
	Wheat	WR – 544	31.20	22.80		
		HD – 2643	11.40	-		
		HD – 2828	21.00	22.20		
	Maize	Laxmi	-	8.95		
	Lantil	HUL – 57	-	19.10		
		KLS – 218	3.10	2.10		
		Arun	5.35	-		
	Chickpea	BG – 256	3.96	-		
	Pea	HUDP - 15	-	3.21		

Name of Unit	Crop	Quantity (q)	
		B/S	F/S, C/S & T/F
BSP Unit and other Breeder Seed Production	Paddy	287.96	
	Wheat	785.90	2097.38
	Maize	35.34	2008.50
	Pulses	58.13	70.65
	Oilseed	04.53	146.48
	Finger millet	06.00	20.65

PRODUCTION

oduced by Units

Crop	Variety	Quantity (q)			
		Breeder	Foundation	Certified	T/L
Spices	Rhizome Seed Spices				65t 10q
Toria	RAUTS-17	39.0	-	-	-
Yellow sarson	66-197-3	19.0	-	-	-
Mustard	Rajendra Suflam	93.0	-	-	-
	Rajendra Anukool	18.0	-	-	-
	Varuna	26.0	-	-	-
	Pusa Bold	20.0	-	-	-
Linseed (Seed Type)	Shekhar	24.0	-	-	-
	Garima	78.0	-	-	-
	Shubhra	93.0	-	-	-
DPL	Meera	33.0	-	-	-
Sunflower	KBSH-1	-	--	35.00	-
	CMS-17A	0.5			
	CMS-17B	0.5			
	RHA-6D-1	2.0			
Sesame	Krishna	25.0	-	-	-
	Pragati	8.0	-	-	-
Paddy	Rajshree	-	104.40		
	MTU – 1010	-	72.90		
	Prabhat	-	97.25		
Arhar	Bahar	13.30	20.55		
	NDA – 1	10.20	8.80		
Moong	SML – 668	7.43	-		
	HUM – 16		-		
	PDM – 39		-		
	Meha	-	-		
Urd	PU – 31	0.20	-		
Wheat	WR – 544	31.20	-		
	HD – 2643	11.40	22.80		
	HD – 2828	21.00	-		
Maize	Laxmi	-	22.20		
Lantil	HUL – 57	-	8.95		
	KLS – 218	3.10	19.10		
	Arun	5.35	2.10		
Chickpea	BG – 256	3.96	-		
Pea	HUDP - 15	-	-		
			3.21		

r	Crop	Quantity (q)	
		B/S	F/S, C/S & T/F
	Paddy	287.96	2097.38
	Wheat	785.90	2008.50
	Maize	35.34	70.65
	Pulses	58.13	146.48
	Oilseed	04.53	20.65
	Finger millet	06.00	

2.4.2 Seed Produced by KVKs

Name of KVK	Crop	Quantity (q)
Begusarai	Lentil (HUL-57)	12.2
	Paddy (R. Bhagwati)	44.0
	Dhaincha	7.0
	Wheat (HD-2733)	85.50
	Green gram	1.467
Darbhanga	Paddy (R. Sweta)	112.0
	Wheat (DBW-14)	61.5
	Lentil (Arun)	4.0
E. Champaran	Paddy- CSR-36	58.7
	Prabhat	110.0
	Wheat (HD-2733)	113.0
	Lentil (Arun)	33.0
	Green gram (PDM-149)	0.419
Gopalganj	Paddy (R. Kasturi)	53.2
	R. Subhasini	48.36
	R. Bhagwati	192.48
	Lentil (HUL-57)	13.0
	Wheat (HD-2824)	342.0
	Gram (P-256)	19.0
Muzaffarpur	Wheat (HD-2647)	68.5
	Green gram (Pusa Vishal)	0.52
	Urad (Pant-31)	0.14
Samastipur	Paddy (R. Mahsuri)	25.1
	Pigeonpea (Pusa-9)	13.32
	Wheat (HW-2045)	29.0
	Tori (RAU TS-17)	1.96
	Yellow Sarso (Ys-16-197-3)	1.44
	Pea (Kashi Nandini)	0.93
KVK, Farm	Paddy (S. Sub-I)	22.0
	Prabhat	28.0
	Pigeonpea (Pusa-9)	12.05
	Wheat (HW-2045)	8.0
	DBW-14	70.0
Seohar	Rice	26.0
	Lentil	22.0
Siwan	Paddy (Prabhat, CSR-36)	72.35
	Wheat (K-307)	0.72
	Lentil (KLS-218)	10.5
	Green gram (HUM-16)	1.4
	Mustard (YS-66-197)	3.5
Vaishali	Rai (R. Suflam)	3.5
West Champaran	Wheat (HD-2733	105.0
	Sugarcane (BO.147, BO-139,91, COP-9301,9206)	1112.0

Crop	Variety	Quantity (q)			
		Breeder	Foundation	Certified	T/L
Spices	Rhizome Seed Spices				65t 10q
Toria	RAUTS-17	39.0	-	-	-
Yellow sarson	66-197-3	19.0	-	-	-
Mustard	Rajendra Suflam	93.0	-	-	-
	Rajendra Anukool	18.0	-	-	-
	Varuna	26.0	-	-	-
	Pusa Bold	20.0	-	-	-
Linseed (Seed Type)	Shekhar	24.0	-	-	-
	Garima	78.0	-	-	-
	Shubhra	93.0			
DPL	Meera	33.0	-	-	-
Sunflower	KBSH-1	-	--	35.00	-
	CMS-17A	0.5			
	CMS-17B	0.5			
	RHA-6D-1	2.0			
Sesame	Krishna	25.0			
	Pragati	8.0	-	-	-
Paddy	Rajshree	-	-	-	-
	MTU – 1010	-	104.40		
	Prabhat	-	72.90		
Arhar	Bahar	13.30	97.25		
	NDA – 1	10.20	20.55		
Moong	SML – 668	7.43	8.80		
	HUM – 16		-		
	PDM – 39		-		
	Meha	-	-		
Urd	PU – 31	0.20	-		
Wheat	WR – 544	31.20	-		
	HD – 2643	11.40	22.80		
	HD – 2828	21.00	-		
Maize	Laxmi	-	22.20		
Lantil	HUL – 57	-	8.95		
	KLS – 218	3.10	19.10		
	Arun	5.35	2.10		
Chickpea	BG – 256	3.96	-		
Pea	HUDP - 15	-	-		
			3.21		

Crop	Quantity (q)	
	B/S	F/S, C/S & T/F
Paddy	287.96	2097.38
Wheat	785.90	2008.50
Maize	35.34	70.65
Pulses	58.13	146.48
Oilseed	04.53	20.65
Finger millet	06.00	

2.4.3 Planting Material Produced by Units

Name of Unit	Crop	Quantity produced	Value in Rs.
T.C.A., Dholi	Fruit Plants	33077 No.	1255230
AICRP on Tuber Crops (Other than Potato)	Sweet potato	100 kg	600.00
	Yam bean (Seed)	162.500 kg	26000.00
	Taro/Arvi	900 kg	10800.00
	Lesser yam	273 kg	4095.00
	Elephant foot yam	85050 kg	1701000.00

