

Dr. Rajendra Prasad Central Agricultural University
Samastipur (Bihar)-848125



Annual Report

2017-18

Foreword from the Vice-Chancellor

It is my proud privilege to present the highlights of the overall activities & salient achievements of the University in the abridged form of the second Annual Report for the year 2017-18 with detailed report uploaded on website of university. The university is marching ahead with a mission to become an outstanding institution in teaching, research and extension in various disciplines of Agriculture and Allied branches by creating a sound, intellectual and hard working manpower in sectors at par with the national/ international institutes; for educational, social, economical and environmental up gradation of the target area and population. We are providing higher education in 05 disciplines of Under-Graduate Programme implementing 5th Dean's Committee Report, in 19 disciplines of PG Programme and in 09 disciplines of Ph.D. Programme. During the year 2017-18, a total no. of 282 students were admitted in various UG, PG and Ph. D courses of the University. The university has initiated the up-gradation of hostel facilities, revival of placement unit, up-gradation and automation of library facilities. The University has 37 AICRPs, 4 foreign project, 15 ad-hoc projects, 17 Government of Bihar projects, 29 university projects and 7 projects of other agencies to develop crop varieties and technology to meet the requirement of farmers of different socio-economic groups under different agro-ecological conditions of Bihar

The University has constituted its executive body such as Board of Management, Research Council, Extension Education Council, Academic Council, Finance Committee and Board of Studies of different colleges as per requirement of a Central Agricultural University.

Besides a high power committee has been constituted by DARE for restructuring and rationalizing of staff structure and also set a bench mark for an ideal central Agricultural University.

Mere expression of thanks can't compensate the wonderful unflinching support and guidance rendered by Hon'ble President of India, His Excellency Shri Ramnath Kovind Ji, Visitor of the University, Prof. P. K. Mishra, Hon'ble Chancellor of the University and Shri Radha Mohan Singh Ji, Hon'ble Minister of Agriculture and Farmers' Welfare, Government of India for benefits of the University. I am also highly thankful to Dr. T. Mohapatra, Secretary, DARE, Ministry of Agriculture & Farmers' Welfare, Government of India for his encouragement and support.

I compliment all Deans, Directors, Registrar, Deans, Head of departments, PIs of projects, PCs of KVKs, Scientists and other administrative, technical and supporting staffs of the University and others for providing valuable information for the report.

R. C. Srivastava
Vice-Chancellor

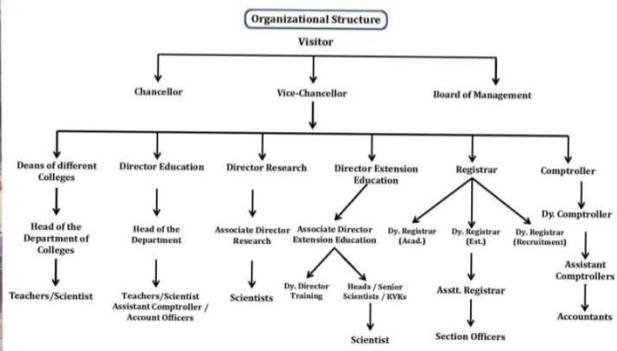
Executive Summary

Dr. Rajendra Prasad Central Agricultural University, Pusa was established on 7th October 2016 after conversion of erstwhile Rajendra Agricultural University, Bihar, Pusa into a Central Agricultural University by the Official Gazette notification of the Government of India to provide the establishment and incorporation of a university for the development of agriculture and also for the advancement of learning, pursuit of research in agriculture and allied sciences and declared it to be an institution of national importance. The jurisdiction and responsibility of the University with respect to teaching, research and programmes of extension education at the university level, in the field of agriculture and allied subjects is extended to the whole country with special reference to the State of Bihar.

The university is conducting under-graduate Programme in 05 disciplines, PG Programme in 19 disciplines and Ph.D. Programme in 09 disciplines in agriculture and allied fields. During the year 2017-18, a total no. of 282 students were admitted in various UG, PG and Ph. D programme of the University. The University has fully implemented 5th Deans committee Report in the UG programme. The university has initiated the up-gradation of hostel facilities, revival of placement unit having soft skill and wage employment development and up-gradation and automation of library facilities. The University had 37 AICRPs, 4 foreign project, 15 ad-hoc projects, 17 Government of Bihar projects, 29 university projects and 7 projects of other agencies.

During the year, the university has developed the variety of Sugarcane Rajendra Ganna-1, Pigeon Pea (Rajendra Arhar-1), Rajendra Wheat -1, Aerobic Rice (Rajendra Nilam), Foxtail (Small Millet)-Rajendra Kauni-1, Coriander entry RD 385 named as Rajendra Dhania-1 and recommended for release by the Research Council Meeting of the University.

The university is also making all efforts to develop technology as per the need of small and marginal farmers and to address the problems of challenged ecology. Development of drum based irrigation system (Laghu Sinchai Yantra) for marginal farmers, design and manufacturing of Soil turner, development of Women-friendly Maize Sheller, development of technologies compatible to socio-economic condition of small and marginal farmers *viz.* Mushroom, Solar refrigerated cart (Matsyabandhu), Cross bred goat, village level processing unit of Honey, Gur, Dal and Spices, etc. are some of the important mile stones during the year towards enhancing the economy of farming community. The scientists of the university earned 41 awards at National/ International level during the year 2017-18.



About the University

Dr. Rajendra Prasad Central Agricultural University came into existence on 7th October, 2016 after conversion of Rajendra Agriculture University, Bihar, Pusa established on 3rd December, 1970. It is named after the most illustrious son of the soil, Bharat Ratna Dr. Rajendra Prasad. The jurisdiction and responsibility of the University with respect to teaching, research and programmes of extension education at the university level, in the field of agriculture and allied subjects is extended to the whole country with special reference to the State of Bihar.

BACKGROUND INFORMATION

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The university has presently six faculties, five constituent colleges, seven research institutes/ stations and fourteen Krishi Vigyan Kendras (Twelve with the university and two with NGOs) to fulfil the teaching, research and extension requirements in respect of agriculture, horticulture, veterinary and allied branches of agriculture. DRPCAUI is committed to provide decent livelihood to youth from agriculture and is poised to lay more emphasis on finding better ways and means to improve wellbeing of people dependent on agriculture and allied sectors for their livelihood. The endeavours of the University 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 standard.

The university is moving forward with a mission to become an outstanding institution for teaching, research and extension in all disciplines of Agriculture and Allied branches that serves the farming community of the state and country. The vision of the University is to improve the quality of education, research and extension by creating a skilled and hardworking manpower in agriculture and allied fields at par with the global level; to provide to improve the nutritional standard and quality of life of the people of Bihar through the promotion of sustainable development in agriculture sector and to provide an integrated outreach to meet the agricultural

needs of the state and to act as a link between the university scientists and farming community as well as allied industries.

LOCATION

The headquarters of the university is situated in Samastipur district of Bihar on the western and southern bank of river Burhi Gandak lying around 25°58'54" N latitude and 85°40'25" E longitude. 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 mid-June to mid-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 23.70C and minimum from 8.7 to 8.80C. Rise in temperature takes places at slow pace from February and picks-up from March and reaches the climax some time during May-June

HISTORICAL PERSPECTIVE

In the Imperial Gazetteer of India 1878, Pusa has been recorded as a government estate of about 1350 acres in then Darbhanga district. It was acquired by East India Company for running a stud farm to supply improved breed of horses mainly for the army, but it did not succeed. However, the real foundation of agricultural development, research and education in the country was laid upon here during the dawn of last century. Improving the agricultural production in India was then a concern of the East India Company. They could foresee, in this region, a bright prospect in boosting the company's revenue by raising the agricultural output in the country as the region is endowed with abundant sunshine, inherently fertile soil and favourable climate capable of producing a variety of crops round the year.

Taking this into consideration, 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 1st 1904.

The Foundation stone of the proposed Institute was laid on April 1st 1905. 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. The grand edifice “Phipps Laboratory” named after its donor Mr. Henry Phipps of USA came up by 1907. 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.

The great earthquake in January, 1934 in Bihar ravaged the region around Pusa 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 more popularly as ‘Pusa Institute’. Bihar was forced to by destiny lose 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 retained a portion of it to serve as Regional Station of its main institute at New Delhi due to its agro-climatic specificity.

The erstwhile Rajendra Agricultural University was established on December 3rd 1970 and started functioning from Bihar Veterinary College Campus at Patna. 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 and in the same year Faculty of Basic Sciences & Humanities was added to Rajendra Agricultural University. 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 domain 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 University was again bifurcated on 5th August 2010 and a new agricultural University, Bihar Agricultural University, Sabour (Bhagalpur) was created.

Mission :

- Promote experiential high quality learning environment and creation of integrated approach that develops an appreciation and understanding of the socio-economic and environmental significance of soil-plant-animal-people interface.
- Shaping agricultural stakeholders into self sustaining mode through innovative centric education, cutting edge research, entrepreneurship/ start up skill development and dissemination of appropriate agricultural technology.
- Nurture national/ global needs of sustainable food production through advance interventions of research and development.
- Making Eastern India agriculture climate resilient and mitigating pressure on agricultural land through higher productivity.

Vision: Augmenting/Advancing professional competency for pursuing excellence in agriculture and allied education, research and entrepreneurship with ethical values to meet the Regional National and Global needs and offering specialized services to the farmers for decent livelihood.

Mandate:

- To impart education in different branches of agriculture and allied fields
- To undertake basic, strategic and applied research for developing technologies to enhance productivity and quality of agricultural and animal produce.
- To disseminate scientific information to farmers.
- To 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

Objectives:

- (i) To impart education in different branches of agriculture and allied sciences as it may deem fit.
- (ii) To further the advancement of learning and conducting of research in agricultural and allied sciences.
- (iii) To undertake programmes of extension education in the country with particular attention to the State of Bihar.
- (iv) To promote partnership and linkages with national and international educational institutions.

- (v) To undertake such other activities as it may, from time to time, determine.
- (vi) To thrive for quality of education in agriculture and allied sciences and quality of livelihood for farming community.

Thrust areas:

- I. **Doubling Farmers' Income:** Integrated Farming System for Banana Growers; Low Cost Animal Feed for Livestock and Fish producer; Establishment of Integrated Bee Development centre.
- II. **Har Khet Ko Pani:** Solar Energy powered floating pump system for Dhab Area; Solar Energy powered portable pump system for Tal and Diara Area; Drum Based Irrigation System for sub-marginal Vegetable farmers of Diara Area.
- III. **Soil Health Management:** Soil Health Management in Maize Based Cropping sequence; Crop rotation planning in Tal and Diara region for soil health management; Soil health conservation through direct seeded rice cultivation.
- IV. **Enhancing Pulse Production:** Pulse seed production through farmer's cooperation; Inter cropping of pulse crop in Rabi and summer maize; Intensification of pulse production research under rice– fallow system
- V. **More Crop per drop:** Evaluation of irrigation system based on underground pipelines; Research on micro-irrigation system in sugarcane and pulse crops; Automation techniques for irrigation.

Executive Body:

- (a) Board of Management:
- (b) Research Council
- (c) Extension Education Council
- (d) Academic Council
- (e) Senior level officers committee

University Administration:

Visitor:	Shri Ramnath Kovind, Hon'ble President of India
Chancellor:	Prof. P. K. Mishra
Vice Chancellor:	Dr. Ramesh Chandra Srivastava
Registrar:	Dr. Ravinadan
Director Research:	Dr. Mithilesh Kumar
Director Extension :	Dr K. M. Singh
Director Education:	Dr. M. N. Jha

Deans of the Colleges:

Dr. S.K. Varshney	Dean , PG College of Agriculture, RPCAU, Pusa, Samastipur
Dr. Harsh Kumar	Dean, College of Basic Sciences & Humanities, RPCAU, Pusa, Samastipur
Dr. (Mrs.) Meera Singh	Dean, College of Community Science RPCAU, Pusa, Samastipur
Dr. K.M. Singh	Director, School of Agribusiness & Rural Management, RPCAU, Pusa, Samastipur
Dr. L.M. Yadav	Dean, Pt. DDU College of Horticulture & Forestry (Pipra Kothi, Motihari), RPCAU, Pusa, Samastipur
Dr. R.S. Verma	Dean, College of Agricultural Engineering, RPCAU, Pusa, Samastipur
Dr. S.C. Rai	Dean, College of Fisheries (Dholi), RPCAU, Pusa, Samastipur
Dr. Devendra Prasad	Dean, Tirhut College of Agriculture, Dholi, RPCAU, Pusa, Samastipur

Director Students Welfare : Dr. A. K. Mishra

Director Planning : Dr. (Mrs.) Arti Sinha

Comptroller : Mr. Radha Krishna Prasad

Salient Achievements:

Education

The university is imparting education in 05 disciplines of under-graduate Programme, 19 disciplines of PG Programme and in 09 disciplines of Ph.D. Programme of agriculture and allied fields. The students are admitted through ICAR admission test conducted for UG, PG and Ph. D programme on all India. The University is making every effort to improve the quality of education and has fully implemented 5th Deans committee Report in the UG programme. The university has initiated the up-gradation of hostel facilities, revival of placement unit having soft skill and wage employment development and up-gradation and automation of library facilities. During the year 2017-18, total 165 students (100 percent of intake capacity) were admitted in various UG programme, 99 students (81% of intake capacity) in PG programme and 18 students (67% of intake capacity) in Ph. D. programme, where as student retention was 79% in UG programme, 75% in PG programme and 37% in Ph. D. programme. During the year 2017-18, degree were awarded to 90 students in UG programme, 52 students in PG programme and 8 students in Ph. D. programme. Ten students of UG/ PG programme have successfully qualified JRF/ SRF/ GATE and 90 percent students of MBA Agri-business programme were placed in various firms through campus placement.

Student intake in U.G., P.G. and Ph. D. degree Programme at a glance

Name of programme	Intake capacity	Admitted		Retention		Passed out
UG	165	165	(100%))	130	(79%))	90
PG	122	99	(81%)	91	(75%))	52
Ph.D.	27	18	(67%)	10	(37%))	08

Research

The university is making every effort to develop technology and varieties of different crops suitable for different agro-ecological condition as per need of farmers belonging to different socio-economic group through different research projects. In the Year 2017-18, the University had

37 AICRPs, 4 foreign project, 15 ad-hoc projects, 17 Government of Bihar projects, 29 university projects and 7 projects of other agencies

Research project in the University at a glance

Sl. No.	Name of funding agency/project	No. of projects
1	All India Coordinated Research Projects	37
2	Foreign aided projects	04
3	Ad-hoc Research projects	15
4	Govt. of Bihar projects	17
5	University projects	29
6	Other agencies	7

Crop Improvement Programme :

The university has been pioneer in crop improvement programme especially in rice, maize, oilseed and pulses and developed a large number high yielding crop variety suitable for different agro-ecological conditions of Bihar. During the year 2017-18, a total of 2561 germplasms have been maintained. Besides about 1440 new entries have been added in the gene pool of the university. During reporting period total 453 q of breeder seed were produced which reflect the inclination of University in crop improvement in the region.

Crop Varieties Developed :

Crop varieties viz. Sugarcane Rajendra Ganna-1, Pigeon Pea (Rajendra Arhar-1), Rajendra Wheat -1, Aerobic Rice (Rajendra Nilam), Foxtail (Small Millet)-Rajendra Kauni-1, Coriander entry RD 385 named as Rajendra Dhania-1 were developed and recommended for release by the Research Council Meeting of the University.



Fig.: Field Visit of Hon'ble Vice-Chancellor



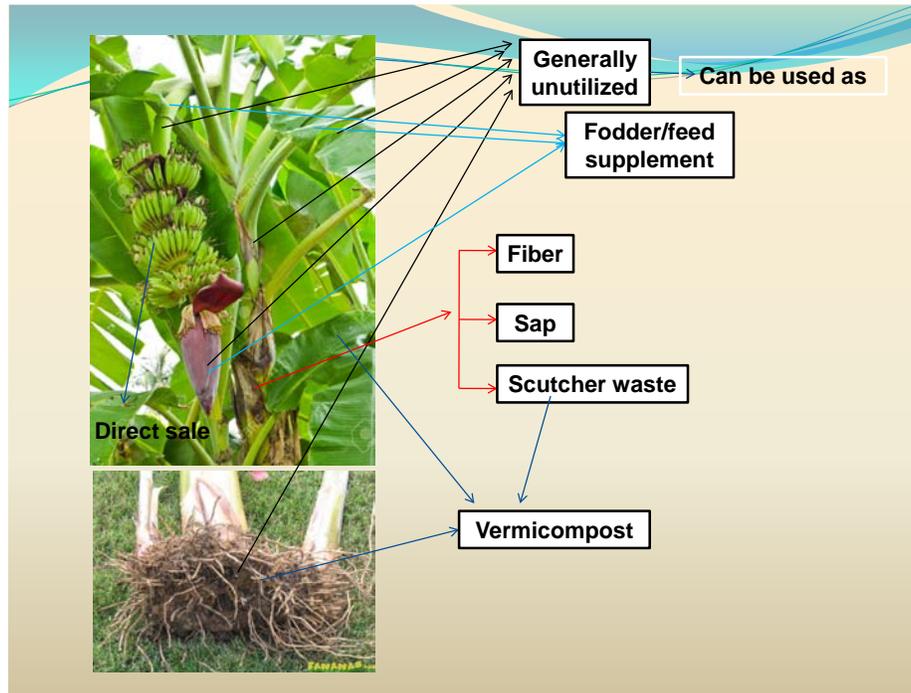
Field view of state varietal trial Wheat and Sugarcane

Research Initiative:

Development of Self Reliant banana Farming Module:

Banana being a major fruit crop of the state, project has been undertaken by the university from its own resources to develop a self-reliant banana farming module. The objectives of the project are

to standardize the processes for extraction of fibre, pulp and sap from the pseudo-stem, explore the possibilities of using



different parts of the crop as cattle feed and to exhibit the impact of modern irrigation methods on banana production. This project may show a path to the banana growers for a self-reliant and self-sustainable banana farming system and help in developing entrepreneurs in the agriculture sector.

***Dhab* land development programme**

The university campus comprises of more than 250 acres of *dhab* land along the river *Burhi Gandak*. More than 80 per cent of this land is not being utilized for any purpose. Programme is being developed to bring this land under cultivation. Accordingly, infrastructure is being developed. The successful cropping systems may prove boon to the resource deprived farming community of *dhab/ diara* lands of the state which is spread over 1.5 million hectares.



Crop in *Dhab* land

Solar Tree for Irrigation:

In the areas like *diara* lands where electric lines could not be laid due to frequent floods and farmers are forced to adopt the costly alternative of dies pumping systems for irrigation to their fields. The light textured soil and undulating topography of these lands require frequent watering. The Solar Trees which are considered safer from the intensional damage to the panels and offer about 20% higher efficiency are being tried as an alternative to the diesel pumps. The submersible pumps which can be operated through this system further enhance the efficiency of pumping and irrigation. It also provides favorable environment for the use of pressurized irrigation systems which are considered to be the best alternative under the prevailing situations of the area. All together eight solar trees are also operating in the University which take care irrigation facilities of *dhab* area and electricity supply for *street* light. Arrangement of Rooftop Solar Power System of over 400kWp Capacity on various buildings of the university is another step towards green energy concept.



Solar Tree for Irrigation

Laghu Sinchai Yantra

This drum based irrigation system has been developed for the marginal farmers involved in vegetable cultivation in diara lands where water is available near their fields but they cannot afford a pumping system. With the help of this portable irrigation system they can carry about 200 litres of water to their field and then apply it to the crops with the help of microirrigation system.



Laghu Sinchai Yantra

Major highlights of research programmes

On the basis of experimental findings it can be recommended that vine treatment with chlorpyrifos @ 0.02 %, earthing up along with fertilizer application, two spraying of chlorpyrifos @ 0.02 % at 30 & 60 DAP followed by two spraying of Nanma (5%) at 45 & 75 DAP has been found effective in minimizing vine infestation (7.3%),tuber infestation (5.4%), with

highest marketable tuber yield (20.1 t/ha) along with maximum net profit (Rs 50800 /ha) with B:C ratio of 2.29 has been recommended.

- ❖ On the basis of eight years of experimentation it was concluded that for managing Panama wilt disease of banana, use of disease free suckers after dipping in 0.2% Carbendazim for 45 minutes followed by soil drenching (0.2%) @2-3 litres /plant at 0, 2 and 4 MAP and Carbendazim injection @ 3ml of 2% solution at 3rd, 5th and 7th, months after planting may be recommended for adoption by farmers. However, bio-control agents i.e. *Trichoderma viride* (@ 10g/sucker three times)used as soil application also found highly effective and causes marked suppression of Panama wilt may be used as an option of chemical management of diseases in organic system of farming.
- ❖ Irrigation should be applied at 10 % moisture depletion of field capacity along with 3 foliar application of 1 % FeSO₄ at tillering, pre-flowering and flowering stages under aerobic condition of rice.
- ❖ On the basis of three years pooled data, it is concluded that mulching with either sugarcane trash or maize-stubble @ 10t/ha significantly improved the grain yield and WUE of *kharif* and *rabi* maize and benefit cost ratio of the system as compared to no-mulch. Irrigation with IW/CPE ratio of 0.8 in *rabi*-maize was found the best and for *kharif*-maize there is no need of irrigation if frequent and sufficient rainfall occurs.
- ❖ GPS based soil sampling and analysis has been completed for Saharsha (2874 soil samples) district. The soil samples were analysed for available nutrient contents along with other chemical properties like pH, EC, OC. The extent of micronutrient in Saharsha district followed the following sequence Zn (55.1%), Cu (9.2%), Fe (14.9%) and Mn (12.5%). The recommended doses of deficient elements should be applied for getting higher crop yields in the GPS based locations
- ❖ Addition of locally available seasonal fruit in the diet of school going children can increase the appreciable amount of micro-nutrients required for the regulation of macro-nutrients.
- ❖ By using plastic mulch with fertigation (100 % of RDF) in potato crop the tuber yield can be significantly increased (33.56 %) as compared to traditional method with benefit cost ratio 2.53.
- ❖ Higher plant population (33%) and 100% NPK + S + Micronutrient + 25% higher NPK were found ideal for enhancing the productivity and profitability of sunflower under North Bihar conditions
- ❖ Sunflower variety DRSH-1 (a high yielding variety of sunflower) farmers practice with conventional and ICM, it was concluded that ICM showed nearly 36.83% of yield advantage over

farmers practice. ICM also delivered net return of Rs. 32359/ha and 1.65 B:C ratio in comparison to net return of Rs. 19302/ha and 0.94 B:C ratio of farmers practice.

- ❖ Six germplasm ICCV 5003, ICCV 14449, BG 372, JG 315, Pusa 256 and C235 were found to be resistant consistently for three years and these breeding lines/germplasm can be helpful in the improvement of breeding efforts to developed wilt disease resistant variety
- ❖ . The highest total Onion bulb yield 263.86 q/ha in protected plot and 243.16q/ha in unprotected plot was recorded when crop was planted on 15th Dec. and this date is recommended for commercial cultivation of onion in Bihar
- ❖ The planting distance of 45 cm and row spacing of 90 cm is advisable for obtaining higher net profit from bud chip raised settlings of sugarcane.
- ❖ Among the new planting materials tested, the highest net benefit: cost ratio from plant crop of sugarcane was obtained with three budded setts, which was followed by bud chip raised settlings. 125 % recommended dose of nitrogen was most economical among the nitrogen levels.
- ❖ For realizing higher productivity and profitability from waterlogged conditions, trench method of sugarcane planting should be adopted. Variety CoP 2061, BO 137 and BO 154 are suitable for cultivation under waterlogged conditions.
- ❖ Variety BO 153 and BO 130 are suitable for cultivation under upland rainfed situations. Among fertility levels, application of 75% recommended dose of fertilizer (112.5-63.8-45.0 kg N-P₂O₅-K₂O/ha) was found adequate for higher productivity and monetary returns under upland rainfed conditions.
- ❖ **Ready reckoner for fertilizer recommendations has been developed.**
- ❖ **Pipe method of compost production was found superior to long method of composting in terms of yield, time and labour expenses.**
- ❖ The pre emergence application of Pendimithline @ 1.0 kg/ha followed by two hand weeding at 30 and 60 DAP recorded the highest marigold flower yield and fetched the highest net return (Rs. 5.58 lakh / ha) and benefit: cost ratio (5.5). It is recommended for production of good size of flowers and higher yield of marigold in Bihar.
- ❖ Early sowing of wheat helps in escaping heat load during flowering to maturity period of the crop. Critical weather thresholds identified at different phenophases of wheat for enhanced crop yield are being utilized in developing wheat crop-weather calendar for operational purposes.

CROP RESEARCH

RICE

IVT-E (DS) : In IVT-E (DS) entries CR 3848-2-1-1-2 (3750 kg/ha.), CB 13 805 (3417 kg/ha.) and IR 95812-CR3948-1-2-1-2 (3417 kg/ha.) were significantly superior over national check Shabhazi Dhan (2417 kg/ha.) and local check Rajendra Bhagwati (1917 kg/ha.).

IVT-DW: In IVT-DW entries NDGR-939 (2385 kg/ha.), NDGR-1529 (2385 kg/ha.) and CR 2687-3-3-1-1-3 (2154 kg/ha.) were significantly superior over national check Jalmagna (1846 kg/ha.) and local check Sudha (1692 kg/ha.).

IVT-MS: In IVT-MS entries WGL-821 (4063 kg/ha.) and NLR 3350 (3750 kg/ha.) were significantly superior over national check WGL-14 (2396 kg/ha.) and local check BPT5204 (2292 kg/ha.).

IVT-NPT: In IVT-NPT entries CR 3561-3-2-1-1-1-1 (5556 kg/ha.) and GNV-13-01 (4583 kg/ha.) were significantly superior over national check Jaya (3472 kg/ha.) and local check R.Mahsuri-1 (3472 kg/ha.).

AVT1 NIL-SUB : In AVT-1 NIL-SUB entry RP 5941-29-2-1-1-B (2339 kg/ha.) was significantly superior over recurrent check RP-CO43 (1988 kg/ha.) and donor check IR81896-B-B-195 (2462 kg/ha.).

One genotype **Rajendra Saraswati** has been recommended by Pre-Variety Release Committee for presentation in 4th Research Council.

AGRONOMY

Nitrogen Varietal Trial (AVT-2-ASG): Incremental doses of nitrogen significantly influenced the grain yield of ASG rice up to 120kg N/ha. Test entries IET 24621 out yielded all the test entries including national and local check. The per cent increase in grain yield was 49 and 38 under 120 and 180kg N/ha over 60kg N/ha.

Nitrogen Varietal Trial (AVT-2-Late): Local check (R.Mahsuri1) out yielded all the test entries including national check. Significant response to varying levels of N was observed up to 120kg N/ha, though improvement in yield was recorded up to 180kg N/ha. The per cent increase in grain yield was of 47 and 54 under 120 and 180kg N/ha over 60kg N/ha.

Evaluation of weed management practices in different rice establishment methods. : Weeds are one of the major constraints to DSR cultivation as dry tillage favours weed growth. Extent of yield reduction was 17.5% in transplanting, 21% in wet DSR and 81.6% in dry DSR as compared

to the treatment pre-emergence herbicides followed by two hand weeding. Among the herbicide interventions aimed at excluding the drudgery of hand weeding, application of two post-emergence herbicides (Pyrozosulfuron@25gai/ha 15DAS and Bispyribac sodium@30gai/ha 30DAS) proved next best alternative.

PLANT PATHOLOGY

To observe the intensity of prevailing disease status & new disease emergence: Date of sowing had marked effect on the development of Brown Spot disease of rice. Sugandha (Susceptible variety) was sequentially sown on three dates- early (D/S- 10.06.2016, D/T- 05.07.2016), normal (D/S-01.07.2016, D/T-30.07.2016) and late (D/S-01.08.2016, D/T- 17.08.2016). Brown spot disease severity recorded moderately (45.5%) in normal sown crop. Whereas disease severity was severe (70%) in late sown crop. R. Bhagwati (moderately resistant) was sequentially sown on three dates – early (D/S-10.06.2016, D/T- 05.07.2016), normal (D/S- 01.07.2016, D/T-30.07.2016) and late (D/S- 01.08.2016, D/T-17.08.2016). Brown spot disease severity recorded moderately (30.5%) in normal sown crop. Whereas it was severe (52.5%) in late sown crop.

ENTOMOLOGY

Multiple Resistant Screening Trial (MRST) :-The trial constituted with 25 entries included 4 promising entries of last year trial. Out of 25 entries only four entries viz Co50, Bahadur, Varalu and KNM 113 were identified as promising entries against stem borer with 0.81 to 3.64 percent white ear damage.

Insecticide Evaluation Trial (IET) :-Insecticide evaluation trial was carried out to evaluate the efficacy of the newer insecticide combination products viz, Spinetoram plus methoxy fenozide compared to other newer and recommended insecticides against stem borer and leaf folder. Stem borer infestation was moderate and recorded 5 to 31.3 % DH at vegetative stage. The performance of spinetoram (6%W/v) plusmethoxyfenozide 30% W/V (28.3% w/w) SC was found (6%W/V) superior over all the insecticides recorded 1.1%white ear damage with maximum 6020 Kg grain yield followed by Acephate (95%) with 5.9%WE (5680 Kg grain yield).

Botanical Insecticides Evaluation Trial (BIET) :- Five botanical insecticide viz. Neem Baan 1.0% EC @ 1000 ml/ha, Neemazal 1.0% EC@ 1000ml/ha, Nimbecidine 0.03% EC @ 2500 ml/ha, Multineem 0.03% EC @ 2500ml/ha and Neem oil @ 2500 ml/ha were compared with commonly

recommended insecticide –Dinotefuran 20 SG @ 40g a.i. /ha and Rynaxypyr 20 SC @ 30 g.a.i. /ha along with untreated control (only water spray).

Stem borer infestation during vegetative stage ranged from 4.06% over control (10.50%). White ear (WE) at heading stage recorded minimum incidence 4.09% and maximum grain yield (52.56 kg /ha) in dinotefuran with maximum damage 12.03% in Azadirachtin (neem ban) in comparison to 9.24% in control.

Effect of Planting dates on insect pest incidence (EPDP) :-The most popular variety Rajendra Mansuri was planted at three dates viz; normal planting as per recommends package of practices, 15 days earlier to normal planting (early planting) and 15 days later than normal planning (late planting). Moderate incidence of dead hearts (13.73-205) and white ears (14.79-17.79%) were recorded in different planting. Low incidence of leaf folder (1.49-6.85) was observed in all the plantings of Rajendra Mansuri variety grown in this trial.

