

# Building on Legacy: Profile and Strategic Initiatives

Department of Genetics and Plant Breeding



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# 1. Profile

## 1.1. Brief History and Evolution

The Genetics and Plant Breeding (GPB) department started with the teaching of undergraduate (UG) degree program in 1978. The postgraduate (PG) and doctoral (Ph.D.) degree programs started in 1981 and 1982, respectively. Since then the department has been instrumental in providing teaching and research to develop human resources. In 1982, research was strengthened by the start of several commodity-based All India Coordinated Improvement Projects (AICRP) (Fig. 1).

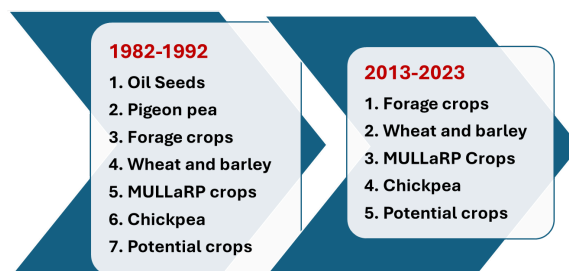


Fig. 1. Different AICRPs operational in the department

The courses and research topics are offered and administered at the university headquarters in Kumarganj, Ayodhya. The experiments are also conducted at Crop Research Stations (CRS) located elsewhere. For instance, a deepwater rice breeding station is in Ghaghra Ghat, Bahraich and research on non-sodic soil is conducted in Masodha, Ayodhya.

## 1.2. The Legacy

The department, the backbone of developing, evaluating, releasing and commercializing crop varieties, has significantly helped farming communities.

Department has released 98 high-yielding varieties of 14 cereals, pulses, forage and oil seed crops (Fig. 2). Many of these are in the seed production chain, for example, the first rice released in 1982 “Sarjoo-52”. This is derived from a cross between the world-famous dwarfing gene donor Taichung Native -1 (TN-1) from Taiwan and Kashi, a local germplasm from Varanasi.

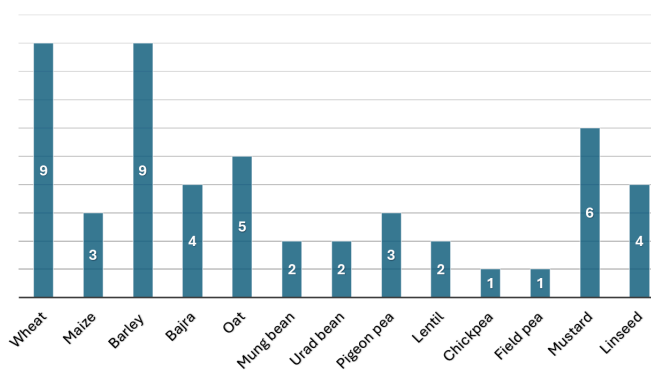


Fig. 2. Besides rice (47), the department is credited with the release of 51 varieties of 13 crops

“Sarjoo-52” is still popular among rice growers in Eastern U.P., Bihar, Jharkhand, and Chhattisgarh. The departmental legacy of breeding deepwater rice is nationally and internationally recognized. ANDUA&T is among the pioneers in releasing deepwater rice varieties such as Jalmagna, Jalnidhi and NDGR-702. These varieties possess traits to produce grains in 10-feet (~3 meters) deep water stagnated in the lowlands.

Our higher-degree students are already conducting part of their research at ICAR institutes like ICAR-NBPGR, New Delhi, and ICAR-Indian Institute of Seed Science, Mau. These are excellent synergistic platforms to build research capacity and improve scientific outcomes.

### 1.3. Vision, Mandates and Objectives

#### Vision

- Strive for excellence in imparting impactful teaching and learning research impact paths to cultivate the next generation of professionals.

#### Mandates

- Offer undergraduate, postgraduate and doctoral academic courses on genetics, plant breeding and other interdisciplinary courses.
- Manage genetic resources and develop improved varieties/lines/populations/markers by embracing genomics and post-genomic tools.
- Engage students, farming communities, extension workers, and entrepreneurs to catalyze rural transformation.