2.4.4 Planting Material Produced by KVKs

Crop	Variety	Quantity	Remarks
KVK, Vaishali			
Banana	Alpan & other varieties)	4381	Sapling
Mango	different varieties	52000	Sapling
Litchi	Sahi, China	8723	Sapling
Guava	L-49, Allahabad safeda	9000	Sapling
Lemon	Jameri, Kagaji	82	Sapling
Papaya	Red Laddy	4000	Sapling
Elephant foot yam	Gajendra	9.0 q	Seed
Tubrose	Single, Double	19000	Tuber
Gladiolus		2000	Bulb
Bottle gourd	Pant-1	3.5 kg	Seed
French Bean	Arka Komal	2.0 kg	Seed
Ridge gourd	Swaran Uphar	500	Seedlings
Bottle gourd	Pant-1, Narendra, Rasmi	1470	Seedlings
Cucumber	Swarna Ageti, F -1. NS	2170	Seedlings
Spoung gourd	F -1. NS	130	Seedlings
Bitter gourd	F-1 parry	154	Seedlings
Vermi compost		283 q	Compost
KVK, Samastipur			
Mango	Amrapali, Maldah, Mallika, Dashari, Sipiya and Chausa	20780	Sapling
Litchi	Shahi, China, Rose scented, Early bedana	11417	Sapling
Guava	L-09, Allahabadi	1041	Sapling
Bel	Kalmi, Bedana, Biju	96	Sapling
Aonla	N-7	114	Sapling
Vermi-worm	Eisenia foetida, Eudrilus eugeniae	29900	Worm
Vermi-compost		88.42 q	Compost
KVK, Gopalganj			
Papaya	Pusa Dwarf	26000	Seedling

Crop	Quantity produced	Value in Rs.
Fruit Plants	33077 No.	1255230
Sweet potato	100 kg	600.00
Yam bean (Seed)	162.500 kg	26000.00
Taro/Arvi	900 kg	10800.00
Lesser yam	273 kg	4095.00
Elephant foot yam	85050 kg	1701000.00

Produced by KVKs

Variety	Quantity	Remarks
Alpan & other varieties)	4381	Sapling
different varieties	52000	Sapling
Sahi, China	8723	Sapling
L-49, Allahabad safeda	9000	Sapling
Jameri, Kagaji	82	Sapling
Red Laddy	4000	Sapling
Gajendra	9.0 q	Seed
Single, Double	19000	Tuber
	2000	Bulb
Pant-1	3.5 kg	Seed
Arka Komal	2.0 kg	Seed
Swaran Uphar	500	Seedlings
Pant-1, Narendra, Rasmi	1470	Seedlings
Swarna Ageti, F -1. NS	2170	Seedlings
F -1. NS	130	Seedlings
F-1 parry	154	Seedlings
	283 q	Compost
Amrapali, Maldah, Mallika, Dashari, Sipiya and Chausa	20780	Sapling
Shahi, China, Rose scented, Early bedana	11417	Sapling
L-09, Allahabadi	1041	Sapling
Kalmi, Bedana, Biju	96	Sapling
N-7	114	Sapling
Eisenia foetida, Eudrilus eugeniae	29900	Worm

2.4.5 Fish Seed Produced

Name of Unit	Species	Quantity	Value in Rs.
College of Fisheries, Dholi	Spawn – IMC & EMC	75,50,000	63,157.00
	Fry- IMC & EMC	4,63,960	1,41,559.00
	Fingerling- IMC & EMC	18,070	9,650.00
	IMC		6852.00
	Mix		1805.00
	Total:-	**80,32,030**	**2,23,023.00**

2.4.6 Honey Produced

Name of Unit	Type	Quantity (Kg)	Value in Rs.
AICRP on Honey Bees & Pollinators	Mustard	118.00	23600.00
	Litchi	311.00	62200.00
	Jamun	94.20	18840.00
		Total:	**104640.00**

2.4.7 Milk Produced

Name of Unit	Type	Quantity(Lt)	Value in Rs.
Cattle Farm	Buffalo	39924.00	998100.00
	Cow	118020.00	2596440.00
		Total:	**104640.00**

2.4.8 Poultry Products Produced

Name of Unit	Type	Hen	Quail	Value in Rs.
Poultry Farm	Eggs	78928.50	1589.00	80517.50
	Meat	147956.00	15976.00	163932.00
			Total:	**244449.00**

3. STUDENTS' WELFARE ACTIVITIES

3.1 GAMES & SPORTS ACTIVITIES

During the year, the games & sports activities were organized in the Colleges for outdoor and indoor games. The students (boys & girls) have taken keen interest in sports activities and the regular classes of games and sports were also organized. The students of the various colleges participated in Annual Inter College Volleyball (Men), Table Tennis (Men and Women), Badminton (Men and Women), Chess (Men and Women) and Athletic meet (Men and Women) held at TCA, Dholi on 16-18 January, 2012. The tally details of Annual Inter College Games, Sports & Athletic Meet are as below:-

S. No.	College/Faculty	Gold	Silver	Bronze	Total
1	COH. Sc., Pusa	07	04	-	11
2	CAE, Pusa	08	03	03	14
3	FBS & H, Pusa	04	09	09	22
4	TCA, Dholi	05	07	03	15
5	COF, Dholi	-	05	02	07
6	Post - Graduate Faculty, Pusa	06	02	03	11

3.1.1 Participation of RAU Team in All India Agricultural Universities Games & Sports 2011-12

On the basis of best performance in the above Athletic Meet & Tournament, 23 boys & 15 girls were selected & participated in XIIIth All India Inter Agricultural Universities Games & Sports Meet 2011-12 held at Dr. Panjabrao Deshmukh Vidyapeeth, Akola (Maharashtra) from 16-19 February, 2012.

3.1.2 University Level Annual Cultural & Debating Programme

On the occasion of Bihar Diwas 2011-12, **Satabdi Samaroh** & Inter College Elocution/ Essay competition on **Bihar Agriculture in the Changing Climate Scenario** was held in the Flax House, RAU Pusa on 12th November, 2011.

3.2 NATIONAL SERVICE SCHEME ACTIVITIES

The details of NSS activities carried out by the students are as below:

- **Enrolment of NSS volunteers**

S.No.	College	No. of NSS Volunteers		
		Male	Female	Total
1	TCA, Dholi	73	42	115
2	FBS & H, Pusa	-	02	02
3	CAE, Pusa	-	02	02
4	COH. Sc., Pusa	-	21	21
5	COF, Dholi	7	5	12

- NSS Unit of College of Fisheries organized a **Blood Group Test Camp cum Awareness Programme** on HIV/AIDS & NRVBD under RRB, Club of RAU, Bihar on 21st February, 2012 at Dholi. During the programme, blood samples were tested. 152 Samples have Rh positive factor, 37 were A+, 45 B+, 17 AB+ and 53 were O +. Three Panel board exhibition was also organized. The first panel clearly showed the

aims, objective and key areas of Red Ribbon Club. The second panel emphasized on HIV aids, its genesis, and mode of transmission, myth, misconception, precaution and prevention. The last panel board exhibited the importance of Non-Remunerated Voluntary Blood Donation (NRVBD) and role of teachers in motivating youth for NRVBD.