SOIL SCIENCE

Nutrient use efficiency and soil productivity in early and late sown rice/transplanted rice:

The productivity was significantly influenced by the time of crop establishment with normal sowing in Kharif recording highest grain yields. The nutrient management practice of 150% RDF + Zn with N in 3 splits (1/3 +1/3 +1/3 or 1/2 + 1/4 +1/4) performed better over others in terms of rice productivity. Nutrient uptake was higher under early/normal planting over late planting by 30 days.

Monitoring soil quality and crop productivity under emerging rice production Systems: The study indicated consistently superior performance of transplanted rice over DSR and aerobic rice. In case of nutrient management practices, maximum yields were obtained with RDF+50% NPK through organic sources. Nutrient uptake was also higher in transplanted rice followed by DSR and soil available nutrients were high in the plots that received organic manures either alone or in combination with chemical fertilizers.

Efficiency of Neem Coated Urea (NCU) in irrigated rice eco-system : The results indicated the superiority of 125% recommended N given in the form of Neem Coated Urea (NCU) in 3 split applications that resulted in significantly higher grain yields over 100% NCU and 100% Prilled urea (PU). This hike in yields with this treatment could be attributed to the increased yield parameters such as panicle number and grains per panicle. Similar trend was observed with regard to nitrogen use efficiency and soil properties.

BORO RICE

IVT-BORO.: Out of 47 entries only 32 entries survived in cold screening nursery of IVT-BORO. Among the survived entries entry 4004 (5476 kg/ha.) was significantly superior over national check Gautam (4071 kg/ha.) and local check Rajendra Bhagwati (4881 kg/ha). However entry no.4043 (5238 kg/ha) and entry no.4020 (5119 kg/ha) were at par to check R. Bhagwati.

UVT-BORO.: Among 34 entries only one entry RAU 1417-11-1-74-3-2 (4047.7 kg/ha) was significantly superior over local checks Gautam (3928.6 kg/ha) and Rajendra Bhagwati (3809.6 kg/ha).

PIGEONPEA

PLANT BREEDING

(a)Evaluation of pigeon pea genotypes under late sown condition (CO).: Three entries viz, NDA 14-22 (1697 kg/ha), KA 13-05 (1574 kg/ha) and DA 15-1 (1250 kg/ha) have shown the significant superiority over the best check NDA-2 (1034 kg/ha) and Bahar (1018 kg/ha). DA 15-2 got promoted in AVT-1 based on the wilt resistance reaction.

(b)Evaluation of pigeon pea genotypes under late sown condition (STATION TRIAL). : Four entries viz., DA 16-1 (1864 kg/ha), DA 16-2 (1854 kg/ha), DA 15-1 (1706 kg/ha), DA 15-3 (1673 kg/ha) were found significantly superior to the best check Bahar (1309 kg/ha). DA 16-1 and DA 16-2 were nominated for IVT *Kharif* 2016-17 at National level.

AGRONOMY

Nutrient management in pigeon pea based intercropping system. : Paired row planting of pigeon pea + urdbean (2890.93 kg/ha) and pigeon pea + sesame (2492.9 kg/ha) recorded significantly higher pigeon pea equivalent yield than their 1:1 row ratio and pigeon pea + maize in both the row ratios. Among the intercropping systems, pigeon pea + urdbean in normal as well as in paired row recorded significantly higher pigeon pea equivalent yield than pigeon pea + sesame and pigeon pea + sorghum in both planting systems. Application of 125% RDF to intercrops recorded significantly higher pigeon pea equivalent yield (2509.95 kg/ha) but was found at par with RDF (2359.61 kg/ha).

PLANT PATHOLOGY

Evaluation of IVT, AVT, Genetic stock, Hybrid & National released entries, breeding lines & ICRISAT entries against wilt & SMD under high disease pressure condition (Sick plot of wilt & SMD). : Altogether 130 entries were evaluated against wilt and SMD & 21 entries were found resistant to wilt and only one entry was found resistant's to SMD while one entry i.e.

BRG5 showed resistant against sterility mosaic disease under epiphytotic conditions. Twenty one entries recorded moderate resistant reaction.

Monitoring of races of *Fusarium udum* in sick plot through host plant differentials. : Out of 8 differentials evaluated, ICP 8858, ICP 9174, ICP 8859 & Bahar have shown resistant reaction. While ICP 8863 and ICP 9174 entries have been recording resistant to moderately resistant reaction against wilt consistently for last nine years. Based on reaction of wilt on standard differentials at multi location testing, variant 1 of *F. udum* was identified at Dholi centre.

ENTOMOLOGY

Evaluation of sequential application of insecticides against pod borer (*Helicoverpa armigera*) in Pigeon pea. : Foliar application of Chlorantraniliprole 18.5SC @ 30g a.i./ha followed by Flubendiamide 480SC @73g a.i./ha and Dimethoate 30EC @600g a.i./ha record lowest pod infestation of 11.8%, 4.2% due to pod fly and pod borer, respectively and highest grain yield 1398.7kg/ha which was statistically at par with one each spray of Chlorantraniliprole 18.5SC @30g a.i./ha followed by Acetamid20SP @20g a.i./ha (12.2% and 4.8%) due to pod fly and pod borer, respectively and occupied second position in recording higher yield (1335.0kg/ha).

NEMATOLOGY

Screening of AVT lines of Pigeon pea, for resistance against root-knot nematodes: Total genotypes screened : 18 Moderately resistant: Four entries (Co-6, CRG-2012-25, GRG-177 and IPA 16F) Susceptible : Ten entries (GRG-2013, PA-440, PA 421, PA 414, NTL-30, PA 291, STP 102, PUSA-151, IPA 8F and AKTM 1012) Highly susceptible: Four entries (UPAS-120, PUSA-153, IPA-9 and IPA 2012-1)

MULLARP

AGRONOMY

Herbicidal weed management in urdbean and its carry over effect on succeeding *Rabi* crops.

: Lower weed density and dry weight (3.60 g/m²), higher weed control efficiency (90%) and seed yield of urdbean (1097 kg/ha) were recorded in hand weeding twice at 15 and 30 DAS. Herbicides Clodinafop propargyl 8% + Aciflourfen sodium 16.5 % @ 187.5 g/ha applied at 15 DAS (1076 kg/ha), Pendimethalin 30 EC+ Imazethapyr 2 EC @ 1.0 kg/ha–PE (1007 kg/ha) and Clodinafop propargyl 8% + Aciflourfen sodium 16.5 % @ 125 g/ha at 15 DAS (986 kg/ha) proved quite promising alternative to hand weeding for controlling weeds and maintaining the productivity of urdbean up to level of H.W.

PLANT BREEDING & GENETICS

IVT Extra Early (Lentil).: One entry namely RVL 15-5 (1806 kg/ha) was found significantly superior to the best check Arun (1526 kg/ha).

IVT Small Seeded (Lentil). : Two entries namely PL 233 (2346 kg/ha) and BPL 16 (2302 kg/ha) shown the significant superiority over the best check KLS 218 (2080 kg/ha).

IVT Dwarf (Field pea).: One entry namely IPFD 16-3 (2401 kg/ha) significantly superior to the best check Aparna (2012 kg/ha).

AVT-2 (Lathyrus).: One entry namely DLY 13-7 (1430 kg/ha) significantly superior to the check Pusa-24 (820 kg/ha).

One variety namely **Rajendra Khesari-1** has been recommended by 3rd Research Council meeting of the University.

PLANT PATHOLOGY

(a) Multilocation evaluation of mungbean yield trial entries (IVT, AVT1 and AVT 2 entries) against yellow mosaic disease (MYMV). : Out of 46 entries evaluated, only eleven entries were found resistant against MYMV and twenty two entries were found resistant against CLS. Six entries (SMP16-23, SMP16-32, SMP16-17, SMP16-9, SMP 16-40, and SMP 16-21) showed resistance against both disease MYMV and CLS.

(b)Multilocation evaluation of urdbean yield trial entries (IVT & AVT1 entries) against yellow mosaic disease: Out of 35 entries, twenty two entries were recorded resistance against MYMV and all thirty six entries were recorded resistance against CLS. Twenty two entries (SMU 16-24, SMU 16-5, SMU 16-22, SMU 16-14, SMU 16-29, SMU 16-33, SMU 16-13, SMU 16-21, SMU 16-6, SMU 16-20, SMU 16-12, SMU 16-31, SMU 16-7, SMU 16-19, SMU 16-8, SMU 16-

28, SMU 16-9, SMU 16-27, SMU 16-10, SMU 16-17, SMU 16-1, & SMU 16-23) showed resistance against both disease MYMV and CLS.

(c) National genetic stock nursery (NGSN-1) against important diseases of mungbean (MYMV): Among the forty four entries, twenty one entries were found resistant against MYMV, only one entry was found resistant against CLS and twenty six entries were showed resistance to web blight. Only one entry, IPM 14-7-6 was found resistant against MYMV & CLS. Sixteen entries, MH 1113, MH 318, MH 1142, SML 1808, SML 1837, SML 1824, IPM 14-35, IPM 14-37, IPM 14-32-2, IPM 14-24, IPM 312-377-2, IPM 14-9, IPM 14-22, SML 1811, TMB 37, & MH 11129 were shoed resistance to MYMV & web blight and none of entry was found to be resistance against all three diseases MYMV, CLS & web blight.

(d) Screening nursery for AVT and IVT entries against lentil wilt. : Out of 92 entries, 56 entries showed resistant against lentil wilt. However, disease pressure was low throughout the experiment and wilt incidence ranged from 0.0 to 33.99 % on DL 16-5 and L4772 entries, respectively among 78 entries evaluated.

(e) Screening nursery for AVT and IVT entries of Field pea against rust and powdery mildew. : Out of 54 entries, only thirteen entries viz., Pant P 42, RFP 2010-1, NDPT 2016-13, Pant P 353, Pant P 354, Pant P 355, , HFP 9907, Pant Pea 74, RFP 2010-11, , HUDP 1601, KPF 14-50, Pant P 340, & RFP 10-05 were found to be resistant against pea rust.

ENTOMOLOGY

(a) Evaluation of germplasm against whitefly (*Bemisia tabaci*) of Urdbean: Thirty seven genotypes of Urdbean were evaluated against whitefly under natural conditions. The lowest population of whitefly (2.4/plant) was recorded on KEU-16-15 which was statically at par to KEU-16-7 (2.6/plant), KEU-16-33 (3.4/plant), KEU-16-21 (3.9/plant) and KEU-16-10 (3.8/plant) as against 15.2/plant in standard check Pant U-31.

(b) Evaluation of newer insecticide against whitefly (*Bemisia tabaci*) and pod borer (*Helicoverpa armigera*) of Urdbean: Among tested insecticides, foliar spray of Triazophos 500 g/ha recorded lowest whitefly population (5.6/plant) which was statistically at par to Diafenthuron @ 312 g/ha (6.4/plant) and significantly lower over rest of the treatments. The lowest pod damage by pod borer (4.7%) was recorded with Thiamethoxam 25.0 g/ha (4.7%) which was significantly superior to Spiromesifen @ 90.00 ml/ha (7.7%) and untreated control (17.2%) and at par with other treatments. Among different treatments significantly higher grain yield (1081.2kg/ha) was recorded with foliar spray of Triazophos 500 g/ha.

NEMATOTOLOGY

Screening of AVT lines of Mungbean for resistance against root-knot nematodes: Total genotypes screened : 18 Moderately resistant : only one entry of Mungbean, KM 2241

Screening of AVT lines of Urdbean for resistance against root-knot nematodes: Total genotypes screened: 15 Resistant: Three (3) entries namely PU10-23, KU 14-1 and KPU 524-65 Moderately resistant : Six entries namely KU 96-3, KU 96-7, RUG 59, Pant U31, DKU 11 and IPU 2-43

CHICKPEA

CROP IMPROVEMENT

IVT Late Sown: - Two genotype namely JG 2016-47 (2168 Kg/ha) and JG 2016-9605 (2052 Kg/ha) were found significant superior and two found at par to the best check BG 372 (1821 Kg/ha).

AVT-1 Late Sown: Only one genotype namely GNG 2299 (1744 Kg/ha) was found significant superior to the best check KPG 59 (1626 Kg/ha) while BG 3068 (1723 kg/ha) was found at par to the check

AVT-2 Desi: GNG 2264 (1772 kg/ha) was found significantly superior to the best check GCP 105 (1364 Kg/ha)

State Multilocational Trail 1: JG-31 (1726 kg/ha) and RSG-44 (1761 kg/ha) were found significantly superior to the best check BG-256 (1458 Kg/ha)

State Multilocational Trail 2: DC-12-3 (2233 kg/ha) was found significantly superior to the best check BG-256 (1900 Kg/ha)

ICAR ICRISAT Chickpea Varietal Trial – Desi (ICVT Desi). : ICCV 16116 (3359 kg/ha), ICCV 16111 (3281 kg/ha), significantly superior and ICCV 16114 are at par with the best check JG-16 (2766 kg/ha).

Chickpea International Elite Nursery-Winter (CIEN – W): FLIP 10-21C, FLIP 10-105C, FLIP 10-146C, FLIP 10-183C, FLIP 10-208C, FLIP 10-251C, FLIP 88-85C were significantly superior to the best check BG-256.

Chickpea International Adaptation Trial (CAT). : FLIP 10-38C, FLIP 10-137C, FLIP 10-157C and FLIP 10-102C were superior to the best check BG-256.

Chickpea International Drought Tolerance Nursery (CDTN). : FLIP 10-3C, FLIP 10-15C, FLIP 10-43C, FLIP 10-96C, FLIP 10-102C, FLIP 10-66C and FLIP 10-288C were found promising for drought tolerance to the susceptible check ILC 3279.

One variety namely, **Rajendra Chana-1** has been recommended by 3rd Research Council Meeting of the University.

AGRONOMY

Conservation agriculture practices for enhancing productivity of chickpea based cropping system (Rice–Chickpea) in rainfed areas: Chickpea sown in zero tillage after harvest of rice produced significantly higher grain yield over reduced tillage but was found at par with conventional tillage. Conventional tillage operation also significantly surpassed over reduced tillage operation. Mulching operation after sowing the seed also produced significantly higher grain yield over non mulching.

PLANT PATHOLOGY

Evaluation of IVT & AVT 1 and AVT 2 (desi, kabuli, rainfed, late sown) entries against wilt caused by *Fusarium oxysporum* f.sp. *ciceri*. : Altogether 256 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. Only six entries viz., JSC 56 (RVG 203), IPC 2012-98, BG 3072, HK 13-105, PG 159, & H 12-17 exhibited resistant reaction against wilt.

National nurseries of elite lines and donors (NNW). : Out of twenty entries, only two entries viz., **Phule G 08108 & IPC 17-28** were found to be moderately resistant.

Evaluation of chickpea wilt & root rot nursery (ICAR-ICRISAT Collaborative trial). Out of 32 entries evaluated, only one entry viz., **ICCWR 1606** found to be resistant and five entries viz., **ICCWR 1602, ICCWR 1603, ICCWR 1616, ICCWR 1625, & ICCWR 1627** showed moderately resistance against wilt. Wilt incidence in susceptible check ICC 4951 was 100.00 %.

Identification of chickpea germplasm as donor against wilt: Six germplasm ICCV 5003, ICCV 14449, BG 372, JG 315, Pusa 256 and C235 were found to be resistant consistently for three years and these breeding lines/germplasm can be helpful in the improvement of breeding efforts to developed wilt disease resistant variety.

ENTOMOLOGY

Screening of IVT, AVT1 and AVT2 entries against *Helicoverpa armigera* in chickpea (Desi):

The mean percent pod damage due to pod borer varied from 2.9 to 19.8% with minimum and maximum in GNG 2207 and JG 2016-43, respectively as against 13.5% in BG-372 used as check. Among different genotypes GL 13001, H12-01, JG 2016-44 and GNG 1581 (ch) recorded lower level of pod infestation (3.9-5.3%) and at par with GNG 2207. The highest grain yield

(1777.7kg/ha) was recorded with the entry GL 13001 and lowest (861kg/ha) in GNG 2264 as against 1083.3kg in BG-372 (Check).

Screening of desi types chick pea entries against *Helicoverpa armigera* in late sown.: Among twelve late sown desi chickpea entries, lowest pod damage (3.7%) with highest grain yield (819.6kg/ha) was recorded with entry CSJ 884 which was at par with the entry GL 29098 in respect to pod damage (4.7%) and grain yield (770.3kg/ha). The highest pod damage (18.3%) and lowest grain yield (464.8kg/ha) was recorded with the entry GL 12003 as against 13.9% and 573.3kg/ha pod damage and grain yield (573.3kg/ha) in check i.e., BG-372.

Screening of Chickpea entries (IVT Kabuli) against *Helicoverpa armigera*..: Fifteen Kabuli type chickpea entries were tested under IVT during 2016-17, the lowest pod damage (7.4%) with highest grain yield (1183.3kg/ha) was recorded with the entry BG 3073 which was at par to JGK 2016-25 (8.0%) and NBeG 529 (8.5%).

MAIZE

PLANT BREEDING

To evaluate the Performance of Medium maturity Experimental Hybrid in NIVT. Trial (NIVT - M). : Among the test entries, one entry from IIMR New Delhi IMH 1605 gave significantly superior yield of 73.99 q/ha as compared to the best check CMH08292 (64.63 q/ha).

To evaluate the Performance of Early & extra early maturity Hybrids in Early-ex-early NIVT (E & Ex). : Grain Yield difference were found highly significant. An entry KH 102 from KGSC Pvt. Ltd. showed significantly higher yield 47.27 q/ha as compared to the best check Vivek hybrid 45, which yielded 38.70 q/ha.

To evaluate the Performance of late maturity Hybrids in AVT- I: Grain Yield difference were found highly significant. Two entries DKC 8161 (86.61 q/ha) and DKC 9163 (72.74 q/ha) were found significantly superior to the best check Seedtech 2324, which yielded 65.19 q/ha.

To evaluate the performance of QPM experimental hybrids in QPM 1-2-3: Grain Yield differences were found highly significant. Two entries BQPMH 36 (60.59 q/ha) and AQH 8 (60.57 q/ha) were found significantly superior to the best check HM 8, which yielded 52.56 q/ha.

To evaluate the performance of Pop Corn experimental hybrids: Significant difference were observed among the entries. An entry KDPC – 2 (PC) from SKUAST Kashmir 35.79 q/ha followed by Dholi. An entry MPC-1-15. Which yielded 34.95 q/ha and SJPC-1 33.27 q/ha from SKUAST Jammu significantly superior to the best check VL POP Corn which yielded 27.69 q/ha.

To evaluate the performance of Sweet Corn experimental hybrids: Significant differences were observed among the genotypes. An entry BSCH-6 yielded 65.28 q/ha followed by an entry Bio 4043 which yielded 65.0 q/ha significantly superior to the best check Madhuri which yielded 59.7 q/ha.

To evaluate the performance of Baby Corn experimental hybrids. : Yield differences were highly significant. Two entries IMHB 1531 from IIMR Delhi (48.06 q/ha) and MBC 11-15 from Dholi (45.89 q/ha) were significantly superior to the best check HM – 4 is yield 38.22 q/ha.

Significant Achievements:-

Three entries were promoted from AVT-1 to AVT-2.

One pop corn Entry MPC 1-15, one entry of Baby corn MBC 11-15 & QPM MH 27.

To evaluate the Performance of Full season Maturity hybrids (IVT - L) Co-ordinated.: Differences in seed yield were found highly significant. Highest and significant grain yield was IMR 138 (142.12 q/ha) followed by IMR-111 (130.45 q/ha), and IMR 110 (124.56 q/ha) as compared to the best check IIMR-123 which yield 109.85 q/ha.

To evaluate the Performance of Medium Maturing hybrids (IVT-M) Co-ordinated. : Seed yield differences were found to be significant. Out of thirty five entries, Three entries viz IMR-182 (94.45 q/ha), IMR-159 (94.08 q/ha) and IMR-174 (82.79 q/ha) were found significantly superior over the best check IMR-167(71.50q/ha).

To evaluate the Performance of Late Maturity hybrids (AVT – L) 1st Year Co-ordinated. : Among the entries Three entries recorded significantly higher grain yield viz IMR 202 (116.03 q/ha), IMR 196 (112.89 q/ha), and IMR 199(110.62 q/ha) were found significantly superior over the best check IMR 197 (105.37q/ha).

To evaluate the Performance of Medium Maturing hybrids (AVT – M) 1st Year Co-ordinated. : Seed yield differences were found to be significant. Three entries viz IMR 213 (101.39 q/ha), IMR 216 (99.30 q/ha), and IMR 212 (95.12 q/ha), have shows the significantly superior over best check IMR 214 (73.17 q/ha).

To evaluate the Performance of Full season Maturity hybrids (AVT 2nd year-L) Co-ordinated. : Among the seven entries, Three entries viz. IMR 222 (116.23 q/ha), IMR 223 (111.36 q/ha) and IMR 227 (109.96 q/ha) was found significantly superior best check IMR 221 (102.31 q/ha).

To evaluate the Performance of Medium Maturing hybrids in (AVT 2nd year-M) Co-ordinated. : Among the medium maturity hybrids. Only three hybrids IMR 233 (108.52 q/ha) IMR 236

(110.66) and IMR 235(103.02 q/ha) was found significantly superior to the best check IMR-231 (88.39q/ha).

To evaluate the Performance of QPM hybrids : In QPM – I-II-III trial total seven entries were evaluated only two entries viz. IMR-243 (105.4 q/ha) and IMR-247(102.2 q/ha) were found significantly superior to the best check IMR-244 (89.6 q/ha).

To evaluate the Performance of newly developed hybrid in station trial 301. : In station trial 301 highest and significant grain yield was of MH 8-16 (119.8 q/ha) MH 18-15 (117.4 q/ha), MH 20-16 (115.6 q/ha), and MH 11-16 (114.2 q/ha) as compare to the best check SM – 5 which yielded (105.5 q/ha).

To evaluate the Performance of newly developed hybrid in station trial 302 in drought condition. : In station trial 302 of drought condition total Twenty hybrids were evaluated in which highest and significant grain yield was at MH – 22 (67.6 q/ha) as compared to the best check P 3522 which yielded 58.4 q/ha.

3.20.2 AGRONOMY

Optimization of Potassium Fertilizer for Eastern India. : Application of 120 Kg K₂O/ha recorded highest grain yield (6360 Kg/ha) which was found at par with 150 Kg K₂O/ha (5272 Kg/ha) and significantly higher over lower levels of Potassium. Similar highest net return was also obtained at 120 Kg K₂O/ha (32511.6 /ha). Value of net return recorded at 0 Kg K₂O/ha (6395.5 Kg/ha).

Effect of planting density and nutrient management practices on the performance of hybrids of maize in Kharif Season : Pioneer 3540 recorded significantly higher grain yield (5727 kg/ha), net return (Rs. 23010/ha) and B: C ratio (0.37) than Rasi 4595. Among the crop geometry 60+20 cm recorded significantly higher grain yield (5833 kg/ha), net return (Rs.24603/ha) and B: C ratio (0.39). Among the fertilizer management RDF and STCR method of fertilizer application recorded similar and significantly higher grain yield and net return.

Weed Management in Maize – wheat cropping Systems: Amongst weedicide treatment T3 **Atrazine** @ 1.5* kg/ha preemergence. T5 Atrazine (750 g/ha) + 2, 4-D Amine (75%) at 25 DAS as PoE T7 Atrazine @ 1.5 kg/ha preemergence fb Halosulfuron 60 g/ha 25 DAS and T9 Pendemathalin (1000 ml/ha) preemergence fb Atrazine (750 g/ha) + 2, 4-D Amine (75%) at 25 DAS as PoE at par yield

3.20.3 ENTOMOLOGY

Screening of Maize genotypes of full season maturity group against *Chilo partellus* under artificial conditions. : Altogether 24 entries were evaluated under artificial infestation conditions. Among these 3 entries were found least susceptible, 16 were moderately susceptible and five entries were ranked as highly susceptible in 1-9 scale of rating.

Screening of Maize genotypes Medium maturity group against *Chilo partellus* under artificial conditions: Seventeen entries were evaluated to find out the resistance against maize stem borer. Of these, 3 entries were found least susceptible, 9 entries moderately susceptible and 5 entries as highly susceptible in 1-9 scale of rating.

Screening of Maize genotypes Early Maturity group against *Chilo partellus* under artificial conditions: Eight entries were evaluated against maize stem borer, *Chilo partellus*. Of these, one entry was least susceptible, 7 entries moderately susceptible in 1-9 scale of rating.

Screening of maize genotype QPM against *Chilo partellus* under artificial conditions: Twenty seven entries were evaluated against *Chilo partellus*, of these 4 entries were found least susceptible, 12 entries moderately susceptible and 11 entries as highly susceptible in 1-9 scale of rating.

Screening of maize genotype pop corn against *Chilo partellus* under artificial conditions: Altogether 14 entries of pop corn genotype were evaluated against maize stem borer. Of these, 2 entries were found least susceptible, 6 entries moderately susceptible and 6 entries as highly susceptible in 1-9 scale of rating.

Screening of maize genotype Baby corn against *Chilo partellus* under artificial conditions: Fourteen entries of maize baby corn were evaluated against stem borer. Of these, 2 entries were found least susceptible, 5 entries moderately susceptible and 7 entries highly susceptible in 1-9 scale of rating.

Screening of maize genotype sweet corn against *Chilo partellus* under artificial conditions: Thirteen entries of sweet corn were evaluated against stem borer and of these, 2 entries were found least susceptible, 7 entries moderately susceptible and remaining 4 entries were observed highly susceptible in 1-9 scale of rating.

Screening of maize inbred lines against *Chilo partellus* under artificial conditions: Altogether 38 entries of maize inbred lines were evaluated against stem borer. Of these, 5 entries were found least susceptible, 26 entries moderately susceptible and remaining 7 entries were observed highly susceptible in 1-9 scale of rating.

To evaluate some insecticides against maize Stem borer *Chilo partellus* (Swinhoe): Efficacy of 10 insecticidal treatments was evaluated against maize stem borer. All treatments were superior over control, however, the best treatment was T₆ (chloraniliprole (20SC) 0.3 ml/litre + carbofuron @ 7 kg/ha) and under this minimum mean (%) plant infestation was 2.2 and mean (%) dead heart were observed 0.9%.

PLAN PATHOLOGY

Screening of maize hybrids of the coordinated trials (NIVT, AVT I & AV II) consisting of Four maturity groups against Maydis leaf blight under artificial inoculated conditions.

NIVT- Late - A: Out of 49 entries 14 entries were found resistant to *Maydis* leaf blight.

NIVT - Late - B : Out of 49 entries 14 entries were found resistant to *Maydis* leaf blight.

NIVT- Medium - A : Out of 39 entries 9 entries were found resistant to *Maydis* leaf blight.

NIVT - Medium - B : Out of 40 entries 9 entries were found resistant to *Maydis* leaf blight.

NIVT- Early: Out of 34 entries 6 entries were found resistant to *Maydis* leaf blight.

AVT- I - II - Late: Out of 24 entries 10 entries were found resistant to *Maydis* leaf blight.

AVT - I - II - Medium: Out of 17 entries 5 entries were found resistant to *Maydis* leaf blight.

AVT- I - II - Early: Out of 8 entries of AVT -1-2 early maturity hybrids of maize, only single entry viz. IIMR 637 was found resistant to *Maydis* leaf blight.

Screening of maize hybrids of the coordinated trials (QPM- I-II-III, Sweet- Corn- I-II-III, Baby Corn- I-II-III and Pop Corn-I-II-III) against *Maydis* leaf blight under artificial inoculated conditions.

QPM- I-II-III: Out of 27 entries of QPM I-II-III hybrids of maize, 6 entries viz., REHQ2014-11, IIMRQPMH 1604, QPM-MH-27, IIMRQPMH 1602, HQPM 4 © and HQPM 7 were found resistant to *Maydis* leaf blight. Susceptible check CML- 186 rated as susceptible reaction to *Maydis* leaf blight.

Sweet Corn- I-II-III: Out of 13 entries of Sweet Corn I-II-III hybrids of maize, 2 entries viz., ASKH 4 and BIO 4043 entries were found resistant reaction to *Maydis* leaf blight. Susceptible check CML- 186 rated as susceptible to *Maydis* leaf blight.

Baby Corn- I-II-III: Out of 14 entries of Baby Corn I-II-III hybrids of maize, 3 entries viz., IMHB 1538, IMHB 1537 and IMHB 1529, entries were found resistant to *Maydis* leaf blight. Susceptible check CML- 186 rated as susceptible reaction to *Maydis* leaf blight.

Pop Corn-I-I-III: Out of 14 entries of Pop Corn I-II-III hybrids of maize 2 entries viz., AP2202 and SJPC1 entries were found resistant to *Maydis* leaf blight. Susceptible check CML- 186 rated as susceptible to *Maydis* leaf blight.

Disease screening of maize hybrids (IVT & AVT-Late and Medium) against Turcicum leaf blight (*Helminthosporium turcicum*) and common rust (*Puccini sorghi*) under artificial inoculated conditions.:

(A) **IVT- Late** : Out of (48) maize entries (14) entries were found resistant and (13) entries were found moderately resistant to *Turcicum* leaf blight disease of maize. Susceptible check CML 186 rated as susceptible reaction to *Turcicum* leaf blight. Common rust disease did not appear.

(B) **IVT- Medium** : Out of (35) entries (9) entries were found resistant and (10) entries were found moderately resistant to *Turcicum* leaf blight. Susceptible check CML 186 rated as susceptible reaction to *Turcicum* leaf blight. Common rust disease did not appear.

(C) **AVT-I –II- Late**: Out of (16) entries (3) entries were found resistant and (4) entries were found moderately resistant to *Turcicum* leaf blight. Susceptible check CML 186 rated as susceptible reaction to *Turcicum* leaf blight. Common rust disease did not appear.

(D) **AVT-I-II- M-Q** : Out of (20) entries, (6) entries were found resistant and (6) entries moderately resistant to *Turcicum* leaf blight. Susceptible check CML 186 rated as susceptible reaction to *Turcicum* leaf blight. Common rust disease did not appear.

