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*Advancing Seed Science for Sustainable Food Security*

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## Director's message

It gives me immense pleasure to present the highlights of the activities and achievements of ICAR-National Institute of Seed Science and Technology (ICAR-NISST), Mau, during January-March 2026. The Institute continued to make significant contributions in seed science, genomics-assisted crop improvement, seed quality enhancement, capacity building, and farmer-centric extension programmes in support of sustainable and climate-resilient agriculture.



Farmer outreach remained a key priority with the successful organization of the two-day NISST-Kisan Mela on the theme "Uttam Beej – Samriddh Kisan", which witnessed the participation of nearly 3,500 farmers and 46 organizations. The programme promoted awareness on quality seed production, climate-resilient agriculture, integrated farming systems, renewable energy technologies, and government support schemes. The Institute also organized the Bharat Vistaar awareness programme to promote Artificial Intelligence and Digital Public Infrastructure in agricultural advisory services.

The Institute achieved notable progress in genomics research, particularly in identifying candidate genes and molecular markers associated with high total soluble solids and seed longevity in onion, providing valuable resources for genomics-assisted breeding and quality seed improvement. Scientific excellence was further reflected through quality research publications, books, training manuals, awards, invited lectures, and fellowships received by the Institute's scientists.

During the period, ICAR-NISST conducted advanced training programmes on modern seed quality testing and genomics-driven innovations in seed science, strengthening the technical capabilities of scientists and academicians. The Institute also promoted women empowerment through awareness programmes on quality seed production, sustainable agriculture, and government welfare schemes.

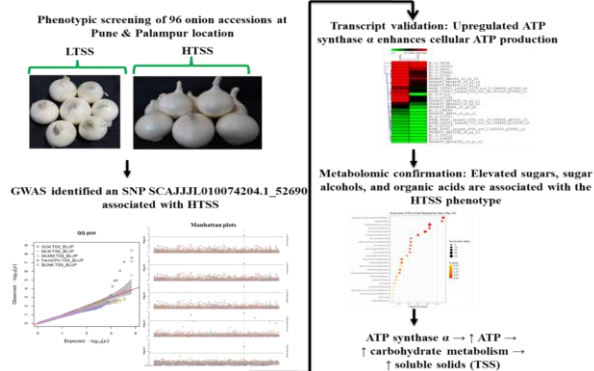
I sincerely appreciate the dedication and contributions of our scientists, technical and administrative staff, students, collaborating institutions, farmers, and stakeholders. I am confident that ICAR-NISST, Mau, will continue to advance seed science research, innovation, and technology dissemination for the benefit of Indian agriculture.

*A. Anandan*  
A. Anandan  
(Director)

## Research Highlights

### Genome-wide association and transcriptome analysis unraveling putative genes responsible for high TSS of *Allium cepa*

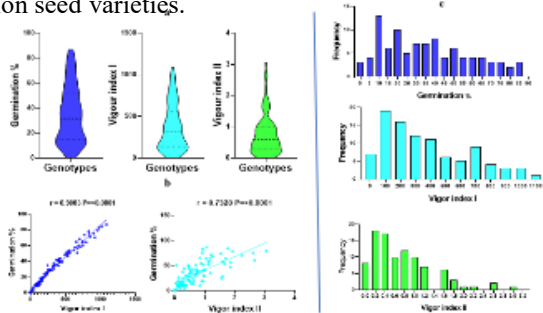
A genome-wide association study in *Allium cepa* identified a major SNP locus (SCAJJL010074204.1\_52690) that explains up to 65% of the variation in total soluble solids (TSS), a key trait for onions suitable for dehydration (>15 °Bx). Integration of GWAS and transcriptome analyses links this locus to transcripts encoding ATP synthase subunit alpha, along with coordinated upregulation of carbohydrate metabolism and energy-related genes in high-TSS lines (S74, S75, S76). These findings highlight robust molecular targets for genomics-assisted breeding and precision genome editing (C→T allele) to enhance TSS and improve processing quality in onion.



(Kuldip Jayaswall et al.)

### Genomics-driven identification of seed longevity-linked markers in *Allium cepa*

A comprehensive genomics study in *Allium cepa* identified key molecular markers associated with seed longevity, a critical bottleneck in onion seed systems. A total of 77 NAC transcription factor-derived SSR markers and 30 AcILP markers exhibited high cross-transferability and polymorphism across Alliums. Genome-wide association analysis integrating SSRs, ILPs, and SNPs reveals a major SNP (SCAJJL010033730.1\_40317) significantly associated with both germination percentage and vigour index, indicating pleiotropic control of seed performance. Additional SNPs linked to vigour traits highlight candidate genomic regions involved in stress adaptation and transcriptional regulation. This first report of SNPs governing seed longevity in Alliums provides robust molecular tools for breeding high-vigor, long-lasting onion seed varieties.