- In order to inculcate an environment friendly attitude among the students and staff, 40 saplings of coconut tree were planted in the campus on 15th August, 2011. The Chief Guest of **Tree Plantation Drive** was Dr. M.L. Choudhary, the then Vice-Chancellor, Rajendra Agricultural University & Sri Suresh Chanchal, Hon'ble Member, Legislative Assembly, Bihar.
- NSS day was celebrated on 24th September, 2011. The students took clean up drive of river Burhi Gandak. The volunteers collected waste and used material like plastic bags, plastic glasses, food wrappers, clothing shoes, etc. in about 1 km stretch from village Raini to village Nemopur of Muzaffarpur district. An orientation training was given to the Junior Volunteers to impart information of NSS and know about badge, logo, motto, setup etc.
- World AIDS Day was observed on 1st December, 2011 and a campaign was organized in the college to make awareness about HIV/AIDS amongst the students.
- One day special camp on **Aqua Clinic** was organized by NSS unit of College of Fisheries on 12th December, 2011 under Rural Fisheries Work Experience Programme of final year B.F.Sc. students for the betterment of fish farmers and students at Govt. Middle School Lautan (Block Muraul) of Muzaffarpur district. 41 Fish farmers & 15 student volunteers participated in the programme.
- Bihar Diwas was celebrated on 22 March, 2012. On this occasion, **Bihar Quiz 2012** was organized. Other activities such as Rangoli competition, Musical programme, Debate etc. were also organized.
- An awareness programme on HIV/AIDS was organized by NSS wing of College of Basic Sciences and Humanities on 29th March, 2012. On this occasion, Dean, FBS & H emphasized for awareness programmes among the youth on HIV/AIDS. Faculty members, non-teaching staff, contractual staff, NSS In-charge of colleges and students actively participated in the discussion. Dr. Bharat Mishra, CMO of University Hospital emphasized about HIV/AIDS and its control. More than eighty participants involved during this programme.
- Aids Diwas-2012 was organized with the support of MBA (Agri-business) students and faculty members on 30th March, 2012 to sensitize and create awareness among young generation. Various activities like poster presentation, debate & speech by distinguished guests were held. The programme was attended by more than 55 participants. Hon'ble Vice-Chancellor emphasized for the control of AIDS.
- An Elocution competition was organized on 5th June, 2011 on the eve of **World Environment Day**. Besides, a debate competition was organized on the eve of **International Literacy Day**. The staff members and students of Home Science participated in these programmes. Awareness creating programmes have been organized by the student of various semesters on population hazards, importance of literacy in our life, out efforts of killing of female's foeticides, discrimination against female child, violence against women and on practices of common health and hygiene. A debate competition on **Indian Agriculture in Changing Environment Scenario** and an essay competition on **Second Green Revolution in India** were also organized.

- An awareness programme on HIV/AIDS was organized by NSS wing of College of Agricultural Engineering, RAU, Pusa on 27th March, 2012. Faculty members, non-teaching staff, contractual staff, NSS In-charge of different colleges and students actively participated in the discussion. Dr. Bharat Mishra, CMO of University Hospital, Dr. Lalita and Smt. Gita Kumari HIV/AIDS Councilor of Pusa Sub-divisional hospital participated as resource persons.

3.3 NATIONAL CADET CORPS ACTIVITIES

National Cadet Corps unit of the University is functioning with a strength of fifty five cadets and one NCC Officer. Apart from regular classes and parades, the cadets took part in Independence Day and Republic Day celebrations and other functions of the University.

Cdt. Manish Kumar Sah and Cdt. Ranjeet Kumar Paswan (B.Tech. Agricultural Engineering students) appeared for 'C' Certificate examination and were declared successful. They were awarded with certificate and momento on the occasion of Republic Day, 2012. Besides, the NCC Officer of the unit actively participated in Combined Annual Training Camp held at Kewati, Darbhanga from 13-22 February, 2012.

3.4 TRAINING & PLACEMENT

To give the employment opportunity to the students of RAU, a Training & Placement Cell is functioning in the University. During the reported year, 46 students have been selected for placement in various agencies as detailed below:-

Name of organization	Name of selected student	Post
Bank of India	Tarun Kumar, B.F.Sc.	Agriculture Officer in JMG -I
Bank of India	Ved Prakash Karn, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Satendra Kumar, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Anupam Kumari, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Mukesh Kr. Mandal, B.Sc.(Ag.) (Hort.)	Agriculture Officer in JMG -I
Bank of India	Swati Singh, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Kumar Ranjan, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Shashi Kant, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Kanwar Singh, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Shudhanshu Kumar, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Nisheh Kashyap, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Mukesh Kumar, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Dharmendra Kumar, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Deepak Kumar Singh, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Chandra Deo, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Anwar Alam, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Mirdu Kumar, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Bank of India	Ashish Kumar, B.Sc.(Ag.)	Agriculture Officer in JMG -I
Canara Bank	Jaya Jagriti, B.Sc.(Ag.)	Extension Officer in JMGS-I
Canara Bank	Shashank Shekhar, B.Sc.(Ag.)	Extension Officer in JMGS-I

Canara Bank	Hemant Kumar, B.Sc.(Ag.)	Extension Officer in JMGS-1
Canara Bank	Kumar Narottam Suman, B.Sc.(Ag.)	Extension Officer in JMGS-1
Canara Bank	Shweta Singh, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Manisha Singh, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Chimmay, M.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Chandra Deo, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Krishana Kr. Singh, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Akhilesh Kr. Thakur, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Manish Bharti, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Sanjeev Kr. Poddar, M.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Amit Ranjan, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Aman Bharti, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Anoop Kr. Singh, M.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Rahul Kr. Anand, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Canara Bank	Chandan Kumar, B.Sc.(Ag.) (Hort.)	Rural Officer in JMG Scale-1
Canara Bank	Praveen Pratap, B.Sc.(Ag.)	Rural Officer in JMG Scale-1
Indian Overseas Bank	Deepak Kr. Singh, B.Sc.(Ag.)	Agriculture Officer in JMG -1
Indian Overseas Bank	Manisha Singh, B.Sc.(Ag.)	Agriculture Officer in JMG -1
Indian Overseas Bank	Mukesh Kumar, B.Sc.(Ag.)	Agriculture Officer in JMG -1
Punjab National Bank	Shashank Shekhar, B.Sc.(Ag.)	Agriculture Officer in JMG -1
Punjab National Bank	Sanjeev Kumar, B.Sc.(Ag.)	Agriculture Officer in JMG -1
Punjab National Bank	Manish Kumar Badal, B.Sc.(Ag.) (Hort.)	Agriculture Officer in JMG -1
Punjab National Bank	Chandan Kumar, B.Sc.(Ag.)	Agriculture Officer
Axis Bank, Kolkata	Raj Kumar, MBA (Agribusiness)	Agriculture Officer
Axis Bank, Kolkata	Rachnya Ramya, MBA (Agribusiness)	Agriculture Officer
Axis Bank, Kolkata	Chandan Kumar, MBA (Agribusiness)	Agriculture Officer

3.5 HOSTEL

The University provides hostel accommodation to each and every student admitted in Under-graduate, Post-graduate & Ph.D. programme alongwith common room and mess facilities in all the campuses viz. Tirhut College of Agriculture, Dholi; College of Fisheries, Dholi; College of Agricultural Engineering, Pusa; College of Home Science, Pusa; College of Basic Sciences & Humanities, Pusa and College of MBA (Agri-business), Pusa under the control of concerned Dean/Assoc. Dean with Warden & Hostel Superintendent.

3.6 DEVELOPMENT ACTIVITIES

To solve the problem of students, aquaguards and refrigerators were provided in the hostels. Besides, electrification work, water supply system, cleaning of sports complex and grass cutting work around hostels were also done.

3.7 EDUCATIONAL/STUDY TOUR

During the reported year, North India tour to 26 students of College of Home Science, RAU Pusa & South India tour to 58 students of TCA Dholi and 13 students of B.Tech. (Biotech.) have been sanctioned. Besides, study tour of 26 VIIIth semester students of B.F.Sc. have also been sanctioned.