WHEAT AND BARLEY

AGRONOMY

Performance of one test genotype under restricted irrigation condition.: Increasing number of irrigations successively gave significantly higher grain yield. One and two irrigation application gave 23.58% and 32.43% higher grain yield (38.83 q/ha & 41.61 q/ha), respectively than no irrigation (31.42 q/ha). All the yield attributing parameters were significantly increased as level of irrigation enhanced. So, the yield increase was due to cumulative effect of all the yield attributing parameters. Test entry HI 1612 produced the lowest grain yield (37.61 q/ha) which was statistically at par with all the check varieties except HD 3171.

Performance of wheat under nutrient management and growth regulator.: The application of 150% RDF has increased the grain yield (45.46 q/ha) at the tune of 9.25% over RDF (41.61 q/ha). Even 15 t/ha FYM application with 150% RDF increased the grain yield (49.73 q/ha) significantly as compared to 150% RDF application. Two sprays of CCC (0.2%) produced maximum grain

yield (40.54 q/ha) which was statistically at par with 2 sprays growth retardant CCC (0.2%) in combination with fungicide tebuconazole (0.1%) (39.69 q/ha).

PLANT BREEDING AND GENETICS

Station Trial on wheat for late sown condition: Out of seven genotypes, RAUW 4 (44.3q/ha), RAUW 6(42.5q/ha) and RAUW 7 (41.7q/ha) were significantly superior to checks DBW 14 (37.6q/ha), DBW 16 (31.5q/ha) and HI 1563 (34.5q/ha).

Station Trial on wheat for timely sown condition: Out of eight genotypes, only one genotype RAUW 105 (55 q/ha) was significantly superior over best check HD2967 (48.9 q/ha).

One variety namely, **Rajendra Genhu-1** has been recommended by 3rd Research council meeting **155** genotypes have been maintained after evaluation for breeding purpose.

Crosses were made in following combinations.

HD 2767 X DBW14

HD 2967 X HD 2733

HD 2733 X DBW 14

64 single plants were selected in F₃ generation of a cross between

HD 2967 X DBW 14

NEMATOLOGY

Screening of wheat genotypes against *Meloidogyne graminicola* for resistance/ susceptibility.

: Highly resistant - Seven entries (AVT-13, 22, 47, 49, 59, 72 and 87) Resistant - The rest 86 entries.

Screening of wheat genotypes against *Meloidogyne graminicola* for resistance/ susceptibility.:

Highly resistant - 10 entries (AVT-3, 10, 12, 19, 28, 45, 47, 48, 52 and 57)

Resistant - 52 (fifty two) entries.

RAPSEED-MUSTARD & LINSEED

Evaluation of rapeseed-mustard germplasm against *Alternaria* blight in Indian Mustard

(station material): 22 lines were found MR (LS1) < 25% ,MS (LS2) 26-50%, R (PS) 1-5% /MR(PS) >5-10 with superiority for Yield , Quality and Yield Components.

Advanced Varietal Station Trial Toria: Out of 16 entries evaluated RAUDT 14-09 (1413.57**) was best and significantly out yielded followed by RAUDT 14-04 (1308.64**), RAUDT 14-08 (1268.51**) & RAUDT 14-11 (1191.35*).

Advanced varietal Station Trial (Yellow sarson): Out of 14 entries evaluated RAUDYS 14-02(16.67 q/ha) significantly out yielded, followed by RAUDYS 14-05 (15.55q/ha) to the best check Swarna (12.7 8q/ha). These station entries exhibited 30.43% and 21.10% yield superiority over Swarna.

IVT (YS) Irrigated (AICRP-RM).Checks gave highest yield.

AVT I (YS) Irrigated (AICRP-RM) Repeat IInd Time. : None of the entry exhibited significant yield superiority over best check YSH-0401 at Multi-locations National evaluation.

Advanced varietal station trial (Early): Three medium maturity entries RAURD-14-18 (18.02q/ha); and RAURD 14-08(15.98 q/ha); &RAURD 14-11(15.93 q/ha) ; and two Early maturity entries , RAURD 14-15(15.68q/ha) and RAURD 14-17 (15.49q/ha) were significantly superior in yield with superiority in earliness for maturity than the national check JD-6 (13.58 q/ha).

IVT (Mustard –Timely sown -Rainfed) AICRP (RM) Trial: At Dholi two entries NPJ 205 and hybrid 61 J 0002 significantly out yielded best check NRCHB 101.

AVT I (Mustard –Late sown) Repeat AICRP (RM) Trial.: At Dholi two entries RH 919 and RGN 330 significantly out yielded best check JD 6 and Pusa Bold.

Utilization of Genetic Variability through Hybridization and selection of superior types.

Number of Crosses, Their Generation and Number of Selections Practiced.:

To develop high temperature tolerant mustard strains for early sown condition with high yield and early / medium maturity 135 SPS (F₃) grown in plant to row progenies out of which 174 single plant selections made in F_{4s} generation.

To develop early sown mustard strains with high yield and early maturity , from the 33 single plant progeny rows grown 27 selections attempted for earliness in flowering-maturity, yield components in segregating F₅ generation.

To develop Timely sown mustard strains with high yield and early maturity, from the 45 single plant progeny rows grown 39 Single Plant Selections attempted for earliness in flowering-maturity, yield components in segregating F₅ generation.

To develop late sown mustard strains with high yield and early maturity, from the 36 single plant progeny rows grown 59 selections attempted for earliness in flowering-maturity, yield components in segregating F₅ generation.

To develop *Alternaria* Resistant/ Tolerant strains with high yield in Mustard suitable for Early/Timely/Late sown conditions , from the 81 single plant progeny rows grown 139 selections attempted for earliness in flowering-maturity, yield components in segregating F₅ generation.

Long term fertility experiment on cropping systems involving rapeseed-mustard: Significant highest mustard yield (1961.0 kg/ha) was obtained under treatment (T4) where 150 % of RFL(80:40:40 kg N:P₂O₅:K₂O/ha) was applied. The treatments which received 100% NPK fertilizers with or without sculpture, zinc or boron were found at par.

Survey and surveillance of dominant weed flora in rapeseed-mustard crops under changing climatic scenario: Dominant weeds found in Aurangabad district in mustard field were-*Cynodon dactylon* was among the grassy weeds; *Parthenium hysterophorus*, *Chenopodium Sp*, *Physallis mininma*, *Melilotus sp*. *Solanum nigrum*, *Vicia sativa* and *Anagallis arvensis*, were among the broad leaved ones. *Cyperus rotundus* was the only sedges Weeds found in Vaishali district in mustard field were- *Cynodon dactylon* and *Polypogon monspeliensis* among grassy weeds; *Anagallis arvensis*, *Chenopodium Sp*. and *Cannabis sativa* were among the broad leaved weeds while *Cyperus rotundus* was noticed as only sedges but main weeds found in Muzaffarpur district were *Cynodon dactylon* was mainly among grassy weeds; *Chenopodium Sp*, *Anagallis arvensis*, *Parthenium hysterophorus*, *Cannabis sativa* and *Convolvulus arvensis* were among the broad leaved weeds while *Cyperus rotundus* was noticed as sedges.

Screening of *Brassica* AVT-1 & AVT-2 strains against *Alternaria* blight diseases under natural condition: Out of 43 entries, no any entries were found free during Rabi 2016-17 from *Alternaria* blight (AB) disease under natural condition. Moderate to severe Percent Disease Severity of *Alternaria* blight were recorded during experimentation. The Severity of the disease in the test entries were ranged between 36.6 to 57.4 %.

National Disease Nursery (NDN) trial for *Sclerotinia* Stem Rot under artificial condition: Out of 10 entries two entries DRMR 32 and DRMR 72 was found resistant against *Sclerotinia* rot disease and three entries DRMR 2035, DRMR 40 and DRMR 73 were found moderately resistant (MR) against *Sclerotinia* rot.

Integrated Management of *Sclerotinia* rot in Indian mustard: T₄(ST with Carbendazim 50WP @ 2g/kg seed (T₁)+ No irrigation during 25th Dec. to 15th Jan.(T₂) + Foliar spray (FS) of Carbendazim 50WP @2g/l at 40-45 DAS followed by 65-70 DAS) gave highest yield (1835

Kg/ha) and minimum per cent disease severity (7.8%) followed by T₅ and T₃ (1567 Kg/ha and 1415 Kg/ha respectively) as compared to control (967 Kg/ha and 33.3%).

Disease monitoring on Farmers' field: During the survey at different locations of three districts viz., Samastipur Muzaffarpur and Vaishali, the *Alternaria* blight disease severity ranged from 48 to 79 %, white rust severity ranged from 9 to 17 % and *Sclerotinia* Stem rot severity ranged from 30 to 47 % at different locations.

Screening of IVT entries of *Brassica* for resistance against mustard aphid: Altogether 110 entries + 1 susceptible check i.e. 66-197-3 (Yellow sarson) were screened against mustard aphid, *Lipaphis erysimi*. Aphid Infestation Index (AII) varied from 2.1 to 3.8. Minimum AII (2.1) was observed in SBG-20 (PHR 240), SBG-54 (TKM 16-2), SBG-65 (PRD-2013-6) and SBG-67 (RH 1599-7); whereas maximum AII (3.8) was observed in SBG-29 (SVJ-72), SBG-52 (RGN-73) and SBG-107 (PYS-2013-03).

Screening of AVT-I and AVT-II entries of *Brassica* for resistance against mustard aphid.: Altogether 44 entries + 1 susceptible check i.e. 66-197-3 (Yellow sarson) were screened against mustard aphid, *Lipaphis erysimi*. Aphid Infestation Index (AII) varied from 2.2 to 3.6. Minimum AII (2.2) was observed in SAG-2 (RH 0725), SAG-5 (NPJ 195), SAG-7 (RH 0761), SAG-8 (KMR L 15-5), SAG-10 (RH1209), SAG-12 (Pusa Bold), SAG-13 (CS 508-1 P2), SAG-17 (CS 2800-1-2-3-5-1), SAG-32 (DRMR 1153-12), SAG-41(Bhawani) and SAG-42 (PT-2010-5); whereas maximum AII (3.6) was observed in SAG-6 (DRMR 150-35).

Assessment of promising lines for resistance against mustard aphid: Altogether 18 promising lines of rapeseed- mustard and 1 susceptible check i.e. 66-197-3 (Yellow sarson) were assessed for resistance against mustard aphid, *Lipaphis erysimi*. Aphid Infestation Index (AII) varied from 2.1 to 3.2. Minimum AII (2.1) was observed in SPG-6 (DRMR 2-11) and SPG-7 (RB 77); whereas maximum AII (3.2) was observed in 66-197-3 (Yellow sarson).

Assessment of yield losses due to aphid in *Brassica* crops.: Avoidable yield loss due to mustard aphid was 33.96 % in Rajendra Sufalam, 34.70 % in NRCDR-2 and 38.94 % in BSH-1.

Population dynamics of mustard aphid on Brassica crops (late sown): Maximum temperature, minimum temperature and relative humidity at 07 hrs were positively correlated with mustard aphid population; whereas relative humidity at 14 hrs was negatively correlated with mustard aphid population.

Screening of genotypes for high temperature tolerance at seedling stage: Under field conditions seedling mortality was 70% in three genotypes (NPJ202, RH1202 and NPJ205) and dry weight/10 seedlings was 13.6 g, 13.8g and 8.5g respectively. Ten genotypes succumbed to high temperature stress at seedling stage. Maximum temperature during the experimental period ranged from 27.2 to 35.5^oC with an average 32.5^oC.

Screening of genotypes for drought tolerance: Analysis of variance revealed significant genotypic differences for RWC, SPAD values, yield components and seed yield. Only eight genotypes (Albeli-1, DRMR 4001, RH 761, DRMR 4685, RGN400, 61J0002, RH725, DRMR1040) recorded <10% decline in RWC with the mean reduction of 14.9% under rainfed over irrigated regime.

SUNFLOWER

Maintenance of working germplasm collection: The centre is maintaining a total of 176 working germ plasm including 61 CMS lines, 22 fertility restorer lines and 93 inbreds. The CMS lines were maintained through their respective maintainer lines while fertility restorer lines and inbred were maintained by selfing or sib-mating.

Evaluation of CMS lines with their Maintainer lines for their perfect synchrony: The 61 CMS lines were evaluated. Among entries evaluated only 2 entries namely CMS-852 A, and FMS-821 A-2 showed perfect synchrony with their responding maintainer lines.

Development of new CMS lines by using improved inbred through back cross breeding programme (BC1): A total no. of eight improved inbred lines are identified as maintainer line during 2015-16 has been utilized for development of new CMS lines through back crossing as BC₁ and program will be continued upto BC₇.

Development of Best Management practices for maximum Economic yield of Sunflower. : (33%) Higher plant population and 100% NPK + S + Micronutrient + 25% higher NPK were found ideal for enhancing the productivity and profitability of sunflower under North Bihar conditions.

Integrated weed Management in Sunflower. : : Application of pendimethalin @ 1.0 kg/ha as pre-emergence + propanil @ 62 g/ha at 20 DAS, pendimethalin @ 1.0 kg/ha as pre-emergence + quizalofop ethyl @ 37.5 g/ha at 20 DAS and pendimethalin @ 1.0 kg/ha as pre-emergence + fenoxaprop ethyl @ 37.5 g/ha were proved equally effective for enhancing seed yield and net return and B:C ratio.

Enhancing sunflower productivity through integrated crop management approach (on station demonstration): Based on three year performance of variety DRSH-1 (a high yielding variety of sunflower) farmers practice with conventional and ICM it was concluded that ICM showed nearly 36.83% of yield advantage over farmers practice. ICM also delivered net return of Rs. 32359/ha and 1.65 B:C ratio in comparison to net return of Rs. 19302/ha and 0.94 B:C ratio of farmers practice.

SOYBEAN

Initial Varietal Trial (Soybean): Out of 35 entries evaluated, entry NRC 126 (2246.92 kg/ha) was best followed by PS 1589 (1950.62 Kg/ha) and RSC 10-71 (1917.70 Kg/ha) and significantly out yielded exhibiting significant yield superiority over best check SL-688 (1506.17kg/ha).

Advanced Varietal Trial 1+ 2 (Soybean): Best Check SL 688 (1553.24 kg/ha) was the highest yielder in comparison to the first and second year promoted (multi-location basis) entries. AVT II level entries, viz. PS 1556, SL 1028 and PS 1092(Check) were significantly early in maturity (around 109 days against 116 days of SL 688) but at par (similar) in flowering, maturity, plant height and 100 seed weight than the best check SL 688.

PLANT PATHOLOGY

Evaluation of IVT entries for different diseases: Only incidence of soybean yellow mosaic virus (YMV) was recorded. Among 35 (IVT entries) + 2 (check) entries evaluated, 2 (RVS 2009-9 & JS 21-05) and 2 (VLS 93 & RSC 10-52) entries of soybean were found Highly Resistant and Moderately Resistant respectively.

Evaluation of breeding materials (AVT-1 entries) for resistant donors(s): Among 7 (AVT-I entries) + 2 check entries (JS-335 & JS-93-05) evaluated, one entry recorded under each Highly Resistant (PS 1572) & Resistant (SL 1074) category whereas both the checks (JS-335 & JS-93-05) showed Highly Susceptible reaction.

Evaluation of breeding materials (AVT-II entries) for resistant donors(s): On three years (2014, 2015 & 2016) basis, KDS 869 (HR in 2014, 2015 & 2016) was most promising as donor against soybean YMV followed by DS 3101(HR in 2014 , 2015 & R in 2016); MACS 1460 (MR in 2014 ,HR in 2015 & R in 2016) and RVS 2008-24(MR in 2014, HR in 2015 & MR in 2016) were promising donors against soybean YMV.

SESAME

Maintenance of working germplasm collection: A total of 100 germplasm lines representing white, black, brown, ash and dark brown seeded type collections were maintained, evaluated and characterized for different traits.

Coordinated trial Initial Varietal Trial (IVT) & AVT : In Initial Varietal Trial (IVT), significant differences were found among the entries for seed yield (g/plot). None of The entries were found higher yielder then local check RT-54 (383.33 g/plot). The incidence of Phyllody disease appeared in traces.

SMALL MILLETS

Maintanance of germplasm: 177 germplasm of finger millet, 50 germplasm of foxtail millet and 180 germplasm of proso millet maintained.

Advance Varietal Trial of Foxtail Millet: Among thirteen genotypes, two genotypes namely, SiA3164 (26.48q/ha) and SiA3163 (24.63q/ha) were at par to Rajendra Kauni-1(25.56q/ha).

Initial Varietal Trial of Finger Millet: Among 20 genotypes only one genotype (GPU67) was significantly superior (45.93q/ha.) than RAU 8 (38.34q/ha).

Advance Varietal Trial of Finger Millet: Out of seven genotypes, none of the genotype was superior to RAU 8 (34.45q/ha).

TUBER CROPS

Collection, Conservation, Cataloguing and Evaluation of Genetic Resources of Tuber Crops: The centre is maintaining highest number of accessions being in sweet potato (1052) followed by

yam bean (140) and Taro (64) during the period under report. Five new accessions of different tuber crops viz. Sweet potato (03), Taro (01) and Elephant foot yam (01) were collected.

Uniform Regional Trial (URT) on Colocasia - On the basis of pooled mean of two years data i.e. 2015-16 and 2016-17, TTr 12-8 recorded significantly higher cormel yield (18.6 t/ha) which was statistically at par to TTr 12-4 (17.9 t/ha) and TTr 12-2 (17.0 t/ha) as and highest number of side tubers & weight of side tubers as compared to Muktakeshi and RA-1 used as national check and local check, respectively.

Uniform Regional Trial (URT) on Yam bean: Significantly higher tuber weight (371.3 g/plant) with tuber yield (41.3 t/ha.) was recorded in entry TYb 14-9 followed by TYb 14-10 with 352.0 g/plant tuber weight and 38.3 t/ha tuber yield as against 255.0 g/plant and 32.0 t/ha for tuber weight and tuber yield, respectively in RM-1 as check.

Micro-nutrient studies in Sweet Potato - Among different treatments, highest tuber yield (24.04 t/ha) was recorded in treatment T5 having soil application of recommended dose of FYM (10t/ha) and NPK (60:40:60 kg/ha) + application of B @1.5kg/ha and Zn (vine dipping in ZnSO₄ 3% solution +Zn @ 1.5% spraying). Among different treatments, highest net income (Rs. 164225/ha.) and B: C ratio (2.16) was derived with soil application of recommended dose of FYM and NPK+ B +Zn as against Rs. 63600 and 1.42, net income and B: C ratio, respectively in absolute control.

URT on Colocasia entries for Phytophthora leaf blight resistance/ tolerance - TCbl 12-4 recorded lowest PDI (11.3) for *Phytophthora* leaf blight which was statistically at par to TCbl 12-6 (12.6), TCbl 12-3 (13.5), TCbl 12-7 (13.7) and Muktakeshi (10.5) as against 24.5 and 14.0 PDI in susceptible check Telia and local check RA-1, respectively.

Screening of promising Yam bean entries against spotted pod borer in URT- Among eight entries, lowest pod infestation due to spotted pod borer observed in the entry TYb 14-9 (9.3%) which was statistically at par with the entry TYb 14-5 (10.7%) as against 20.7% in RM-1 (Check).

Integrated management of sweet potato weevil (*Cylas formicarius*) - Vine treatment with chlorpyrifos @ 0.02 %, earthing up along with fertilizer application, two spraying of chlorpyrifos @ 0.02 % at 30 & 60 DAP followed by two spraying of Nanma (5%) at 45 & 75 DAP has been found effective in minimising vine infestation (7.3%),tuber infestation (5.4%), with highest marketable tuber yield (20.1 t/ha) alongwith maximum net profit (Rs 50800 /ha) with B:C ratio of 2.29.

POTATO

Development of heat tolerant red hybrids: 48 cross combination were made by using 8 red skin female lines crossed with 6 heat tolerant lines.

Varietal evaluation trial to identify top three promising variety- crop period 90 days: Ten varieties were evaluated and significant differences for total and marketable tuber yield recorded. The variety K. Pushkar (19.39q/ha & 18.75q/ha), K. Ashoka (18.95q/ha & 18.33q/ha) and K. Garima (18.33q/ha & 18.25q/ha) were recorded Ist, IInd and IIIrd for total and marketable tuber yield, respectively.

Effect of NPK levels on growth and yield of Potato.: Significantly higher total tuber yield was recorded when 150 % RDF (225:135:150: NPK) kg/ha was applied (26.25 t/ha) with higher net return (Rs 127060) and B: C (1.53). Reduction in dose of nutrient or skipping of any nutrients influenced tuber yield significantly towards the lower side.

Optimizing Phosphorous requirement of Potato.: Application of 120 kg P₂O₅/ha gave higher total tuber yield (26.25 t/ha) which was at par with 90 kg P₂O₅/ha (24.05 t/ha) and RDF (24.60 t/ha).

SPICES

Germplasm Collection, Characterization, Evaluation and Conservation of ginger. : Out of 75 accessions, only ten accessions gave higher yield ranging from 108.33 to 133.33q ha⁻¹ as compared to check variety Nadia (96.67q/ha.) under shade condition.

Germplasm Collection, Characterization, Evaluation and Conservation of turmeric. : Out of ninety eight accessions, only nineteen accessions gave higher yield ranging from 527.78 to 578.33q ha⁻¹ as compared to check varieties, Rajendra Sonali & Rajendra Sonia.

Coordinated varietal trial on turmeric. : Among ten entries and two checks, RH-9/90 and RH-80 gave significantly higher yield (641.49 & 593.33q ha⁻¹ respectively) as compare to best check variety Rajendra Sonali (518.52q ha⁻¹).

Germplasm Collection, Characterization, Evaluation and Conservation of coriander: Out of one hundred fifty seven accessions, only thirteen accessions gave the higher yield ranging from 20.56 to 17.36q ha⁻¹ as compared to best check variety Hisar Anand (16.67q ha⁻¹). Among promising accessions, RD-422 gave the highest yield of 20.56q ha⁻¹.

Initial evaluation trial on coriander (IET): Among seven entries and two check varieties, RD-437 gave significantly higher yield (29.24q ha⁻¹) as compared to best check variety Hisar Anand (22.01q ha⁻¹).

Germplasm Collection, Characterization, Evaluation, Conservation of fennel : Out of sixty accessions, only nine accessions gave the highest yield ranging from 23.06 to 19.45q ha⁻¹ as compared to best check variety GF-11 giving yield of 19.33q ha⁻¹.

Initial evaluation trial on fennel (IET). : Among nine entries and two check varieties, RF-31 gave significantly higher yield of 27.16q ha⁻¹ as compared to best check variety Rajendra Saurabh (24.07q ha⁻¹) and other entries.

Germplasm Collection, Evaluation, Characterization and Conservation of fenugreek: Among one hundred sixty three accessions, only eleven accessions gave the highest yield ranging from 20.56 to 19.31q ha⁻¹ as compared to check variety Hisar Sonali & Rajendra Kanti *i.e.*, yield 18.75q ha⁻¹.

Survey for recording incidence of different diseases in ginger: Diseased rhizome of ginger collected from Darbhanga districts of state were found to be associated with Bacterial wilt and Soft rot disease. Bacterial wilt incidence of ginger ranged from 10 to 40% with mean disease incidence of 21%. Whereas Soft rot disease incidence ranged from 0 to 35% with mean disease incidence of 15%. The crop was also found to be infected with *Phyllosticta* leaf spot disease. Disease severity was in the range of 5 to 60% with mean disease severity of 30%.

Survey for recording incidence of different diseases in turmeric. : Turmeric crops cultivated by farmers were found to be affected with leaf spot caused by *Colletotrichum capsici* and *Taphrina maculans* in Darbhanga district of Bihar. Disease severity of *Colletotrichum* leaf spot was found in the range of 0 to 15% with mean disease severity of 6%. Disease severity of *Taphrina* leaf spot ranged from 25 to 65% with mean disease severity of 26%.

Screening of coriander germplasm against disease: Out of 159 germplasm, 54 nos. of germplasm were found Resistant against stem gall disease under natural condition. Susceptible check (Rajendra Swati) showed Susceptible reaction against stem gall disease under natural condition.

Integrated management of stem gall disease of coriander: Lowest disease incidence (PDI=16.67) and highest yield (15.91q ha⁻¹) was recorded in treatment comprising of soil drenching with copper oxychloride (50% WG) @0.3% + seed treatment with a fungicidal formulation containing carboxin (37.5% WS) & Thiram (37.5WS) @0.4% followed by foliar

spray with a fungicidal formulation having Azoxystrobin (11% SC) & Tebuconazole (18.3%SC) @0.1% at 46, 60 & 75 DAS.

Screening of coriander entries against stem gall disease under artificial condition.: Among 18 entries along with one local susceptible check (Rajendra Swati) screened against stem gall disease of coriander caused by *Protomyces macrosporus*, four entries viz., ACr-1, ACr-2, RCr-435 & RCr-436 and seven test entries viz., RD-154, RD-377, RD-385, RD-393, RCr-728, RCr-475 & RCr-480 were found to be Resistant and Moderately Resistant respectively.

VEGETABLE CROPS

Collection, evaluation and conservation of early cauliflower: Sixteen genotypes were evaluated to screen out the promising lines for September and October maturity group (early cauliflower). Among them RECF-7 and RECF-2 were the potential yielder having net curd weight 465.2g & 426.2, respectively.

Collection, evaluation and conservation of mid cauliflower: Ten genotypes were evaluated to screen out the promising lines for November maturity group i.e. mid-season cauliflower. Among them RMCF-5 and RMCF-1 were the potential yielder having net curd weight 593.1 & 567.9 g, respectively.

AVT 2 (Advance Varietal Trial) on brinjal: Seven entries were evaluated including two national check and one local check entry 2014/ BRRVAR-2 was found significantly superior for total marketable yield as compare to other entries including checks.

Collection, evaluation and conservation of Pointed Gourd: 15 germplasm were collected from different part of Bihar and Jharkhand.

Collection, evaluation and conservation of Cow Pea: 18 germplasm were collected form IIVR and one from Samastipur, Bihar and nine from GBPUA&T, Pantnagar. Total 28 germplasm were collected.

Collection, evaluation and conservation of Tomato: Seven varieties were collected from HP, UP & Jharkhand

FRUITS

BANANA

Collection, Characterization, Conservation and Evaluation of germplasm: In a field gene bank 69 banana accessions were maintained. Twenty four accessions produced more than

20.0 kg bunch weight in plant crop cycle under agro-ecological conditions of Bihar. Seven varieties produced more than 25 kg fruits/ plant.

Clonal selection of Banana: Three promising clones were selected from farmer's field in month of July, 2016 and planted in germplasm block. The banana plants are progressing well.

New and emerging disease(s) of banana: During survey of the state, Panama wilt was observed as a major problem of tall bananas i.e. Malbhog (AAB), Alpan (AAB), Champa (AAB), Chini Champa (AB), Kanthali (AAB), Kothia (ABB) in Zone –I comprising of (Samastipur Muzaffarpur, Vaishali, Hazipur districts). This disease did not appear in Zone-II (Saharsa, Katihar, Purnea and Bhagalpur districts). Eumusae leaf spot(24 PDI) and BBTV(16%) were observed as a major problem in both the zone. All the diseases of banana appeared to be more severe during rainy season (i.e. July to October) as compared to other parts of the year.

Integrated management of *Fusarium* wilt disease of banana: On the basis of eight years of experimentation it was concluded that for managing Panama wilt disease of banana use of disease free suckers after dipping in 0.2% Carbendazim for 45 minutes followed by soil drenching (0.2%) @2-3 litres /plant at 0, 2 and 4 MAP and Carbendazim injection @ 3ml of 2% solution at 3rd, 5th and 7th, months after planting may be recommended for adoption by farmers. However, bio-control agents i.e. *Trichoderma viride* (@ 10g/sucker three times)used as soil application also found highly effective and causes marked suppression of Panama wilt.

PAPAYA

Emerging disease(s) of papaya: In case of survey in major papaya growing districts of Bihar viz, Samastipur, Muzaffarpur, Vaishali, Siwan, Saran, Katihar, Saharsa, Bhagalpur and Aurangabad during 2016-17, the incidence of various fungal diseases –collar rot, fruit rot and root rot was observed at various locations. Highest incidence was observed in case of root rot (60-80%) while fruit rot and collar rot showed less than 16% incidence in area under survey. The incidence of PRSV was found between 80 and 100%; while leaf curl showed less than 3% incidence only.

Epidemiology and Integrated management of papaya ring spot virus.

a. Epidemiological studies: The comparative study also indicated that October planted papaya plants were exposed to PRSV disease for shorter duration as compared to July planted crops which was exposed to PRSV disease for much longer duration, so resulted in quite less marketable fruit yield i.e. 18 kg/plant as compared to October planted crop which resulted higher marketable fruit yield (24 kg/plant). On the basis of above finding October planting of papaya proved to be more

proper for managing PRSV due to delayed PRSV appearance as compared to July planting which encourage the PRSV incidence.

b. Management: Among the various treatments the most effective treatments was spraying of Urea @ 10g/litre + Zinc sulphate @1.5g + Boron @ 1.0g per litre applied at monthly intervals up to 8 months which registered lowest rate of PRSV disease development (12% at 150days, 25% at 180 days and 48% at 210 days).

Integrated management of papaya diseases: Comparative study of Module-I (Proposed recommendations) and Module-II (Standard recommendations of the University) on development of papaya diseases showed that module-I recorded PRSV in the month of February, 2016 at 6% which enhanced to the level of 62% in the month of August, 2016 where as in case of module-II PRSV disease appeared earlier in the month of January,2016 at the level of 8% which increased to 15% in Febraury,2016 and further enhanced to 71% in the month of August, 2016.Thus module-I slowed down the development of PRSV on papaya.

ONION & GARLIC

Initial Evaluation Trial (IET): Eighteen entries including check variety ADR were evaluated. Three entries were recorded significantly higher yield as compared to check var. ADR (222.15 q/ha). Entry ON16-13 with 262.77 q/ha total bulb yield was found highest yielder.

Advance varietal trial – 1 (AVT-1): Thirteen entries including check variety ADR were evaluated. Five entries recorded significantly higher yield as compared to check var. ADR (225.44 q/ha). Entry ON15-21 recorded 271.66 q/ha total bulb yield which was maximum.

Advance Varietal Trial- 2(AVT-2): Nine entries viz: ON14-04, ON14-27, ON14-01, ON14-23, ON14-15, ON14-13, ON14-11, & ON14-09 including check var. ADR were evaluated. Entries ON14-13 & ON14-04 recorded significantly higher yield, as compared to check var. ADR (218.55 q/ha). Entry ON14-13 recorded 265.55 q/ha total bulb yield which was maximum.