(Kuldip Jayaswall et al.)

### R software package DESNP:

#### Differentially Expressed Single Nucleotide Polymorphisms

The DESNP R software package provides a framework for the identification and analysis of Differentially Expressed Single Nucleotide Polymorphisms (deSNPs) using high-throughput sequencing data. It enables users to import SNP count data from variant files, perform allele-specific read count extraction, and statistically detect SNPs showing significant differences in allele expression between biological conditions or sample groups. This package contains tools for calculating SNP-index and  $\Delta$ SNP-index from VCF-derived allele depth data with statistical testing and filtering, including sliding-window analysis of genomic regions.

The DESNP R software package has been developed and submitted to The Comprehensive R Archive Network (CRAN) repository. The package is publicly accessible at the following URL: ([https://Name of Package: DESNP Author: Sayanti Guha Majumdar \[aut, cre\], Saima Bano \[aut\], Nandita Banerjee \[aut\], Rahul Kumar Tiwari \[aut\], Dipro Sinha \[aut\], Subham Ghosh \[aut\], Sanjeev Kumar \[aut\].](https://Name of Package: DESNP Author: Sayanti Guha Majumdar [aut, cre], Saima Bano [aut], Nandita Banerjee [aut], Rahul Kumar Tiwari [aut], Dipro Sinha [aut], Subham Ghosh [aut], Sanjeev Kumar [aut].))

DOI: 10.32614/CRAN.package.DESNP

## NISST Kisan Mela 2026

### “Uttam Beej - Samriddh Kisan”

A two-day NISST-Kisan Mela on the theme “Uttam Beej – Samriddh Kisan” was organized at ICAR-National Institute of Seed Science and Technology (ICAR–NISST), Mau, on 13 & 14 March, 2026 to create awareness among farmers on quality seed production, improved agricultural technologies, climate-resilient farming, and government support schemes for agricultural development. Shri Arvind Kumar Sharma, Hon'ble Minister for Urban Development, Employment and Poverty Alleviation and Energy, Government of Uttar Pradesh, inaugurated the Kisan Mela, while Dr. J. P. Lal, Chancellor, Central University of Jharkhand, graced the occasion as Guest of Honour. The programme was chaired by Dr. A. Anandan, Director, ICAR-NISST, Mau. The event commenced with the rendition of *Vande Mataram*, the ICAR Song, and ceremonial lighting of the lamp. Dr. Ajay Kumar, Senior Scientist, delivered the welcome address and greeted the dignitaries and participating farmers. Progressive farmers shared their experiences and highlighted regional agricultural needs and opportunities.

In his presidential address, Dr. A. Anandan highlighted the Institute's efforts in the production of quality seed of improved crop varieties and its research, extension, and capacity-building initiatives for agricultural development in the Purvanchal region. Technical sessions emphasized crop diversification, integrated farming systems, use of biofertilizer, climate-resilient agriculture, renewable energy technologies, and government welfare schemes for farmers. Five progressive farmers namely Smt. Urmila Devi, Smt. Prema Singh, Shri Dharendra Nath Singh, Shri Vijay Mal Yadav, and Shri Shravan Singh were felicitated for their outstanding contributions to agriculture. A total of 46 government and non-government organizations showcased advanced agricultural technologies, quality seeds, farm machinery, and



farmer support services through exhibition stalls. Approximately 3,500 farmers from Mau, Azamgarh, Ghazipur, and Varanasi participated in the Kisan Mela, making it a highly informative and successful event. The programme concluded with a vote of thanks proposed by Dr. Anjani Kumar Singh.



### ICAR-10 Days Short Course

ICAR-National Institute of Seed Science and Technology, Mau, organized a 10-day ICAR-sponsored Short Course on "*New Frontiers in Seed Quality Testing for Sustainable Agriculture*" from 16 to 25 January, 2026. The programme was inaugurated under the chairmanship of Dr. A. Anandan, Director, ICAR–NISST, Mau, in the presence of Dr. Sanjay Singh, Director General, UPCAR, and Dr. H. V. Singh, Principal Scientist, ICAR-NBAIM, Mau. Dr. Kalyanrao, Course Director, presented the course overview, while Dr. Kalyani Kumari welcomed the participants. A total of 20 scientists and faculty members from various ICAR institutes and State Agricultural Universities across the country participated in the programme. The course was designed to enhance participants' knowledge and skills in advanced seed quality testing technologies and sustainable agricultural practices through expert lectures, practical sessions, and exposure visits.