3.8 FELLOWSHIP/SCHOLARSHIP

34 M.Sc. (Ag.) & 4 Ph.D. students of various disciplines were awarded Junior & Senior Fellowship and in U.G. programme, 40 students were given Merit/Merit-cum-Means Scholarship during the reported year as detailed below:-

(A) FELLOWSHIP

S. No.	Name of Programme	Fellowship sanctioned for 1st & IInd semester	Fellowship sanctioned for IIIrd & IVth semester	Fellowship sanctioned for Vth & VIth semester
1	M.Sc. (Ag.)	16	18	-
2	Ph.D.	02	01	01
	Total :	**18**	**19**	**01**

(B) SCHOLARSHIP

S. No.	Name of College	Merit Scholarship
1	CAE, Pusa	40

(C) RAWE

S. No.	Name of College	No. of students
1	CAE, Pusa	04
2	College of Home Science, Pusa	07

4. UNIVE

University Library, Pusa has beer extension specialists, students and staff o scientific staff of the research stations, sub

Opening hours
Circulation hours
Documents in the Library
Additions during the year:
E-Books
Indian Journals Subscribed (2012)
Foreign Journals Subscribed (2011)
CD ROM Databases Available
Circulation of books:
No. of Readers registered during the year:
No. of visitors during the year:
No. of Visitors in Computer Centre:
No. of Photocopies produced:
Services Provided:
No. of Staff:
Courses offered:

4. UNIVERSITY LIBRARY

University Library, Pusa has been catering to the needs of scientists, teachers, extension specialists, students and staff of the main campus of the university as well as scientific staff of the research stations, sub-stations and KVKs of the University.

Opening hours **Circulation hours**	08.00 AM to 06.00 PM 09.30 AM to 04.30PM	
Documents in the Library		65472
Additions during the year:	Books on 31.03.2011: Books by purchase: Documents on Gratis: Theses by Students: TOTAL Addition :	62575 2516 370 011 2897
E-Books	Perpetual Subscription of CAB E-Books (IP authenticated)	
Indian Journals Subscribed (2012)		130
Foreign Journals Subscribed (2011)		00
CD ROM Databases Available	1.CAB Abstracts (1984 – Present) 2.CROP CD (1973-2003) 3.CABPEST CD (1973-2004) 4.AGRIS CD (1991 – 2003) 5.AGRICOLA (1984 – 2003) 6.CABSAC (1973 – 1997) 7.Food & Hum. Nutr. CD (1975 – 2004)	
Circulation of books:	Books issued: Books returned: **TOTAL:**	7557 6267 **13824**
No. of Readers registered during the year:	Teachers/ Scientists : PG Students: UG Students: Staff : **TOTAL:**	105 149 253 012 **519**
No. of visitors during the year:	Teachers/ Scientists: Students and others: **TOTAL :**	1836 20144 **21980**
No. of Visitors in Computer Centre:		**12645**
No. of Photocopies produced:		**7261**
Services Provided:	1. CAB Abstracting Service 2. Photocopying Service 3. Reference Service 4. Document Delivery Service - CeRA	
No. of Staff:	1. Technical/Professional: 2. Ministerial Staff: 3. Support Staff: 4. Contractuals/Casuals	01 05 04 06
Courses offered:	**PGS – 501**	

5. UNIVERSITY HOSPITAL

5.1 Number of patients treated in University Hospital

S.No.	Particulars	Total Number
1	Patients treated	4874
2	Patients admitted	101

6. STAFF POSITION

S. No.	Post	Sanctioned post	Filled up post	Vacant post	Remarks
	Non Plan				

6. STAFF POSITION

S. No.	Post	Sanctioned post	Filled up post	Vacant post	Remarks
Non Plan					
1.	Dean / Director / Registrar / Comptroller	22	0	22	Work of Dean / Director / Registrar / Comptroller is being assigned to Senior Officers / Teachers of RAU
2.	Univ. Prof.-cum-Chief Scientist	36	0	36	Promoted under Career Advancement Scheme
3.	Assoc. Prof.-cum-Sr. Scientist	97	13	84	Promoted under Career Advancement Scheme
4.	Asstt. Prof.-cum- Jr. Scientist	259	149	110	
ICAR Projects					
1	Chief Scientist-cum-Univ. Prof.	3	0	3	
2	Sr. Scientist-cum-Assoc. Prof.	27	22	5	
3	Jr. Scientist-cum-Asstt. Prof.	58	50	8	
Krishi Vigyan Kendras					
1	Programme Coordinator	11	0	11	
2	Subject Matter Specialist	66	55	11	

1.	State Non-Plan	639534000.00
2.	State Plan	18735344.00
3.	ICAR	810597424.00
4.	KVK	125488723.00
5.	University Receipt	48908170.44
6.	Misc. Scheme	26638674.00
7.	Other Scheme	61194677.75
8.	Revolving Fund	48723581.61
9.	GIS	7922889.70
10.	Students Fund	1072881.50
	Total :	**1788816366**
	Add Opening Balance :	**1146647132.65**
	Grand Total :	**2935463498.65**

(B) EXPENDITURE

S.No.	Particulars	Amount (in Rs.)
1.	Non-Plan	768524617.73
2.	Plan	39501859.65
3.	ICAR Scheme	420520440.78
4.	ICAR Plan	28048005.25
5.	University Receipt	1696386.63
6.	KVK A/C	111243086.50
7.	Misc. Scheme	115677038.66
8.	Other Scheme	14334525.84
9.	Revolving Fund	40607810.15
10.	GIS	4666779.00
11.	Students Fund	552049.50
12.	Remittances adjustable	459690636.30
	Total :	**2005063235.99**
	Closing Balance :	**930400262.66**
	Grand Total	**2935463498.65**

8. AWARDS / RECOGNITIONS

- AICRP on Soil Test Crop Response, RAU, Pusa Centre got the Chaudhary Devilal Outstanding All India Coordinated Research Project Award from Indian Council of Agricultural Research in 2010.
- Dr. Harendra Singh, Sr. Scientist, Agronomy, SRI, Pusa got the Radha Krishna Teacher's award from Abhivyakti Society, Dalsingsarai, Samastipur in 2011.
- Dr. S.C. Rai, Associate Dean-cum-Principal got the Best Educationist Award from International Institute of Education and Management, New Delhi 2012.
- Dr. Anil Pandey got the National Fellowship of Society for Rapeseed-Mustard Research (SRMR) in 2012.
- Dr. Anil Pandey was nominated as Councilor, East Zone for Binneum 2011-2013 by SRMR 2011.

9. SEMINAR / TRAINING / WORKSHOP ORGANIZED

- AICRP on Honey bees & Pollinators scheme organized a Two-day State Level Seminar on Awareness, Motivation & Technology Transfer for Development of Beekeeping in Bihar on January 6-7, 2012 at RAU, Pusa (Sponsored by National Bee Board, Ministry of Agriculture, New Delhi and Lee Bee Foundation, Punjab) .

- College of Agricultural Engineering organized a Group meeting of AICRP on Ground Water Utilization in collaboration with Directorate of Water Mangement, Bhubaneswar on April 28-30, 2011 at RAU, Pusa.

- College of Fisheries, Dholi organized a Workshop on Self Sufficiency in Carp Seed Production on January 20-21, 2012 at Dholi (Muzaffarpur).

- Faculty of Basic Sciences & Humanities organized a State Level Training cum Awareness Programme on Protection of Plant Varieties and Farmers Rights on 31st March, 2012 at RAU, Pusa (Sponsored by Protection of Plant Varieties and Farmers Right Authority, Government of India, New Delhi).