Initial Evaluation Trial (IET) Rabi Onion: Twenty two entries were evaluated including check var. ALR. Three entries viz: ON16-05, ON16-11, and ON16-35, were significantly higher yielder and entry ON16-11 with 254.77 q/ha total bulb yield was better one as compared to check var. ALR (186.11 q/ha).

Advance Varietal Trial-I (AVT-I) Rabi Onion. : Fourteen entries were evaluated including check var. ALR. Three entries viz: ON15-01, ON15-06, and ON15-27, were significantly higher

yielder and entry ON15-06 with 252.43 q/ha total bulb yield was better one as compared to check var. ALR (183.72 q/ha).

Advance Varietal Trial-II (AVT-II) Rabi Onion: Ten entries were evaluated including check var. ALR. Three entries viz: ON14-01, ON14-11, and ON14-25, were significantly higher yielder and entry ON16-01 with 246.83 q/ha total bulb yield was better one as compared to check var. ALR (191.77 q/ha).

Collection, maintenance and evaluation of Garlic Germplasm: The best entry RAU G-12 planting material has been submitted to DOGR Rajgurunagar Pune for evaluation at national level.

Initial Evaluation Trial (IET) Garlic: Ten entries were evaluated including check var. G-323. Four entries viz: GN15-71, GN15-68, GN15-63, and GN15-65 were significantly higher yielder and entry GN15-68 with 64.17 q/ha total bulb yield was better one as compared to check var. G-323 (47.67 q/ha).

Advance Varietal Trial-II (AVT-II) Garlic. : Ten entries were evaluated including check var. G-323. Two entries viz: GN14-27 and GN14-17 were significantly higher yielder and entry GN14-27 with 70.00 q/ha total bulb yield was better one as compared to check var. G-323 (48.33 q/ha).

3.32.2 CROP PRODUCTION

Effect of sulphur on yield and quality of garlic: Yield of garlic significantly affected by Sulphur application. Increasing dose of S up to 45 kg /ha increased total yield of Garlic. Decline in yield were recorded with 60 kg and 75 kg S/ha. Highest bulb yield (68.96 q/ha) was recorded with @ 45 kg S/ha followed by 60 kg S/ha (62.50 q/ha) and 30 kg S /ha (66.67 q/ha).

3.32.3 PLANT PATHOLOGY

Screening of Kharif onion (AVT-2 entries) against Stemphylium Blight (SB) & Purple Blotch (PB) disease: Nine entries were screened. Among them, only one entry ON14-15 recorded Moderately Resistant reaction against Stemphylium Blight as well as Purple Blotch disease.

Initial Evaluation Trial (IET) Rabi onion Patho: Among 22 entries screened, 5 entries viz., ON16-05, ON16-13, ON16-22, ON16-30, and ON16-32 and 4 entries viz., ON16-05, ON16-11, ON16-30, and ON16-32 were found moderately resistant against Stemphylium Blight and Purple Blotch disease respectively.

Advance Varietal Trial-I (AVT-I) Rabi onion Patho: Among 14 entries screened, 3 entries viz., ON15-01, ON15-06, and ON15-27 and 3 entries viz., ON15-01, ON15-06, and ON15-27 were found moderately resistant against Stemphylium Blight and Purple Blotch disease respectively.

Advance Varietal Trial-II (AVT-II) Rabi onion: Among 10 entries screened, 3 entries *viz* ON14-01, ON14-11, and ON14-25 and 3 entries *viz.*, ON14-01, ON14-11, and ON14-25 were found moderately resistant against Stemphylium Blight and Purple Blotch disease respectively.

Advance Varietal Trial-II (AVT-II) Garlic Patho: Among 10 entries screened all 10 entries were found moderately resistant against Stemphylium Blight and Purple Blotch disease respectively.

Impact of planting dates on Disease infestation in Onion Patho: Highest total bulb yield 263.86 q/ha in protected plot and 243.16q/ha in unprotected plot was recorded when crop was planted on 15th Dec. and this date may be recommended for commercial cultivation of onion in Bihar.

Advance Varietal Trial-1 (AVT-1) against thrips: Thirteen entries including check var. ADR were evaluated against thrips. Significantly low no. of thrips were recorded in entry ON15-06, ON15-16, ON15-13, ON15-28 and ON15-11 as compared to check var. ADR (21.92 thrips/plant & 210.00 q/ha) accordingly significantly higher yield were also recorded. Entry ON15-21 with 244.00 q/ha total yield was proved higher yielder.

Impact of planting dates on thrips infestation in Onion: Six planting dates of onion were evaluated *viz:* 1st Nov., 15th Nov., 1st Dec., 15th Dec., 1st Jan., & 15th Jan. Among the 6 planting dates, the low number of thrips/plant was recorded when crop planted on 15th Dec. The highest total yield (261.13 q/ha) in protected and (247.60q/ha) in unprotected plots with minimum yield loss was recorded when crop was planted on 15th Dec. & the minimum yield (175.19q/ha) in protected and (164.08q/ha) in unprotected plots was recorded in 15th Jan. planted crops.

Effect of foliar application of micronutrient on storage life of Onion: With T₅ (T5-Foliar application of Boric acid (0.25 %), zinc sulphate (0.50 %) & calcium chloride (0.50 %) at 60, 75 and 90 DAP significant effect on higher total bulb yield (229.58q/ha) over control (water spray) followed by T₂ (T2-Foliar application of Zinc sulphate (0.50 %) at 45, 60 and 75 DAP and T₄ (T4-Foliar application of Calcium chloride (0.50 %) at 60, 75 and 90 DAP. The best storage life of onion was recorded with T₅ (T5-Foliar application of Boric acid (0.25 %), zinc sulphate (0.50 %) & calcium chloride (0.50 %) at 60, 75 and 90 DAP followed by T₁ (T1-Foliar application of Boric Acid (0.25 %) at 30, 45 and 60 DAP.

FLORICULTURE

Testing of new genotypes of gladiolus: Performance of six gladiolus genotypes including one national check were evaluated. The gladiolus genotype “Arka Naveen” recorded the highest spike length (66.74 cm), rachis length (48.86 cm) and number of florets/spike (19.00) which statistically at par with Arka Manorama and was significantly superior over rest of the treatments.

Testing of new genotypes of tuberose: Performance of seven tuberose genotypes including one local check were evaluated. The genotype “Bidhan Rajani H-1” recorded the highest spike length (88.08 cm), rachis length (38.68 cm), number of spikes (4,56,250/ha) and loose flower yield (365.82 q/ha) which statistically at par with Prajwal, Phule Rajani, GK-T-C4, Bidhan Rajani H-2 and Arka Nirantra and was significantly superior over rest of the treatments.

Collection, evolution and maintenance of tuberose germplasm: Eight genotypes of tuberose were collected from west Bengal, Bihar and Uttar Pradesh during the year 2016-17, out of it seven are single type florets and one is double type florets. The crop is growing well and data are being recorded.

Effect of different herbicides on weed control in marigold: The pre emergence application of Pendimithline @ 1.0 kg/ha followed by two hand weeding at 30 and 60 DAP recorded the highest marigold flower yield and fetched the highest net returned (Rs. 5.58 lakh / ha) and benefit: cost ratio (5.5). It is recommended for production of good size of flowers and higher yield of marigold in Bihar.

Evaluating performance of gerbera varieties for cut flower production under poly house conditions: Performance of five gerbera varieties including one check were evaluated. The genotype “Liberty” differed significantly with respect to plant height, plant spread, number of sucker/plant, length of flower stalk, flowering duration and cut flower yield than other genotypes.

Evaluating performance of chrysanthemum varieties for cut flowers production under poly house condition: Performance of five chrysanthemum varieties including one check was evaluated. The genotype “Salvadore” differed significantly with respect to plant spread, diameter of flower, weight of individual flower and cut flower yield than other genotypes.

FORAGE CROPS

IVT –Oat-SC: Among the eleven entries of oats, entry OL-6 recorded maximum green forage yield (372q/ha) and dry matter yield (74.10q/ha). It was significantly superior over other test entries except HFO-525-5(361q/ha), JO-05-7(357q/ha) and Kent (366q/ha).

AVT Oat-SC: Entry OS-6 out yielded all other test entries with green forage yield of 394q/ha and dry matter yield of 78.17q/ha except HFO-529 (383q/ha) and JHO-99-2 (383q/ha).

IVT Berseem: Among the seven entries of Berseem evaluated at this centre, entry Wardan (273q/ha) was significantly superior to BL-205(228q/ha) and remaining at par with other test entries.

IVT Pearl Millet: Among the thirteen entries, entry PHBF-4 recorded maximum green fodder yield (461q/ha) and dry matter yield (105q/ha). It was significantly superior over other test entries except NDFB-1502 (443q/ha) and Raj Bajra Chari-2 (434q/ha).

AVT Pearl Millet: Entry APFB-9-1, out of eight entries tested at Pusa, out yielded all other test entry with green fodder yield of 469q/ha and dry matter yield of 105q/ha except TSFB-13-12(453q/ha) and TSFB-14-10(437q/ha).

AVT Rice bean: Among the six entries tested, Bidhan-1 recorded maximum green fodder yield (274q/ha) and dry matter yield (57q/ha). It was significantly superior over other test entries except JRBJ-07-1(260q/ha).

SUGARCANE

Hybridization programme at Pusa with the prime objective to evolve varieties suitable for biotic and abiotic stresses: During 2016-17, altogether, 75 Crosses (Biparental-44, Poly cross-4, Self-2 and FCs-25) were attempted and 2013 seedlings were generated.

Hybridization programme at S.B.I., Coimbatore with the prime objective to evolve varieties having high cane yield and high sucrose: During 2016-17, altogether, 49 Crosses (Biparental-17, Poly cross-5, Self-7 and GCs-30) were attempted and 38414 seedlings generated.

Selection in Second Clonal Generation (CG₂): During 2016-17, altogether, 64 promising clones of both the maturity groups (33 early and 31 mid-late) were selected from 174 clones of second clonal generation and promoted to third clonal generation (CG₃) on the basis of cane yield, juice quality characters and field resistance to major diseases and insect pests.

Selection in third Clonal Generation (CG₃): During 2016-17, total 14 promising clones of both the maturity groups (Early- 08 and Mid-late-06) were selected from 50 (29 early and 21 midlate) clones of third clonal generation trials and promoted to fourth clonal generation (CG₄) on the basis of cane yield, juice quality characters and field resistance to major diseases and insect pests.

Evaluation of Early varieties in Advanced Varietal Trial-I Plant: During 2016-17, in Advanced varietal trial Early Ist Plant, among the three test entries CoP 12436(121.27 t/ha) had maximum cane yield followed by CoLk 12207 (102.64 t/ha) than the best standard BO 130 (102.71 t/ha).

Evaluation of Early varieties in Advanced Varietal Trial-II Plant: During 2016-17, in Advanced varietal trial Early IInd Plant maximum cane yield of 100.93 t/ha was obtained for the test entry CoP 11437 which was statistically superior to the best check BO 130 (92.06 t/ha).

Evaluation of Early varieties in Advanced Varietal Trial-Ratoon: During 2016-17, in Advanced varietal trial Early entries of Ratoon, maximum cane yield of 104.35 t/ha was obtained for the test entry CoP 11436 which was statistically superior to the best check BO 130 (98.82 t/ha) followed by CoP 11437 (103.35 t/ha).

Evaluation of Midlate varieties in Advanced Varietal Trial-I Plant: During 2016-17, in Advance Varietal Trial on midlate Ist plant, maximum cane yield of 111.18 t/ha was obtained for the test entry CoLk 12209 which was statistically superior to the best check CoP 9301(75.25 t/ha) followed by CoP 12438(89.54 t/ha) and CoLk 09204(84.97 t/ha).

Evaluation of varieties in Advanced Varietal Trial-II Plant Midlate: During 2016-17, in Advance Varietal Trial on mid late IInd plant, among the test entries maximum cane yield of 106.31 t/ha was obtained for the entry BO 155 followed by CoSe 11453(90.27 t/ha).

One variety **Rajendra Ganna-1** has been recommended by 3rd Research Council Meeting of the University.

To select suitable early maturing varieties of sugarcane from 3rd year varietal trial:

Cane yield: The variety had significant impact on yield attributes and yield of sugarcane. The maximum cane yield (105.8 t/ha) was noticed with the variety CoX 11394 which was statistically similar to CoX 11598 (103.7 t./ha), CoX 11404 (102.6 t/ha) and CoX 11189 (96.2 t/ha) and significantly higher than rest of the varieties.

To select suitable mid-late maturing varieties of sugarcane from 3rd year varietal trial:

Cane yield: Variety had significant impact on yield attributes and yield of sugarcane. The maximum cane yield (94.3 t/ha) was noticed with the variety CoX 11547, which was significantly superior to CoX 11123 (66.2 t/ha) and statistically comparable to rest of the varieties.

To select suitable early maturing varieties of sugarcane from 3rd year varietal trial: On the basis of cane yield and sucrose percent in juice the three genotypes have been selected in early group viz. CoX 08059, CoX 08139 and CoX 08337.

To select suitable mid-late maturing varieties of sugarcane from 3rd year varietal trial: On the basis of cane yield and sucrose percent in juice the three genotypes have been selected in mid late group viz. CoX 08017, CoX 08036 and CoX 08514.

To assess the effect of sugarcane variety and method of planting under waterlogged condition: For realizing higher productivity and profitability from waterlogged conditions, trench method of sugarcane planting should be adopted. Variety CoP 2061, BO 137 and BO 154 are suitable for cultivation under waterlogged conditions.

Evaluation of early sugarcane varieties to different fertility levels under rainfed condition: Variety BO 153 and BO 130 are suitable for cultivation under upland rainfed situations. Among fertility levels, application of 75% recommended dose of fertilizer (112.5-63.8-45.0 kg N-P₂O₅-K₂O/ha) was found adequate for higher productivity and monetary returns under upland rainfed conditions.

Effect of organic products Durga Gold and Durga Shaktizyme on productivity of sugarcane:

The maximum number of tillers (101.44×10^3 /ha), NMC (76.68×10^3 /ha), single cane wt. (863.3 g) and cane yield (66.12 t/ha) were recorded in organic treated plots receiving Durga gold @1 t/ha (mixture of pressmud and neem cake 9:1) and Durga shakti zyme@ 10 Kg/ha (seaweeds extract) in combination and lowest in control (RDF).

Effect of salinity levels on productivity and juice quality of sugarcane genotypes: The pot experiment was conducted with five sugarcane varieties (CoP 112, BO154, BO 153 and CoP 9301 and CoP 9702) at three salinity levels (0, 2.5 and 5.0 d Sm⁻¹) under artificial saline condition. Increasing salinity levels (ECe 0 to 5.0 dS m⁻¹) significantly reduced yield attributing characteristics and yield of sugarcane with deterioration in juice quality parameters and sugar yield.

Survey and surveillance of sugarcane insect pest: During survey the incidence of ESB (5.5 to 11.5%), RB (3 to 6%), TB (10.5 to 17.5%), SB below 5%, AW (6.5 to 15.5%) and Pyrila (6 to 19/leaf) were observed as key pests of sugar factory reserved area of sugarcane.

Monitoring of insect pests and bio-agents in sugarcane agro-ecosystem: The data on monitoring of insect pests and their bio-agents revealed that the mean per cent incidence of Root borer, Shoot borer, Top borer and Stalk borer were varied from 1.8 to 10.2%, 2.0 to 14.3%, 1.0 to 16.7% and 2.0 to 5.3% respectively. Whereas, the incidence of sugarcane Pyrilla was recorded which varied from 1.0 to 17.9/leaf. The data revealed that population of *S. deesae* varied from 5 to 11.5% during May to November. Where its peaks (11.5%) noticed in September.

Bio-efficacy of newer insecticides for the control of sugarcane early shoot borer: It reveals from the results that Chlorantraniliprole 18.5 SC@375ml/ha was superior when it was sprayed at 30 DAP and 60 DAP as recorded maximum germination (34.0 %), least cumulative incidence of ESB (5.00%) and highest yield (86.20 t/ha).

Reaction of clones/varieties to borers in 3rd year: 19 (Nineteen) varieties of two maturity groups were screened against different borers at field condition during 2016-17 at Pusa Farm. The minimum (6.80%) and maximum (7.90%) incidence recorded with variety BO – 153 and CoX – 09511, respectively, under early maturity group of variety.

Identification of pathotypes of red rot pathogen (2016-17): Differentials BO 91, Baragua and SES-594 showed resistant reaction while, Co 1148, Co 997, CoJ 64, CoC 671 and Khakai produced susceptible reaction against all the test isolates. Differentials Co 419, CoS 767, Co 7717, CoS 8436, Co 62399, Co975, CoV, 92102, Co 86032 and CoSe 95422 showed differential reaction against all the test isolates.

Survey of Sugarcane diseases naturally occurring on Sugarcane Varieties (2016-17): An extensive survey was conducted in different cane growing areas of Bihar. Twelve sugarcane varieties were found affected with red rot, smut, wilt, GSD, top rot & mosaic diseases. The major diseases and varieties were found affected are as follows.

Screening, epidemiology and management of Pokkah Boeng in sugarcane (2016-17): Eleven sugarcane genotypes including one check were screened under natural condition, out of eleven genotypes, four genotypes CoX 12278, CoX 12137, CoX 12489 and CoX 12494 were showed mild infection.

Screening of 3rd year promising genotypes to find out the level of resistance against red rot, smut and wilt diseases (2016-17): Out of sixteen genotypes, six genotypes (CoX 09658, CoX 09643, CoX 09296, CoX 09125, CoX 09328 and X 09317) showed resistant reaction, whereas, ten genotypes, (CoX 09240, CoX 09721, CoX 09123, CoX 09647, CoX 09415, CoX 09276, CoX

09503, CoX 09541, CoX 09626 and X 09328) were graded as moderately resistant reaction against red rot disease. In case of smut, twelve genotypes, (CoX 09240, CoX 09123, CoX 09647, CoX 09415, CoX 09276, CoX 09503, CoX 09626, CoX 09658, CoX 09643, CoX 09296, CoX 09328 and X 09328) remained free from infection and they were graded as resistant.

ALLIED RESEARCH

FARM IMPLEMENTS MACHINERY

Feasibility testing of Maize dehuskar cum Sheller: The test was conducted with the, devki, Kargil maize variety in about 7 hour. But the different data for research was taken with the variety Kargil. The maximum threshing and shelling output capacity was 510 kg/h at 16% moisture content and 740 RPM. The dehusking efficiency at 16% moisture content and 740 RPM was also maximum i.e. 96%. Grain breakage and unthreshed grain % was minimum at cylinder speed of 740 RPM. But in the specification given by the manufacturer maximum output at 720 RPM. The cost of use of machine was calculated by straight line method (power tiller as prime mover) and found to be Rs. 352/hr. The machine attracts the farmers because of its characteristics to conduct dehusking and shelling operation simultaneously. So this machine appears to be very useful for the farmers particularly from labour saving point of view

Feasibility testing of self-propelled power weeder for low land rice: The PFT of self-propelled power weeder for low land rice was conducted after modification in RPCAU farm as well as in the farmers' field and compare with/without modification in the paddy crop manually transplanted and mechanically transplanted. The modification was conducted in the increasing in number of blade and reducing in the size(width) of blade. The following are the result

S. No	Particular	TNAU make	Modified
1.	Actual field capacity, ha/h	0.023	0.15
2.	Field efficiency, %	78	80
3.	Weeding efficiency, %	53.25	72
4.	Plant damage percentage, %	6	0.5

Frontline demonstration of self propelled 8 row self propelled riding type rice transplanter

: The machine was demonstrated in the different farmers' field of Samastipur District of Bihar in about 7.5 ha in the year 2016. The cost of operation was found to be Rs 3906.00 /ha. The payback

period of transplanter was about 3 years if operated for 200 hour per year. The average field capacity and average field efficiency was found to be 0.16 ha/h and 63% respectively.

Front line Demonstration of manual operated low land rice seeder (TNAU Make): The manual operated low land rice seeder (TNAU Make) was demonstrated in the farmers' field of Samastipur District as well as RPCAU, Pusa farm with different variety of paddy in 15.25 ha. Field capacity and field efficiency were 0.12 ha/h and 60% respectively. The average seed rate was 30 Kg/ha. The soaking time was 24 hrs. The net saving in cost of sowing by drum seeder was Rs 6300/ ha.

Feasibility testing of Sugarcane sett cutter planter: The field capacity and field efficiency of machine was 0.56 ha/h and 62% respectively at forward speed of 2.5 km/hr at 2nd low gear. An average sett length of 35 cm at speed of 2.5 km/hr with an overlap of 12.4 cm was observed. Cost of sugarcane planting by this machine was found Rs. 1443.00/h and Rs. 3607.00/ha. Cost of sugarcane planting by conventional method was found Rs. 7000.00/ha. There was net saving found Rs. 3393.00/ha by the machine over conventional method.

Front line demonstration of T/D laser guided land leveller: T/D laser guided land leveler machine was demonstrated in the farmer's field as well as in the university farm field of about 6.25 ha. Observation and farmers feedback were also taken. The Cost of leveling was about Rs 1500/h. About 5-7% enhancement of yield was also observed.

Farmer's feedback: Farmers were impressed with performance of machine. Requirement of high power tractor and high cost of machine was reported to be a major constraint in purchase of laser land leveler.

Front line demonstration of Reaper cum binder: Reaper cum binder machine was demonstrated in the farmers' field of about 9.75 ha. Observation and farmers feedback were taken. The average field capacity of the machine was found 0.35 ha/h. The Cost of harvesting by machine was about Rs 2500/ha. Compared to traditional method of harvesting, saving Rs of 3000/ha was found. Farmer's feedback: Farmers liked this machine but cost of Twines and its availability was a hurdle.

Front line demonstration of Tractor operated Aero blast sprayer: Tractor operated Aero blast sprayer machine was demonstrated in the farmer's field as well as in the KVK Birauli farm of about 34 ha. The number of Mango tree was (782) and Litchi tree was (2103). Some of the observation and farmers feedback were also taken. The average field capacity of the machine was found 0.53 and 0.64 ha/h in mango and litchi orchard respectively. The Cost of per spraying by

machine was about Rs/ha for 1330.00 Mango orchard and Rs/ha 1172.00 for Litchi orchard. Saving Rs/ha 3247.00 was found as compared to traditional method of spraying by Gator.

POST HARVEST ENGINEERING TECHNOLOGY RESEARCH

Development of ohmic heating unit for food processing: A prototype of continuous type ohmic heating unit was designed and fabricated for volumetric/processing capacity of 15 ± 5 litres/hour and which could be able to elevate the temperature up to $25 \pm 5^{\circ}\text{C}$. The ohmic heating unit has been tested for three liquid foods i.e. sugarcane juice, milk, and watermelon juice at frequency of alternating current at 40, 45, 60 Hz, applied voltage of 25, 30, 35 V and volumetric flow rate at 12, 18, 24 lph. All the observed data were used to calculate different dependent parameters i.e. temperature rise and system performance coefficient. The effect of different independent variables was seen on dependent parameters by developing multiple regression polynomial equations. Following are the optimum values of independent variables for three different liquid foods to get optimized yield in continuous mode of ohmic heating:

Liquid Food	Optimized Independent Variables		
	Frequency (Hz)	Applied Voltage (V)	Flow Rate (lph)
Sugarcane Juice	45.00	31.1	12
Milk	38.75	30.0	24
Watermelon Juice	42.00	30.0	24

The OHU has been found most efficient in time and money saving as compared to traditional heating method.

WATER MANAGEMENT

To demonstrate and evaluate improved water management practice for rice (ORP) : Under OFWM activities in Village-Narha Panapur, Block- Tetaria, Distt-E. Champaran, it was found that improved water management practices for rice under SRI consisting of 3 days drying after disappearance of 3 cm of ponded water performed better with mean grain yield being 62.30 q/ha as compared to farmer's practices (conventional method) in which mean grain yield was 46.32 q/ha. Water use efficiency (WUE) was also higher in SRI (207.67 kg/ha-cm) as compared to 110.29 kg/ha-cm in conventional method.

Mulching for improvement of WUE and crop productivity of maize-maize cropping system under calciorthents. : On the basis of three years pooled data, it may be concluded that mulching with either sugarcane trash or maize-stubble @ 10t/ha significantly improved the grain yield and WUE of *Kharif* and *rabi* maize and benefit cost ratio of the system as compared to no-mulch. Irrigation with IW/CPE ratio of 0.8 in *rabi*-maize was found the best and for *Kharif*-maize there is no need of irrigation if frequent and sufficient rainfall occurs.

Assessment of Ground Water Quality nearby Mokamah Leather Factory: Altogether, 18 ground water samples of different water bodies were collected from various locations with radial distance of the leather factory. The pH and EC values of water samples of various water bodies were found within safe limit where pH values come under neutral to medium saline. The concentration of Na and Ca+Mg was found high nearby leather factory as compared to those water bodies located away from the sources but were within safe limit. In general, concentration of carbonate and bicarbonate, chloride and values of SAR were found in acceptable range of irrigation water. Amongst, the micronutrients, the concentration of Fe were recorded in the range of 0.70 to 4.50 ppm which is beyond safe limit of irrigation purpose. In case of heavy metals, like Cd, Ni & Pb were not detected whereas only Cr was recorded in some water bodies which was situated nearby leather factory and was found beyond permissible range of irrigation water.

AGROMETEOROLOGY

Studies on crop weather relationship in *Kharif* rice : Crop weather relationship studies on rice grown under irrigated conditions with four sowing dates viz. 31 May, 15 June, 30 June and 15 July revealed that accumulated heat units decreased with delay in sowing till crop reached tillering stage and increased thereafter till crop maturity. The studies brought out several critical information, which could be useful in achieving attainable yield of *Kharif* rice in the state of Bihar. Higher grain yield was observed at maximum temperature (T_{max}) between 32.2 and 32.8 °C during heading phase, while grain yield reduced appreciably when $T_{max} > 33$ °C was recorded during this phase. Grain yield declines by 4.30 q ha⁻¹ per 1 °C rise in T_{max} during heading stage due to reduction in 'pollen viability', resulting in greater spikelet sterility and subsequently lower yield. Daily bright sunshine hours (BSH) of 7 to 8 hours during flowering phase led to enhanced grain yield. However, BSH of less than 7 hours resulted in decline of grain yield. The weather during the flowering phase of the crop played an important role in deciding the grain yield.

Studies on crop-weather relationship in wheat: Early sowing of wheat helps in escaping heat load during flowering to maturity period of the crop. Critical weather thresholds identified at different phenophases of wheat for enhanced crop yield being are being utilized in developing wheat crop-weather calendar for operational purposes.

Agro climatic resource characterization and climate change studies: Trend analysis of rainfall revealed decreasing pattern of rainfall in most of the districts. Although annual rainfall is showing a decreasing trend, pre-monsoon rainfall is observed to be showing an increasing trend. Standardized precipitation indices (SPI) analysis of Kharif season rainfall indicated increasing level of dryness in recent years in many districts of Bihar. Evaluation of rainy season onset based on 75 mm forward rainfall accumulation, potential evapo-transpiration during different crop growing seasons, moisture availability and analysis of wet spell at different probability levels was made and thematic GIS maps were generated based on these agro met products.

AGROFORESTRY

Evaluation of Aonla (*Emblica officinalis*) based Agrihorticultural System with turmeric varieties: The maximum yield was recorded with the NDH-92 (19.57 Mg ha⁻¹) followed by Rajendra Sonali (11.08 Mg ha⁻¹) and Rajendra Sonia (10.94 Mg ha⁻¹). Turmeric yield and light intensity under canopies of Aonla orchard showed highly significant and positive relationship ($r^2 = 0.819^{**}$ to 0.940^{**}). By and large, Aonla+NDH-92 system is the most profitable on the basis of Land Equivalent Ratio (2.12), Aonla Equivalent Weight (32.74 Mg ha⁻¹) and B:C ratio (4.22).

Evaluation of Kadamb (*Anthocephalus cadamba*) based Agrisilvicultural System with turmeric varieties: Under 11-year-old Kadamba plantation, light intensity ranged from 134×100 to 180×100 lux showing 17.63 to 23.56 percent light available to the crops. Coefficients of determination (r^2) for the yield of turmeric varieties and the light intensity varied from 0.821^{**} to 0.983^{**}. Height, Girth at breast height and Crown diameter of tree varied from 8.52 to 9.43 m, 56.8 to 65.2 cm, and 5.52 to 6.79 m, respectively. Volume of trees varied from 111.0 to 125.5 m³ha⁻¹ under agrisilvicultural system, while it was 86 m³ha⁻¹ without intercrop. The timber biomass varied from 55.5 to 63.0 Mg ha⁻¹ under agrisilvicultural system, while it was 43.0 Mg ha⁻¹ without intercrop. Carbon sequestered in the stem of kadamb tree ranged from 22.0 – 32.0 Mg ha⁻¹

Performance of agricultural crops under different density Semal (*Bombax ceiba*) plantations: The results indicated that the yield of crops under two-year-old Semal plantations

adversely affected under higher density plantations (666 – 1000 trees ha⁻¹). Sesamum yield varied from 5.14 (5x2m tree spacing) to 5.48 q ha⁻¹ (5x5m tree spacing), whereas mustard varied from 14.6 (5x2m tree spacing) to 17.4 q ha⁻¹ (5x5m tree spacing). Height, Collar girth and Crown diameter of tree varied from 1.75 to 2.05 m, 18.52 to 23.20 cm, and 0.78 to 0.90 m, respectively. Semal plantations of different spacings intercropped with sesamum were found to have average light intensity varying from 386×100 (60.8 %) to 464×100 lux (74.8 %).

Evaluation of different clones of poplar (*Populus deltoides*) under nursery condition:

Different morphological growth parameters for 18 poplar clones were recorded in terms of sprouting percentage, height and collar diameter. Sprouting, height and collar diameter varied from 56 – 100 %, 2.90 – 4.27 m and 1.95 – 3.03 cm, respectively. Clone number S1 showed the maximum height followed by PH-6, while collar diameter was maximum for clone number PP 9-25 followed by S1.

MAP& BETEL VINE

Collection and Maintenance of germplasm of Brahmi: Fourteen germplasm are being maintained. Among the germplasm, collection RAU BM-11, registered the highest herbage fresh yield (221.87q/ha) and dry herbage yield (47.11 q/ha). However, RAUBM-12 and RAUBM-10 also showed better performance in terms of yield as compared to other collections.