The training programme comprised 20 expert lectures, six hands-on practical sessions, and exposure visits to IRRI, Varanasi, the National Seed Research and Training Centre (NSRTC), and the Central Seed Testing Laboratory (CSTL), Varanasi. Eminent scientists from ICAR-IARI, ICAR-IIMR, ICAR-DFR, IRRI, ICAR-NISST and ICAR-NBAIM delivered lectures on emerging advances in seed

science, seed quality testing, speed breeding, computational biology, grain quality analysis, and scientific seed testing procedures. The valedictory function was held on 25<sup>th</sup> January, 2026 under the chairmanship of Dr. A. Anandan, during which certificates were distributed to the participants. The feedback received indicated that the programme was highly informative and beneficial, with participants particularly appreciating the expert lectures, practical training, and exposure visits.



### ICAR-HRD Sponsored Short Course

ICAR-National Institute of Seed Science and Technology, Regional Station, GKV Campus, Bengaluru, organized a 10-day ICAR-HRD-sponsored Short Course on "*Genomics-Driven Innovations in Seed Science and Quality Traits Improvement in Crop Plants*" from 18 to 27 February, 2026. The programme was conducted with the objective of enhancing the knowledge and technical competencies of scientists, academicians, and researchers in the emerging fields of genomics, molecular breeding, and seed science for crop improvement. The course provided a comprehensive platform for understanding recent advances in genomics-assisted breeding, molecular marker technologies, genome sequencing, gene discovery, functional genomics, and precision breeding approaches for the improvement of seed quality traits and crop productivity.



### Rashtriya Karmayogi

As the Nodal Agency for the Rashtriya Karmayogi Large Scale Jan Seva Program, the HRD Unit of ICAR-NISST, Mau organized a two-day training programme for



the permanent staff of ICAR-NISST, Mau and ICAR-NBAIM, Mau on 06 & 07 February, 2026. A total of 79 permanent employees participated in the programme, including 43 from ICAR-NISST, Mau and 36 from ICAR-NBAIM, Mau. The participants comprised scientists, administrative personnel, technical officers, and supporting staff.

## Capacity Building Programme for Farmers

| S. No.                                          | Date           | Name of the programme                                              | District         | No. of farmers |
|-------------------------------------------------|----------------|--------------------------------------------------------------------|------------------|----------------|
| 1.                                              | 5-9 Jan 2026   | Quality Seed Production Techniques                                 | Nawada, Bihar    | 28             |
| 2.                                              | 27-31 Jan 2026 | Pulse Seed Production Techniques                                   | Sitamarhi, Bihar | 21             |
| 3.                                              | 2-6 Feb 2026   | Pulse Seed Production Techniques                                   | Gopalganj, Bihar | 42             |
| 4.                                              | 9-13 Feb 2026  | Quality Seed Production                                            | Patna, Bihar     | 22             |
| 5.                                              | 10-12 Mar 2026 | New Techniques in Seed Production                                  | Buxar, Bihar     | 22             |
| 6.                                              | 10-14 Mar 2026 | Certified Seed Production of Wheat                                 | Saran, Bihar     | 20             |
| Trainings conducted at ICAR-NISST RS, Bengaluru |                |                                                                    |                  |                |
| 7.                                              | 11-13 Mar 2026 | Quality Seed Production for Enhancing the Income of Tribal Farmers | Karnataka        | 25             |



## Bharat Vistaar Launch Telecast and Digital Agriculture Awareness Programme

The “Bharat Vistaar” online telecast programme was organized on 17<sup>th</sup> February, 2026 with the participation of 62 participants. The programme highlighted the Government of India’s initiative announced in the Union Budget 2026-27 for the launch of Bharat Vistaar, a multilingual AI-based conversational advisory system for the agriculture sector. Bharat Vistaar integrates resources from Agri Stack, the Indian Council of Agricultural Research (ICAR), government schemes, IMD, mandi prices, and state systems to provide a unified digital platform offering advisories, market information, credit, insurance, and scheme-related services aimed at improving agricultural productivity and reducing risks for farmers.

The national launch of Bharat Vistaar-the Digital Public Infrastructure (DPI) for AI in Agriculture-was held at Jaipur as a side event of the India AI Impact Summit 2026 and was live telecast on 17<sup>th</sup> February, 2026 from 9:30 AM onwards. The programme served as an important platform for disseminating information on digital agricultural innovations,



emerging technologies, and farmer-centric advisory services. Participants actively engaged in the sessions, enhancing their understanding of AI-enabled agricultural extension and digital support systems.