10. PARTICIPATION OF SCIENTISTS IN SEMINAR/ SYMPOSIUM/CONFERENCE

- Dr. Anil Pandey, Dr. R.S. Singh, Dr. Phoolchand and Dr. S.S. Dash participated in National Brassica Conference -2012 from 02-03March, 2012 at CCS HAU, Hisar
- Dr. Ashish Kumar and Dr. Rajesh Kumar participated in 6th International Hybrid Rice symposium from 10-12 Septemeber, 2012 at Hyderabad
- Dr. Birendra Kumar participated in the 3rd Global Conference on Plant Pathology from10-13 January, 2012 at MPUAT, Udaipur.
- Dr. Birendra Kumar participated in the National Seminar on Glimplses of Phytopathology for Sustainable Agriculture from 27-28 March, 2012 at TNBCollege Bhagalpur (Bihar).
- Dr. C.K. Jha participated in National Seminar on Water Conservation and Distillery Effluent Treatment Technologies for Zero Discharge from 26-27 February, 2011 at New Delhi
- Dr. C.K. Jha participated in 4th IAPSIT International Sugar conference IS-2011 on Balancing Sugar and Energy Production in Developing Countries Sustainable Strategies from 21-25 November, 2011 at New Delhi.
- Dr. L.M. Yadav participated in International Symposium on Minor Fruits and Medicinal Plants for Health and Ecological Security from 19-22 December, 2011 at B.C.K.V, Kalyani.
- Dr. Phool Chand participated in the National Symposium on Biology of Infection, Immunity and Disease Control in Pathogen Plant Interactions from 2-4 December, 2011 at Hyderabad.
- Dr. P.P. Singh and Dr. A.K. Choudhary participated in Global Conference on AROIDS Opportunities and Challenges from 23-25 January, 2012 at Bhubaneshwar.
- Dr. R.K. Sahu participated in 46th Annual Convention of ISAE and International Symposium on Grain Storage from 27-29 February, 2012 at GBPUAT, Pantnagar.
- Dr. S.C. Rai participated in National Conference on Aquaculture: Fish for Billions from 16-17 February, 2012 at CIFA, Bhubneshwar.
- Dr. S.K.Thakur and Dr. Minatullah participated in India International Sugarcon from 12-13 September, 2011 at Patna.
- Dr. S.K.Thakur participated in 2nd International Conference on Agrochemicals Protecting Crop, Health and Nature Environment- Role of Chemistry for Sustainable Agriculture from 15-18 February, 2012 at IARI, New Delhi.
- Dr. Vinod Kumar, Dr. Rajan Kumar, Dr. S.P. Gupta and Dr. M.P. Singh participated in National Seminar on Strategic Resource Management for Sustainable Food and Water Security held at Pantnagar from 13-15 June, 2011

11. PARTICIPATION OF SCIENTISTS IN SHORT COURSE / TRAINING / WINTER SCHOOL

- Dr. A. K. Paswan, Assistant Professor (Extension Education) participated in Winter school organized by BCKV, West Bengal from 02 – 22 December, 2011 at Kalyani.
- Dr. A.K. Singh, Jr. Scientist (Horticulture) participated in Winter school organized by YSPUH&F, Nauni, Solan (HP) on Advances in Fruits and Vegetables Processing and Preservation from 25th June to 15th July, 2012 at Solan.
- Dr. Nilanjaya, Assistant Professor (Plant Breeding & Genetics) participated in Winter school organized by IIPR, Kanpur on Advance Training on Biometrical Methods in Plant Breeding from 10-15 October, 2011 at IIPR, Kanpur
- Dr. Neeraj Kumar, Assistant Professor (Entomology) attended 21-days Advanced Training Course on Advances in Bio-Ecology and Management of Insect Pollinators of Crops from 21st February to 12th March, 2012 at Centre of Advanced Faculty Training, Department of Entomology, CCS HAU, Hisar.
- Dr. Rajesh Kumar, Jr. Rice Breeder participated in Winter school organized by DRR, Rajendranagar, Hyderabad on Molecular Breeding for Rice Improvement from 17-30 August, 2011 at DRR, Rajendranagar, Hyderabad.
- Dr. Satya Prakash, Assistant Professor (Extension Education) participated in Winter school organized by BCKV, West Bengal from 2-22 November, 2011 at Kalyani.
- Dr. Shankar Jha, Jr. Scientist, (Soil Science) participated in Winter school organized by Centre of Advanced Faculty Training, Department of Soil Science, Punjab Agricultural University, Ludhiana on Enhancement of Soil Health for Sustaining Crop Productivity and Improving Environmental Quality from 22nd November to 12th December, 2011 at Ludhiana.
- Dr. (Mrs.) Vibha, Assistant Professor (Plant Pathology) participated in Winter school organized by IARI, New Delhi on Monitoring and Forecasting of Plant Disease Epidemics under Climate Change Scenario from 10th October to 01st November, 2011 at New Delhi.
- Er. I.B. Bhagat, Assistant Professor (Agril. Engg.) participated in Winter school organized by BBSS&LUP, Nagpur from 6-26 September, 2011 at Nagpur.
- Mrs. Geeta Kumari, Jr. Scientist (Soil Science) SRI, Pusa participated in inter school organized by National Bureau of Soil Survey and Land Use Planning (ICAR), Regional Centre, Kolkata on Application of Remote Sensing and GIS for Watershed Characterization and Resource Planning from 20th February to 11th March, 2012 at Kolkata.
- Sri R.K. Brahmchari, Assistant Professor (Fishery) participated in Winter school organized by Central Institute of Fisheries Education, Mumbai on Diagnostics in Fish Health Management from 10-30 January, 2012 at CIFE, Mumbai.
- Mrs. Gitanjali, Assistant Professor (Home Science) participated in Winter school organized by Junagarh Agril. University, Junagarh on Instrumental Technique in Agriculture and Food Quality Assessment from 1-21 October, 2011 at Junagarh, Gujarat
- Sri Anil Kumar, Jr. Scientist (Entomology) SRI, Pusa participated in Short course organized by NBAII, Bangalore on Introduction to Biosystematics of Insect, Mites, Spiders and their Biodiversity from 14-23 November, 2011 at Bangalore.

12. PARTICIPATION OF SCIENTISTS IN WORKSHOP / GROUP MEETING

- Dr. L.M. Yadav and Dr. Udit Kumar participated in the Group Meeting of AINRP on Onion & Garlic from 29-30 April, 2011 at Coimbatore.
- Dr. Udit Kumar participated in the XXX Annual Group Meeting of AICRP on Vegetable Crops from 11-16 January, 2012 at GBPUA&T, Pantnagar.
- Dr. A.K. Singh participated in the Annual Workshop of DAC-ICARDA from 17-18 June, 2011 at New Delhi.
- Dr. R.S. Singh participated in the 8th International Safflower Conference from 19-23 January, 2012 at Hyderabad
- Dr. S.K. Varshney, Dr. Ravi Kant, Dr. S.K. Singh, Sri V.K. Choudhary and Sri R.K. Ranjan participated in the XXVI Annual Group Meet of AICRP-NSC (Crops) from 2-4 May, 2011 at CSKHPKV, Palampur.
- Dr. S.K. Varshney participated in the meeting of ICRISAT-BMZ/GTZ project from 15-16 December, 2011 at Patancheru, Hyderabad.
- Dr. L.M. Yadav participated in the 13th Agricultural Scientists & Farmers Congress from 19-20 February, 2011 at Allahabad.
- Dr. A.K. Choudhary, Dr. P.P. Singh and Mrs. Rita Kumari participated in the Conference on AROIDS: Opportunities and Challenges from 23-25 January, 2012 at Bhubaneswar.
- Dr. I.B. Pandey and Dr. Shankar Jha participated in the Conference on Organic farming in Bihar: Problems & Remedy on 18th August, 2011 at Patna.
- Dr. S.K. Singh participated in the Annual Workshop of AICSMIP from 23-25 April, 2011 at OUAT, Bhubaneswar.
- Dr. K.K. Sinha participated in the Group Meet on Mungbean and Urdbean from 11-13 May, 2011 at PAU, Ludhiana.
- Dr. D. Singh, Dr. S.B. Mishra, Dr. B. Kumar, Dr. R. Kumar and Dr. K.K. Sinha participated in the QRT Review Meeting of AICRP Programmes of Pulses from 13-15 April, 2011 at BAU, Ranchi.
- Dr. S.B. Mishra, Dr. B. Kumar, Dr. I. B. Pandey and Dr. R. Kumar participated in the Group Meeting of Pigeonpea from 31st May to 2nd June, 2011 at ANGRAU, Hyderabad.
- Dr. L.M. Yadav, Dr. B. Kumar, Dr. D.K. Diwedi and Mrs. Pramila participated in the 29th Group Meeting on Potato from 10-12 September, 2011 at IGKVV, Raipur.
- Dr. N.K. Singh, Dr. S.K. Tiwari and Dr. J.P. Singh participated in the Inception Meeting and Planning Workshop of the STRASA from 5-7 April, 2011 at NASS Complex, New Delhi.
- Dr. Amlendu Kumar participated in 94th Annual Conference of Indian Economic Association from 27-29 December, 2011 at BVDU, Pune.
- Dr. M. Kumar, Dr. A. Kumar and Sri D. Rai participated in the 54th AICRP Annual Maize Workshop from 02-04 April, 2011 at TNAU, Coimbatore.

