# आईसीएआर - आइएआरआइ - झारखण्ड
# सूचना-पत्र
# ICAR - IARI - JHARKHAND
# NEWSLETTER

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### IARI-Jharkhand Proudly Welcomes Dr. Ch. Srinivasa Rao as Its New Director

ICAR–IARI, Jharkhand proudly welcomes Dr. Cherukumalli Srinivasa Rao as its new Director. Dr. Cherukumalli Srinivasa Rao took charge as the Director of ICAR–Indian Agricultural Research Institute (IARI) on December 26, 2024. A globally renowned agricultural scientist, he brings a wealth of expertise in research, academic leadership, and institutional development. His distinguished career includes leadership positions at premier institutions such as ICAR–National Academy of Agricultural Research Management (NAARM), Hyderabad, where he served as Director from 2017 to 2024. Prior to this, he was Director of ICAR–Central Research Institute for Dryland Agriculture (CRIDA) from 2014 to 2017 and Project Coordinator of the All India Coordinated Research Project on Dryland Agriculture (AICRPDA) in 2013–2014. His strategic leadership led CRIDA (2015) and NAARM (2021) to receive the prestigious Sardar Patel Outstanding ICAR Institution Award, a testament to his transformative vision.

Dr. Rao is a Fellow of India's leading scientific academies: INSA, NASI, and NAAS, as well as a member of distinguished professional societies, including the Indian Society of Soil Science, A.P. Academy of Sciences, and Telangana Academy of Sciences. His contributions to agricultural research have been widely recognized with 48 national and international awards, including the Rafi Ahmed Kidwai Award for Excellence in Agricultural Research, ICRISAT Millennium Science Award, Coromandel Plant Nutrition Award by FAI, and Dr. N.S. Randhawa Memorial Award by NAAS. His scholarly achievements include 361 research papers, 56 authored or edited books, and 18 copyrights, reflecting his commitment to advancing agricultural science. Dr. Rao has played a crucial role in national and global research initiatives, serving as Technical Chairman of the National Mission for Sustainable Agriculture and National Coordinator of ICAR's flagship NICRA program. His expertise has been acknowledged internationally, with memberships in organizations such as the International Dryland Development Commission (IDDC), Cairo, and the Asian Long–Term Experimental Network for Agriculture (ALTENA), Japan. His contributions to climate change negotiations at UNFCCC CoP, IPCC, and APN forums have earned global recognition, reinforcing India's position in sustainable agricultural development. His recent address at the Royal Society of London on Biodiversity–Water Nexus with Food Security was highly appreciated. Under his visionary leadership, ICAR–IARI, Jharkhand is set to strengthen its role as a state–of–the–art agricultural research institute, driving scientific advancements tailored to the resource–rich eastern region of India. His commitment to sustainable agricultural practices and cutting–edge research will play a vital role in harnessing regional potential and ensuring long–term progress in farming and allied sciences.

# From Director's Desk

It is my pleasure to present the latest edition of the ICAR–IARI Jharkhand newsletter, covering the period from January to March 2025. This publication highlights the institute's continued commitment to advancing agricultural research, education, and extension activities for sustainable and inclusive agrarian growth in eastern region of India.

**Dr. Ch. Srinivasa Rao**
Director & Vice–Chancellor
ICAR–IARI, Jharkhand

ICAR–IARI Jharkhand was established with the vision of fostering excellence in agricultural sciences, recognizing the need for region–specific research and education. Since its inauguration by Hon'ble Prime Minister Shri Narendra Modiji on 28 June 2015, the institute has evolved into a leading center for innovation, spanning a 1000–acre campus in Gauriakarma, Hazaribagh district. Rooted in the Integrated Farming Systems (IFS) approach, the institute is committed to ushering in an Evergreen Revolution across the eastern region of India. Over the years, ICAR–IARI Jharkhand has strengthened its academic programs and research initiatives, now offering postgraduate courses in 4 disciplines while attracting talented scholars dedicated to pioneering advancements in soil health, crop improvement, and precision agriculture. Additionally, extensive outreach programs have empowered farmers through training, seed distribution, and advisory services, contributing to sustainable agricultural practices and rural economic growth.

This newsletter reflects the institute's commitment to excellence, bridging scientific discovery with practical application. It highlights key research breakthroughs in soil health management, genetic improvements, nutrient optimization, and innovative agricultural techniques tailored for Jharkhand and the broader eastern region of India with similar agroclimatic conditions. Additionally, it showcases recent academic and training milestones, along with capacity–building initiatives to strengthen the farming community. This edition features significant advancements in crop improvement, soil health management, and precision agriculture, addressing key challenges unique to Jharkhand and its neighbouring states. Research efforts include phosphorus use efficiency in lentil, genetic regulation of flowering in pigeon pea, and nutrient optimization in onion and rice. Further studies focus on evaluating diverse crop genotypes, enhancing soil fertility, and promoting sustainable agricultural practices through natural resource mapping, microbial interventions, and innovative advisory services for livestock and aquaculture. These findings aim to bolster productivity and resilience in regional farming systems, ensuring the widespread dissemination of scientific knowledge to benefit farmers and stakeholders.

I extend my heartfelt congratulations to our scientists and staff for their dedication and hard work in compiling this newsletter. Their contributions reinforce our collective commitment to excellence, and I am confident that the insights shared will serve as a valuable resource for all engaged in the pursuit of agrarian progress.