IET evaluation of promising lines of Basil for high yield and quality: Three entries along with one local check were evaluated during Kharif 2016-17. All the three entries AB-2 (178.58 q/ha), AB-1 (166.82q/ha) and AB-3 (148.08q/ha) recorded significantly higher fresh herbage yield than local check (135.43 q/ha).

AVT-1 evaluation of promising lines of Basil for high yield and quality: Five entries along with one local check were evaluated during Kharif 2016-17. All the five entries recorded significantly higher fresh herbage yield than local check.

AVT-1 evaluation of promising lines of Kalmegh for high yield and quality: Thirteen entries along with one local check were evaluated during Kharif 2016-17. All the thirteen entries recorded significantly higher fresh herbage yield than local check (73.87q/ha).

Effect of organic manures and biofertilizers on satavari: Result revealed that application of Vermicompost (2 t/ha) + mustard cake (1 t/ha) inoculated with mixture of PSB-5 kg and

Azospirillum- 2 kg/ ha (M4 S3) produces significantly higher root yield (145.63 q/ha) whereas minimum was recorded M1S1(114.15 q/ha).

Effect of organic manures and biofertilizers on tulsi: Result revealed that application of vermi compost@2.5 tone /ha inoculated with mixture of PSB-5 kg and *Azospirillum*- 2 kg/ ha. (M2 S3) produces significantly higher herbage yield on fresh weight basis (169.21 q/ha).

Effect of planting time and spacing on plant growth and dry biomass yield of tulsi (*Ocimum sanctum*): Result revealed that the crop planted on first July with spacing of 40X30 cm (D3 S2) recorded maximum fresh herbage yield (166.23 q/ha).

Standardization of organic production technology for Kalmegh: Result revealed that plant biomass yield was recorded maximum (131.56 q/ha) with Vermicompost application(M2) which was recorded significantly higher yield over rest of the treatment . Maximum plant biomass yield (126.87 q/ha) was recorded with S2 biofertilizer (*Azotobacter* + PSB) which was recorded significantly higher yield over rest of the treatment .

Collection, cataloguing, identification and seasonal variation of insects' pest associated with the medicinal plants: There were two categories of insects found on tulsi plants i.e., major and minor groups of insects. Major group of insects were lace bug, leaf folder on *Ocimum basilicum* while spittle bug on *Ocimum sanctum*. The other associated insects are Eplichna beetle, snail and Scutellarid bug.

Population dynamics of economically important insect (Lace bug) on Medicinal and Aromatic Plants: Lace bug peak number was found during 43 standard week (22 -28 oct.2017) at 32.30 and 21.30^oC, 86 and 49 per maximum and minimum relative humidity and 1.7mm rainfall. Population started to increase during 38th standard week (17-23 oct,2017) and continued till January first week in the temperature, humidity and rainfall range, 34.50- 18.90^oC (max. temp.), 25.40^oC- 9.70^oC, 73-51% relative humidity and rainfall 3.40 0.00 mm, respectively.

Life cycle study of Lace bug, *Cochlochila bullita* on Tulsi, *Ocimum basilicum* plants : It was found that the *Cochlochila bullita* had 4-7 days of incubation period, 10- 14 days of nymphal period, 14-21 days of adult longevity, 32-36 days of total developmental period and 46- 59 days of total life cycle.

Field efficacy of locally available botanical products against Lace bug, *Cochlochila bullita* on Tulsi (*Ocimum basilicum*)plants In course of investigation it was observed that tobacco

decoction 5%, neem seed kernel extract 5% and neem oil 2% were markedly effective in suppression of lace bug population over control at post count of 1st, 3rd, 7th day of spraying. However neem oil 2% and tobacco decoction 5% were found to be more effective in suppression of pest population than neem seed kernel extract at 14th day after spraying.

Mandookparni (*Centella asiatica*) showed serious incidence of stolon rot, caused by *Fusarium* clade VII (IMI 502631) during July-September, 2016 (up to 35%).

Pipali (*Piper longum*) was found to be affected by leaf spot (5-10% intensity) caused by *Botryodiplodia theobromae* (ITCC-8867.12) during August-September, 2016

Sarpgandha (*Rauvolfia serpentina*) showed the incidence of leaf spot (up to 15% intensity) caused by *Xanthomonas oryzae* (IMI 503563). in the month of July – October, 2016.

Ghrit kumari (*Aloe vera*) showed the incidence of black rot (< 10% intensity) caused by *Colletotrichum gloeosporioides* (IMI 503564)

Tulsi (*Ocimum sanctum*) was found to be affected by leaf spot (<10%) caused by *Alternaria alternata* during July to September, 2016. and Powdery mildew (Trace) caused by *Erysiphe* sp. during March, 2017.

Integrated Management of stolon rot of *Centella asiatica* caused by *Fusarium Clade VII*
:: The soil incorporation of FYM @ 200 kg/ha inoculated with *Trichoderma harzianum* @ 2 kg/ha combined with sapling treatment with suspension of *Trichoderma harzianum* @ 10 g/L of water for 10 minutes was most effective and caused maximum disease suppression (65.16%) over control.

Integrated Management of Leaf spot of *Piper longum* caused by *Botryodiplodia theobromae*: The incorporation of 10 g of *Trichoderma viride* formulation with 100 g of FYM per pit at the time of planting was found to effectively reduce the development by 21.4% over control. When this treatment was accompanied with preventive spray of Blitox 50 (0.3%), and spray of propiconazole @ 0.1% or carbendazim (0.1%) just after appearance of initial symptoms showed promising effect on disease development causing 64.28% reduction over control.

Effect of integrated crop management (INM+ IDM) on crop performance of Betel vine in farmers' fields: The ICM/IDM technology of Betel vine cultivation developed by center was tested in 30 farmers' fields at 7 different locations in 4 different districts—Samastipur, Vaishali, Darbhanga and Begusarai districts of Bihar. The crop performance under ICM/IDM practice was found superior at all locations with maximum marketable yield (50.8 lakh leaves/ha) and quite less disease incidence in Darbhanga district. The crop in ICM/IDM practice also recorded longer shelf

life (15-16 days). The crop under ill managed condition (Farmers practice) registered lower yield (maximum-35.8lakh leaves/ha) with higher incidence of Phytophthora rot (up to 15.0 %) and shorter shelf life (10-12 days)

MICRO AND SECONDARY NUTRIENTS AND POLLUTANTS

GPS based delineation of micro and secondary nutrient deficient areas: Maps of spatial variability of micro and secondary nutrients on district and block levels are being prepared. GPS based soil sampling and analysis has been completed for Saharsha (2874 soil samples) district. The soil samples were analysed for available nutrient contents along with other chemical properties like pH, EC, OC. The extent of micronutrient in Saharsha district followed the following sequence Zn (55.1%), Cu (9.2%), Fe (14.9%) and Mn (12.5%).

Optimizing zinc levels and crop residue management under rice-wheat cropping system: Rajshree was replaced by Sahabhagi Dhan. Highest rice grain yield was found in 100% crop residue incorporated plots which was 14.1% higher than residue control plot little differences in rice grain yield was observed among different levels of initial Zn applied plots

Effect of phasing of Zn application on fate of Zn pools in calcareous soil and rice wheat cropping system: In R-W cropping system, Zn was applied in combinations of four different doses (0 to 10 kg ha⁻¹) and four modes i.e. every year, alternate year and only initially applied in a six year experiment. Highest rice grain yield in the fourth year was found in initially applied Zn at 7.5 and 10 kg ha⁻¹ in R-W and at 5.0 kg ha⁻¹ at alternate year

GPS based delineation of micro and secondary nutrient deficient areas: GPS based soil sampling and analysis has been completed for Saran (250) district. The extent of micronutrient and secondary nutrient deficiency in Saran district followed the sequence Zn (39.6 %), Mn (13.6 %), Cu (5.6 %) and Fe (16.8 %). The extent of micro nutrient deficiency alone or in combination with other micronutrients revealed that the extent of deficiency of two elements were to the tune of 15.2 % while single element deficiency was 32.8 %. Even three (2.4 %) and four elements (1.2 %) deficiency were also observed.

Optimizing zinc levels and crop residue management under rice-wheat cropping system: Increasing the levels of crop residue progressively increased the grain yield from 36.9 to 41.0 q/ha. Residue retention at 100 % had significantly higher grain yield (11.1%) over control. **Effect of phasing of Zn application on fate of Zn pools in calcareous soil and rice wheat cropping system:** Wheat grain yield varied from 37.77 to 46.53 q/ha whereas the straw yield varied from

64.66 to 79.70 q/ha. Significant increase in wheat grain yield was observed when zinc was applied in alternate years @ 5.0, 7.5 and 10 kg Zn/ha or each year @ 5.0 and 10 Zn kg/ha over control. Similar was the case with straw yield.

Effect of phasing of Zn application on fate of Zn pools in calcareous soil and rice-maize cropping: The maize grain yield varied from 50.99 to 65.92 q/ha whereas the straw yield varied from 70.84 to 91.94 q/ha. In the third year initial application of Zn @ 10kg/ha or application of Zn @ 2.5, 5.0, 7.5 or 10 kg/ha in alternate years or every year resulted in significantly higher grain and straw yield over control.

Effect of phasing of B application on fate of B pools in calcareous soil and rice - mustard cropping system: Mustard grain yield varied from 8.66 to 12.39 q/ha whereas the straw yield varied from 38.18 to 54.64 q/ha. Mustard crop responded significantly to the 1.0 to 2.0 kg Borax at alternate year and 0.5 to 2.0 Borax at every year application.

SOIL TEST CROP RESPONSE CORRELATION (STCR)

Complex experiment to develop targeted yield equations for Lentil (PL 72-12) under integrated nutrient management. : N, P and K requirement of Lentil under integrated nutrient management (FYM) to produce one quintal of grain of lentil on an average are 4.70, 0.46 and 1.95 kg, respectively. Contribution of applied nutrients in terms of fertilizer to the total uptake by lentil in calcareous soil were 220.26% for N, 18.14% for P and 129.80% for K and those of soils were 16.85% for N, 35.94 % for P and 11.68 % for K. Contributions of FYM were 280.84% for N, 48.86% for P and 94.14 % for K. Targeted Yield Equations developed:

$$FN = 2.13 T - 0.08 SN - 1.28 CN, FP = 2.54 T - 1.98 SP_2O_5 - 2.69 CP_2O_5$$

$$FK = 1.50 T - 0.09 SK_2O - 0.73 CK_2O$$

Complex experiment to develop targeted yield equations for Coriander (Pant Haritma) under integrated nutrient management. : N, P and K requirement of Coriander under integrated nutrient management (FYM) to produce one quintal of grain of coriander on an average are 3.27, 0.58 and 3.86 kg, respectively. Contribution of applied nutrients in terms of fertilizer to the total uptake by coriander in calcareous soil were 44.04% for N, 19.95% for P and 193.35% for K and those of soils were 8.40% for N, 47.15 % for P and 17.77 % for K. Contributions of FYM were 13.35% for N, 3.48% for P and 15.35 % for K. Targetted yield Equations developed: FN = 7.43 T

$$- 0.19 SN - 0.30 CN, FP = 2.92 T - 2.36 SP_2O_5 - 0.17 CP_2O_5$$

$$FK = 2.00 T - 0.09 SK_2O - 0.08 CK_2O$$

Long term front line demonstrations on yield targeting of Mustard under Rice – Mustard cropping system in calcareous soil at experimental field, Dr. RPCAU, Pusa.

: Targeted yield equation used: $FN = 6.45T - 0.20 SN - 0.30 CN$

$FP_2O_5 = 2.16T - 1.42 SP_2O_5 - 0.34 CP_2O_5$, $FK_2O = 2.78T - 0.10 SK_2O - 0.50 CK_2O$

One verification trial on yield targeting of Mustard indicated that the percent deviation between yield target and actual yield were +1.96 to + 11.11 and response ratios varied from 8.94 to 14.96 kg grain / kg nutrient. Benefit per Rs. investment on fertilizer varied from 7.24 to 16.82. It was observed that response of Mustard and net profit due to STCR calibrated fertilizer doses both with and without IPNS were greater than that of general recommended dose (GRD) and farmer's practice (FP). The response of Mustard 8.94 to 10.35 to STCR calibrated fertilizers which increased further under IPNS 10.35 to 14.96 kg/kg nutrients at 15 to 25 q/ha yields targets respectively. Similarly, at the same targets net profits of Rs. 35100 to Rs. 74700 which without IPNS which increased from Rs. 36900 to Rs. 71100 under IPNS system.

Long term effect of organic manure, crop residues & inorganic fertilizer on grain yield of wheat (q/ha) 56th crop: Grain and straw yield of rice (56th crop) increased significantly with increasing levels of fertilizers up to 150% NPK. The relative performance of organic manure and crop residues on the yield of rice varied in the order: Compost + crop residues > compost > crop residues > no compost or no crop residues. The result indicated that crop residues could substitute compost @ 10 t/ha. The compost, crop residues and compost + crop residues increased the grain yield of rice 39.52, 32.07 and 56.09%, respectively and that of straw yield 58.59, 24.71 and 36.97%, respectively.

Long term Front Line Demonstrations on yield targeting of Rice under Rice – Mustard cropping system in Calcareous soil at experimental field, DRPCA, Pusa:

Verification trial on yield targeting of Rice under Rice–Mustard cropping system in Calcareous soil indicated that the percent deviation between yield target and actual yield were +2.44 to 6.67 and response ratios varied from 11.94 to 16.99 kg grain/kg nutrient. Benefit per Rs. investment on fertilizer varied from 6.42 to 8.54. It was observed that response of rice to STCR calibrated fertilizer doses and net profit due to soil test based fertilizer dose at yield target 35 to 45q/ha under IPNS were greater than that of General Recommended Dose (GRD) and farmer's Practice (FP). The response of rice (kg/kg nutrients) to STCR calibrated fertilizers (13.52 to 14.86) increased further under IPNS (15.12 to 16.99) at 35 to 45q/ha yields targets. Similarly at the same targets net profits (Rs. 38220 to Rs. 53655) also increased under IPNS system (Rs. 38220 to Rs. 55125).

Long term Front Line Demonstrations on yield targeting of Rice under Rice – Winter Maize cropping system in Calcareous soil at experimental field, DRPCA, Pusa :

Verification trial on yield targeting of Rice under Rice–Winter Maize cropping system in Calcareous Soil indicated that the percent deviation between yield target and actual yield were +0.71 to +4.11 and response ratios varied from 10.28 to 19.87 kg grain/kg nutrient. Benefit per Rs. investment on fertilizer varied from 5.53 to 10.77. It was observed that response of rice to STCR calibrated fertilizer doses and net profit due to soil test based fertilizer dose at yield target 35 to 45q/ha under IPNS were greater than that of General Recommended Dose (GRD) and farmer's Practice (FP). The response of rice (kg/kg nutrients) to STCR calibrated fertilizers (16.16 to 18.07) increased further under IPNS (17.95 to 19.87) at 35 to 45q/ha yields targets. Similarly at the same targets net profits (Rs. 34913 to Rs. 49980) also increased under IPNS system (Rs. 36750 to Rs. 51450).

Complex Experiment to develop targeted yield equations for (Foxtail millet) *Kauni* under integrated nutrient management:

N, P and K requirement of Foxtail millet (*Kauni*) under integrated nutrient management (FYM) to produce one quintal of grain on an average were 1.76, 0.44 and 1.42 kg, respectively. Fertilizer-use-efficiency by *Kauni* in calcareous soil were 31.31 for N, 22.81% for P and 76.22 % for K and contribution of soils were 12.30 % for N, 108.36 % for P and 25.06 % for K. Similarly contribution of FYM was 95.15 % for N, 30.14% for P and 42.08 % for K.

Creation of fertility gradient for complex experiment: To create fertility gradient in 3 strips, 0, 100 and 200% of recommended dose of fertilizer (120:60:40; NPK kg/ha) were added and exhaust crop rice was grown. The grain and straw yield of rice (Rajendra Bhagwati) increased with increasing fertility levels. The grain yield varied from 16.88 to 64.00 q/ha for rice whereas, straw yield ranged from 52.80 to 138.40 q/ha for rice in strip I to III, respectively.

Front Line Demonstrations on yield targeting of Rice in Young Alluvium Non -calcareous soil on farmers field in Sitamarhi under TSP:

Thirty seven Front line demonstration on yield targeting of Rice indicated that the percent deviation between yield target and actual yield were – 9.09 to + 2.70 and response ratios varied from 12.26 to 15.60 kg grain / kg nutrient. Benefit per Rs. investment on fertilizer varied from 6.39 to 8.58. In majority of cases, it was observed that response of rice to STCR calibrated fertilizer doses, net profit due to soil test based fertilizer dose were greater than that of General Recommended Dose (GRD) and farmer's Practice (FP).

Front Line Demonstrations on yield targeting of Rice in Young Alluvium Non-calcareous soil on farmers field in Saran district under TSP:

Twenty Front Line Demonstrations on yield targeting of Rice indicated that the percent deviation between yield target and actual yield were – 7.53 to + 5.88 and response ratios varied from 11.92 to 15.97 kg grain / kg nutrient. Benefit per Rs. investment on fertilizer varied from 6.42 to 10.03. In majority of cases, it was observed that response of rice to STCR calibrated fertilizer doses, net profit due to soil test based fertilizer dose were greater than that of General Recommended Dose (GRD) and farmer's Practice (FP).

HONEY BEES AND POLLINATORS

Nesting behaviour and domiciliation of *Xylocopa fenestrata*.: In case of carpenter bee (*Xylocopa fenestrata*), the acceptance percent for nesting in bamboo tops varied from an extent of 60 to 70 per cent having a mean value of 65.0%. The nest of carpenter bees was located at a height of 162.2 cm (male) and 176.6 cm (female) on bamboo from ground. The diameter of entrance hole was found in case of male was 1.78 cm and 1.94 cm in female. The girth of bamboo having nest of carpenter bee varied from 2.49 to 2.58 cm.

Assessment of Pollinator Diversity of Ridge gourd: A total of 8 insect species belonging to five families were recorded as the pollinator on ridge gourd flowers. Among the insect species the hymenopterans were found most dominant pollinators viz., *Apis mellifera* L., *Apis dorsata* Fab., *Xylocopa fenestrata* Fab. And *Apis florea* Fab. From Apidae.

Foraging behaviour of *Xylocopa fenestrata*. : The foraging rate of *Xylocopa fenestrata* was minimum in the morning hours (0700-0900 h) and at evening hours (1500-1700 h) being 3.9-4.0 flowers/minute and 3.8- 3.2 flowers/minute, respectively. The maximum foraging speed was recorded 18.4 second on during mid flowering period while the minimum time spent was recorded 15.3 sec. during end of flowering season.

Survey of bee diseases and enemies : The survey bee diseases in *Apis mellifera* apiaries revealed that about 9.73% colonies were infested with nosema, wax moth and mite. In a day, about 21.06 wasps were attacking *A. mellifera* apiaries. The intensity of predatory bird, green bee eater in the apiaries were recorded in the tune of 6.62 birds per day. No new disease incidence was recorded in the apiaries.

MUSHROOM

Germplasm collection. : The survey was by conducted during 2016-17 in Samastipur and Vaishali District in Bihar. A total of 3 germplasms were collected and identified as *Auricularia* sp., *Agaricus* sp. and *Calocybe* sp.

Evaluation of Button Mushroom Varieties.: Button mushroom varieties U3, U358, U354, NBS01 & NBS05 were evaluated for yield potential. Result indicated that NBS-1 (Yield – 22.3 kg per 100 kg straw) & NBS-5 (Yield – 22.63 kg per 100 kg straw) gave higher yield as compare to other varieties under control condition.

Evaluation of pleurotus strains: 4 strains/varieties i.e. PL-16-01 to PL-16-04 were evaluated for yield potential. Result indicated that PL-16-04 gave maximum yield i.e. 85 kg. per 100 kg. Straw during summer (September crop). However PL-6-02gave maximum yield 78.5 kg. Per 100 kg. Straw during winter (December crop).

Evaluation of pipe method of button mushroom production: Out of three methods of compost production maximum yield was obtained by pasteurization tunnel method (25-27kg/ 100 kg compost). Pipe method gave 23-25 kg per 100 kg compost as compare to minimum yield ranges 14-18 kg per 100 kg compost in Long method of composting. Pipe method was superior to long method of composting in terms of yield and time and labour expenses.

NATIONAL SEED PROJECT

Recognition of seed film coating polymers for efficient and health friendly seed treatment operations for certified seeds of maize: Seed coating with Polymer + Thiram + Genius coat (T₃) recorded significant effect on days to 50 % flowering, Inter node length, 100 seed weight, Seed yield / Plant (g), Seed Yield (q/ha), Field emergence at 30 Days and 60 Days. Seed Coating with Polymer + Thiram + Quick Root + Mycorrhiza (T₄) recorded significant effect on days to First flowering, days to 50% flowering, Plant height at 30 days, seed yield per plant and field emergence at 30 & 60 days. Seed coating with Polymer DISCO AG SP RED L -200 + Thiram + Carboxine (T₂) influenced significantly to very few traits. Therefore, the study indicates that Seed Treated with Polymer + Thiram + Genius coat (T₃) and Polymer + Thiram + Quick Root + Mycorrhiza (T₄) was found superior in increasing seed yield of maize.

Monitoring of emerging new diseases of seed borne nature (Rice & Wheat): Between paper (rolled paper) and standard blotter paper method were used for detection of new seed borne pathogens. The main fungi observed in seed samples were *Aspergillus* sps., *Penicillium* sps.,

Curvularia spp., *Drechslera oryzae*, *Fusarium* spp., etc. No new seed associated plant pathogens recorded in rice and wheat samples.

A studies on Seed health status of farmers own saved seed: Total 91 samples of 13 varieties were collected and analyzed for rice bunt infection by NaOH seed soak method. Two samples recorded 1% bunt infection and 5 samples (5.49%) fail to fulfill the minimum germination %. The fungi were observed in laboratory were *Aspergillus* spp., *Penicillium* spp., *Curvularia* spp., *Drechslera oryzae*, and *Fusarium* spp.

A studies on Seed health status of farmers own saved seed (Wheat): Total 44 samples of 4 varieties were observed for bunt infection. All the samples were observed free from bunt infection and 6 (13.62%) samples fail to fulfill the minimum germination %. The fungi were observed in laboratory were *Aspergillus* spp., *Penicillium* spp., *Curvularia* spp., *Bipolarissor okiniana*, *Alternaria* spp and *Fusarium* spp. A seed discoloration was recorded 4 – 12%. Ear cockle and loose smut disease were not recorded in samples.

Development of technologies to mitigate the effect of elevated temperatures on seed set, yield and quality in wheat: Analysis revealed that the chemical treatment T1 & T2 (Glycine betaine & Salicylic acid respectively) significantly influenced 1000- seed weight, seed yield /plant, seed yield q/ha and vigour index while rest of the treatments had also observed significant effect on seed yield /plant, seed yield q/ha and vigour index . Among date of sowing significant effect was observed for normal date of sowing (DS1) in all the characters except germination percentage while late sowing (DS2) had significant effect on seed yield /plant, seed yield q/ha and vigour index only. Among interaction effects, no significant contribution was recorded for any treatment combination.

Grow out test of wheat.: Out of 9 varieties taken under GOT, two varieties i.e. DBW-14 (0.02) and WR-544 (0.03) had found off-type plants but not more than MSCS% of foundation seed (0.05).

UNIVERSITY FUNDED RESEARCH PROJECTS

FACULTY OF AGRICULTURE

Performance of varieties at different seed rate under direct seeded rice: Varieties and seed rate have marked influence on grain yield of rice. Among the cultures tested, hybrid-Arize6444 (44.96q/ha) out yielded the inbred varieties. Abhishek (40.69q/ha) was next best followed by Sahbhagidhan (37.41q/ha). Grain yield increased significantly when seed rate was increased from 20 to 30kg/ha in case of varieties while it remained unaffected for hybrid.

Performance of varieties at different dates of sowing under direct seeded rice: Varieties and date of sowing had significant influence on the productivity of direct seeded rice. Early sowing (20th June) gave significantly higher grain yield (41.96q/ha) over delayed sowing (36.79q/ha) of 20th July. Among the cultures tested, hybrid performed better over conventional owing to more number of effective tillers per unit area.

Performance of different weed management practices on direct seeded rice: Weeds are one of the major constraints to direct seeded rice as dry tillage favours weed growth. Extent of yield reduction was 54.18% as compared to two hand weeding. Higher weed biomass, reduced number of effective tillers and less number of grains per panicle were responsible for decline in grain yield in different treatments. Among the herbicide interventions, application of two post-emergence herbicide (Pyrozosulfuron+ Bispyribac sodium) recorded maximum yield remaining at par with two hand weeding.

Study of rice yield under low light intensity using genomic approaches (icar funded project) : Three hundred rice genotypes were screened under field (100%) and shade (75 % light incidence of pen field) conditions during wet season, 2016. Significant reduction was observed in tiller number, panicle number, biomass, grain weight and grain yield while increase was observed in day to 50% flowering, height, chlorophyll a and chlorophyll b content. The reduction was observed in chlorophyll a/b ratio, number of fertile grains and % of grain fertility under shade. The promising genotypes, namely, Nagra, Safed dhan, Maliksail, Kali Khasa, Dehradun basmati, Radhunipagal, CN-365 and Purnima were identified. These genotypes performed well both in open field and low light conditions and can be used for improving yield potential in low light regions of India.

The survey of present status of bamboo species, traditional/existing practices for post-harvesting management/practices & their processing by artisan & marketing in Bihar:

Diagnostic surveys recorded general distribution and natural occurring of the Bihar bamboo viz. *Bambusa balcooa*, *B. tulda*, *Dendrocalamus strictus*, *D. asper*, *B. wamin* and *Thyrsostachys oliveri*. Some commercial bamboo species, occurred in different home –steads, agro-forestry fields, agri-horti system, bamboo garden, farm field as in boarder planting, row planting, random planting, shelter belts, house garden & block planting along with other MPT and NFTs. Recorded occurrence of 70% *B. balcooa*, 15% *B. tulda*, 10% *B. nutan* and 5% misc species. Consumption pattern of bambu species varied for 47 to 1%. The survey study was also carried out in some districts of Bihar with a view to ascertain knowledge level and extent of practices related to harvesting & post-harvesting managements/ practices. The findings revealed that the majority of bamboo grower & artisans had low to medium knowledge of post-harvesting practices. But, in fact they were unaware about sustainable post-harvesting management/ practices for the processing of the quality bamboo based products. The exiting market price of the bamboo culms and their local products varied from Rs. 25.00 to 400.00 .in rural Local market & Rs. 50.00 to Rs.600.00 in Urban market. Construction of working hall for the post-harvest management is under-process.

Isolation of bacterial wilt pathogen (*Ralstonia solanacearum*): Those samples confirmed the ooze test, the ooze were collected and plated on Triphenyl terazolium chloride (TTC) medium by following the standard procedure streaking and serial dilution method and kept for incubation at 27 ± 1 °C, to isolate bacterial wilt pathogen caused by *R. solanacearum*. After 48 hrs of incubation bacterial colonies observed for appearance of fluidal, irregular and creamy white with pink at the centre, were selected. These colonies were further streaked on TTC medium for purification and finally single purified colonies were taken on casamino acid peptone glucose (CPG) medium for further use.

Pathogenicity test: Pathogenicity test was done through stem inoculation on potato plant cv. Kufri Jyoti. All the isolates were able to produce wilt symptom on potato plants after one week of inoculation. Those isolates confirm the pathogenicity test, were maintained on CPG test tube for further biochemical, biovars characterization and race determination.

KOH test: All the isolates of *R. solanacearum* confirm the pathogenicity test, also proves the KOH test as gram –ve bacteria produces string of slime.

Soil Testing Campaign in Koshi Flood Affected Areas: A total of 7668 GPS-based samples from 1278 villages of Purnia district were collected. Soil samples from five blocks namely Jalalgarh, Kasba, Purnia East, Barhara Kothi and Bhawanipur totaling 1692 were analyzed during

Rabi 2016-17 for Organic Carbon, N, P and K. 83.51, 100 and 86.17 percent analyzed samples were found to be low to medium in Organic Carbon. All the soil samples were deficient in N. 75% of samples were deficient in available P and 86.17% samples were deficient in available K. With regards to the EC value, 99% samples recorded values $<1 \text{ dSm}^{-1}$.

Assessment of Soil Carbon Stock and Nutrient Status of Orchard in Agrolimatic Zone- I of

Bihar : Three pedons P1, P2 and P3 in the orchard were studied for their morphological description and a total 120 soil samples at different depth from orchards were collected from Muraul block and analyzed for physico-chemical properties and nutrient content in soil. Colour of the soils varied between 2.5YR to 10YR. The value ranged 4 to 7 whereas chromas were 4 or less. Organic carbon of 0-15, 15-30 and 30-45cm depth of soil was in the range of 0.35 to 0.92, 0.22 to 0.54 and 0.16 to 0.37 percent respectively. The soil pH and EC was ranges from 7.8 to 8.2 and 0.36 to 0.42 dSm^{-1} whereas, BD and PD of Soil are ranged from 1.18 to 1.40 and 2.11 to 2.38 respectively. $\text{CaCO}_3\%$ of varied between 18.60 to 25.5 reveals calcareous soils which reflected strong effervescence with dilute acid and the water holding capacity varied from 27.60 to 29.65%. The N, P, K and S content was found low to medium in range.

Development of Dhab Area for Enhancing Livelihood through Agricultural Interventions:

Soil sampling and soil analysis has been done at Bairiya Dhab from below embankment to the riverbed on the basis of land topography to assess the soil texture, chemical properties and nutrient status. In order to convert 50 acres of undulating and unutilized area, cleaning and up-rooting of unwanted plants in 30 acres has been performed to make it cultivable. In this area, economically important horticultural plants such as Aonla (100 plants), Jamun (100 plants), Bael (20 plants), etc. has been planted in the month of July, 2017. 5.0 acres of area under Bairiya dhab has been utilized for seed production of Moong (Variety –Pusa Vishal) and 2.0 acres land is being utilized for seed production of Til (Sesame) variety- Krishna. Altogether, 200 Kg seed of Green gram var. Pusa Vishal and 160 kg Til var. Krishna has been handed over to Directorate of seed and farms for its processing and sale. During the crop period, moong was infested by Tobacco caterpillar (25%), White fly (2-3 insect/leaf), Pod borer (30%) and Yellow mosaic virus (10-15 %) and Til hawk moth (45%) in Til. Crops like pigeonpea in 2.0 acres, turmeric (0.25 acre) and arvi (0.10 acre) had been planted during May-Aug.,2017. Infrastructural facilities such as Solar tree and tube well (5 H.P. submersible) has been installed. Excavation of Fish pond in 1024 sq.m. is under progress. Dhab fields were submerged for more than 10 days upto 5 feet height due to flood in the river

Bhudi Gandak during the month of August. All the horticultural plantations as well as pigeonpea and turmeric were lost, only *Colocasia* (Arvi) crop survived and sprouting again.