- Dr. S.P. Singh and Dr. A.K. Mishra participated in the XXII National Workshop of AICRP on Spices from 18-19 June, 2011 at RAU, Jaipur (Rajasthan).
- Dr. A. Pandey, Sri D. Rai and Dr. R.S. Rai participated in the 18th Annual Group Meeting of Rapeseed & Mustard from 5-7 August, 2011 at AAU, Guwahati (Assam).
- Dr. D. Singh and Dr. S.B. Mishra participated in the Annual Group Meeting on Chickpea from 20-22 August, 2011 at UAS, Banglore.
- Dr. K.K. Sinha, Dr. A. Kumar and Dr. B. Kumar participated in the Annual Group Meeting of MULLaRP from 17-18 September, 2011 at SKRAU, Durgapura, Jaipur.
- Dr. A.K. Singh participated in the Annual Group Meeting on MULLaRP from 23-24 January, 2012 at IIPR, Kanpur.

13. PUBLICATIONS

13.1 RESEARCH PAPERS PUBLISHED

Ajit, Das, D. K., Chaturvedi, O. P., Jabeen, N. and Dhyani, S. K. (2011). Predictive models for dry weight estimation of above and below ground biomass components of *Populus deltoides* in India: Development and Comparative diagnosis. *Biomass and Bioenergy*, **35**: 1145-1152.

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Chaudhary, S. K., Singh, J.P. and Jha, S. (2011). Effect of integrated nitrogen management on yield, quality and nutrient uptake of rice under different dates of planting. *Indian Journal of Agronomy*, **56** (3): 228-231.

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Das, D. K., Chaturvedi, O. P., Jha, R.K. and Kumar, R. (2011). Yield, soil health and economics of aonla (*Emblica officinalis* Gaertn.)-based agri horticultural systems in eastern India. *Current Science*, **101**(6): 786-790.

Deo, S. (2011). Dyeing of silk with natural colouring material-Butea. *RAU Journal of Research*, **20** (1&2).

Deo, S. and Sarkar, S.R. (2012). Empowering women through innovative embroidery training. *Textile Trend*, **LIV** (12): 33-34.

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Kumar, V. and Kumar, M. (2012). Influences of temperature-time blanching on drying kinetics and quality attributes of yam chips. *International Agricultural Engineering Journal*, **21**(1): 31-39.

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Kumar, V., Pandey, A. K., Prasad, R. K. and Prasad, B. (2011). Long term influence of organic and inorganic sulphur and fertility levels on yields, distribution and build-up of sulphur under rice-wheat cropping system in calciorthents. *Journal of Indian Society of Soil Science,* 59: 278-282.

Kumar, V., Prasad, R.K., Suman, S.N. and Tiwari, S. (2011). Integrated nutrient management for better soil fertility and rice productivity. *Oryza,* 48(4): 335-338.

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Verma, R. Chourasia, S.K. and Jha, M.N. (2011).Population dynamic and identification of efficient strains of *Azospyrillum* in maize ecosystem of Bihar. *Biotech,* 1: 247-253.

13.2 RESEARCH PAPERS PRESENTED IN SEMINAR / SYMPOSIUM

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Choudhary, A.K. and Singh, P.P. (2012). Genetic diversity study in bunda (*Colocasia esculenta*). *In:* Global Conference on AROIDS: Opportunities and Challenges held at Bhubaneswar, January 23-25, 2012.

Choudhary, A.K., Singh, P.P. and Singh, A.K. (2012). Genetic variability, correlation and path analysis study in arvi (*Colocasia esculenta*). *In:* National Seminar on Climate change and Food Security Challenges and Opportunities for Tuber Crops (NSCFT 2011) held at Thiruvananthapuram, January 20-22, 2011.

Jha, C.K., Alam, M., Sinha, S.K. and Verma, K. (2011). Integrated effect of bio-methanated distillery effluent and bio-compost on soil properties, juice quality and yield of sugarcane in entisol. *In:* 4th IAPSIT International Sugar Conference held at New Delhi.

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Kumari, R., Singh, P.P. and Rai, R.C. (2012). Integrated management of diseases of elephant foot yam (*Amorphophallus paeoniifolius*). *In:* Global Conference on AROIDS: Opportunities and Challenges held at Regional Centre of CTCRI, Bhubaneswar, January 23-25, 2012.

Prasad, B., Singh, P.P., Singh, K.K. and Choudhary, A.K. (2012). Studies on intercropping spice crops in elephant foot yam. *In:* Global. Conference on AROIDS: Opportunities and Challenges held at Bhubaneswar, January 23-25, 2012.

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Rani, M., Dayaram, Patel, Y. and Singh, V.K. (2011). *Calocybe indica* can also be grown in North India on wheat straw. *In:* National Conference on Frontiers in Biological Sciences held at VVS Purvanchal University, Jaunpur, December 4-5, 2011.

Sahu, R.K. and Kumar, N. (2012). Evaluation of SCS-CN method and its modified versions for a small watershed of Jharkhand. *In:* 46th Annual Convention of ISAE and International Symposium on Grain Storage held at GBPUAT, Pantnagar, February 27-29, 2012.

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Suman, S., Rajak, K.K., Sharma, V.K. and Kumar, H. (2011). Isozyme studies in micro-propagated and *in vivo* plants of banana cultivars. *In:* National Conference on Frontiers in Biological Sciences held at VVS Purvanchal University, Jaunpur, December 4-5, 2011.

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Yadav, L.M. and Pramila (2011). Status of spices and medicinal crops in Bihar. *In:* International Seminar on Minor Fruits and Medicinal Plants for Health and Ecological Security held at BCKV, Kalyani (W.B), December 19-22, 2011.