# Research

## Crop Science

### Studying the Phosphorus use efficiency (PUE) of diverse lentil germplasm

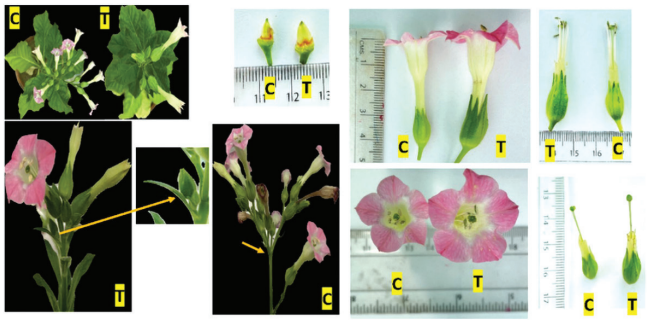
Phosphorus deficiency is reported to be one of the major problems of acidic soils of India. A diverse set lentil germplasm, representing acidic zones of Jharkhand, Bihar, Odisha, West Bengal, Andhra Pradesh, and the North–Eastern states, was procured from ICAR–NBPGR and evaluated for their PUE. Two distinct soil phosphorus environments: low phosphorus (11.2 kg/ha) and optimum phosphorus (66.3 kg/ha) at the Research Farm of ICAR–IARI–Jharkhand were used for the study during the *rabi* 2023–24. The average PUE in optimum conditions was 0.52, which decreased by 46.87% under P stress with an average value of 0.35 in low P conditions. Ten superior genotypes were identified on the basis of PUE and its associated traits. Based on standard deviation and mean, the genotypes IC0623666, IC78460, IC260897, IC78449, IC78455, IC0623667, IC201569, IC78376, NMK11/17, IC201741, IC201533, IC201566, IC78463, IC78474, EC795496 and IC139864 were reported to be highly efficient across environments in terms of PUE related traits.


**Representation of single plant of some efficient genotypes across the environments**

**(Jyotsna Maurya, Anima Mahato, Avinash Pandey, Monu Kumar, Padmavati Ganpat Gore, Joshitha Vijayan, Sushanta Kumar Naik)**

### Characterization of CEN-like Protein 2 in Pigeon Pea for Flowering Control

*CEN–like protein 2* of pigeon pea, a candidate anti–florigen gene and a close homolog of *AtTFL1* (*Arabidopsis Terminal Flower 1*) of the PEBP family, has been characterized through constitutive expression in tobacco, which showed delayed flowering. Silencing the gene in the pigeon pea genomic background could be a potential target for the early flowering trait.

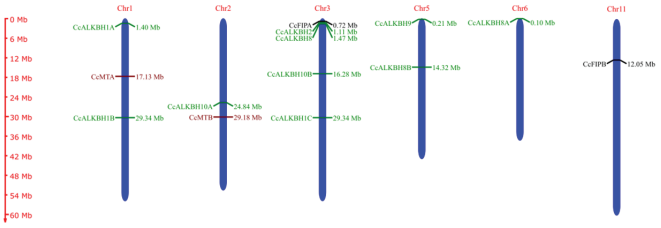



**Delayed flowering and larger flower size with elongated flower tube and ovary in transgenic plants.**

**(Bhattacharjee S., Debasis Pattnayak)**

### Epigenetic Regulation in Pigeon Pea: Key RNA Methylation Genes Identified

Methylation and demethylation dynamics have a major role in epigenetic regulation of plant growth and development and stress responses. Methyltransferase and demethylase genes involved in RNA methylation in pigeon pea had been identified using computational analysis. A total of four methylation–related (two methyltransferases, MTs, and two adaptor' proteins for methylation; *FIPA* and *FIPB*) and 10 *ALKBH* (*CcALKBH1A, CcALKBH1B, CcALKBH1C, CcALKBH2, CcALKBH18, CcALKBH8A, CcALKBH8B, CcALKBH9, CcALKBH10, and CcALKBH10B*) family genes had been identified.




**Chromosomal map depicting chromosomal locations of the identified genes involved in methylation-demethylation in pigeon pea. The maroon colour indicates CcMTs, green indicates CcALKBHs and black indicates CcFIPs.**

**(Bhattacharjee S., Priyanka Kumari, Debasis Pattnayak)**

### OpEnHiMR: A Breakthrough in Histone Modification Prediction for Rice

An optimization–based ensemble model for prediction of

histone modifications in rice has been developed. To our knowledge, this is the first multiclass classifier for predicting histone modification in plants. The package 'OpEnHiMR was published on January 20, 2025 <doi:10.1186/s12864–019–5489–4>.

**(Bhattacharjee S., Dipro Sinha)**

### Evaluation of Okra Genotypes Underway

Evaluation of different genotypes of okra was conducted during the rainy season of 2024. The genotypes are being evaluated again for the second season during the spring–summer of 2025 by Dr. Saheb Pal under the in–house project "Genetic Improvement of Okra." Also, during the ongoing season, experimental hybrids are being generated following line × tester mating design.

**(Saheb Pal)**

### Optimizing Nutrient Management in Onion cv. Pusa Madhavi

During the *rabi* season of 2024–2025, Dr. Saheb Pal conducted a research trial to standardize the NPKS dosage for onion cv. Pusa Madhavi. The study involved varying nitrogen levels between 60–140 kg/ha, phosphorus and potassium between 48–112 kg/ha, and sulphur between 24–56 kg/ha. The impact of these treatments on plant growth, yield and quality traits will be analysed to optimize nutrient application for improved onion production.

Recording plant growth and bulb parameters of onion cv. Pusa Madhavi under variable dosage of NPKS

**(Saheb Pal)**

### Collection of Local *Amaranthus* sp. Genotypes at ICAR-IARI, Jharkhand

To conduct an exploratory trial at ICAR–IARI, Jharkhand, Dr. Saheb Pal has collected 20 local genotypes of *Amaranthus* sp. from different regions of India. The evaluation would aim to identify the best–performing accessions for this region.

**(Saheb Pal)**

### Evaluation of Cooking-Type Watermelon (*Khero*)

Dr. Saheb Pal has collected 21 genotypes of cooking–type watermelon, locally known as '*khero*' in parts of West Bengal and Jharkhand, from Visva Bharati, Shantiniketan through a Material Transfer Agreement. These accessions will undergo systematic evaluation following DUS guidelines of watermelon and will be incorporated into future crop improvement programs, aiming to enhance their adaptability and productivity.