## International Women’s Day Celebration and Awareness Programme

International Women’s Day was celebrated at ICAR-National Institute of Seed Science and Technology, Mau on 08<sup>th</sup> March, 2026 with the participation of 55 women farmers. The programme focused on women empowerment, capacity building, and the role of women in agriculture. Scientists of the institute delivered lectures on quality seed production, compost preparation from kitchen waste, the role of women in agriculture, and government schemes for women farmers. A motivational video on women empowerment and an interaction session further enhanced awareness among participants. Dr. A. Anandan, Director, ICAR-NISST, Mau, appreciated the efforts of the organizers and encouraged women to actively participate in agricultural development programmes and adopt improved technologies. Overall, the programme was informative and successful in promoting sustainable agricultural practices and awareness about support systems for women farmers.



## Seminars/ Conferences/ Meetings/ Trainings Attended

**Dr. Kalyanrao**, Senior Scientist (Seed Science and Technology), attended a three-days training programme on "Seed Testing, Quality Assurance & ISTA Accreditation" organized by the Telangana State Seed and Organic Certification Authority (TGSOCA) ISTA Laboratory, Hyderabad, from 5 to 7 March, 2026. The training provided comprehensive exposure to international standards and best practices in seed testing, quality assurance systems, laboratory quality management, and the requirements for International Seed Testing Association (ISTA) accreditation.



**Dr. A. Anandan**, Director, NISST, Mau, delivered a keynote lecture on the topic “Introgression and Validation of qAG2.1 Controlling Anaerobic Germination Tolerance in Rice” at the International Conference on “Climate Resilient Agriculture for Sustainable Development: Innovations and Solutions” held at Banaras Hindu University, Varanasi, during 5 to 7 February, 2026.





**Dr. Kalyanrao**, Senior Scientist (Seed Science and Technology), attended the meeting on "Finalization of Breeder Seed Indent for Kharif 2027" held at the NAAS Complex, New Delhi, on 26<sup>th</sup> February, 2026. The meeting focused on the assessment and finalization of breeder seed indents ensuring the timely availability of quality breeder seed to support the national seed production programme. The deliberations included crop-wise and variety-wise breeder seed requirements, coordination among research institutions and seed-producing agencies, and strategies for strengthening the breeder seed production and supply chain in accordance with national agricultural priorities.

**Dr. Kuldip Jayaswall**, Scientist, delivered an invited lecture titled "Harnessing immunogenic memory from wild alliums for durable anthracnose resistance through genomics-assisted breeding" at the National Conference on "Pathogens, Microbes and Plant Defense: Bridging Research and Applications," organized by the Indian Phytopathological Society (IPS), New Delhi, and ICAR-National Bureau of Agriculturally Important Microorganisms (NBAIM), during 28 & 29 January, 2026 at ICAR-NBAIM, Mau.

## Awards and Recognitions

**Dr. Kalyanrao**, Senior Scientist (Seed Science and Tech.), was elected as the Vice President of the prestigious Indian Society of Seed Technology, New Delhi, for a three-year tenure (2026–2029) with the highest vote margin among all contestants.



**Dr. Kalyanrao**, Senior Scientist (Seed Science and Tech.), was conferred the Best Teacher Award 2025 in recognition of his outstanding contributions to teaching in the horticultural sciences during the 4<sup>th</sup> Indian Horticultural Summit-cum-International Conference held at Rani Lakshmi Bai Central Agricultural University, Jhansi, from 28 to 30 January, 2026.



**Dr. Deepanshu Jayaswall**, Scientist (Agri. Biotech.), was awarded the Springer Nature Young Scientist Award 2026 by the Society of Plant Biochemistry and Biotechnology at the two-day National Conference on "Advances in Biochemistry & Biotechnology for Nutritional Security in the Era of Climate Change" held during 27-28 February, 2026 at RPCAU, Pusa, Bihar.



**Dr. Kuldip Jayaswall**, Scientist (Agri. Biotech.), was awarded the INSA Visiting Scientist Fellowship by the Indian National Science Academy. As a part of the fellowship, he underwent one month of advanced research training in functional genomics under the guidance of Dr. R. K. Sharma, Chief Scientist, at the CSIR–Institute of Himalayan Bioresource Technology, Palampur.