#### Objectives

- To provide high-quality teaching, experiential learning environment and mentorships for students.
- To conduct interdisciplinary plant breeding discovery and anticipatory research with larger impact potentials through strategic partnerships.
- To acquire resources, generate strategic scientific knowledge, create improved seeds and effective science communications that inspire others.

### 1.4. Strengths, Collaborations and Partnerships

The department is led by the Head and supported by a cadre of teaching, scientific, and support staff. *Most recently (2023), the department has regained its strength as long pending vacant posts of teachers and plant breeders have been filled. The faculty members and students will drive us to build on our legacy.* The department has excellent experimental field facilities and we intend to consolidate the research farm by reclamation of several experimental plots. We have access to state-of-the-art facilities with other departments and our prospective partners. Classroom teaching, mutual learning with farmers, nutrition, gender, and climate-sensitive research projects for development (R4D) are our primary focus.

The department has existing national, international, and industrial partnerships at institutional and project levels. We have a long history of collaborations with the Consultative Group of International Agricultural Research (CGIAR) like the International Rice Research Institute (IRRI), CIMMYT, ICARDA and others. We will strengthen the existing ones by faculty visits, knowledge exchange and joint project endeavors.

### 1.5. Educational Programs

In the current session (2023-24), 48 M.Sc. and 21 Ph.D. students

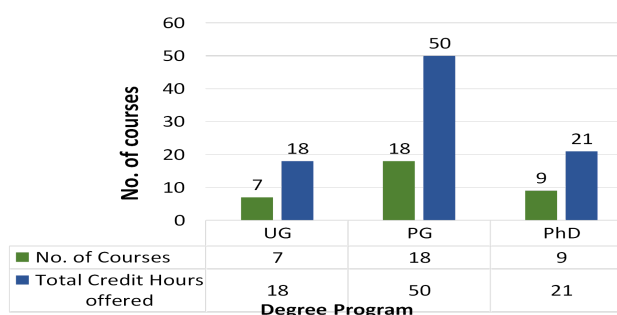


Fig. 2. Number of courses and credit load offered by the department.

are enrolled. We offer 34 courses with 89 credit loads to UG, PG and Ph.D. degrees (Fig. 3). The minimum credit required for M.Sc. is 70 credits (40 for the courses and 30 for the thesis) and for Ph.D. 100 credits (25 for the course and 75 for the thesis). Besides offering these disciplinary courses, interdisciplinary courses such as Seed Production and Certification, Breeding Vegetable Crops and Intellectual Property Rights are also offered. Now our student-faculty ratio is 9:1 with diverse and passionate faculties to provide core services of teaching and mentoring.

## 1.7. Faculty

### Team with Shared Values

The department hosts specialists from allied sciences such as plant pathologists, entomologists and agronomists. This provides an excellent environment for interdisciplinary team research. We are proactively embracing faculties from social sciences to increase our longer-term competency by promoting self-motivated teams that focus more on team goals, and less on individual goals, and are open to accepting change (to enhance competency), constructive suggestions (to improve), and realize the power of win-win. Such an enabling environment would influence our enrolled and passing students - creating a continuous cycle of learning and improvement.

*Name & Designation: Dr. Sanjeet Kumar, Professor & Head of Department*

**Experience:** Over 24 years of research, teaching and projects/ program implementation in more than 20 African and Asian countries. **Teaching and Research Interests:** Plant cytogenetics, pre-breeding, traits-specific breeding, male sterility traits, intellectual property rights, private and public plant breeding systems. **Current Focus:** Mentoring breeding teams and strengthening the crop breeding portfolios, discovery research and breeding rapeseed-mustard for economically important traits, fostering sustainable and scalable commodity value chains. **Contact:** Email: sanjeet.kumar@nduat.org, Phone: 9934874800

*Name & Designation: Dr. Vinod Singh, Retired Professor*

**Experience:** More than 30 years of teaching, research and extension at different Acharya Narendra Deva University of Agriculture & Technology (ANDUA&T) locations. **Teaching and Research Interests:** Plant Breeding and Genetics, developing high-yielding wheat and barley varieties and project management. **Current Focus:** Providing experiential services to wheat and barley breeding teams. **Contact:** Email: singhv.1959@gmail.com, Phone: 9450882524