**(Saheb Pal)**

## Natural Resource Management

### Improving soil health for enhancing input use efficiency and productivity

A study evaluating nutrient management in the Pearlmillet–Chickpea system has been conducted at IARI Jharkhand. The application of 75% nutrients through chemical fertilizers and 25% through FYM in the Pearlmillet–Chickpea system has resulted in significantly higher plant height (cm), ear head length (cm), head girth (cm), number of seeds per head, seed weight per head (g), test weight (g), and grain yield (kg/ha) of Pearlmillet. In chickpea, the maximum test weight (g) and grain yield (kg/ha) were observed with the application of Ghanjeevamrit (5q/ha) and two sprays of Jeevamrit, showing improved performance compared to the control. The soils of the experimental plot at IARI Jharkhand are acidic in nature, with low organic carbon, nitrogen, and phosphorus, low to medium potassium, and a sandy loam texture.


Growth pattern of Pearlmillet and Chickpea crops

**(Manoj Chaudhary, Preeti Singh, Dipak Kr. Gupta and Sarvendra Kumar)**

### Micronutrient Status of Surface Soils at ICAR-IARI Jharkhand Research Farm

Assessment of the micronutrient status was carried out using surface soil samples (0–15 cm) collected from the selected area of ICAR–IARI Jharkhand Agricultural Research Farm. The soil samples were analyzed for available forms of key micronutrients, including available zinc (Zn), copper (Cu), iron (Fe), manganese (Mn), and boron (B). The results showed considerable variability across the research farm.

Available zinc content ranged from 0.18 to 0.88 ppm, indicating low Zn status in many parts of the farm. Copper levels were relatively higher, varying from 0.12 to 3.36 ppm, with a majority of the samples falling within adequate to high range. Iron content showed the widest variation, from 2.48 to 56.60 ppm, suggesting highly heterogeneous Fe availability. Manganese concentrations ranged from 1.70 to 139 ppm, highlighting adequate to excessive levels in some locations. Available boron ranged between 0.10 and 0.61 ppm. These findings reflect an uneven distribution of micronutrients in the soils and underscore the importance of precision nutrient management which might be useful for conducting research and seed production trials. Also, it will help in studying long term effects of different crop management practices on soil properties.

**(Preeti Singh, Manoj Chaudhary, Dipak Kumar Gupta, Santosh Kumar, and Vishal Nath)**

### Osmotolerant Bacterial Inoculation and Irrigation Effects on Wheat in Acidic Soil

Field experiments at ICAR–IARI, Jharkhand, evaluated the impact of osmotolerant *Bacillus* along with diazotrophic bacteria *Azotobacter* consortia and irrigation regimes on wheat performance in acidic soil (pH 5.7). Three bacterial consortia [(MKS–6 + *Azotobacter* W7), (MRD–17 + *Azotobacter* W7), and (MKS–6 + MRD–17 + *Azotobacter* W7)] were tested under three irrigation levels (3, 4, and 5 irrigations) on two wheat varieties—*HD 2967* (drought–susceptible) and *HD 3171* (drought–tolerant). The treatment with five irrigations combined with Consortium 3 significantly enhanced vegetative growth and yield traits in both varieties. Results demonstrated that bacterial inoculation significantly enhanced plant growth and yield across all irrigation levels compared to the uninoculated control, particularly with *MKS*–6, which positively influenced wheat growth and productivity across irrigation levels, highlighting its role in improving wheat resilience and yield under acidic soil and water–limited conditions.


Field view and wheat crop growth in the experimental plot

**(Himani Priya, Sangeeta Paul, Ranjit Singh, Akash A, Manoj Chaudhary, Asha Kumari)**

### Native Diazotrophs Enhance Rice Growth in Acidic Soils

A study was conducted at ICAR–IARI, Jharkhand, to develop and evaluate a native diazotrophic bacterial consortium for improving rice productivity and soil health under acidic soil conditions using Direct Seeded Rice (DSR) and Transplanted Rice (TPR) methods. A bacterial consortium (F1) comprising *Brucella oryzae*, *Brucella ciceri*, and *Pseudomonas nitroreducens* was prepared using two carriers—vermiculite + paddy straw compost (C1) and charcoal (C2). Pot trials identified C1–based F1 as superior in enhancing plant growth, enzyme activity, and nutrient availability. Field trials with C1–based bioformulations showed that treatment (75% N + 100% PK + C1F1) consistently outperformed others across growth stages and planting methods, especially in variety *IR64 Drt1* under *DSR*. Treatment (75% N + 100% PK + C1F1) also allowed 25% nitrogen saving while improving soil enzymatic activities and plant physiological traits. The study underscores the potential of native microbial consortia in sustainable rice production under resource–constrained and acidic soil environments.

Field view and rice crop growth in the Pot and Field Experiment

**(N. Bavana, Himani Priya, Radha Prasanna, Ranjit Singh)**

## Animal and Fisheries Science

### Data collected from three agroclimatic zones of Jharkhand for providing location specific animal advisory service to livestock farmers

As part of the ongoing research, data collected from district located at three agroclimatic zones (Central and North Eastern Plateau Zone, Western plateau sub–Zone, South Eastern Plateau Sub Zone) of Jharkhand related to livestock problems. Number of problems identified for its prioritization. It was found that in Central and North Eastern Plateau Zone there is no defined breed rearing of cattle and goats by farmers. Farmers mainly rear nondescript cattle having poor production performance. Some crossbreds' cattle (Jersey, Red Sindhi) are reared in large commercial farms. Goats are distributed in all zones and it is mainly a cross of Black Bengal. Local breed of pig rearing in South Eastern Plateau Sub Zone is practiced. Due to lack of irrigation facilities, no fodder cultivation and animals are allowed for open grazing. No other feed supplement is provided due to lack of knowledge about livestock nutrition. No proper shelter management, farmers keep livestock in traditional method i.e, Macha system. The most prevalent disease in Cattle is FMD, HS, BQ, in goat is PPR, Enterotoxaemia, FMD and in pig Swine fever and FMD is common. Recently huge population of large ruminants got infected with Lumpy Skin disease. In Western plateau sub–Zone feed concentrate to large ruminants' awareness about azolla cultivation and preservation of fodder but lack knowledge about feed formulation, azolla cultivation and fodder preservation technique.