Distribution of boron in soils of bihar and its nutritional impact on sugarcane: The calcareous surface soil samples collected (90) from Samastipur district were analyzed for pH, EC, organic carbon and available N, P and K content of soil. The soils were moderately alkaline in nature and non-saline with rich in free calcium carbonate (>20.50%). The 60 percent soil samples were rated as medium in organic carbon (0.50-0.75%), 80 percent samples were medium in available nitrogen (250-500 kg/ha), 65% samples were medium in available phosphorus (25-50 kg/ha) and all the samples were rated as low in potassium (<125 kg/ha). The overall data indicated that pH ranges from 7.23-8.79, EC 0.10-1.86 dS/m and organic carbon 0.13-0.97%. The bulk samples from calcareous, non-calcareous and salt affected area were collected for incubation study to see the release pattern of B in soil.

Screening of stress tolerant rice genotypes in salt affected soils: Among 66 rice genotypes, only 21 genotypes performed better as shown by their overall performances under stressed conditions. On the basis of yield performance, STBN 16-40 (NDRK11-22) emerged as highest yielder (5.40 t/ha) clearly indicating its highest resistance to tolerate the stressed condition followed by STBN 16-41 (NDRK11-24) (5.15 t/ha), STBN 16-34 (TR-05043) (5.15 t/ha), STBN 16-26 (CSAR-1610) with 5.00 t/ha, STBN 16-24 (PAU7114-3480-1-1-1-0) (4.5 t/ha). While lower yield recorded in case of CSR-2748-4441-22, TR-13069, and KR 15005 where each of them produced only 0.30 t/ha yield.

Popularization of biofertilizer (BGA, AZOLLA & VAM) production technology among farmers of Muzaffarpur district: 30 Azolla pits and VAM production unit have been constructed at Marwapakar, Kurkuria, Rewa, Basantpur, Sahilapatti and KVK, of the Saraiya block of Muzaffarpur District and 6 BGA pit at Marwapakar has been constructed. Besides these, the technology has been disseminated with the support of *Aga Khan Foundation* and till date 305 Azolla pits has been constructed and demonstrated in different blocks namely; Bhutaha(72), Mushari (112), Mural (51) and Sakra(70) of Muzaffarpur district.

FACULTY OF AGRICULTURAL ENGINEERING

Mechanization gap study in different farm operations in Bihar : As per mandates of project, 12 districts were selected for survey work to be carried out each by Dr. Rajendra Prasad Central

Agricultural University, Pusa and Bihar Agricultural University, Sabour. The proforma for survey related to both above experiment were developed and got duly approved by State Nodal Officer (Mechanization), Government of Bihar. The nominated surveyors from identified districts were imparted training. Base on the proforma, tables for compilation of data were developed for computation of farm power availability and interpretation of result related to mechanization gap in different farm operations.

Assessment and prevention of post harvest losses in wheat & maize in selected districts of Bihar through community participation: For wheat, data were collected from 322 farmer's fields of 32 selected villages in Samastipur and Begusarai districts for harvesting loss and threshing loss. The average harvesting loss has been calculated as 2.53 % while average threshing loss has been calculated as 2.09 %. Similarly the average shelling/threshing loss has been calculated as 0.24 % in maize from 239 farmer's field of selected 32 villages in Samastipur and Begusarai districts. As an intervention to reduce post harvest losses, the STR dryers (designed by ADMI, UIUC) are to be introduced in selected ADMI village. Tests were conducted on STR dryer for different varieties of wheat and maize at various levels of initial moisture content at drying air temperature of 60-70⁰C. For wheat, the moisture was removed @ 2.15 to 2.66 % (w.b.) per hour, while for maize it was removed @ 2.30 to 2.85 % (w.b.) per hour. The drying results obtained have been found satisfactory in terms of moisture removed per hour and can be very beneficial in drying of maize harvested in October-November when the solar drying is not effective. Storage studies are going on in hermetic and traditional storage modes at farmers household for wheat (35 households) and maize (45 household) at ADMI village (Dih- Sarsauna). This study is also in progress in 13 other villages of Samastipur/ Begusarai districts. In addition to this, lab storage study for wheat and maize at different moisture content is also going on at CAE, Pusa in order to verify the effectiveness of the hermetic bags at different moisture level of storage.

Residual effect of hydrogel on soil moisture availability and yield of Kharif Maize

Brief Research Highlights: At the end of the season, the soil moisture contents in all the treatments were observed to be statistically same for both the depths 0-15 cm & 15-30 cm. It indicates that there is an insignificant residual effect of the hydrogels applied in the *Rabi* season on the moisture availability in the subsequent *Kharif* season for most part of the season.

Residual effect of hydrogel on soil moisture availability and yield of Kharif Brinjal : The soil moisture contents in all the treatments were found to be statistically similar for both the depths. Further, the results indicated that there is no any significant difference in yield of Brinjal. Hence,

the present study indicated that there is an insignificant residual effect of the hydrogels applied in the *Rabi* season on the soil moisture availability and yield of *Kharif* Brinjal in the subsequent *kharif* season.

Design and Development of Portable Irrigation System cum Sprayer for the Small and Marginal Farmers. One portable irrigation system as conceived, has been developed/ fabricated at the Central Workshop. After preliminary testing, the system alongwith drip irrigation system, was handed over to a landless farmer, Sri Dwarika Manjhi of village – Darauli (Dist. Sivan) on 07th January, 2017. The farmer is growing vegetables in about ¼ acre land in the diara of river Ghaghra. He has been lifting water in earthen pot from about 100 m distance to irrigate his vegetable crops. As per the information received, the farmer is using it and is happy with the system. The development of a solar powered sprayer using this system is in process.

Design and Evaluation of Drainage cum Recharge Structure under North Bihar condition.:

Groundwater recharge or deep drainage or deep percolation is a [hydrologic](#) process where [water](#) moves downward from [surface water](#) to [groundwater](#). Recharge is the primary method through which water enters an [aquifer](#). This process usually occurs in the [vadose zone](#) below plant [roots](#) and is often expressed as a [flux](#) to the [water table](#) surface. Recharge occurs both naturally (through the [water cycle](#)) and through anthropogenic processes (i.e., "artificial groundwater recharge"), where rainwater and or [reclaimed water](#) is routed to the subsurface. Keeping the importance of aquifer material analysis for ground water recharging, particle size distribution analysis of aquifer materials drilled at different locations has been done. The sieve technique was used to determine the grain size distributions. The effective grain size was characterized by the coefficient d_{10} , the value corresponding to 10% finer by weight. We characterized the sorting by the uniformity coefficient defined to be $C_u = d_{60}/d_{10}$ where d_{60} is the grain size corresponding to 60% finer by weight. If $C_u > 4$, the sample is commonly referred to as "poorly sorted", and if $C_u < 4$ the sample is "well sorted" (Fetter, 1994). The Particle size analysis of the aquifer materials obtained at Dr. R.P.C.A.U., Pusa, Boy's Hostel clearly indicates that depth below 69 m upto 90 m the majority of particle size is above 0.25 mm. That indicates zone of potential aquifer. Aquifer material analysis of tubewell drilled at Boy's Hostel, Dr. R. P. C. A. U., Pusa clearly suggests that median diameter (d_{50}) has increased more than 0.3 mm below 69 m from ground surface. The effective diameter (d_{10}) has also increased from 0.10 to 0.25 mm from 69 m upto 90m below ground level. The coefficient of uniformity lies between 1 to 2 for the depth

below 69 m upto 90 m. This depth is having good storage capability. The particle size can be categorized as medium sand. Gravel Packing is required during tubewell installation. Lithology of boreholes indicates that there is persistent clay capping in the study area. In the upper part of the alluvial sequence, sand is fine to medium grained whereas in the lower parts those are medium to coarse with occasional association of gravels. The concentration of total suspended solids (TSS) value of for runoff water it varied from 1200 to 1340 mg/L with an average value of 1270 mg/L. The analysis revealed that the Filter combination 6 consisting of Gravel, Sand and Charcoal was having highest recharge rate and 2nd lowest TSS value. Filter combination-6 was found most promising in terms of Recharge rate and TSS values. The Total Suspended Solid was found to be lowest after passing through the Filter combination-7 consisting of Coloured Gravel, White Gravel and Sand, but the recharge rate was also the lowest. The average turbidity of runoff water was found to be 410 NTU. The Filter combination No.-7 consisting of Coloured Gravel, White Gravel and Sand was found to be the best amongst all the combinations with regard to turbidity of water. The turbidity reduced by 81.7 % after passing through Filter combination no.7. The analysis revealed that the Filter Combination 6 consisting of Gravel, Sand and Charcoal was having highest recharge rate and 2nd lowest turbidity value.

Standardization of Irrigation and Fertigation Schedule for Capsicum under Polyhouse. : The water requirement varies from 0.5 l to 1.24 liter per plant. Irrigation scheduling done as per water requirement and availability of soil moisture content, from October to January 0.5 liter per plant at 2 days interval and on February 1 liter per plant at 2 days interval and from march to May 1.5 liter per plant at 2 days intervals. Application of fertilizer is done as 25 % RDF as basal done and remaining 75 % through fertigation at seven equal split doses at different stages of crop growth. Yield attributes like average fruits length, average number of fruits/plant, circumference of fruits, average weight per fruit and yield per plant were recorded, it was found that highest is treatment T₁₁ (120 % RDF with 100% WR through drip with plastic mulch) to the tune of 12.30cm, 20.5, 22.7cm, 105.65 gram and 2.16 kg, respectively. On the other hand, in control treatment T₁₀ (100 % RDF with 100% WR through surface method without plastic mulch) they were 7.50cm, 9.5cm, 16.7, 93.10 gram and 0.88 kg, respectively.

Standardization of Irrigation and Fertigation schedule for Okra with plastic mulching under open field condition. : The water requirement varies from 0.5 l to 4.0 liter per plant. Irrigation

scheduling done as such on the month of January 0.5 liter per plant at 2 days interval, February 1 liter per plant at 2 days interval, March 2 liter per plant at 2 days interval, April 4 liter per plant at 2 days interval and May 3 liter per plant at 2 days intervals. Application of fertilizer is done as 25 % RDF as basal done and remaining 75 % through fertigation at four equal split doses at different stages of crop growth. The vegetative growth and yield attributes was also recorded, it was found that the average plant height, canopy area, average length of fruits, average number of fruits/plant, average weight per fruit and yield per plant highest is treatment T₁₁ (100 % RDF with 100% WR through drip with plastic mulch) to the tune of 159 cm, 95 sqcm, 16.30 cm 50.00, 15.80 gram and 0.79kg, respectively. On the other hand, in control treatment T₁₀ (100 % RDF with 100% WR through surface method without plastic mulch) they were 105 cm, 53.50 sqcm, 12.10cm, 35.00, 12.50 gram and 0.44 kg, respectively.

COLLEGE OF HOME SCIENCE

Enhancement in Nutritional value of mid day meal recipes and recommended suggestion for whole week: It was identified that estimated nutritive values of recipe of Monday and Thursday i.e., rice, mixed dhal and vegetable is comparable with the recommended nutritive value of MDM. The estimated nutritive value of protein and calorie is 12.6 g and 454 Kcal for primary and 19.0 g and 672.1 Kcal for upper primary classes respectively. Addition of 1 Boiled egg in recommended MDM recipe of Monday and Thursday improved the protein and calorie to 66.20 & 22.60 percent for primary and 41.9 & 15.4 per cent in upper primary classes respectively. Addition of egg increased the level of folic acid, calcium and carotene that improve the nutritional status of children. Addition of one boiled egg and one banana in MDM increases the protein, calories, minerals & vitamin. Addition of locally available seasonal fruit in the diet of school going children can increase the appreciable amount of micro-nutrients required for the regulation of macro-nutrients.

ProPAN study for improving infant diet diversity for prevention of malnutrition through local-agriculture solutions: Out of 40 infants, 24 were male and 16 were female infants. As far as, weight for age is considered, in case of male infants, 20.83 per cent were under -2SD category and 12.50 per cent infants were under -3SD category. As well, the percentage of female infants under -2SD and -3SD category was 18.75 each. The percentage of underweight infants was found

to be more than 30 which depicts very high prevalence of underweight as stated by WHO and it requires urgent attention

Kitchen gardening in school premises : Previously in first phase, 10 Madhya Vidyalaya were selected for Ankuran Project in Jalalgarh block. In all selected schools, kitchen garden were successfully started. In continuation, in 2nd phase, total 40 Madhya Vidyalaya were selected for Ankuran Project in Jalalgarh, Kasba, K. Nagar & Dagarua block. In the same line, 3rd phase started in January, 2017 in three blocks were i.e., Banmankhi, Shrinagar and Purnea Purv. In all blocks total 50 schools were selected for kitchen garden.

Intervention trial for improving maternal and infant health through supplementation trial together with the marked anthropometric indices: For intervention trial, two types of food were developed: Infant Food mix for malnourished children and Nutri laddoo for the mothers at risk. All these mixes were developed using locally available food materials such as wheat, ragi, linseed, til, groundnut, mung and jaggery. All raw materials were processed to reduce toxicants and enhance nutritional value. The prepared food mix was given at the dose of 50 gm /day to the infants. At risk mothers were given 7-8 laddoos of 130 g/day. The anthropometric parameters have been recorded at an interval of one month. The increase in MUAC and weight have been observed among women and infants.

Strengthening Play and Early Childhood Stimulation at Nutrition Rehabilitation Centres (NRCs) for Holistic Development of Children.: The work has been planned to be carried out in Nutrition Rehabilitation Centres of 9 districts (Begusarai, Darbhanga, Lakhisarai, Munger, Muzaffarpur, Madhepura, Nalanda, Patna and Sheikhpura). Initially, the planning has been made how to feed infants and young children from the food available in their houses. The training is being provided to mothers and counselors.

Analysis of Maize Stone Powder: The maize stone powder has been analyzed for its constituents keeping in view to take maximum profitability. The composition of Maize stone Powder per 100 g is: Moisture- 4.76 g; Ash- 1.29 g; Fiber- 91.56 g; Protein - 1.52 g and Carbohydrate- 0.87 g. Since the maize stone Powder contains very high amount of fiber content, there may be the chance to utilize it as animal feed after adding some concentrates and supplements.

Quality Analysis of seed of Rajendra Arhar 1 and Bahar: The seeds of Rajendra Arhar 1 and Bahar has been analysed for different quality parameters. The hydration capacity (g/seed) and swelling capacity (ml/seed) of seeds of Rajendra Arhar-1 was more than those of Bahar. The cooking time for both variety remained same. The protein content of Rajendra Arhar 1 has been 21.8 per cent. Interestingly, the flavor which affects the palatability, is quite high in Rajendra Arhar 1.

Organoleptic quality testing of chips of different potato varieties.: Potatoes of different varieties viz. Pushkar, Ashoka, Arjun, Jyoti and RA 3) have been supplied form TCA Dholi for testing the acceptability of chips developed out of these varieties. The chips were prepared and kept for organoleptic testing by panel members selected for the purpose. The chips of all varieties except Arjun were scored between ‘Like moderately’ to ‘Like very much’. The chips of ‘Arjun’ variety has scored high i.e. between ‘Like very much’ and ‘Like extremely’

Effect of enzyme pre-treatment on eco-friendly natural dyeing: Not much work has been done on Tassar silk, so our main focus is on utilization of enzymes on dyeing with natural dyes on Tassar silk, mostly aimed at betterment of dye uptake and improvement of fastness properties. Two proteolytic enzymes Papain and Pepsin were used as pre-treatments and various conditions like concentration, temperature and time were optimized Percentage dye uptake was calculated by measuring absorbance before and after dyeing. Percentage gum loss was calculated by weight of samples before pre-treatment and after the natural dyed treated samples. It was found that samples treated with Papain enzyme showed 60.5 % dye uptake at 0.3% concentration where as samples treated with Pepsin showed maximum 55.0 % of dye uptake at 0.1 % concentration. Dye uptake for Papain and Pepsin was maximum at 30 and 20 minutes of enzyme pre-treatment respectively. Dye uptake for Papain and Pepsin was maximum at 30 and 45 degree centigrade temperature respectively. In order to select the most appropriate enzyme for natural dye (Litchi leaves) dye uptake was evaluated using enzymes and without enzymes at optimum conditions. The gum loss level was found to be 13.80 % for conventional soap washing as against 30 % for Papain at 0.3% concentration and 20.83 % for pepsin at 0.1 % concentration. More loss of gum in case of Papain was responsible for better uptake of dye percentage. So it was concluded that Papain has more compatibility for litchi leaves natural dye.

FACULTY OF BASIC SCIENCES & HUMINITIES

Development of heat tolerant, high yielding and climate resilient wheat cultivars by utilizing genomics, molecular and physiological information and resources: Percentage reduction in the mean yield of all the 24 genotypes was recorded as 51.98% for late sown and 93.98% for very late sown conditions. Minimum reduction was observed in genotype KSG1201 whereas, KSG 1176 exhibited maximum reduction. Phenotyping of Doubled Haploid Population under very late condition with respect to segregation for heat stress tolerance. F1 2500 Fresh crosses were attempted between donor and recipient (HD 2967/ PBW 343). Bioinformatics study of Starch Synthase III (SS) gene revealed that all the exons are highly conserved except Exon2 with large number of insertions and deletions.

Spot blotch of wheat delivering resistant wheat lines and diagnostic and molecular markers for resistance (S.B -I): Heat stress increases disease severity of the spot blotch disease in agroecology of Pusa, Bihar. Identification of genetic stocks CRP-18, CRP-50, CRP-15, CRP-51 with high resistance to spot blotch.

Identification of high temperature tolerant wheat cultivars based on their membrane stability index (MSI) and heat susceptibility index (HSI): Based on HSI and physiological traits contrasting (tolerant and susceptible) genotypes were identified and grouped into tolerant genotypes (HD2643, HW2045, PBW 373, RAUW4, RAUW6, DBW14, HI1563, K9107) and susceptible genotypes (PBW 343, DBW 15, HD2733, DBW 37).

Development of Hybrid Rice for Bihar: A summary of the research activities carried out under this project during *boro* season Altogether 43 test crosses involving 2 CMS lines and 27 testcross pollen parents taken from rice varieties and advanced breeding lines were evaluated for the identification of sterility maintainers and fertility restorers of wild abortive cytoplasmic male sterility system.

ANIMAL SCIENCES

Study on culture and propagation technique of freshwater prawn *Macrobrachium dayanum* (Henderson): *Macrobrachium dayanum* (Henderson) is a truly freshwater small sized prawn found in river Budhi Gandak but in very negligible quantity. Stocking is still being done as and

when live specimen are available. During sampling they do not come in bulk, so still collection and stocking is going on. It is difficult to isolate only the desired species, because they are so delicate that if time is spent on their isolation, they die. The live specimen were collected at the bank of the river and transported in live condition in a bucket containing freshwater. The collection and stocking has been stopped due to flood in the rivers. They are not available in flooded water. Biology studied so far reveals that their survival in captivity is difficult. Feeding is being done with rice bran and mustar oil cake @ 5% of their total body weight. Trial is being done to stock brood in glass tank to observe and study the colour of egg, incubation period, hatching and survival of hatchling.



Population of mix species in Sample collected from river BadhiGandak



Population of single species of fish in the collection



Male & female of *M. dayanum*

Popularization of giant freshwater prawn *Machrobrachium rosenbergii* (de man) farming:

Three no. of earthen ponds have been undertaken for stocking of seed of giant freshwater prawn (GP) having an area of 20m x 20m = 400m² each. After pond preparation stocking have already been done @ 5000 PL in each pond having an average length of 1.00cm and an average weight of = 0.05 gm. The growth performance study shows differential growth pattern right from second month which is inherent property of freshwater giant prawn (GP).



Oxygen Packing of PL of *M. rosenbergii*



Specimen from Pond no. 5



Specimen from Pond no. 7



Specimen from Pond no. 4

Feeding is being done with readymade pelleted feed only @ 15% of the body wt. Feed contains 36% protein, the ingredients are fish meal, squid meal, soybean meal, wheatflour, fish oil etc. The GP stocked in pond no. 4 are being given conventional feed containing rice bran and mustard oil cake. In the month of August, due to scorching sun water temp at mid day goes as high as 37⁰C which is causing mortality among prawn, to cope-up with, groundwater has been added to keep the water temperature around 30-32⁰C.

Extension

The University has developed adequate infrastructure and efficient system such as Directorate of Extension education, 12 KVKs, ATIC, Kisan call centre, Agromet advisory service etc for effective transfer of technology among farmers and other stake holders by conducting farmers training programme, On Farm Trials, Front Line Demonstration, Kisan Mela, Kisan Gosthi and publication of articles in newspaper and local magazine, Radio/TV talks and community radio station , mobile app based advisory service etc.

Important extension activities in 2017-18 at a glance

Sl. No.	Extension activity	No. of activity/ beneficiary
1	Training of farmers/ rural youth/ farm women	49336
2	Kisan Mela	1
3	Frontline demonstration	5704
4	On farm trial	78

Seminar / Symposiums / Conferences / short courses / trainings / workshops organized (01.04.2017 to 31.03.2018)

Sl. No.	Name of the organizer & sponsoring agency	Nature of the event- Training , Winter School, Summer school etc.	Title of the event	Date & Venue	Number of participants
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1.	DoEE, RPCAU, Pusa	Training	Soil Testing	Department of Soil Science, RPCAU	25
2.	DoEE, RPCAU, Pusa	Training	HRD Training Programme for Newly Appointed Technical Staff of KVK	17-19 Jan., 2018, Sanchar Kendra, DoEE, Pusa	29
3.	ATMA, Bhojpur	Training	Management of Milch Animals	06.10.2017 to 10.10.2017, Sanchar Kendra, DoEE, Pusa	20
4.	ATMA, Bhagalpur	Training	Improved Production technology of spices crops	14.12.2017 to 18.12.2017, Sanchar Kendra, DoEE, Pusa	30
5.	ATMA, Sitamarhi	Training	Post harvest Management of farm product	05.01.2018 to 09.01.2018, Sanchar Kendra, DoEE, Pusa	25
6.	ATMA, Darbhanga	Training	Mushroom Production Technology	01.02.2018 to 03.02.2018, Sanchar Kendra, DoEE, Pusa	30
7.	ATMA, Darbhanga	Training	Fish Production	12.02.2018 to 14.02.2018, Sanchar Kendra, DoEE, Pusa	30
8.	ATMA, Darbhanga	Training	Animal Husbandry	15.02.2018 to 17.02.2018, Sanchar Kendra,	30

				DoEE, Pusa	
9.	ATMA, Begusarai	Training	Honey production and processing	24.02.2018 to 26.02.2018, Sanchar Kendra, DoEE, Pusa	30
10.	NFL, Muzaffarpur	Training	National Fertilizers Limited	27.02.2018 to 28.02.2018, Sanchar Kendra, DoEE, Pusa	30
11.	ATMA, Bhojpur	Training	Bee Keeping	06.03.2018 to 10.03.2018, Sanchar Kendra, DoEE, Pusa	25
12.	ATMA, Sitamarhi	Training	Mushroom production and processing	28.03.2018 to 31.03.2018, Sanchar Kendra, DoEE, Pusa	25
13.	ATMA, Sitamarhi	Training	Use & maintenance of farm implements for crop production	04.04.2018 to 08.04.2018, Sanchar Kendra, DoEE, Pusa	25
14.	ATMA, Madhepura	Training	Integrated Farming System	12.04.2018 to 14.04.2018, Sanchar Kendra, DoEE, Pusa	40

Trainings Conducted by KVK's (01.04.2017 to 31.03.2018)

Name of training	Total No of Training	Type of training	Sponsored by	No. of Participants	
				Male	Female
Crop production	32	Practicing Farmers /Farm Women	KVK's	9264	933
Plant Protection	38	-do-	KVK's	10125	1070
Home Science		-do-	KVK's	567	3264
Vet. & AH	34	-do-	KVK's	8234	897
Fisheries	29	do	KVK's	7664	788
Horticulture	8	do	KVK's	1591	467
Other (Including Kharif and Rabi Mahotsav)	128	do	KVK's	11931	2387

FLDs conducted (01.04.2017 to 31.03.2018)

Name of KVK	Technology demonstrated	Area in ha	No. of participants	Crop	Impact of demonstration (%)
Begusarai	PS- 1042 (Varietal)	6.5	18	Kharif	Good Impact, 26.81
	Rajendra. Suflam (Varietal)	6.0	15	Rabi	Good Impact, 27.47
	LRG-41 (Varietal)	8.0	33	Kharif	Good Impact, 29.26
	HUL-57 (Varietal)	1.02	3	Rabi	Good Impact, 29.63

	SSP	3.0	12	Kharif	Good Impact, 8.31
	Weed Management (Bispyribac sodium)	4.0	12	Kharif	Good Impact, 12.98
	R. Bhagwati (Varietal)	12.0	38	Kharif	Good Impact, 6.04
	DSR	4	10	Kharif	Good Impact, 6.08
	Variety + Zero tillage (HD-2967)	10	25	Rabi	Good Impact, 16.72
	sugarcane + Rajmash	2	5	Rabi	Ongoing (Rajmash harvested)
Darbhanga	HUM-16	4.6	29	Green Gram	Good Impact, 33.9
	TMB-37	4.0	23	Green Gram	Good Impact, 26.6
	Kashi Pragati	0.25	06	Okara	Good Impact, 17.2
	Veg. Prod ⁿ .	5.8	34	Cow Pea	Good Impact, 14.11
	Fodder Prod ⁿ	2.5	20	Cow Pea	Good Impact, 16.7
	COR-51	12	42	Paddy	Good Impact, 11.58
	Sugandha-5	1.0	12	Paddy	Good Impact, 16.4
	PNR-381	1.0	12	Paddy	Good Impact, 9.4
	Zn EDTA (R. Mansuri)	5.0	15	Paddy	Good Impact, 12.9
	Management of false smut (Propiconazole 25-EC)	8.0	20	Paddy	Good Impact, 24.7
	Composite Fish Culture	2.5	12	Fish	Good Impact, 29.97
	Pragati-40	0.03	7	Cauliflower	Good Impact, 7.17
	CFL-1522	0.03	7	Cauliflower	Good Impact, 9.88
	Prabhav-1322	0.07	20	Tomato	Good Impact, 9.21
	Probiotics	2.5	10	Fish	Good Impact, 45.0
	RAUTS-17	4.0	11	Toria	Good Impact, 19.79
	Gamosis in mango	2.0	27	Mango	Crop is in field.
	Barseem-Maskovi	1.0	20	Fodder	Harvesting is still going on.
	Multi Mineral Mixture	3.5	15	Fish	Good Impact, 39.18

	R. Suflam	10.0	36	Mustard	Good Impact, 35.35
	DBW-14	4.2	14	Wheat	Good Impact, 10.2
	HD-2967	1.8	10	Wheat	Good Impact, 12.97
	HD-2733	0.7	7	Wheat	Good Impact, 13.94
	HD-2824	0.5	5	Wheat	Good Impact, 10.5
	HD-3118	0.2	2	Wheat	Good Impact, 18.0
	HI-1563	0.5	5	Wheat	Good Impact, 12.27
	Azotobacter + PSB (var- HD-2967)	5.0	7	Wheat	Good Impact, 11.2
	Pusa dwarf	0.3	44	Papaya	Good Impact, 17.78
	Udrillus ugenae & Eisenia foetida	20 Unit	10	Worms	-
	HUL-57	10.0	25	Lentil	Crop is at threshing floor.
	BG-372	10.0	25	Gram	Crop is at threshing floor.
	R. Suflam	30.0	36	Oilseed	Good Impact, 54.04
East Champan	Bhagwati	6.0	16	Paddy	Good Impact, 13.19
	Rajshree	4.0	12	Paddy	Good Impact, 13.37
	Sahbhagi	2.5	07	Paddy	Good Impact, 19.09
	R.Mansuri	4.0	10	Paddy	Good Impact, 14.23
	R. Kasturi	1.0	04	Paddy	Good Impact, 19.65
	HD2967	31.0	70	Wheat	Good Impact, 15.54
	HUM16	6.4	04	Moong	Standing Crop
	PDM	3.6	16	Moong	Standing Crop
	Pant U315	1.6	09	Urd	Standing Crop
	NDA 1	20	43	Arhar	Good Impact, 24.52
	PantU-315	20	34	Urd	Good Impact, 21.45
	Arun	16	31	Lentil	Good Impact, 16.93
	HUL-57	24	33	Lentil	Good Impact, 17.45

	R. Suflam	25	43	Tori	Good Impact, 25.71
Gopalganj	PDM 139	10	25	Green Gram	Good Impact, 21.4
	Pusa 9	20	50	Pigeon Pea	Good Impact, 50.0
	HUL 57	30	75	Lentil	Good Impact, 47.7
	R. Suflam	50	125	Rape seed	Good Impact, 72.9
	NDA 1	10	25	Pigeon pea	Result awaited
	R. Suflam	50	125	Rape seed	Result awaited
	HUL 57	10	25	Lentil	Result awaited
	HD 2824	10	25	Wheat	Good Impact,24.5
	CO 51	10	25	Paddy	Good Impact,17.9
	Mescavi	2	16	Berseem	Good Impact,21.8
	Kent	2	13	Oats	Good Impact,17.7
	Trace minerals	-	20	Mineral mixture	Good Impact,12.5
	HD 2733	16	40	Wheat	Good Impact,19.6
	Fipronil 0.3 GR	4	10	Sugarcane	Good Impact,40.35
Muzaffarpur	Pusa sugandha	24.4	45	Paddy	Good Impact,22.16
	Kalkatiya	3.0	10	Marigold	Good Impact,10.00
	<i>Kufri ashoka, K.arun, K.lalima</i>	0.5	12	Potato	Good Impact,22.45
	Kashi kanchan	3.0	10	Cow pea	Good Impact,16.47
	<i>P. florida</i>	10	20	Mushroom	Good Impact,33.33
	<i>T.viridi</i>	10	50	Cauliflower	Good Impact,36.57
	<i>Pheromone trap</i>	10	17	Litchi	Good Impact,24.06
	<i>Hand maize shellor</i>	-	20	Maize seller	Good Impact,74
	<i>Mascavi</i>	2.0	15	Barseem, green fodder	Good Impact,21.64
	<i>Sudan</i>	2.0	20	Sorghum green fodder	Good Impact,38.67
	<i>IPM-02-03</i>	20	57	Green Gram	Good Impact,23.62
	<i>PS-1042</i>	10	35	Soybean	Good Impact,24.45