*Name & Designation: Dr. Shiv Nath, Professor*

**Experience:** Over 19 years of teaching, research and extension at ANDUA&T. **Teaching and Research Interests:** Plant genetics and breeding, chickpea and legume crops breeding, seed production of cereals, pulses and oil seeds. **Current Focus:** Breeding chickpea and other legume varieties/lines. Principal Investigator of AICRP on Chickpeas. **Contact:** Email: shivnduat@gmail.com, Phone: 9452276217

*Name & Designation: Dr. Vinod Kumar Singh, Associate Professor*

**Experience:** Over 15 years of teaching, research and extension in eastern Indian states. Worked on Jute and allied fiber crops and barley improvement. **Teaching and Research Interests:** Plant genetic resources, plant breeding, mutation breeding, developing wheat and barley lines and varieties for biotic and abiotic resistance. **Current Focus:** Breeding wheat

and barley varieties and elite lines. Principal Investigator of AICRP on Wheat and Barley.  
**Contact:** Email: vinod546@gmail.com, Phone: 7992281425

**Name & Designation:** Dr. V.P. Chaudhary, Associate Professor

**Experience:** Nineteen years of teaching, research and extension with ANDUA&T in eastern Uttar Pradesh. **Teaching and Research Interests:** Plant pathology, wheat and barley pathology. **Current Focus:** *Helminthosporium* blight of barley. **Contact:** Email: arungpb@nduat.org, Phone: 7983893550

**Name & Designation:** Dr. Pankaj Kumar, Scientist/Assistant Professor, Entomology

**Experience:** Over 18 years of teaching, research and extension at ANDUA&T. **Teaching and Research Interest:** Plant entomologist, insects of chickpea and legume crops. **Current Focus:** Developing newer IPM strategies against *Helicoverpa armigera* and other pests of chickpeas. **Contact:** Email: pk\_scientist@yahoo.co.in, Phone: 9415918411

**Name & Designation:** Dr. Subhas Chandra, Professor

**Experience:** More than 19 years of teaching, research and extension with ANDUA&T in eastern Uttar Pradesh. **Teaching and Research Interests:** Plant pathology, field and artificial screening of wheat rust and blight resistance lines. **Contact:**

Email: drsch716@gmail.com, Phone: 9450768159

**Name & Designation:** Dr. Piyusha Singh, Assistant Professor

**Experience:** Five years of teaching and research in eastern Uttar Pradesh while working with ANDUA&T. **Teaching and Research interest:** Genetics, molecular biology and biotechnology. **Current Focus:** Development of early maturity salt tolerant lines of wheat. Academic in charge. **Contact:** piyusha\_singh@yahoo.com, Phone: 9458362834

**Name & Designation:** Dr. Gagan Kumar, Assistant Professor

**Experience:** More than five years of teaching, research, and extension with different private and government organizations. **Teaching and Research Interests:** Plant Pathology, Plant-Microbe Interaction, Transcriptomics, Biocontrol, Plant Growth Promoting Rhizobacteria (PGPR), Oilseed Pathology. **Current Focus:** Screening and development of biotic stress-resistant lines of rapeseed-mustard and other oil seed crops. **Contact:** Email: gkcbhu@gmail.com, Phone: 8896286455

**Name & Designation:** Dr. Akash Gaurav Singh, Assistant Professor

**Experience:** Three years of research at the ICAR-Indian Agricultural Research Institute (IARI), New Delhi. **Teaching and Research Interests:** Pre-breeding in minor pulses, quality breeding, marker-assisted breeding. **Current Focus:** Genetic characterization of early maturing chickpea lines, breeding for biotic and abiotic resistance in minor pulses. Principal Investigator of AICRP MULLaRP. **Contact:** Email: agsingh2023@nduat.org, Phone: 8736031933