Local cattle (left) and Black Bengal cross goat (right)

**(Shilpi Kerketta, S. K. Mahanta, Pankaj Kumar Sinha, B. N. Mandal, Abhay Kumar Giri, Monika M. and Nuzaiba, P.M.)**

### Performance Evaluation of Freshwater Fish Varieties in Captivity

Under the ongoing research project, 'Performance Evaluation of Important Freshwater Fish Varieties under Captivity Conditions of Jharkhand', significant advancements have been made toward sustainable aquaculture practices. A prototype experimental aquaculture farm was established, integrating specialized research units for nursery, rearing, and grow–out farming of fish. To ensure an efficient farming model, critical structural parameters such as pond depth, bottom slope, free board, dyke width, dyke slope, inlet channel, and outlet channel were scientifically designed. To enhance pond stability, control seepage, and improve natural productivity, innovative methodologies and management strategies have been implemented. Additionally, to optimize feeding efficiency, rectangular floating bamboo frames were developed using Indigenous Technical Knowledge (ITK). These frames prevent feed drift caused by water currents, ensuring better feed intake for experimental fishes.

**(Giri A.K., Nuzaiba P.M., Kerketta S., Monika M., Pavithra K.N., Gupta D.K., Sinha P.K. and S.K. Mahanta)**

### Innovative Model for Predicting Shrimp Freshness

A multivariate regression model has been developed, integrating metabolite data derived from LC–HRMS analysis along with the conventional freshness indicator, K–value analysis, to enhance seafood quality assessment. This cutting–edge model is designed to predict the freshness of ice–stored Indian White Shrimp. This model can also be utilized to assess the freshness of seafood samples transported over long distances, ensuring quality retention throughout the supply chain. The model was presented at the International Conference on Fisheries Biotechnology at ICAR–Central Institute of Fisheries Education, Mumbai, where it received positive recognition.

**(Nuzaiba P.M.)**

## Education

### Academic Excellence Shines at ICAR-IARI Hazaribagh

Mr Arijit Chowdhuri, Student MSc (Soil Science) received 2 gold medals

Demonstrating outstanding academic dedication and excellence, Mr. Arijit Chowdhuri, a M.Sc. student in Soil Science at ICAR–IARI Hazaribagh, has achieved remarkable success by securing two prestigious gold medals in recognition of his academic achievements. Dr. S.P. Raychaudhuri Gold Medal for his exceptional M.Sc. thesis, highlighting significant contributions to the field of Soil Science and Dr. K.N. Synghal Memorial Gold Medal, honoured as the Best M.Sc. Student of the Year, reflecting his commitment to academic brilliance and leadership. His dedication and hard work have set a benchmark of excellence, inspiring fellow students and young researchers in the field.

### Students' Educational Tour to Ranchi

On January 24, 2025, UG third–year students, guided by Dr. Akash, Dr. Santosh Kumar, Mr. Santesh Kamath, Dr. Priyranjan Kumar, and Dr. Himani Priya, conducted an educational tour to Ranchi. In their tour they visited biofertilizer production unit, vermicompost unit, soil science unit and commercial plant breeding unit of Birsa Agricultural University (BAU), Ranchi. Dr. Shashi Bhushan Kumar and Dr. N. C. Gupta, Assistant Professor cum junior scientist lead the team in BAU. Students explored soil science, biofertilizer production, vermicomposting, microbiology, and plant breeding at BAU Ranchi, gaining hands–on experience in soil analysis, sustainable farming, modern propagation techniques, and advanced agronomic practices for agricultural development. Students visited Green Garden Nursery, Ranchi, gaining insights into indoor/outdoor plant varieties, polyhouse techniques, grafting, layering, and modern farming methods to enhance their understanding of sustainable and innovative agricultural practices. This immersive tour enriched students' practical knowledge and strengthened their understanding of sustainable agriculture and modern farming techniques.

BSc. (Agriculture) 2022-23 batch students visited BAU Ranchi

### Hands-on Training in Molecular Biology for PG Students

ICAR–IARI Jharkhand organized exposure visits and hands–on training sessions on basic molecular biology techniques for postgraduate (GPB) students on 6th and 11th February 2025, under the guidance of Dr. Sougata. These interactive sessions provided students with practical insights into essential laboratory techniques, strengthening their foundational understanding of molecular biology.

## Extension and Outreach Activities

### ICAR-IARI Jharkhand Showcases Research Innovations at Kisan Mela

The team from ICAR–IARI Jharkhand, represented by Manoj Chaudhary, Asha Kumari, and Jitendra Kr. Mandal, actively participated in the Kisan Mela cum Agricultural Exhibition organized at ICAR–NISA, Ranchi, on February 20–21, 2025.

During the event, the team exhibited a stall showcasing advancements in agricultural research and technology, aimed at empowering farmers with sustainable and innovative farming practices.

The exhibition facilitated interaction, knowledge exchange, and discussions on modern techniques, soil health, and crop diversification. With a strong participation of farmers, scientists, and industry representatives, ICAR–IARI Jharkhand contributed to raising awareness about agricultural innovations to improve productivity and livelihoods.