13.3 BOOKS PUBLISHED

- Alam, M., Jha, C.K. and Sinha, S.K. (2012). Ikh mein Suchum Tatwo ka Mahatwa, Kami ke Lakchan evam Nidan. Pub., SRI, RAU, Pusa, 31p (Hindi).
- Kumar, S. (2011). GATE Digest in Agricultural Engineering, Kalyani Pub., New Delhi, 411p (English).
- Kumar, V., Pandey, I.B and Roy, D.K. (2011). Ghagh Bhaddari ki Krish Sambandhi Kahawaten- Vaigyanikon ki Najar Mein, Publication Division, RAU, Pusa, 74p (Hindi).
- Kumari, A. (2011). Phal & Sabji Parirakshan Digdarshika, New India Publishing Agency, Vikas Surya Plaza, New Delhi,110p (Hindi).
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- Shekhar, D., Kumar, Neeraj, Kumar, Rajesh, Singh, S.K. and Kumar, U. (2011). Agricultural Technology Module, Publication Division, RAU, Pusa, 432p (English).
- Singh, A.P., Kumar, Vipin and Singh, R. R. (2012). Adhunik Krishi men Mrida Prabandhan - Ek Awashyak Sanshadhan. Publication Division, RAU, Pusa, 176p (Hindi).
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13.4 TECHNICAL BULLETINS PUBLISHED

- झा, शंकर, पाण्डेयए आर०के०, सिंहए एस० पी०, सिंह, एम. पी. एवं मंडल, के० (2012). वर्मी कम्पोस्ट एवं जीवाणु खाद, राजेन्द्र कृषि विश्वविद्यालय, पूसा, 48 p.
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13.5 LEAFLETS PUBLISHED

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- Singh, P.P. (2012). Arvi kee unnat kheti. AICRP on Tuber Crops (other than Potato), 4 p (in Hindi).
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13.6 POPULAR ARTICLES PUBLISHED

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- Choudhary, K., Singh, S.K. and Kumar, V. (2011). Sukshma evam dwityik poshak tatwa prabandhan. Mrida swasthya parikshan evam urvarashakti prabandhan, *Prashikshan Margdarshika*: 9-15 (in Hindi).
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14. RESEARCH PROJECTS IN OPERATION

(A) All India Coordinated Research Projects

(Rs. in lakhs)

S.No.	Name of the Project	Name of P.I.	Place of Operation	Total Budget
1.	AICRP on Honey Bee	Dr. M.L. Agarwal	F. A. , Pusa	45.91
2.	AICRP on Medicinal & Aromatic Plants	Dr. P.K. Jha	-do-	22.39
3.	AICRP on Soil Test Crop Response	Dr. M. Kumar	-do-	83.96
4.	AICRP on MNS	Dr. M.P. Singh	-do-	78.12
5.	AICRP on Rice	Dr. N.K. Singh	-do-	49.80
6.	AICRP on Agroforestry	Dr. D.K. Das	-do-	44.67
7.	AICRP on Agrometeorology	Mr. A. Sattar	-do-	14.93
8.	AICRP on Water Management	Dr. V. Kumar	-do-	69.80
9.	AICRP on Tropical Fruits	Dr. P.K. Ray	-do-	109.95
10.	AICRP on Mushroom	Dr. Dayaram	-do-	19.98
11.	AICRP on Vegetable	Sri U. Kumar	-do-	01.96
12.	AICRP on Floriculture	Dr. A.K. Singh	-do-	06.51
13.	AICRP on Post Harvest Technology	Dr. M. Srivastava	F.A.E. Pusa.	27.95
14.	AICRP on FIM	Sri S. Chandra	-do-	24.38
15.	AICRP on Ground Water Utilization	Dr. S.K. Jain	-do-	30.87
16.	AINP on Biofertilizer	Dr. M.N. Jha	FBSH, Pusa	09.25
17.	AICRP on Sugarcane	Dr. M. Alam	SRI, Pusa	78.80
18.	AICRP on Oil Palm	Dr. S.K. Narain	RRS, Madhopur	31.54
19.	AICRP on Weed Control	Dr. Y. Singh	D.O.R. Pusa	41.39
20.	AICRP on Seed Technology	Dr. S.K.Varshney	TCA, Dholi	144.38
21.	AICRP on Maize	Dr. M.Kumar	-do-	99.03
22.	AICRP on MULLaRP	Dr. D. Singh	-do-	23.70
23.	AICRP on Chickpea	Dr. D. Singh	-do-	16.51
24.	AICRP on Pigeonpea	Dr. D. Singh	-do-	17.70
25.	AICRP on Small Millet	Dr. S.K. Singh	-do-	13.83
26.	AICRP on Tuber Crops	Dr. P.P. Singh	-do-	89.79
27.	AICRP on Potato	Dr. L.M.Yadav	-do-	53.07
28.	AICRP on Spices	Dr. S.P. Singh	-do-	19.15
29.	AICRP on Rapseed & Mustard	Dr. A. Pandey	-do-	67.06
30.	AICRP on Sunflower	Dr. A. Pandey	-do-	19.60
31.	AICRP on Oinon & Garlic	Sri U. Kumar	-do-	28.90
32.	AICRP on Breeder Seed Production	Dr. S.K.Varshney	DSF, Dholi	107.54

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Name of the Project	Name of P.I.	Place of Operation	Total Budget
AICRP on Honey Bee	Dr. M.L. Agarwal	F. A. , Pusa	45.91
AICRP on Medicinal & Aromatic Plants	Dr. P.K. Jha	-do-	22.39
AICRP on Soil Test Crop Response	Dr. M. Kumar	-do-	83.96
AICRP on MNS	Dr. M.P. Singh	-do-	78.12
AICRP on Rice	Dr. N.K. Singh	-do-	49.80
AICRP on Agroforestry	Dr. D.K. Das	-do-	44.67
AICRP on Agrometeorology	Mr. A. Sattar	-do-	14.93
AICRP on Water Management	Dr. V. Kumar	-do-	69.80
AICRP on Tropical Fruits	Dr. P.K. Ray	-do-	109.95
AICRP on Mushroom	Dr. Dayaram	-do-	19.98
AICRP on Vegetable	Sri U. Kumar	-do-	01.96
AICRP on Floriculture	Dr. A.K. Singh	-do-	06.51
AICRP on Post Harvest Technology	Dr. M. Srivastava	F.A.E. Pusa.	27.95
AICRP on FIM	Sri S. Chandra	-do-	24.38
AICRP on Ground Water Utilization	Dr. S.K. Jain	-do-	30.87
AINP on Biofertilizer	Dr. M.N. Jha	FBSH, Pusa	09.25
AICRP on Sugarcane	Dr. M. Alam	SRI, Pusa	78.80
AICRP on Oil Palm	Dr. S.K. Narain	RRS, Madhopur	31.54
AICRP on Weed Control	Dr. Y. Singh	D.O.R. Pusa	41.39
AICRP on Seed Technology	Dr. S.K.Varshney	TCA, Dholi	144.38
AICRP on Maize	Dr. M.Kumar	-do-	99.03
AICRP on MULLaRP	Dr. D. Singh	-do-	23.70
AICRP on Chickpea	Dr. D. Singh	-do-	16.51
AICRP on Pigeonpea	Dr. D. Singh	-do-	17.70
AICRP on Small Millet	Dr. S.K. Singh	-do-	13.83
AICRP on Tuber Crops	Dr. P.P. Singh	-do-	89.79
AICRP on Potato	Dr. L.M.Yadav	-do-	53.07
AICRP on Spices	Dr. S.P. Singh	-do-	19.15
AICRP on Rapseed & Mustard	Dr. A. Pandey	-do-	67.06
AICRP on Sunflower	Dr. A. Pandey	-do-	19.60
AICRP on Oinon & Garlic	Sri U. Kumar	-do-	28.90
AICRP on Breeder Seed Production	Dr. S.K.Varshney	DSF, Dholi	107.54