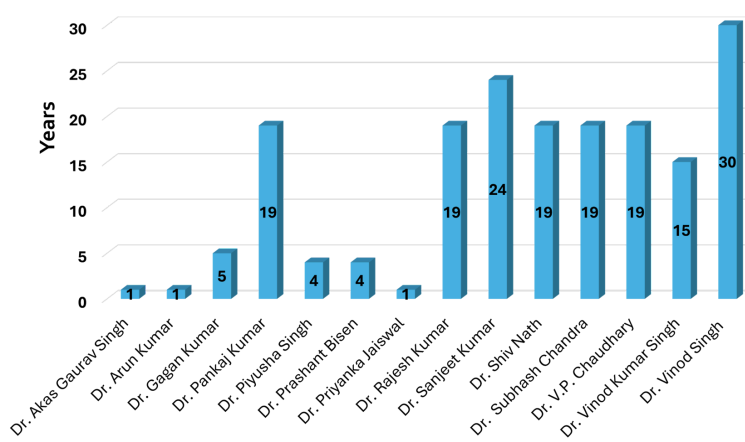


Fig. 3. Diverse level of experiences is biggest strength for learning and performing.

**Name & Designation:** Dr. Arun Kumar, Assistant Professor

**Experience:** Over four years of teaching, research, and extension with the ICAR-Indian Institute of Maize Research Unit, New Delhi and ANDUAT in eastern Uttar Pradesh.

**Teaching and Research Interests:** Plant Breeding, Molecular Breeding, Genomic Assisted Breeding. **Current Focus:** Development of salt-tolerant and biotic stress-resistant lines of rapeseed-mustard and other oil seed crops. **Contact:** Email: arungpb@nduat.org, Phone: 7983893550

**Name & Designation:** Dr. Priyanka Jaiswal, Assistant Professor

**Experience:** Two years in teaching, research, and extension with private and Government institutions. **Teaching and Research Interests:** Genetics, Plant Breeding, Biometrical Genetics, Molecular Biology, Genomics in Crop Improvement. **Current Focus:** Development of salt-tolerant, huskless and biotic stress-resistant barley lines. **Contact:** Email: priyankajgpb@nduat.org, Phone: 9452370912

**Name & Designation:** Dr. Prashant Bisen, Assistant Professor

**Experience:** Four years in teaching and research with private and government institutions. **Teaching and Research Interests:** Genetics, Plant Breeding, Biometrical Genetics, Molecular Breeding, Genomics in Crop Improvement. **Current Focus:** Development of abiotic stress-tolerant rice lines of rice and quality rice breeding. **Contact:** Email: pbisen@nduat.org, Phone: 7905192682

## 2. Strategic Initiatives

### Empower and Innovate

Given the re-gained scientific strength, team GPB is conceptualizing and implementing new initiatives. *These strategic initiatives are small-looking but they could be entry points for a continuous improvement cycle for the growth of staff and students.* The goal is to develop realistic teaching and research strategies aligned with strengths and limitations.

#### 2.1 Teaching, Learning & Opportunities

The success of teaching and experiential learning is contingent upon the highly competitive environment. Therefore, we take a holistic mentoring approach to students prepare for advanced studies, entrepreneurship, employment opportunities and self-employment. The courses offered such as commercial plant breeding are instrumental for students to understand the role of plant breeding and allied sciences contributing to national and global seed industries and employment opportunities.

*Lectures by highly experienced researchers would be a regular feature to complement classroom learning.* This began with a presentation by Dr. Bijendra Pal of BioSeed, Hyderabad



Fig. 4. Guest lecture from experienced breeders from public and private seed industries would be regular feature.

(6 April 2024), India. He shared excellent insights “plant breeding is art, science, and

business” from his 33 years of seed industry experience out of which 15 years were in the Philippines and Vietnam (Fig. 4). We will leverage our geographical location the “Ayodhya” to bring such experienced professional to deliver guest presentations.

We aim to inspire higher-degree students to pursue professions they are passionate about. We will do this by engaging students, mentoring and continuously equipping them with knowledge, skills and networks that will help them get a platform to perform as champion workforce.

## 2.2. Breeding Science & Comprehending Markets

We started aligning students' research with local farmers so they understand the research impact pathways. The idea is to make a footprint in their mindset for translational science and make them productive professionals for society.