Kisan Mela cum Agricultural Exhibition at ICAR- NISA, Ranchi

### Seeds Distributed to 1500 Farmers in Hazaribagh Under SCSP

ICAR–IARI Jharkhand facilitated the distribution of 50 quintals of maize seeds, 15 quintals of moong seeds, and

1800 vegetable seed kits to 1500 scheduled caste farmer beneficiaries across four blocks of Hazaribag district under the Scheduled Castes Sub Plan (SCSP) scheme, from January to March, 2025.


Seed distribution programme organized at Chauparan and Dadi block of Hazaribagh

## 2500 Vanaraja Chicks Distributed to Trained TSP Farmers

To support rural livelihoods, 2500 Vanaraja chicks were distributed to 50 trained TSP farmers, enabling them to enhance poultry farming and generate sustainable income. In addition, a specialized training program on Backyard Poultry and Quail Farming Practices was conducted at ICAR–Central Avian Research Institute, Izzatnagar, Bareilly, from January 8–10, 2025, equipping farmers with essential knowledge for efficient poultry management. The initiative, led by Course Director Dr. Monika M., with Co–Course Directors Dr. Shilpi Kerketta and Dr. Pankaj Kumar Sinha, and supported by Programme Coordinators Dr. Vishal Nath and Dr. S.K. Mahanta, aims to strengthen economic self–sufficiency among tribal farmers. Technical Assistant Arun Kumar Rajak facilitated the program. Vanaraja chickens, known for their high adaptability and productivity, provide farmers with a reliable source of income, reinforcing the ongoing commitment to skill development and agricultural sustainability.

Fifty trained TSP farmers received 2500 Vanaraja chicks

## Animal Health Camp Organized under SCSP Supports Livestock Care in Nichitpur

A One–Day Animal Health Camp was successfully organized under SCSP on March 28, 2025, at Nichitpur, Gauriakarma. The event provided essential livestock health services to around 100 farmers, offering routine check–ups and treatment for their animals.

To promote better livestock health and productivity, beneficiaries received medications such as dewormers, mineral mixtures, and liver tonics. The camp served as an effective platform for educating farmers on animal care, disease prevention, and nutritional management, ensuring sustainable and improved livestock practices in the region. This initiative underscores the importance of accessible veterinary services, contributing to enhanced farm productivity and rural livelihoods.

Glimpses from the Animal Health Camp organized at Nichitpur, Gauriakarma on March 28, 2025

## Empowering Farmers: SCSP Training Programs Enrich Rural Agriculture

A series of 14 capacity–building training programs were organized on campus during February–March 2025 under the Scheduled Castes Sub Plan (SCSP). These sessions aimed to enhance agricultural skills and knowledge among selected beneficiaries. These programs enrolled 496 participants from Hazaribag district, offering training sessions of one–day, three–day, and five–day durations. The trainings covered various aspects of agriculture, horticulture, natural resource management, animal husbandry, poultry, and fisheries. Each training session incorporated hands–on practical exercises on improved technologies related to the respective fields. Additionally, exposure visits were organized to enhance farmers' learning experiences.

The horticulture–based entrepreneurship training included modules on protected cultivation, nursery bed preparation, raising nurseries in trays and polybags, and propagation techniques such as grafting, budding, and cutting. Mushroom cultivation training was conducted in collaboration with Dr. Rajendra Prasad Central Agricultural University (DRPCAU), Pusa, Samastipur, Bihar. Furthermore, training on seed production of Rabi crops was organized, accompanied by an exposure visit to ICAR–Indian Institute of Maize Research (IIMR), Regional Station, Begusarai, Bihar.

Glimpses from various training programmes organized under SCSP subplan during February to March, 2025

At the conclusion of each training, the training organizing secretaries, Dr. Krishna Prakash and Dr. Pankaj Kumar Sinha ensured that the participants were provided with seeds, agricultural inputs, animal health medicines, and small farm tools as part of a kit, along with training certificates.

**Table : Training programme organized under Scheduled Caste Sub Plan**

| Sl. No. | Training Name | Date | Training Co-ordinators | No. of Participants |
|---|---|---|---|---|
| **One - day trainings** | | | | |
| 1 | Biofertilizer Application for Promoting Organic Farming in Eastern India | 28th March 2025 | Dr. Himani Priya | 50 |
| 2 | Integrated Pest Management in crops | 3rd March 2025 | Dr. Asharani Patel | 50 |
| 3 | Vermicomposting of Agricultural Waste | 4th March 2025 | Dr. Dipak Kumar Gupta | 43 |
| 4 | Scientific Goat Production Practices | 7th March 2025 | Dr. Shilpi Kerketta | 50 |
| 5 | Cultivation of Important Freshwater Fish Varieties | 8th March 2025 | Dr. Abhay K. Giri | 42 |
| 6 | Weed Management Aspects in Crops | 10th March 2025 | Dr. Kashinath Teli | 48 |
| **Three - days trainings** | | | | |
| 7 | Mushroom Cultivation and Value Addition Techniques | 9–11 March 2025 | Dr. Pankaj Kumar Sinha | 30 |
| 8 | Application of Microbial Biofertilizers in Crops for Sustainable Agriculture | 17–19 March 2025 | Dr. Himani Priya | 25 |
| 9 | Livestock and Poultry Production and Management | 19–21 March 2025 | Dr. Shilpi Kerketta | 25 |
| 10 | Integrated Fish Farming for Sustainable Livelihood and Income Generation | 19–21 March 2025 | Dr. Abhay Kumar Giri | 25 |
| 11 | Nursery Management of Horticultural crops | 24–28 March 2025 | Dr. Narendra Singh | 25 |
| 12 | Techniques of Vermicomposting for efficient management of Agricultural Waste | 26–28 March 2025 | Dr. Dipak Kumar Gupta | 25 |
| **Five-days trainings** | | | | |
| 13 | Seed Production Technologies in Rabi Crops | 3–7 March 2025 | Dr. Priya Ranjan Kumar | 25 |
| 14 | Scientific Vegetable Cultivation Practices | 24–28 March 2025 | Dr. Krishna Prakash | 25 |

# Special Events

## The Institute Celebrated 76th Republic Day

ICAR–IARI, Jharkhand, commemorated the 76th Republic Day on January 26, 2025, with great spirit and joy. The celebration featured a vibrant cultural event organized by students, showcasing their talents and patriotic fervor. Following the event, an exciting volleyball match was held between students and staff, fostering camaraderie and sportsmanship within the institute. The occasion highlighted the institute's commitment to unity, cultural appreciation, and team spirit, making it a memorable day for all participants.