	<i>Krishna</i>	10	21	Sesamum	Good Impact,30.82
	<i>Hull 57</i>	10	25	Lentil	Good Impact,30.22
	<i>R.Suflam</i>	50	126	Rapeseed and mustard	Good Impact,23.69
	<i>LRG41</i>	10	27	Red gram	Result awaited
Samastipur	R. Sonia	0.3	6	Turmeric	Good Impact,16.52
	SML-668	10.0	16	Moong	Good Impact,36.0
	Dairy Management	-	50	Dewomer + Mineral mixture	Good Impact,10.00
	Rajendra Sufalm	30.	75	Rapeseed & mustard	Good Impact,41.17
	NDA 1 Pusa Bahar	10.0	25	Pigeon Pea	Good Impact,37.93
	KLS-218	30.0	75	Lentil	Good Impact,41.78
	Prakash	10.0	25	Field pea	Good Impact,34.96
	GNG-581	10.0	25	Chickpea	Good Impact,40.21
	Pusa Vishal	10.0	25	Green Gram	Good Impact,33.09
Saran	Hybrid	20	122	Sunflower	Good Impact,43.5
	Krishna	20	122	Sesame	Good Impact,24.44
	Krishna	10	25	Sesame	Good Impact,33.33
	(Shekhar)	5	21	Linseed	Good Impact,69.79
	(Subhra)	5	26	Linseed	Good Impact,62.66
	R. Suphlam	40	110	Rapeseed and Mustard	Good Impact,90.1
	Hybrid	10	25	Sunflower	0
	(Krishna)	10	25	Sesame	0
	SML-668	10	22	Green Gram	Good Impact,60.36
	Bahar	26	58	Red Gram	Good Impact,60.95
	Pusa-9	18	51	Red Gram	Good Impact,49.32
	NDA-1	6	16	Red Gram	Good Impact,47.90
	(Utkarsh)	3	10	Rajmah	Good Impact,82.29

	Uttra	10	25	Black Gram	Good Impact,45.29
	(BG-372)	20	75	Gram	Good Impact,25.45
	(KLS-218)	10	21	Lentil	Good Impact,14.38
	(HUL-57)	12.66	73	Lentil	Good Impact,50
	(HUDP-15)	7.32	113	Pea	Good Impact,37.75
	(GDPF-1)	3.46	47	Pea	Good Impact,31.63
	(HUM-16 & PDM-139)	20	52	Green Gram	-
	(Shivalik)	2	3	Lentil	Good Impact,54.16
	Shaktiman-5	11.5	29	Maize	Good Impact,12.62
	Sahbhagi	41	104	Paddy	Good Impact,20
	R. Bhagwati	20.4	27	Paddy	Good Impact,32.14
	Hybrid	5	13	Paddy	Good Impact,53.33
	R. Bhagwati	32	44	Paddy	Good Impact,23.2
	R. Mansuri	1	2	Paddy	0
	R. Sweeta	1	4	Paddy	Good Impact,70.08
	Deep Jwala	5	13	Maize	Good Impact,12.33
	HD-2967	12.8	22	Wheat	Good Impact,18.18
	K-307	3.8	14	Wheat	Good Impact,7.6
	WR-544	13.3	41	Wheat	Good Impact,14.4
	DBW-14	5	17	Wheat	Good Impact,9.24
Sheohar	R.Suflam	10.0	27	Mustard	Good Impact,28
	Pant-1241	3.6	10	Soya bean	Good Impact,25.58
	HUL-57	4.0	16	Lentil	Good Impact,38
	Bahar	2.0	08	Pigeon Pea	Good Impact,29
	R.bhagwati	3.0	08	Paddy	Good Impact,15
	Shahbhagi	6.0	17	Paddy	Good Impact,25
Siwan	PGR	-	50	Gibberellin	Good Impact,259.97
	HYV	7.0	35	Onion	-
	R. Suflam/Quality Seed pesticide, micro nutrient,	30	85	Rape seed & mustard	Good Impact,47.36

				(2017-18)	
	HUDP-15/HYV, Quality Seed, pesticide, micro nutrient,	10	33	Pea (2017-18)	Good Impact,40
	GNG-1581/HYV, Quality Seed, pesticide, micro nutrient,	20	41	Gram (2016-17)	Good Impact,38.46
	KLS-218/HYV, Quality Seed, pesticide, micro nutrient,	20	56	Lentil (2017-18)	Good Impact,60.86
	NDA-1 Insecticide, Pesticide, Bio-fertilizer Micronutrient and Sulphur	20	31	Arhar (2016-17)	Good Impact,73.68
	R. Bhagwati/HYV, Quality Seed, pesticide, micro nutrient,	4.0	10	Paddy (2017-18)	Good Impact,50.0
	R. Sweta/HYV, Quality Seed, pesticide, micro nutrient,	2.0	05	Paddy (2017-18)	Good Impact,70.0
Vaishali	R. Bhagwati	13	10	Paddy	Good Impact,40.34
	R. Suwashni	08	08	Paddy	Good Impact,44.04
	R. Suflam	18.5	10	Mustard	Good Impact,32.84
	KLS-218	04	06	Lentil (Cluster Demo.)	Good Impact,26.56
	KLS-218	06	05	Lentil (Seed Hub)	Good Impact,26
	Seed	0.4	12	Makkhan grass	Good Impact,6.6
	HD-2967 & HD-3118	35	28	Wheat	Crop is standing.

	Aptaor fly string	500 meter length	27	Fly string (Aptaor fly string)	2.3% (less incidence of disease and clean milk production)
West Champaran	IPM-02-03 / R.culture/ PSB / Insecticide	10.0	39	Moong	Good Impact,40.0
	NDA-1 /R.culture /fungicide/ insecticide	20.0	74	Pigeon pea	Good Impact,26.72
	R.Mahsoori	12.0	27	Paddy	Good Impact,24.62
	Sahbhagi	10.0	29	Paddy	Good Impact,9.18
	COR-51	9.6	27	Paddy	Good Impact,41.64
	R.suflam	20.0	43	Rai	Good Impact,23.25
	HUL-57	40.0	97	Lentil	Good Impact,32.08
	HD-2967	12.0	35	Wheat	Good Impact,18.96
	R.Sonia	0.25	08	Turmeric	Good Impact,20.91
Muraul	Vitamin-Mineral mixture in the feed	2.5	18	Fish (Carp)	14.09 % increase in yield (Farmers are ready to adopt the technology)
	Pheromone trap & Neem Oil	10	30	Summer	Crop is standing & Result awaited
	Oyster (Mushroom)	10 bags/farmer	30	Mushroom	It has been found popular among farmers/farm women; & they are ready to incorporate in their diet for nutritional security.
	Kitchen gardening	0.125	30	Okra, Tomato, sponge	After fulfilling their daily consumption requirement for

				guard, Bottle guard, Bitter guard (Hybrid)	family nutrition, Individual beneficiary sells the produced vegetables and earned Rs.1500-1800 in addition.
Sitamarhi	Use of boron 15kg/ha.	5.0	30	Cauliflower	Good Impact,29.73
	Arka Ananya	3.0	20	Tomato	Good Impact,59.04
	Zinc sulphate 2gm/lt. (2times)	5.0	10	Litchi	Good Impact,64.28
	Planofix 2ml/5lt. Water				
	Boric Acid 4gm/lt. (3times)				
	Use of minerals in fish pound @ 1kg/ton feed	5.0	10	Fish	Good Impact,13.30
	Use of Boron @ 10kg/ha	4.0	20	Wheat	Good Impact,26.00
	Pant Masoor- 5	2.0	20	Lentil	Good Impact,42.30
	Shambha Mansoori- 1	2.0	20	Paddy	Damage due to flood
	PPR Vaccine @ 1ml/sc	1200 goats	400	Goat	Good Impact,41.25
	Use of uterine tonic (Himrop) @ 100ml BD for 10 days	200 buffalo	100	Buffalo	Good Impact,18.75
Madhubani	R. Mansuri	07	20	Paddy	Good Impact,46
	R. Kastoori	02	10	Paddy	Good Impact,23
	R. Subhashni	07	20	Paddy	Good Impact,28
	Redgram P-9	05	17	Pulse	Good Impact,50
	Mustard, R. Suphlam	05	20	Oilseed	Good Impact,29
	Linseed, Garima	05	21	Oilseed	Good Impact,29
	Lentil,HUL-57	05	13	Pulse	Good Impact,56.25
	Sesamum, Krishna	05	24	Oilseed	Good Impact,41

	Green Gram, Meha	05	18	Summer	Good Impact,47.38	
	Arka suarav	2.5	10	Tomato	Good Impact,38.26	
	P. Samrat	2.5	10	Brinjal	Good Impact,29.4	
	Lime	4	10	Fish	Result is awaited	
	SRI, Pusa	Package and practices for Doubling the farmers income	2 ha	5	Sugarcane	Continuing
	Dr.V.Bharati Agronomy, TCA, Dholi	WP/FP	40.8	102	Spring Sunflower	Increased in yield 30.14%
	Dr.R. S. Singh Agronomy, TCA, Dholi	FYM+Fertilizer application	20.0	16	Sweet potato and Elephant foot yam	20-35 % increase in yield.

OFT conducted (01.04.2017 to 31.03.2018)

Name of KVK	Technology tested	No. of trails	Crop	Result	Feed back
Begusarai	Effect of Agrochemicals for minimizing moisture stress in wheat	09	Wheat	To achieve better and efficient resource utilization along with higher economic return and yield, wheat crop in Begusarai district should be administered with two foliar application of Thio-urea @ 10mM/l of water +	Farmers are adopting

				2 Irrigation along with adopting the all the recommended agronomical packages of practices, which eventually produced higher grain yield and B:C ratio i.e. 52.67 q/ha and 1.49, respectively.	
	Assessment of different formulation of herbicides for broad spectrum control of weeds specially Motha in sugarcane	10	Sugarcane		Farmers are adopting
	Assessment of plant products and microbial formulation in the management of brinjal fruit and shoot borer, Leucinoides or bonalis	08			Farmers are adopting
	Assessment of performance of dried leaves (drum stik leaves) and protein rich diet (laddu) for curing anemia in adolescent girls	08			Farmers are adopting
	Performance of various methods for preparation of green chilli pickles	08	Chilli		Farmers are adopting
	Assessment of mineral mixtures and Azolla on	08	Azolla		Farmers are adopting

	milk production of cattle				
Darbhanga	Performance of Azolla culture on growth and yield of paddy	10	Paddy	Application of Azolla along with RDF is recommended to increase yield, net return and BC Ratio.	Farmers are adopting
	Assessment of INM on yield and economics of cauliflower	10	Cauliflower	75% RDF + Vermi compost @ 2.0 ton/ha + Soil application of Azotobacter & PSB @ 5.0 kg/ha is recommended to increase yield, net return and BC Ratio.	Farmers are adopting
	Assessment of liquid bio-fertilizer and their mode of application for sustaining potato productivity	10	Potato	RDF along with soil application of liquid bio-fertilizer is recommended to increase yield, net return and BC Ratio.	Farmers are adopting
	Performance of different sources of sulphur on growth & yield of Mustard.	10	Mustard (R. Suflam)	RDF along with soil application of Phosphogypsum is recommended to increase yield, net return and BC Ratio.	Farmers are adopting
	Efficacy of newer fungicides against late blight of potato.	10	Potato	T3 (Farmoxidone 8 % + Mancozeb 64 % (Sectin) @ 1000 gm/ha) is recommended to increase yield, net return and BC Ratio.	Farmers are adopting
	Assessment of different chemicals for controlling	10	Fish (Carp)	CIFAX @ 1 ltr/ha/m is recommended to get	Farmers are adopting

	EUS in major carps.			maximum yield, net return and BC Ratio.	
	Assessment of different chemotherapeutic treatment for fish lice (<i>Argulus sp.</i>) Control in Indian Major Carp.	10	Fish (Carp)	Use of Ivermectin (1% w/w) @ 0.25 mg/kg body weight (fed twice weekly) is recommended to get maximum yield, net return and BC Ratio.	Farmers are adopting
	Performance of different sterilization technique for production of quality mushroom	10	Mushroom	Treatment by formalin 1.25 ml/lt is recommended to increase yield, net return and BC Ratio	Farmers are adopting
East Champan	Effect of Irrigation during terminal heat on Wheat yield in E. Champan Distt.	10	Wheat	OFT was conducted with three treatments along with farmers practice at ten different locations in the district and found that crop received four irrigation ie at 21, 65, 105 and 125 DAS yielded more (ie 47.34 q/ha) as compared to others treatment.	Farmers are adopting
	Effect of different level of Potassium on Yield of Paddy under DSR system.	10	Paddy	Maximum yield was obtained in the plot where fertilizer dose was 120:60:4:25(N:P:K:Zinc) kg/ha	Farmers are adopting
	Use of different Substrate for Oyster Mushroom Production	30	Mushroom	OFT was conducted during Rabi, 2017-18 among 30 beneficiaries and found that cultivation of Oyster	Farmers are adopting

				Mushroom with Wheat straw gave more yield ie 6.96kg/kg Spawn than Paddy straw and Sugarcane leaves.	
	Management of Sheath Rot disease of Rice caused by <i>Sarocladium oryzae</i>	10	Paddy	Which recorded minimum disease severity ie 9.05 %, maximum grain yield ie 39.50 q/ha and maximum B:C ratio ie 1.92	Farmers are adopting
	Management of Top borer (<i>Scirpophaga excerptalis</i>) in Sugarcane	10	Sugarcane	Which recorded minimum dead heart infestation ie 11.64% and highest yield ie 705q/ha.	Farmers are adopting
Gopalganj	Yield maximization in wheat crop	07	Wheat	The Net return (Rs 49111.25) and BC ratio (1.76) was also highest in comparison to the other treatments. The wheat yield can be maximized by balance use of chemical fertilizers.	Farmers are adopting
	Management of brinjal shoot and fruit borer	10	Brinjal		Farmers are adopting
	Management of white fly in tomato	10	Tomato		Farmers are adopting
Muzaffarpur	Management of stem rot disease in Rai caused by <i>Rhizoctonia solani</i> .	10	Rai (R.Suflam)	Recorded highest yield i.e.1714 kg /ha (T4), Net return (32242.00) and B: C ratio (3.04).	Farmers are adopting
	Management of Litchi	10	Litchi	Lamda cyholothrin @ 2 ml	Farmers are

	Fruit Borer			at after 15 days of Neem oil spray at pre fruit ripening stage reduces percent damage of fruit 4.70.	adopting
	Integrated nutrient management in potato	10	Potato	All treatment is at par to each other. Benefit cost ratio was also recorded higher in as compared to other <i>i.e</i> 2.09.	Farmers are adopting
	Effect of sulphur for improving storage and bulb yield in onion	10	Onion	Crop is standing, data are being collected.	Farmers are adopting
	Comparative study of storage loss of tomato stored in zero energy cool chamber in compare to traditional storage system	04	Tomato	Storage losses for 4th days and 6th days in Zero Energy Cool Chamber were recorded only for comparing with traditional storage system when they were discarded for consumption in traditional system.	Farmers are adopting
	Assessment of weight and spoilage loss of onion by using different methods of storage.	03	Onion	All the storage structure is completed and the storage of onion will be done after its harvesting in the month of May. Result waited.	Will be popularized in FLD
	Storage of potato in zero energy cool chambers to retain the freshness of vegetables to get maximum return.	03	Potato	The trial is ongoing and result awaited.	Will be popularized in FLD

	Effect of plant density for production of <i>Rabi</i> Maize	05	Rabi Maize	Crop is standing and result awaited	Will be popularized in FLD
	Yield Maximization of Wheat based on soil test value.	10	Rabi Wheat	The data indicated that yield maximization of wheat on soil test based fertilizer application resulted in significantly higher effective tiller m ⁻² and grain yield (34.66 q/ha)	Will be popularized in FLD
	Effect of different anthelmintics drugs performance on gastrointestinal parasitic infection in cattle.	BVC,Patna	Animal husbandary	Indicated that either <i>i.e.</i> albendazole or fenbendazole or ivermectin can prevent the gastrointestinal infection in cattle, as resultant the milk yield of animals (Av.300-500g/d/animal, percentage of onset of estrus increased and simultaneously health status also improved.	Will be popularized in FLD
	Effect of multienzyme with probiotics as feed supplements in poultry feed in production performance of broiler under field condition.	CARI, Izatnagar	Animal husbandary	It is revealed that use of multienzyme with probiotic is beneficial to improve the feed conversion ratio (FCR) in broiler and also increase income because it also increases the mortality of birds.	Will be popularized in FLD
Samastipur	Boron management in Rajmash	03	Rajmash	To achieve higher yield and best economical return in	Will be popularized

				rajmash, crop should be fertilized with borax @ 15kg/ha as soil application along with other optimum and recommended agronomical practices, which resulted markedly higher yield (19.06 q/ha) and BC ratio at 4.77.	in FLD
	Assessment of different formulation of sulphur on growth and yield in Fenugreek	03	Fenugreek	To achieve higher and sustainable yield in fenugreek, crop should be fertilized with Bentonite sulphur @ 20kg/ha as soil application along with other recommended agronomical practices that manifested in term of significantly higher yield (10.76 q/ha) and B:C ratio @ 2.61.	
	Study on DSR technology on different seedbed condition	03	Paddy	The DSR cultivation undertaken in tilled and no-tilled seedbed conditions provide insignificant difference in yield. Though under no-tilled condition, the cost saving has been due to elimination of seedbed preparation and saving of irrigation water required for irrigation	Will be popularized in FLD

				provide better BC ratio at 1.99.	
	Study on mechanized sowing of lentil on different seedbed condition	03	Lentil	The lentil sown in rows on tilled soil bed condition resulted in marginally better yield and B:C ratio in comparison to that of sown on no-till condition. This difference is attributed to the better root expansion in tilled condition.	
	Evaluation of varietal performance of hybrid cauliflower for higher yield in Samastipur district at early sown conditions.	03	Cauliflower	To achieve maximum yield in Samastipur district the hybrid cauliflower, Dawn-175 (Seminis) which resulted in maximum yield.	Will be popularized in FLD
	Assessment of impact of dry cow therapy as intervention for prevention of mastitis	15	Buffalo/cow	Mastitis is major problem in dairy industry. The treatment is very costly when clinically mastitis diagnosed and many times one or more teat may blocked & milk yield reduced by 25-50%.	Will be popularized in FLD
	Fodder production under different land use pattern	05	Fodder crops	Final result awaited.	Will be popularized

	in Rabi Season in Samastipur district				in FLD
Saran	Assessment of different doses of Pusa Hydrogel (Pusa Varidhar) in paddy	10	Paddy	Recommended dose of Hydrogel i.e. 2.5 kg/ha is recommended for maximum yield 35 q/ha	Will be popularized in FLD
	Assessment of different doses of Pusa Hydrogel (Pusa Varidhar) in Kharif Maize	10	Maize	Recommended dose of Hydrogel i.e. 2.5 kg/ha is recommended for maximum yield 79.2 q/ha	Will be popularized in FLD
	Assessment of different combinations of Micronutrients for sustainable yield of Rapeseed and Mustard	10	Rapeseed and Mustard		Will be popularized in FLD
	Assessment of pheromone based IPM modules against Yellow stem borer, <i>Scirophaga incertulas</i> Walker in paddy	10	Paddy	IPM Module II is recommended for maximum yield 38.26 q/ha with higher gross return Rs. 53564 /ha.	Will be popularized in FLD
	Assessment of IPM modules against major pests of okra in Saran (Bihar)	10	Okra	IPM Module IV is recommended to get maximum yield 228.15 q/ha with higher return Rs. 98046/ha.	Will be popularized in FLD
	Assessment of different doses of fertilizer in Rabi Maize as recommended by different methods	10	Maize	Maximum yield obtained i.e. 85.4 q/ha with software based recommendation as compared to soil test based recommendation i.e. 83.4	Will be popularized in FLD

				q/ha.	
	Assessment of different doses of fertilizer in Wheat as recommended by different Methods	10	Wheat	Application of fertilizer with soil test based recommendation to get maximum yield 29.80 q/ha and net return Rs. 14930/ha	Will be popularized in FLD
	Assessment of different chemicals on management of leaf curl disease in chilli	10	Chilli	Abamectine 1.9% EC @ 0.014% is recommended for the management of leaf curl disease in chilli to get maximum yield 136.2 q/ha	Will be popularized in FLD
Sheohar	Selection of suitable short duration variety rice under upland condition	07	Paddy		Will be popularized in FLD
	Selection of suitable variety of rice under low land condition	07	Paddy		Will be popularized in FLD
	Integrated management of damping of papaya	07	Papaya	Among the six treatments, basal soil drenching with mancozeb +metalaxyl (64:8)@ 0.25% and two top soil drenching with manchozeb +metalaxyl (64:8)@ 0.25% proved best by having minimum disease incidence.	Will be popularized in FLD
	Integrated management of gummosis disease of mango	06	Mango	Among five treatments, application of Copper oxychloride @ 0.5% + Streptocycline @ 0.01/+	Will be popularized in FLD

				Tetracycline @ 0.01% + Wetwell @ 0.1% proved best by having minimum disease incidence.	
	Performance evaluation of weeding tools for weeding in paddy transplanted in row	07	Paddy	Yield obtained in plots weeded by CIAE Bhopal grubber and KVK, Sheohar grubber was statistically at par but both found statistically superior over the farmers practice. KVK, Sheohar grubber performed best by having maximum B:C ratio (2.16)	Will be popularized in FLD
Siwan	Yield increment of coriander through varietal intervention	10	Coriander	All technology options performed better than farmers practice that is R-Swati. Pant Haritima and R-Dhaniya-1 were equal in performance. Maximum yield and net return were obtained by cultivation of R- Dhaniya -2. Maximum BC ratio 2.01 was found in R- Dhaniya -2.	Will be popularized in FLD
	Evaluation of novel fungicides for management of sheath blight disease of Paddy in Siwan district	05	Paddy	Technology option 3 (Tricyclazole 45% WP + Hexaconazole 10% WP @ 1.0g/L) performed better in term of yield, gross return, net return and BC ratio.	Will be popularized in FLD

	Selection of suitable variety of turmeric in Siwan district.	05	Turmeric	Higher yield 275 q /ha with highest net return of Rs. 215100.00 in comparison to R- Soniya	Will be popularized in FLD
Vaishali	Integrated Pest Management of stem borer of maize.	04	Maize	Maize stem borer starts damaging maize crop from 2-3 leaf stage after germination. 4-6 leaf stage is not of vulnerable stage with ETL 01 larvae per plants. The use of carbaryl 85% @ 3-4 kg/ha at 8-10 leaf stage in the whorls of maize crop and removal of dead hearts /top shoots will help to the reduce the pest population and also help in reducing of second generation infestations.	Will be popularized in FLD
	Dieback/Gummosis <i>Lasiodiplodia theobromae</i> disease of Mango and their Management.	05	Mango	Hence for the management of dieback of Mango two spray of of chlorothalonil @ 2g/l is of chlorothalonil @ 2g/l is recommended for the Vaishali district with pruning of infected trees. Mango trees where only pruning was applied heavy gummosis and few new flushes were seen and with ultimately mango orchards	Will be popularized in FLD

				are visible with heavy symptom of dieback and death of plants started.	
	Assessment of impact of dry cow therapy an intervention for prevention of Mastitis.	07	Cow	Hence there is a recommendation of dry cow therapy to prevent subclinical mastitis in dairy cow in Vaishali district. Dry cow therapy with spectramast DC in all teats with Intavita H (I/M injection) on last day of milking.	Will be popularized in FLD
West Champanan	Assessment of different substrate in oyster mushroom cultivation	08	Mushroom	Mushroom yield after addition of different concentrations of sugarcane bagasse revealed that maximum was observed when wheat straw is amended with sugarcane bagasse (50%)	Will be popularized in FLD
	Assessment of dietary approach to combat Iron Deficiency Anaemia (IDA) among adolescent girls of farm families.	08		For improving the nutritional status of the adolescent girls, dried leaves of moringa olifera @10gm / day / subject was the best giving the increase in Hb content by 12.1% and body wt. by 1.2 kg.	Will be popularized in FLD
	Evaluation of power weeder for weeding in	10	Sugarcane	Brief write up of result should be given separate	Will be popularized

	sugarcane			table for each OFT. Maximum BC Ratio 5.82 was obtained by power weeder. Whereas minimum BC Ratio 4.79 was obtained by spade.	in FLD
	Comparative study of rice sowing methods.	10	Paddy	Brief write up of result should be given separate table for each OFT. Rice transplanter gave maximum net return and BCR. Whereas manual transplanting gave minimum net return and BCR.	Will be popularized in FLD
	Assessment of suitable insecticides for Management of Sugarcane Top Borer, <i>Scirpophaga excertalis</i> Walker	08	Sugarcane	Waited	Will be popularized in FLD
Muraul	Assessment of Water Probiotics in Fish Farming Pond	10	Carp fish	It was observed that addition of water probiotics in pond lead to increase in fish production. The gross yields observed were 7.60 Q/ha/4 month in Farmer's practice pond; 11.08 Q/ha/4 month in the pond treated	Farmers are very much influenced by this technology & ready to accept.
	Comparative performance of small	07	Pulses & vegetable	KVK Muzaffarpur (Additional) conducted	It was also found

	weeding tools for drudgery reduction of farm women		crops in line sowing	OFT to judge comparative performance of small weeding tools for drudgery reduction of farm women during weeding operation. Results indicated that the performance of grabar was very good in terms of area covered (0.15 ha/day), weed mortality (95%) and low cost of weeding (Rs 12320/- per ha for two times weeding).	highly acceptable by farm women/men due to less stress during weeding operation and observed normal blood pressure & heart beat after weeding operation.
Sitamarhi	Assessment of oyster mushroom production by different options	20	Mushroom		Will be popularized in FLD
	Assessment of leaf curl infestation on yield of Tomato	20	Tomato		Will be popularized in FLD
	Performance of newly herbicide for weed management in Lentil	10	Lentil		Will be popularized in FLD
	Effect of balance feeding on milk production in buffalo	10	Buffalo		Will be popularized in FLD
	Evaluation of cow dung	10	Fish		

	in culture pond with bran and mustard oil cake				
Madhubani	Performance of difference sources of sulphur vermin compost on growth and yield of mustard	10	Mustard	Npk @40:20:20 along with vermicompost @ 2.5 tons /ha + sulphur 15 kg / ha has highest yield, net return & b c ratio.	Will be popularized in FLD
	Control of water insect in nursery pond for increasing fish fry production.	08	Fish	It was observed that application of Kerosene oil (80 lit/ha) before stocking the spawn. Gave highest productivity with 4.84 BC ratio.	Will be popularized in FLD
	Assessment of feeding efficiency for adequate production and profitability of fish fry.	10	Fish feed	It was found that application of Rice bran and mustard oil cake (1:1) @ 560 gm (5 days) @ 1120 gram during 6-10 days for lakh spawn + cobalt chloride 0.10 mg/day/lakh spawn during 15 days daily gave higher return with BC ratio (2.21).	Will be popularized in FLD
	Effect of different hormone for increasing productivity in summer bottle gourd.	10	Summer bottle gourd	Indicated that use of Hormone at 2-3 leaf stage is more beneficial than farmers practice	Will be popularized in FLD
	Assessment of different pesticides against shoot and fruit borer in Okra.	10	Okra.	It was observe that T3, ½ dose of Imida cloroprid 17.8 SC, NSKE (4%) + sticker (0.5 ml/ liter of	

				water) at 40 days after sowing, 10 days interval gave more yields.	
	Integrated management of Tomato wilt.	10	Tomato		Will be popularized in FLD
	Evaluation of Zero till drill machine for sowing of wheat	10	Wheat	Better result	Will be popularized in FLD

Radio talks / TV programmes (01.04.2017 to 31.03.2018)

Name of the Scientist	Topic	Date	Radio talk or TV talk	Name of radio/ Doordarshan/ ETV
Dr. Anupma Kumari	Marua ki kheti & Soyabin ki kheti	09.06.17	ETV, Bihar	ETV
Dr. A. P. Rakesh	Nursery Management of early cauliflower	09.06.17	ETV, Bihar	ETV
Mukesh Kr. Singh	Pond preparation and Stocking management of Fish pond	09.06.17	ETV, Bihar	ETV
Dr. Seema Pradhan	Grain storage techniques	09.06.17	ETV, Bihar	ETV
Dr. A. P. Rakesh	Cultural practices in vegetable pea	02.12.17	ETV, Bihar	ETV
Dr. A. P. Rakesh	Different methods of wheat sowing	03.12.17	ETV, Bihar	ETV

Mukesh Kr. Singh	Pond management in winter season	27.12.17	ETV, Bihar	ETV
Mukesh Kr. Singh	Use of substrate based bio-film in carp culture for increasing pond productivity	10.03.18	ETV, Bihar	ETV
Dr. A. P. Rakesh	Azolla production techniques	26.03.18	ETV, Bihar	ETV
Dr. A. P. Rakesh	Cultural practices of Boro rice	31.03.18	ETV, Bihar	ETV
Dr. Jitendra Prasad	Selection of improved variety of Soyabean and its cultivation	05.06.2017	Patna, Doordarshan	Patna, Doordarshan
Dr. Jitendra Prasad	Paddy cultivation through DSR, SRI	30.06.2017	Patna, Doordarshan	Patna, Doordarshan
Dr. Savita Kumari	Low cost nutritionally rich foods	12.07. 17	Patna, Doordarshan	Patna, Doordarshan
Dr. Jitendra Prasad	Scientific cultivation of toria	13.07.2017	Patna, Doordarshan	Patna, Doordarshan
Dr. Ranjan Kumar	Important disease of poultry, their prevention and control.	20.07.2017	Patna, Doordarshan	Patna, Doordarshan
Dr. K. K. Singh	Protective measures after flood receding for cultivation of crops	25.08.2017	Muzaffarpur Door darshan	Muzaffarpur Door darshan
Dr. A. K.Singh	Grafting in mango and gotee preparation in litchi	30.08.2017	Muzaffarpur Door darshan	Muzaffarpur Door darshan
Dr.Ranjan Kumar	Winter poultry production	16.11.2017	Patna, Door darshan	Patna, Door darshan