Experimental learning about crop production costs at farmers' fields is required for

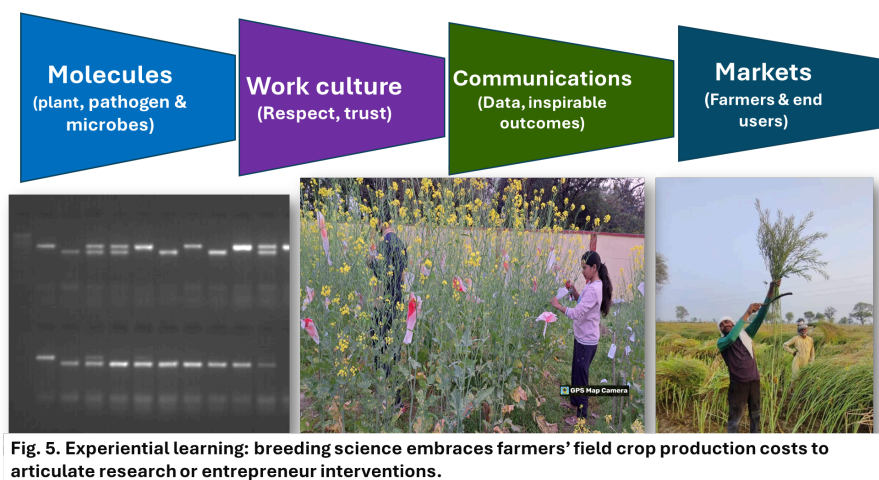
higher-degree students' skill development and data generation. The community-level data will also help us articulate research, development, and entrepreneurship interventions in small-scale producers' landscapes. Hence,

we initiated a research philosophy of “comprehending molecules to market for the marginal growers” (Fig. 5). The questionnaire is designed to learn item-wise production costs at small farm families and commodity value chains, impact paths, and trade-offs. This optional initiative for postgraduate research students is similar to an ongoing university-level undergraduate program ‘Rural Agriculture Work Experience - RAWE’.

The first step is to design and open up experiments that can bring transdisciplinary faculties and students together and get first-hand experience in contributing to team goals. Generating information about economically important pathogens dynamics will be required for anticipatory resistance breeding. Planning and developing breeding and molecular marker product profiles and their impact pathways will help us know our competency.

## 2.3. Exploring New Partnerships

Although less privileged, we are highly inspired to develop partnerships to increase the uptake of our students in advanced studies - nationally and internationally. We also intend to strengthen existing relationships with the seed industry. The next step is to engage them in joint initiatives through consultations for “meaningful synergistic partnerships”.



We started exploring new partnerships within India and abroad for discovery research. For germplasm acquisition and knowledge exchange, the National Bureau of Plant Genetic Resources (NBPGR), New Delhi, and Genetic Resource Information Network (GRIN), the United States Department of Agriculture (USDA) are obvious choices. The breeding institute and departments in the USA, France, Russia, Australia, and others will be useful for knowledge exchange and acquiring publicly available elite lines. Considering restrictions in germplasm movement due to bio-security issues and IPR regulations, we will develop a standard operation producer of our germplasm management. On the developmental front, we will join hands with community-based organizations (COBs), Kishan Vigyan Kendras (KVKs) and mentor local entrepreneurs to create employment opportunities.

## 2.4. Developing a Strategic Plan

The formal and informal consultations will help us develop our Strategic Teaching and Breeding Plans for 2024-26. This will be a rolling plan to embrace our crops, traits, project and product profiles and ways to disseminate our research outputs through public and private partnerships. This Strategic Plan will be based on proceedings and recommendations made during the Research Advisory Committee Meeting, 19-21 November 2023 chaired by the Hon'ble Vice-Chancellor of the University.

We suggest foresight studies. For instance, over the decades, the deep-water rice areas have declined. This is hypothesized due to the loss of cultivable area in river streams and allowing rice growers to opt for other high-yielding hybrid rice. However, empirical data are needed to validate the hypothesis and decide on future research. The second aspect to focus on is educating research students and creating knowledge about deepwater rice traits, like elongation, kneeling ability, etc. The strategic plan will be periodically fine-tuned to accommodate unexpected results and assumptions underlying research for developmental interventions.

## Acknowledgments

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## Reach out to us

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