IARI Jharkhand Celebrating Indias 76th Republic Day on January 26, 2025

## The Institute Hosts First-Ever Sports and Games Meet 'अभ्युदय'

The Indian Agricultural Research Institute (IARI)–Jharkhand successfully hosted its first–ever annual sports and games meet, अभ्युदय, from February 19 to 21, 2025, at its campus. This three–day event marked a historic moment for the institute, bringing together undergraduate and postgraduate

Students of IARI Jharkhand organized sports meet

*students in a spirited celebration of athleticism and teamwork. Students from three undergraduate batches and two master students' batches* participated. The men's category featured 15 competitive events, while women's featured 12, spanning track races such as the 100m, 200m, 400m, 800m, and 4 Ч 100m relay, field events including discus, javelin, shot put throw, and long jump, as well as games like volleyball, badminton, chess, table tennis, and cricket.

The meet emphasized the importance of discipline, focus, dedication, teamwork, and commitment, reinforcing how sports contribute to mental health and overall student well–being. Faculty members encouraged students to incorporate physical activities into their academic routines, noting that participation in sports enhances concentration and focus.

## Festiverse 2025- Students' Cultural Event at ICAR-IARI Jharkhand

The students of ICAR–IARI, Jharkhand proudly celebrated their annual cultural festival, FESTIVERSE 2025, from January 15 to 17, bringing together a spectacular display of talent and creativity. The event featured a variety of artistic and literary competitions, including singing, dancing, drama, literary events, and arts & crafts activities, providing students with a platform to express their skills and passion. With mesmerizing performances, thought–provoking dramatics, and dazzling artwork, FESTIVERSE truly captured the essence of cultural vibrancy.


Glimpses from 'Festiverse', the cultural programme organized at IARI, Jharkhand by the students on January 15-17, 2025

## Basant Panchami Celebrated at IARI-Jharkhand

ICAR–IARI, Jharkhand, observed Basant Panchami on February 2, 2025, marking the arrival of spring and honouring the goddess, Saraswati. Students and staff from the institute participated in the celebrations, which included traditional rituals. The event provided an opportunity for the community to come together, reflect on the significance of knowledge, and appreciate the festive atmosphere.

## Website of IARI Jharkhand Developed


# Awards and Recognition

Dr. Ch. Srinivasa Rao, Director of IARI, has been honoured with the prestigious N.S. Randhawa Award by the National Academy of Agricultural Sciences (NAAS), during the XVII Agricultural Science Congress 2025 held at Pantnagar.


Dr. Rao has been appointed as the Convener of the Agricultural Section at NASI, Prayagraj, U.P., further strengthening his leadership in agricultural science.

Dr. Rao has also been selected as a member of the National Adaptation Committee under the Ministry of Environment, Forest, and Climate Change, Government of India, contributing his expertise to national climate adaptation strategies.

Dr. Viswanathan Chinnusamy, Joint Director (Research), ICAR–IARI, has been honoured with the prestigious NAAS Recognition Award. The award was conferred during the XVII Agricultural Science Congress 2025, held at Pantnagar, in recognition of his outstanding contributions to agricultural research.



The Excellent in Research and Mentoring Award received by Dr. Manoj Chaudhary from the International Conference on Innovation, Entrepreneurship, Incubation in Agriculture Science, Commerce and Social Sciences, during March 7–8, 2025 at the Janta College, Bakewar, Etawah, UP.

Dr. S. K. Mahanta with his team of five members successfully registered Bundelkhandi breed of Goat in the breed registration committee of Indian Council of Agricultural Research on January 6, 2025 with the accession numbere INDIA_GOAT_BUNDELKHANDI_06041.



Dr. Krishna Prakash received the Scientist of the Year Award in Horticulture at the International Agriculture Conference on Navigating Unique Trends in Agricultural Research, Innovation, Engineering, Nutrition, and Technology ("NUTRIENT–2025"), which took place on February 20–21, 2025. The conference was organized by Agri Meet Foundation Bharat in knowledge partnership with ICAR New Delhi, ICARDA (Lebanon), SFU (Russia), BGGI (Sangrur), NDRI (Karnal), SKLTGHU (Telangana), MHU (Karnal), and MGUVV (Durg, Chhattisgarh).

Dr Narendra Singh received IARI Merit Medal for the Outstanding Academic Performance during PhD degree program at ICAR–Indian Agricultural Research Institute, New Delhi during the 63rd Convocation held on 22nd March 2025.


Dr. Himani Priya was recognized with the Best Researcher Award by the Indian Society of Agriculture and Horticulture Research Development (ISAHRD) in Chandigarh, Punjab, India, during the 9th International Conference "Agrinext: Future Trends in Agriculture" (ICANFTA–2025). The conference, organized by the Department of Agriculture at Brainware University, Kolkata, took place from February 10th to 12th, 2025.


## Expert Contributions from IARI Jharkhand


Dr. Krishna Prakash (Scientist, Horticulture) Served as an expert in the 'Hello Kisan' live phone–in program on DD Kisan Channel on January 6, 2025, from 6:00–7:00 PM, discussing the topic 'प्राकृतिक खेती' (Natural Farming).