Dr. A. K.Singh	Cultivation of pea onion and cauliflower	20.11.2017	Patna, Door darshan	Patna, Door darshan
Dr. Jitendra Prasad	Seed Production	13.12.2017	Patna, Door darshan	Patna, Door darshan
Dr. Jitendra Prasad	Crop production	24.01.2018	Patna, Door darshan	Patna, Door darshan
Dr. R. K. Tiwari	Management of dairy animals in winter season	26.09.17	ETV, Bihar	ETV
Dr. R. K. Asthana	Vaccination in dairy animals	22.11.17	ETV, Bihar	ETV
Dr. Surendra Prasad	Safe storage of rabi crops in rainy season	16.04.2017	TV	ETV
Dr. Surendra Prasad	Cultivation of oyster mushroom	16.04.2017	TV	ETV
ArchanaKumari	Fruit & Vegetable Preservation	14.09.2017	TV Talk	ETV
Archana Kumari	Balance Diet of Pregnant Women		Radio Talk	Radio Talk
Dr.Ratnesh Kumar Jha	Climate Resilient Agriculture	09.09.2017	TV Talk	ETV
Dr.Ratnesh Kumar Jha	Disease & Pest management of Rice	12.09.2017	TV Talk (LIVE)	ETV
Dr. Surendra Prasad	Crop Seminar	22.11.2017	ETV	ETV
Dr. Ram Niwas Singh	Disease management papaya	9.02.2018	ETV	ETV
Dr. Devendra Kumar	Value addition in maize	16.08.17	DD Bihar	DD Bihar

Dr. S. K. Thkaur	Pest management in Paddy crop		DD Patna	DD Patna
Dr. S. K. Thkaur	Pest problem in Maize	03.09.17	Radio	Radio
Dr. Narendra Kumar	Quail farming	09.10.17	Radio	Radio
Dr. S. K. Thkaur	Ear cocle disease in wheat	18.11.17	Radio	Radio
Dr. Narendra Kumar	Vaccination schedule of dairy animal	22.02.18	ETV	ETV
Dr. Devendra Kumar & Dr. S. K. Thakur	Harvesting, threshing and storage of grain	13.03.18	DD Bihar Live	DD Bihar Live
Dr. Devendra Kumar	Kisano ke swarojgar me krishi vigyan kendro ki bhumika	25.03.18	ETV	ETV
Dr. Narendra Kumar	Heat stress on dairy animal	27.03.18	DD Live	DD Live
Dr. Pushpa Singh	Management of Paddy Nursery against Insect pest attack.	25.05.2017	ETV	ETV
Dr. Shivendra Kumar	Fish Pond Management before Rainy Season	25.05.2017 & 29.05.2017	Doordarsan, Muzaffarpur	Doordarsan, Muzaffarpur
Dr. Shivendra Kumar	Integrated Fish Farming.	09.06.2017	ETV	ETV
Dr. Pushpa Singh	Management of insect pest of paddy at flowering stage	07.09.2017	ETV	ETV
Dr. Shivendra Kumar	Management of fish & fish pond after flood	26.09.2017	ETV	ETV
Dr. Shivendra Kumar	Fish Aquarium Management	31.01.2018	ETV	ETV

Dr. Ram Eshwar Prasad	Vermicompost and vermin wash production technique and their importance in crop production	16.02.2018	E TV, Bihar / Jharkhand,	ETV
Mr. Manohar Panjekar	Integrated Pest Management in Mango and Litchi orchard	17.02.2018	E TV, Bihar /Jharkhand	ETV
Dr. Kinkar Kumar	Feed and Disease Management in cattle	18.02.2018	E TV Bihar/ Jharkhand,	ETV
Dr. M.N. Jha	Nursery and Rairing Pond's Management for fish seed production	15.07.2017	ETV, Bihar	ETV
Dr. M.N. Jha	Scientific Composit Fish Culture	15.07.2017	ETV, Bihar	ETV
Dr. P.K. Jha	Scientific Banana Cultivation	15.07.2017	ETV, Bihar	ETV
Dr. A. Gautam	Soil Health Management	19.07.2017	ETV, Bihar	ETV
Dr. R.K. Yadav	IPM in Paddy & Red gram	19.07.2017	ETV, Bihar	ETV
Ashish Narayan	Ole ki Kheti	June,2018	E-TV, Bihar	E-TV
Ashish Narayan	Arvi ki Kheti	June,2018	E-TV, Bihar	E-TV
Dr. S.P. Singh	Scientific cultivation of turmeric and ginger	16th May, 2017	TV talk	Etv Bihar
	Muli ki vaigyanik kheti	13 May, 2017	TV talk	Etv Bihar
	Mirch kee nursery taiyar karna & vaigyanik kheti	13 August, 2017	TV talk	DD Muzaffarpur
Dr. D.K. Dwivedi	Sowing of potato and its care		TV	ETV
	Potato + maize		TV	ETV

	intercropping			
Dr. R. S. Singh	jkbZ&ljlksa dh mUur ,oa IL; [ksrhA	10-11-17	TV	ETV
	rhlh dh IL; ,oa mUur [ksrhA	10-11-17	TV	ETV
Dr.V.Bharati	clar dkyhu@“kjn dkyhu lw;Zeq[kh dh IL; fdz;k,sA vUunkrk] bZ0Vh0oh0	10-11-17	TV	ETV

Important Awards/Recognitions: In the year 17-18 the university has earned total of 41 awards , some important ones are listed below:

Best Ph. D. Thesis Award was received by Dr. Abdus Sattar, Assistant Professor and Nodal Officer (Agro-meteorology for his thesis “Agro-climatic characterization for assessment of crop potential under rainfed condition in Bihar”.

Dr. R. C. Srivastava, Vice-Chancellor, RPCAU, Pusa received following awards:

Higher Education Leadership Award

E-Dewang Mehta National Education Award

Lifetime Achievement Award by Andaman Science Association

Lifetime Achievement Award during International Seminar on Agriculture and Food for Inclusive Growth and Development at CSIR-NBRI, Lucknow.

Delivered the Rabindranath Tagore Memorial Lecture (2-3 Feb, 2018) by the Institution of engineers (India).

JISL Fellowship – 2017 (28th May, 2017) for outstanding contributions and commitment to furtherance of agriculture including horticulture by Confederation of Horticulture Association of India.

Fellow of Indian Society of Extension Education (ISEE), New Delhi was received by Dr. Ashok Kr. Singh, Univ. Prof.-cum- Chief Scientist, DRPCAUI.

Certificate of Recognition for developing landmark varieties of rice (BR-8, BR-34 and Sita) by Indian Society of Genetics and Plant Breeding, New Delhi was received by Dr. Ramagya Thakur and his team.

Best Poster Award to Shankar Jha, S. S. Prasad, S. P. Singh, M. P. Singh and R. C. Srivastava in National conference on Organic Waste Management for Food and Environmental Security, held at Indian Institute of Soil Science, Bhopal during 8-10 February, 2018.

Infrastructure development

The university has started the modernization of campus and academic infrastructure to provide ideal academic environment to the faculty and students. All the classrooms of UG, PG and Ph.D. programmes were converted into Smart Classrooms to improve the impact of classroom teaching. The university has taken up renovation & modernization of Vidyapati Sabhagar, electrification & beautification of campus roads, renovation of Academic complex, laboratory, classrooms, hostels and residential building and installation of street light.



Smart Class Room

Development of Irrigation Infrastructure in University farm:

Laying of underground pipeline system for irrigation to the university farms is underway. Under depleting water table scenario, it will save huge quantity of irrigation water on one hand and will help in providing irrigation in time, on the other hand. Few tube wells of the university farms are being equipped with the solar pumping system to demonstrate their working and economics and to create awareness among farmers for use of green energy.

Administrative Initiative:

The university has taken the initiative to constitute the executive committee to set a benchmark of Central Agricultural University. Accordingly the university has Constituted Academic Council, Research Council, Extension Council, Board of Management, Finance Committee, and issued ordinance of different academic programme of the university

Waste Management Initiatives:

Being a residential university, with large campus and many students, academic, technical and supporting staff (approx population of 5000) residing in 750 quarters of different categories and hostels which lead to consumption of a large amount of electricity, water, chemicals, and other resources and generation of huge household wastes. The un-segregated wastes were dumped in the bank of river *Burhi Gandak*, RPCAU, Pusa. Keeping in view of the above facts present waste management program has been initiated on **14th August 2017** as a pilot project on safe disposal and recycling the university wastes and the economics of the project. For waste collection, green and yellow dust bins have been supplied to each household/premises to keep biodegradable waste in green bin and non-biodegradable in yellow bins. Awareness campaign organized and hand bill distributed among the households. Wastes of different categories collected daily with the help of trolley and stored at vermicompost production unit for further segregation, composting and recycling. Compostable wastes utilized for vermicomposting and saleable non biodegradable wastes are disposed through vendors while other waste is disposed off as landfills. For vermicomposting compostable waste and cow dung in equal proportion (50:50) are mixed together and windrows are prepared. The epigeic earthworms species (*Esenia fetida*, *Eudrillus eugeniee*, *Perionyx excavatus*) @ 2 kg per ton of material are inoculated in windrows at optimum moisture and temperature under the shade. Moisture and temperature are maintained properly during composting period and cast is collected regularly. Prepared cast are utilized by farmers and other stakeholders. A poster on “New Initiative: University Campus waste Management Strategies” was presented in National conference on Organic Waste Management for Food and Environmental Security, held at Indian Institute of Soil Science, Bhopal during 8-10 February, 2018 and *Received Best Poster Award*.



Dr. Shankar Jha, Assistant Professor Soil Science received best poster award in National conference on Organic Waste Management for Food and Environme

University Library: The University Library, Pusa has been catering to the needs of scientists, teachers, extension specialists, students and staff of the University. During the year 2017-18 the university has the collection of 73901 books, E- books, CD ROM data base of CAB Abstracts, CROP CD, CABPEST CD, AGRIS CD, AGRICOLA, CABSAC, Food & Hum. Nutr. CD. Total number of visitors in the library during the year was 19304. The university library is also providing the service of CAB Abstracting Service, Photocopying Service, Computer Print-out service, Reference Service and Document Delivery Service – CeRA facility.

Games and Sports

The Sports and games are the regular events of the university for boosting physical fitness, mental health and disciplines among the students. The university organized Inter college Volley ball, Badminton, Table Tennis & Football tournament from 9- 12 August, 2017 and

annual Athletic and Sports Meet-2017-18 from 20-22 January, 2018. Besides five boys and six Girls Students of the university participated in the XVIIIth All India Inter Agricultural Universities Sports and Games Meet- 201-18 which was organized from 30th January to 3th February, 2018 at University of Agricultural Science, GKVK, Bengaluru, Karnataka.

A Glimpse of Inter College Athletic and Sports Meet (2017-18)



Publication :

In the year 2017-18, the university has published 187 research articles, 5-books, 10 book chapters, 26 popular articles and 23 leaf lets. Besides scientists of the university published a large number of articles in the local news papers.

The University has a Publication Division which publishes a bi-monthly magazine - Adhunik Kisan to cater the needs of farmers and publishes quarterly news letters to reflect the salient achievements of the university. Besides Kisan Diary which is an annual publication of the University contains package of practices for cultivation of various crops, technology for other farming activities namely, Dairy, Poultry, Goatry, Fishery Beekeeping, Mushroom, Agroforestry etc. some of the research papers having NAAS rating above 6.0 are mentioned below:

Research papers published

S.N	Name of the author(s)	Year	Title	Name of the Journal	Vol. no. & Page numbers
1.	Kumar, Navnit	2018	Effect of planting method on productivity and economics of sugarcane	<i>Indian Journal of Agronomy</i>	63 (1) : 95-99

			(<i>Saccharum</i> spp. hybrid complex) varieties under waterlogged condition.		
2.	Kumar, Navnit and Pandey, S.S.	2017	Agronomic performance of new sugarcane (<i>Saccharum</i> spp. hybrid complex) genotypes as influenced by levels of nitrogen.	<i>Journal of Pharmacognosy and Phytochemistry</i>	6 (SP1): 1125-1127
3.	Kumar, Navnit., Kumari, G. and Kumar, V.	2017	Enhancing crop productivity and soil health from intercropping coriander with autumn sugarcane through scheduling of fertilizer and irrigation.	<i>Journal of the Indian Society of Soil Science</i>	6 (3): 300-307
4.	Jha, C.K., Sinha, S.K and Thakur, S.K.	2017	Enhancing soil fertility, nutrient uptake and sugarcane productivity through integrated use of iron and organics in sub-tropical system.	<i>Indian Journal of Ecology</i>	44 (5) 521-525
5.	Sinha, S.K., Jha, C.K., Kumar Vipin and Pandey, S.S.	2017	Yield and soil organic carbon pool in relation to soil fertility of sugarcane (<i>Saccharum spp</i> hybrid complex) plant –ratoon system under integrated nutrient management.	<i>Indian Journal of Agronomy</i>	62 (1) 25-30.
6.	Thakur, S.K. and	2018	Effect of different plant nutrients on soil fertility,	<i>Indian Journal of Agronomy</i>	63 (1): 50-53

	Pandey, S.S.		yield and quality of sugarcane (<i>Saccharum</i> spp complex hybrid) in calcareous soils of Bihar.		
7.	Suman, S.N., Thakur, S.K. and Kumar, V.	2018	Effect of sludge on sorption of cadmium in calcareous soils.	<i>International Journal of Chemical Studies</i>	6 (1):1016 – 1021
8.	Sinha, S.K., Jha, C.K. and Kumar V.	2017	Productivity and soil fertility of sugarcane plant-ratoon in sub-tropical region under integrated nutrient management system.	<i>Indian Journal of Ecology</i>	44 (5): 513-517
9.	Balkrishna and Kamat, D.N.	2018	Evaluation of sugarcane (<i>Saccharum officinarum</i> L) midlate clones under waterlogging condition of Bihar, India.	<i>Applied Biological Research</i>	20 (1): 55-61
10.	Balkrishna., Kamat, D.N., Kumari, Juli and Divya Prakash	2018	Genetic divergence of sugarcane under waterlogging condition.	<i>International Journal of Pure and Applied Biosciences</i>	6 (1):210-218
11.	Minnatullah, M. and Kamat, D.N.	2018	Losses due to red rot pathogen in cane juice quality.	<i>International Journal of Current Microbiology and Applied</i>	7 (2):13-16

				<i>Science</i>	
12.	Ranjan Relisha and Kumar Balwant	2017	Study of genetic variability for cane yield and its component traits in early maturing sugarcane.	<i>International Journal of Current Microbiology and Applied Sciences</i>	6(10): 1739-1748
13.	Balkrishna and Kamat, D.N.	2017	Character association among cane yield and their component traits in sugarcane under waterlogged condition.	<i>International Journal of Current Microbiology and Applied Science</i>	6(10):2331-2339
14.	Nelofer Sara and Kumar Balwant	2017	Estimation of variability in red rot inoculated and un-inoculated early maturing sugarcane clones for cane yield and juice quality traits.	<i>International Journal of Current Microbiology and Applied Sciences</i>	6(10): 2347-2359
15.	Agrawal., Rupesh Kumar and Kumar Balwant	2017	Variability, heritability and genetic advance for cane yield and its contributing traits in sugarcane clones under waterlogged condition.	<i>International Journal of Current Microbiology and Applied Sciences</i>	6(6) 1669-1677
16.	Kumar, Praveen., Kumar, Balwant and Chandra Khoosbu	2017	Estimation of extent of variability for various productive traits in sugarcane under waterlogged condition.	<i>International Journal of Current Microbiology and Applied Sciences</i>	6(7): 1187-1192.

17.	Kumar, Praveen., Kumar, Balwant and Chandra Khoosbu	2017	Study of inter-relationship and cause-effect of yield and its attribute of sugarcane under waterlogging condition	<i>The Bioscan</i>	11 (4) 3149-3153
18.	Agrawal., Rupesh Kumar and Kumar Balwant	2017	Genetic Divergence estimation and selection of water-logging tolerant sugarcane clones.	<i>International Journal of Current Microbiology and Applied Sciences</i>	6 (7): 4044-4055
19.	Bal Krishna., Kamat, D.N., Balwant Kumar., Jay Jay Ram., Kumar, G., Kumari, R., Bharati, S.P., Ranjan, R. and Kumar, S.	2017	Study of genetic variability among midlate maturing sugarcane clones for different yield and juice quality traits under waterlogged condition.	<i>International Journal of Current Microbiology and Applied Sciences</i>	6 (7): 1390-1397.
20.	Chand, P., Kumar, A., Chand, H. and Paswan, S.	2017	Population dynamics of sugarcane leaf hopper, <i>Pyrilla perpusilla</i> Walker with relation to abiotic factor in Bihar, India.	<i>Ecology Environment and Conservation</i>	23 (2) : 859-863

21.	Kumari, R., Chand, H. and Paswan, S.	2017	Screening of early and mid maturing sugarcane varieties against <i>Pyrilla perpusilla</i> Walker based on pest population buildup.	<i>Journal of Entomological Research</i>	41 (4) : 405-407
22.	Chand, H., Kumari, R., Md. Minnatullah and Paswan, S.	2018	Management of borer complex through pheromone traps in sugarcane Agro-ecosystem of Bihar.	<i>International Journal of Current Microbiology and Applied Science</i>	7 : 158-167
23.	Paswan, S., Minnatullah, M.D., Kumar, M. and Sattar, A.	2018	Impact of weather factors on development of red rot disease of sugarcane agro ecosystem.	<i>International Journal of Current Microbiology and Applied Science</i>	
24	Chandra*,Khushboo, Pandey, Anil and Mishra, S.B.	2018	Characterization and genetic variability for branching behavior, yield and its attributes among Indian mustard (<i>Brassica juncea</i> L. Czern. & Coss) genotypes under rainfed condition. ”	<i>Int. J. Curr. Microbiol. App. Sci.</i>	
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139	Kumar, Sanjeev, Shivani, Kumar Shantosh, Mondal S. Singh S.S. and Singh K.M..	2017	Economics and Yield Response in Rice (<i>Oryza Sativa</i>)-Wheat (<i>Triticum Aestivum</i>) Cropping system as influenced by different tillage and sowing methods in Eastern Region.	<i>In. J. Agronomy</i>
140	Ahmad Nasim, Mishra, R. R., Sinha,	2017	Price Spread and Vegetables Marketing in the Hinterlands of Pusa and Tajpur	<i>Int. J. Adv. in Agri. Sci. Techno.</i>

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141	Kumar Santosh; Singh N. K; Kumar Rajesh and Nilanjaya	2017	Assessment of Genetic Parameters for yield and yield Components in Hybrid Rice and Parents under Drought Condition	Trends in Biosciences
142	Kumar Rajesh; Nilmani Prakash and Kumar Vinay	2017	Analysis of Morpho-Physiological Traits for Rice Improvement Under Submergence Condition	In. J. Ecology
143	Kumar Rajesh; Nilmani Prakash; Singh U.K and Kumar Neeraj	2017	Principal Component Analysis of Submergence related traits in landraces of Rice (oryza sativa.L)	Green farming
144	Kumar Santosh; Singh N.K.; Kumar Rajesh; Kumar Satish Singh; Nilanjaya; Kumar Chandan and Kumar Avinash	2017	Hetrosis Studies for Various Morphological Traits of Rice under Drought Condition	Int. J. Current Microbiol. Appl. Sci.
145	Garg Himanshu Shekhar and Kumar Rajesh	2017	Genetic diversity of drought tolerant rice (Oryza sativa L.) genotypes under drought stress condition	Inter. J. Chemical Studies
146	Garg Himanshu Shekhar ;Kumar Rajesh ; Kumar Binod and Singh Akhilesh Kumar	2017	Screening and identification of rice genotypes with drought tolerance under stress and non-stress condition	Inter. J. Chemical Studies
147	Garg, H.S., Kumari .P, Bhattacharya C., Panja S., and Kumar Rajesh	2017	Genetic parameter estimation for yield and yield related traits in rice (Oryza sativa L) with drought tolerance trait under stress condition	J.crop and Weed

148	Kanchan Kumare, Nilanjaya and Chandan Kumar	2017	Association among morphological and physiological characters in rice genotypes under Aerobic condition (<i>Oryza sativa</i> L.)	The Bioscan
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151	Rai, D. and Tewari, A.K.	2017	Effect of different incubation period and pH on biomass production of <i>Trichoderma harzianum</i> (Th 14).	<i>Journal of Eco-friendly Agriculture</i>
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158	Gautam, P.P. and Kumar, N.	2018	Pollinator diversity and relative abundance of insect pollinators on ridge gourd (<i>Luffa acutanglula</i> L.) flowers in Bihar (India)	<i>J.Ent. & Zool., Studies</i>	6 (2):1177-1181
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169	Bishun Deo Prasad*, Sangita Sahni, Pankaj Kumar	2018	Instant genomic DNA extraction method from safflower leaf for PCR analysis	J. Pharma. Phyto.	7(2): 3500-3502
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172	Kumar, Vipin, Laik, R and Singh, S. K.	2018	Screening of rice (<i>Oryza sativa</i> L) genotypes for zinc efficiency under zinc stress condition	J. Pharm. Phyto.	Special issue: 281-283
173	Singh, Santosh Kumar, Suman, S. N. and Kumari, Aradhna	2018	Performance of autumn maize crop as influenced by seaweed saps	Int. J. Chemical Studies	6(2): 2341-2345.
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177	Ahmad, Nasim, Sinha, D.K. and Singh K.M.	2018	Economic analysis of production and instability of lentil in major lentil growing states of India	<i>Int. J. of Pure and Appl. Biosci.</i>	6 (1): 593-598.
178	Pavithra, A.S., K.M. Singh, Nasim	2018	Economic Analysis of Rice Value Chain in Bihar and	<i>Int.J.Curr.Microbiol.AApp..</i>	7(03): 2738-

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179	Ahmad N, Sinha DK and Singh KM	2018	Growth and instability in pulses: A spatiotemporal analysis in eastern India	<i>Journal of AgriSearch</i>	5(1): 67-76
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182	Singh R.K.P., Kumar Abhay, Singh K.M., Chandra N., Bharati R.C., Kumar, Ujjwal and Kumar, Pankaj. Vol.	2018	Farm Size and Productivity Relationship in Smallholder Farms: Some empirical evidences from Bihar, India.	<i>J. Community Mobilization and Sustainable Development</i>	13(1), 61-67
183	Singh, Pushpa , Singh, K.M. and Shahi, Brajesh.	2018	Doubling Income of Cauliflower Seed Producer Farmers of Vaishali District through Pollination Service by <i>Apis mellifera</i> Colonies.	<i>Int.J.Curr.Microbiol.App.Sci</i>	Special Issue-7: 5242-5249
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185	Kumar, Rajesh; Singh, Chandra Mohan; Arya, Madhuri; Kumar, Rahul; Mishra, S.B.; Singh, U.K. and Paswan, Sudhir	2018	Investigating stress indices to discriminate the physiologically efficient heat tolerant genotypes of mungbean (<i>Vigna radiata</i> L.)	Legume Research	Published online:LR-3950:1-7
186	Ahmad, Mohammad Abbas; Agnihotri, Meena; Khan, M.S.; Dubey, Ashutosh; Tyagi, Bhawana; Kumar, Rajesh and Prakash, Nilmani	2018	Biochemical basis of resistance in chickpea varieties against <i>callosobruchus chinensis</i> linn. (coleopteran: bruchidae)	Legume Research	Published online:LR-3848:1-5
187	Pankaj Kumar, Bishun Deo Prasad*, Sangita Sahni. (2018).	2018.	Rapid and efficient method for pre-field screening of mutants for salt tolerance in rice. International Journal of Current Microbiology and Applied Science.		(Special Issue-7): 4594-4597

13.2 Books published (1.4.17 to 31.3.18)

S.N.	Name of the author(s)	Year	Title	Name of Publisher	No. of pages	No. of copies printed	Price
1.	Ravi Kant, V. K. Choudhary,	2018	Training Manual (A	DRPCA, Pusa.			

	R K Ranjan & S. K. Varshney		CLASS NOTE) for Seed Science & Technology	(In process)			
2.	Dr. S.P. Singh & Dr. A.K. Mishra	2018	Spices production	RPCAU, Pusa, Bihar	60	1000	-
3	Bishun Deo Prasad , Tushar Ranjan, Sangita Sahni , Ravi Ranjan Kumar and Suhail Muzaffar	2017	A text book of Biophysical techniques	Kalyani Publication, New Delhi. ISBN: 978- 93-272-8086- 9	174 p w/Index		Rs. 140.00
4	Bishun Deo Prasad, Tushar Ranjan, Dharamsheela, Sangita Sahni & Md. Shamim	2018	A Text Book of Immunology	Kalyani Publication, New Delhi ISBN: 978- 93-272-8697- 7	209 p w/Index		Rs. 175.00
5	Tushar Ranjan, Bishun Deo Prasad, Sangita Sahni & Awadhesh K. Pal.	2018	A Text Book of Nucleic acid and Bioinformatics.	Kalyani Publication, New Delhi ISBN: 978- 93-272-8778- 3	182 p w/Index		Rs. 150.00

Book Chapters Published

S.N.	Name of the author(s)	Year	Chapter	Name of Book	Pages	Name of Publisher
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1.	Thakur, S.K. and Tomar, N.K.	2017	Effect of cadmium pretreatment on phosphate sorption in alkaline calcareous soils	<i>Sustainable farming and soil health management</i>	320-325	Eds: Sanjay Arora and Suraj Bhan @ 2017, Soil conservation society of India, New Delhi. (ISBN: 978-81-909228-7-6)
1.	Bishun Deo Prasad, Diksha Kumari, Sangita Sahni and Tushar Ranjan	2017	Transgenic Plants: Methods and Current Innovations	<i>Plant Systematics & Biotechnology</i> ISBN: 81-7019-608-9	pp: 305-326.	Today and Tomorrow's Printers and Publishers, New Delhi
2.	Bishun Deo Prasad, Tushar Ranjan, Prashant Kumar, Sangita Sahni, Vinod Kumar and Nimmy MS	2017	Bioremediation of Arsenic contaminated soil for crop improvement under changing climatic scenario.	<i>Role of Women Scientists in National Development</i> ISBN: 978-93-81785-37-9	pp: 64-83.	Novelty & Company, Patna
3.	Varsha Mohan and Sangita Sahni	2017	Fungal Transformations and Advancements	<i>"Plant Biotechnology: Transgenics, Stress management and Biosafety issues"</i> ISBN: 978-1-77188-581-2	pp: 47-67	Apple Academic Press, USA
	Tushar Ranjan,	2017	Sterilization	<i>Plant</i>	pp: 69-	Apple Academic

4.	Sangita Sahni, Bishnu Deo Prasad et al		Technique.	<i>Biotechnology: Principles, Techniques and Applications.</i>	86	Press, USA
5.	Tushar Ranjan, Pankaj Kumar, Bishnu Deo Prasad, Sangita Sahni et al	2017	Ligation of Insert DNA in to Cloning Vector	<i>Plant Biotechnology: Principles, Techniques and Applications</i>	pp: 259- 282	Apple Academic Press, USA
6.	Manoj Kundu, Jayesh Pathak and Sangita Sahni	2017	Embryo culture and Endosperm culture	<i>Plant Biotechnology: Principles, Techniques and Applications</i>		Apple Academic Press, USA
7.	Prasant Kumar, Mitesh Dwivedi, Chandra Prakash, Sangita Sahni and Bishun Deo Prasad	2017	Blotting techniques	<i>Plant Biotechnology: Principles, Techniques and Applications</i>	pp: 283- 300.	Apple Academic Press, USA
8.	Vaishali Sharma, Tushar Ranjan, Pankaj Kumar, Awadhesh Kumar Pal; Vijay Kumar Jha, Sangita Sahni and Bishnu Deo	2017	Protein-Protein Interaction Detection: Methods and Analysis.	<i>Plant Biotechnology: Principles, Techniques and Applications</i>	pp: 391- 412	Apple Academic Press, USA

	Prasad					
9.	Tushar Ranjan, Sangita Sahni, Vinod Kumar, Pankaj Kumar, Nimmy M.S, Vijay Kumar Jha, Vaishali Sharma, Prasant Kumar and Bishun Deo Prasad	2017	Chloroplast Transformation.	<i>Plant Biotechnology: Transgenics, Stress management and Biosafety issues</i>	pp: 29- 46	Apple Academic Press, USA
10.	Tushar Ranjan, Sangita Sahni, Bishun Deo Prasad,Vijay Kumar Jha	2018	Genetically Modified Crops For Insect Pests And Disease Resistance	<i>Plant Biotechnology: Principles, Techniques and Applications. ISBN: 978-1- 77188-519-5</i>	pp. 308- 328.	Apple Academic Press, USA.

Revenue generation : The university has several programme such as seed production, sale of planting material, vermicompost, biofertilizer production etc to generate revenue . The important activities/sources of revenue generation. Under seed production programme, the university has produced 453 quintals of breeder seed and 1152.81 quintals of foundation/ truthful seed of rice, wheat, maize, lentil, pulses and oil seeds in different farms during the year 2017-18. Besides The university has generated a sum of Rs.52200/- through production sale of honey, a sum of Rs. 508918.00 through sale of vermicompost and earth worm and a sum of Rs. 2.84 lakh through sale of biofertilizer. The university has also produced and developed high quality planting material of horticultural crops and earn a revenue of Rs. 13,41,520.00 through their sale. Moreover the

university has generated total revolving fund of Rs. 10.76 lakh in different units and total revenue of 4.46 crore.

Annual Account : During the year, 2017-18 the university received the allocation of Rs.4477.62 lakh from state government, Rs. 1203.95 lakh from ICAR, Rs. 473.69 lakh from university receipt and Rs.8200.00 lakh from DARE, thus total receipt of the university in the year 2017-18 was Rs.14355.26 lakh only. The entire receipt was properly utilized during the year.

Financial overview 2017-18

(Rupees in Crore)

Sl. No.	Particulars	Receipt	Expenditure
1.	State (Plan/Non-Plan)	44.78	44.78
2.	ICAR (AICRP/KVKs)	12.04	12.04
3.	Univ. Receipts (Other/Misc.)	4.73	4.73
4.	DARE	82.00	82.00
Total :-		143.55	143.55