(B) Adhoc Research Projects **(Rs. in lakh)**

S. No.	Name of the Project	Name of P.I.	Place of Operation	Total Budget
1.	Effect of bio-methanated distillery effluent and bio compost on soil enzymatic activity	Dr. M. Alam	SRI, Pusa	4.80
2.	Evaluation of biofertilizer with bio compost and bio methanated distillery effluent in sugarcane crop	Dr. M. Alam	SRI, Pusa	5.28
3.	Nutrient management through biomethanated distillery effluent for enhancing sugarcane productivity and sustaining soil health in entisol of Bihar	Dr. M. Alam	SRI, Pusa	5.97
4.	Sugarcane development fund	Dr. M. Alam	SRI, Pusa	9.40
5.	Efficacy trials of customized fertilizer Nagarjuna fertilizer at RAU, Pusa (Funded by Nagarjun fertilizer chemicals)	Sri S.N. Suman	Soil Science	-
6.	Solubility of Zypmite and its utility as source of Sulphur (Funded by Paradeep Phosphate Pvt. Ltd.)	Dr. V. Kumar	Soil Science	-

(C) Foreign Aided Research Projects **(Rs. in lakh)**

S. No.	Name of the Project	Name of P.I.	Place of Operation	Total Budget
1.	IRRAS Project	Dr. S.B. Mishra	D.O.R. Pusa	13.67
2.	IFAD Funded Project	Dr. A.K. Singh	D.O.R. Pusa	03.46
3.	Submergence Rice Breeding	Dr. N.K. Singh	D.O.R. Pusa	01.12

(D) Government of India Research Projects

S. No.	Name of the Project	Name of P.I.	Place of Operation
1.	Precision farming development centre (PFDC)	Dr. R. Suresh	CAE, Pusa
2.	National horticulture mission (CSS, Spices)	Dr. S.P. Singh	TCA, Dholi
3.	Soil profile distribution thermodynamics and kinetics of micronutrient reaction in soil and integrated micronutrient recommendation for rice sugarcane, wheat cropping system in Bihar. Funded by SDF (Govt. of India)	Dr. M. Alam Dr. A.K. Singh	SRI, Pusa TCA, Dholi
4.	Enhancing lentil production for food nutritional security and improved rental livelihood. (DAC- ICARDA)	Dr. J. Prasad	Soil Science
5.	GPS-GIS based model soil fertility maps for selected districts for precise fertilizer recommendation to the farmers of India.		

8.	Forecasting agricultural output using space agrometerological and land waste observation fasal	Sri A. Sattar	ADR
9.	National initiative on climate resilient agriculture (NICRA, ICAR)	Sri A. Sattar	ADR
10.	Production evaluation and adoption of enriched vermicompost from locally available natural resources	Dr. R.K. Pandey	Soil Science

(E) Government of Bihar Research Projects

S. No.	Name of the Project	Name of P.I.	Place of Operation
1.	Soil testing compaign in kosi flood affected area	Dr. J. Prasad	Soil Science
2.	Level of aflatoxin in maize grown under different situation in Bihar and its control	Dr. U. Singh	Home Science
3.	National project on management of soil health fertility	Dr. J. Prasad	Soil Science

(F) Rastriya Krishi Vikas Yojna Projects

(Rs. in lakh)

S. No.	Name of Project	Name of P.I.	Place of Operation	Budget
1.	**(RKVY-01):** Promotion and adoption of insect sex-pheromones and bio-agents at farmers field for the management of major rice insect pest (stem borer and leaf folder) in Bihar	Dr. A. K. Misra University Professor	Dept. of Entomology, RAU, Pusa	33.62
2.	**(RKVY-02):** Development of golden rice for diverse agroecologies of Bihar	Dr. V. K. Sharma Associate Professor	Dept. of AB&MB, RAU, Pusa	143.86
3.	**(RKVY-03):** Production and popularization of bio-fertilizer for nutrient availability and crop production	Dr. R. K. Pandey University Professor	Dept. of Soil Science, RAU, Pusa	115.85
4.	**(RKVY-04):** Enhancement of heat tolerance in locally adapted wheat cultivars of Bihar	Dr. Rajeev Kumar Assistant Professor	Dept. of AB& MB, RAU, Pusa	115.81
5.	**(RKVY-05):** Development of aerobic rice for sustainable rice production in Bihar	Dr. Nilanjaya Assistant Professor	Dept. of PB&G, RAU, Pusa	120.00
6.	**(RKVY-06):** Protected cultivation of vegetable and flowers in Bihar	Dr. A. K. Singh, Assistant Professor	Dept. of Horticulture, RAU, Pusa	528.92

DBT India abiotic stress tolerant 2010-15 rice varieties with major QTLS for draught submergence and salt tolerance	Dr. R. Kumar	Director Research
Agrometerological advisory services	Sri A. Sattar	ADR
Forecasting agricultural output using space agrometerological and land waste observation fasal	Sri A. Sattar	ADR
National initiative on climate resilient agriculture (NICRA, ICAR)	Sri A. Sattar	ADR
Production evaluation and adoption of enriched vermicompost from locally available natural resources	Dr. R.K. Pandey	Soil Science

Government of Bihar Research Projects

Name of the Project	Name of P.I.	Place of Operation
Soil testing compaign in kosi flood affected area	Dr. J. Prasad	Soil Science
Level of aflatoxin in maize grown under different situation in Bihar and its control	Dr. U. Singh	Home Science
National project on management of soil health fertility	Dr. J. Prasad	Soil Science

7.	**(RKVY-07):** Farm machine bank	Er. Subhash Chandra Assistant Professor	Dept. of CAE, RAU, Pusa	107.00
8.	**(RKVY-08):**Vermicompost production	Dr. Shankar Jha Assistant Professor	Dept. of Soil Science, RAU, Pusa	155.00
9.	**(RKVY-09):** Mushroom production technology	Dr. Dayaram Associate Professor	Dept. of Microbiology, RAU, Pusa	69.05
10.	**(RKVY-10):** Strengthening of seed production programme	Dr. N. K. Singh Chairman	Dept. of PB&G, RAU, Pusa	1500.00
11.	**(RKVY-11):** Mechanization of KVK's scheme	Er. Subhash Chandra Assistant Professor	Dept. of CAE, RAU, Pusa	74.00
12.	**(RKVY-12):** Evaluation of mukhya mantri tibra bej vistar & beej gram yojana	Dr. R. N. Yadav University Professor	Dept. of Agril. Economics, RAU, Pusa	10.35

(G) NAIP Research Projects

S. No.	Name of Project	Name of P.I./CO-PI/CCPI
1.	**NAIP (Samastipur):** Sustainable Livelihood Improvement through Need Based Integrated Farming System Models in Disadvantaged District of Bihar.	Dr. K.N. Padhak University Professor(Nematology), RAU, Pusa & Co-PI
2.	**NAIP (Muz. & Sheo.):** Improving Livelihood Security in Salt-affected Watersheds of Muzaffarpur and Sheohar Districts of Bihar.	Dr. S S. Prasad, Assistant Professor (Soil Science), TCA, Dholi & CPI
3.	**NAIP (Comp.-IV), BVC, Patna:** Understanding the mechanism of variation in status of a few nutritionally important micronutrients in some important food crops and the mechanism of micronutrient enrichment in plant parts.	Dr.Pramod Kumar, Assistant Professor, BVC, Patna & CCPI.
4.	**NAIP (Comp.-IV), RAU, Pusa:** Understanding the mechanism of variation in status of a few nutritionally important micronutrients in some important food crops and the mechanism of micronutrient enrichment in plant parts.	Dr. Vipin Kumar Assistant Professor(Soil Science), RAU, Pusa & CCPI

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