Dr. Nuzaiba P.M. (Scientist, Fish Nutrition) honoured with the role of rapporteur for the session 'Biotechnological Innovations for Aquatic Food / Seafood Quality & Safety' during the International Conference on Fisheries Biotechnology held on March 17–18, 2025, at ICAR–Central Institute of Fisheries Education, Mumbai.

Dr. Asharani Patel was invited at the two–day workshop on 'Dissecting Traits for Biotic and Abiotic Stress Tolerance in Crops and Nutritional Food Security Enhancement Through Advanced Phenotyping', held from March 19–20, 2025, under IDP, NAHEP at the College of Agriculture, Bhawanipatna (Odisha University of Agriculture and Technology), Odisha. She presented on "Plant Microbiome Engineering: Manipulating the Plant Microbiome to Enhance Biotic Stress Tolerance in Crops" and "Exploring the Use of Beneficial Microorganisms for Biotic Stress Management." The workshop was attended by 200 students.


## Lectures Delivered by Scientists from IARI Jharkhand at Training on Integrated Agriculture Techniques

The Soil Conservation Research and Training Centre, Demotaand, Hazaribagh, Govt. of Jharkhand conducted a multi–batch training program on Integrated Agriculture Techniques from February 5, 2025, to March 23, 2025. Scientists from IARI Jharkhand led sessions, sharing expertise on advanced agricultural practices. Each batch engaged a substantial number of farmers, ensuring effective knowledge dissemination and hands–on learning.

| Expert | Lecture Topic |
|---|---|
| Dr. Vishal Nath | समेकित कृषि प्रणाली का उद्देश्य, महत्व, एवं उपयोगिता कृषि में आधुनिक/बागवानी फसलों एवं फूलों की व्यावसायिक खेती अग्रिनेट शेड एवं पालीहाउस निर्माण की तकनीकी जानकारी |
| Dr. Dipak Kr. Gupta | फसल/सब्जी/फल उत्पादन में जैविक कृषि प्रणाली का उपयोग एवं महत्व तथा प्रमाणीकरण की विधि |
| Dr. Asharani Patel | विभिन्न खरीफ/रबी/उद्यानिक फसलों में समेकित रोग/कीट एवं पोषक तत्त्व प्रबंधन |
| Dr. Niranjan Kumar | विभिन्न खरीफ/रबी/उद्यानिक फसलों में समेकित रोग/कीट एवं पोषक तत्त्व प्रबंधन |
| Dr. Pankaj Kr Sinha | पानी पंचायत की अवधारणा तथा भूमि एवं जल प्रबन्धन में सहायक संरचनाओं का निर्माण एवं उपयोगिता |
| Dr. Vishal Nath | विभिन्न फसलों उत्पादों का कटाई उपरांत तकनीकी प्रबंधन एवं मूल्य संवर्धन का महत्व एवं उपयोगिता |
| Dr. Pankaj Kr Sinha | समेकित कृषि प्रणाली का उद्देश्य, महत्व, एवं उपयोगिता कृषि में आधुनिक/बागवानी फसलों एवं फूलों की व्यावसायिक खेती |
| Dr. Himani Priya | फसल/सब्जी/फल उत्पादन में जैव उर्वरक का उपयोग एवं महत्व तथा प्रमाणीकरण की विधि |
| Dr. Sanat Kr. Mahanta | जल छाजन क्षेत्र में समेकित कृषि प्रणाली यथा मत्स्य/गव्य/पशुपालन इत्यादि का उद्देश्य, महत्व एवं उपयोगिता |
| Dr. Manoj Choudhary | मिट्टी नमूनों को एकत्रित करने की विधि तथा जाँचोपरान्त मृदा स्वास्थ्य कार्ड का महत्व एवं उपयोग |

## Capacity Building Programme

- Dr. Himani Priya, Scientist (Agricultural Microbiology), participated in the National Training on *"Microbial Identification and Diversity Analyses: Gene to Genome based Approaches"* at ICAR – National Bureau of Agriculturally Important Microorganisms, Maunath Bhanjan – 275103, UP, India during 5th to 12th February 2025.
- Dr. Anima Mahato, Scientist (Plant Genetics and Breeding), participated in the Centre of Advanced Faculty Training on "Advanced Breeding Strategies for Developing Stress Tolerance in Plants Under Changing Climatic Conditions" at Punjab Agricultural University, Ludhiana, from February 4–24, 2025.
- Dr. Shilpi Kerketta, Scientist (Livestock Production and Management), and Dr. Sougata Bhattacharjee, Scientist (Plant Biotechnology), participated in the NAAS–organized training programme "Pedagogical Competencies for Enhancing Agricultural Education" at the NASC Complex, Pusa, New Delhi, from January 28–February 1, 2025.
- Dr. Krishna Prakash, Scientist (Horticulture), attended the workshop "Achieving Land Degradation Neutrality (LDN) in Jharkhand: A Comprehensive Roadmap," jointly organized by the Centre of Excellence on Sustainable Management, Dehradun, and ICFRE–Institute of Forest Productivity, Ranchi, from February 20–25, 2025.
- Dr. Pavithra K.N., Scientist (Agricultural Economics), attended the Online National Seminar on "Progressive Agriculture – Viksit Bharat: Preparedness for Eastern Region" held at ICAR–RCER, Patna, from February 21–23, 2025.
- Dr. Krishna Prakash, Scientist (Horticulture), attended the International Agriculture Conference on "Navigating Unique Trends in Agricultural Research, Innovation, Engineering, Nutrition, and Technology (NUTRIENT–2025)," organized by Agri Meet Foundation Bharat on February 20–21, 2025.