## AICRP News

**CSKHPKV, Palampur:** Dr. Rajesh Kanwar received 'Young Scientist Award' at 13<sup>th</sup> International Conference ICAHFAS-2026 Agriculture, Horticulture, Forestry & Allied Sciences for Sustainable Himalayan ecosystem from 18 to 20 March, 2026 organized by ICFRE-HFRI Shimla in association with National Medicinal Plant Board, RRS,HP (Govt. of India) and ISAHRD Society, New Delhi.

**IARI, New Delhi:** Dr. Atul Kumar received the Dr. K C Mehta and Manoranjan Mitra Award of Indian Phytopathological society in February, 2026 at Kolkata National Conference of Indian Phytopathological Society

**AAU, Jorhat:** AICRP on Seed (Crops), Directorate of Research, AAU, Jorhat organized two farmers' training programmes on quality seed production during February-March 2026. The first training programme on "Quality Seed Production of Black Gram" was conducted on 27.02.2026 at Gormora, Dergaon, while the second programme on "Quality Seed Production and Certification of Field Crops"





was organized on 09.03.2026 at Assam Agricultural University, Jorhat, Assam. A total of 60 farmers participated in the two training programmes, including 30 members of the Jakve Farmer Producer Company (FPC) who attended the second programme. As part of the programme, 1.80 quintals of Ranjit Sub-1 paddy seed and 30 kg of CR Dhan 310 paddy seed were distributed to the participating farmers.

**PAJANCOA & RI, Karaikal:** A two-day exposure visit on “Agri-Innovation” was organized by PAJANCOA & RI, Karaikal for farmers associated with MYRADA, an NGO based in Puducherry, under the Prabhat Water Stewardship Program on 07 & 08 January, 2026. The programme provided participants with first-hand exposure to innovative and sustainable agricultural technologies, improved crop production practices, water stewardship approaches, and successful farming models. The visit facilitated knowledge exchange between farmers and scientist, enabling the participants to gain practical insights for enhancing agricultural productivity, resource-use efficiency, and sustainable farming in their respective areas.

information on quality seed production, seed processing, storage, and the use of improved crop varieties. Scientists and experts interacted with the participants, emphasizing the role of quality seed in enhancing crop productivity and farm income, while also facilitating farmer-scientist interaction, exchange of experiences, and the promotion of improved seed technologies for sustainable agricultural development. A total of 160 farmers participated in the two Annual Seed Festivals.



**CCS HAU Hisar:** The Department of Seed Science and Technology, CCS Haryana Agricultural University, Hisar actively participated in two Kharif Kisan Melas organized during 2026. The first Kisan Mela was held from 28 February to 1 March, 2026 at Ladwa, Kurukshetra, followed by the second on 23 to 24 March, 2026 at the University’s main campus, Hisar. During both events, the Department showcased advanced seed technologies and created awareness among farmers on the importance of quality seed, scientific seed production, and safe seed storage practices. The Department’s impressive exhibit and technical presentation at the Kisan Mela held on the main campus earned the first prize, reflecting its commitment to promoting quality seed production and dissemination of seed technologies among the farming community.

**TNAU, Coimbatore :** Two Annual Seed Festivals were organized to create awareness among farmers on the importance of quality seed, improved crop varieties, and scientific seed production practices. The first festival was held on 21.01.2026 at KVK, Sandhiyur, with the participation of 60 farmers, while the second was organized on 18.02.2026 at TCRS, Yethapur, attended by 100 farmers. The festivals served as a platform for disseminating



**CAU Imphal:** A three-day training programme on "Seed Certification and Seed Law Enforcement in the North Eastern Hill (NEH) Region" was organized from 26 to 28<sup>th</sup> March, 2026 at the College of Agriculture, Iroisemba, Central Agricultural University (CAU), Imphal. The programme aimed to enhance the knowledge and skills of participants in seed certification procedures, seed quality assurance, and enforcement of seed laws in the NEH Region. A total of 38 participants, comprising 29 men and 9 women participants, attended the programme.



**ICAR RC NEH, Manipur:** ICAR NEH Manipur center was awarded the Best Exhibition Stall Award at the North-East Rice Festival – *Grains of Heritage 2026* cum National Seminar on *Harnessing Indigenous Rice Genetic Diversity for the Food–Climate–Market Nexus*, organized by the INTACH Nagaland Chapter in collaboration with ICAR Research Complex for NEH Region, Nagaland Centre, Medziphema, from 26 to 28 February, 2026. The award recognized the Department's outstanding exhibition showcasing innovations and technologies related to seed science and quality seed production.

## Research Papers

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