- Dr. Himani Priya, attended and presented Oral Presentation (Virtual Mode) on the topic "*Influence of Phosphate solubilizing Cyanobacteria on Rice growth and Root architecture under varying levels of inorganic Phosphorus in sand culture*" in the "AGRINEXT: FUTURE TRENDS IN AGRICULTURE" (ICANFTA– 2025), jointly organized by Dept. of Agriculture, Brain ware University, Kolkata, Just Agriculture Education Group & ISAHRD, Chandigarh held on 10th–12th February, 2025 at Brainware University, Kolkata.
- Dr. Pavithra K.N., Scientist (Agricultural Economics), participated in the 38th National Conference on "Agricultural Marketing at the Institute of Agribusiness Management", organized at the University of Agricultural Sciences, Bangalore, from January 9–11, 2025.
- Dr. Nuzaiba P.M., Scientist (Fish Nutrition), participated in the International Conference on "Fisheries Biotechnology" held at ICAR–Central Institute of Fisheries Education, Mumbai, from March 17–18, 2025. Selected Publications

# Selected Publications

## Research Articles

- Divyadarshan, A., Naik, S.K., Dhakar, M.K., Purakayastha, T.J., Mahanta, D., **Choudhary, M.**, Mali, S.S., Kumar, R., Dash, A.K., Das, A. and Meena, R.S. 2025. Soil Carbon Dynamics and Soil Quality Index Under Different Agricultural Production Systems in Rain–Fed Ecosystems. *Land Degradation & Development* 1–14.
- **Bhattacharjee, S.**, Paul, K., Raman, K.V., Tilgam, J., Kumari, P., Baaniya, M., Sreevathsa, R., Anand, A., Prashat, G.R. and Pattanayak, D. 2025. Constitutive expression of CEN–like protein 2, a TFL1 ortholog of pigeon pea (*Cajanus cajan* [L.] Millspaugh) delays flowering in transgenic tobacco plants. *Physiology and Molecular Biology of Plants* 1–15.
- Konjengbam, N.S., Singh, D., **Mahato, A.**, Singh, V.J. and Taunk, J. 2025 Mapping QTLs for aluminium and phosphorus tolerances at seedling and reproductive stages in lentil (*Lens culinaris* Medikus). Plant Stress 15:100709.
- Kumar, V., **Nuzaiba, P.M.**, Gupta, S., Dasgupta, S., Nayak, S.K., Prabhakaran, A., Mahadevaswamy, C.G., Sundararajan, A., Sankar, S. and Varghese, T. 2025. Disruptive effects of genistein and daidzein on steroidogenesis, testicular development and maturation of *Cyprinus carpio* (Linn, 1758) males. *Fish Physiology and Biochemistry* 51– 7.
- Kumari, P., **Bhattacharjee, S.**, Venkat Raman, K., Tilgam, J., Paul, K., Senthil, K., Baaniya, M., Rama Prashat, G., Sreevathsa, R. and Pattanayak, D. 2025. Identification of methyltransferase and demethylase genes and their expression profiling under biotic and abiotic stress in pigeon pea (*Cajanus cajan* [L.] Millspaugh). *Frontiers in Plant Science* 15.
- Prasad, V.V.V., Patel, V.B., Dhakar, M.K., Das, B., Bishi, S.K., Bhadana, V.P., Mishra, G.P., Mhetre, V., Singh, S.K., **Nath, V.** and Asrey, R. 2025. Elucidation of fruit cracking mechanism in bael [Aegle marmelos (L.) Correa.] using physico–biochemical and de novo transcriptomic approaches. *Plant Stress* 16: 100819.
- Sakhare, A.S., Kumar, S., Ellur, R.K., Prahalada, G.D., Kota, S., Kumar, R.R., Ray, S., **Mandal, B.N.** and Chinnusamy, V. 2025. Genome–wide association study on root traits under non–stress and osmotic stress conditions to improve drought tolerance in rice (*Oryza sativa* Lin.). *Acta Physiologiae Plantarum* 47(1):1–20.
- Sharma, S., Oulkar, D., Pongener, A., Singh S.K., Pandey S.D., **Vishal Nath,** Das, B., Kole, B. and Banerjee, K. 2025. Determination of alpha–methylenecyclopropyl glycine in Shahi and China litchi cultivars at 2 different maturity stages: A quantitative study using liquid chromatography tandem mass spectrometry. *Food Chemistry* 462: 140971.
- **Singh, N.,** Sharma, R.M., Dubey, A.K., Saha, S., Awasthi, O.P., Bharadwaj, C., Sevanthi, A.M., Kumar, A., Sharma, N., Kumar, R. and Kumar, V. 2025. Bioactive Compounds and Bitterness Properties of Newly Developed Interspecific Citrus Hybrids (*Citrus maxima* [Burm. f.] Osbeck Ч *Citrus sinensis* [L.] Osbeck). *Horticulturae* 11(2): 208.
- Singh, S., Singh, T., Kumar, N., Koli, P., Das, M.M., **Mahanta, S.K.,** Singh, K.K., Jha, P.K., Vara Prasad, P.V., Srivastava, M.K., and Katiyar, R. 2025. Assessment of genetic diversity in *Sehima nervosum* for yield, nutritional traits and ensiling quality. Heliyon 11: e42033.
- Rice, D., **Singh, R., Priya, H.,** Valerozo, J., & Anal, A. K. (2025). Transforming plant–based alternatives by harnessing precision fermentation for next–generation ingredients. Journal of the Science of Food and Agriculture. https://doi.org/10.1002/jsfa.14168;
- Karki, S., Bhattarai, S., **Singh, R.,** & Anal, A. K. (2025). Protein extraction technologies for foxtail, pearl, and proso millets along with their structural and techno–functional properties: a review. International Journal of Food Science and Technology, 60(1), vvae045.

## Books

- Ningomban, L., **Prakash, K.,** Chetan B.L., Hansda, S. and Hazarika B.N. 2025. *Advanced Production Techniques in Vegetable Farming*. The Opus Coliseum Publication, Odisha, India. pp.175. ISBN: 978–93–6341–258–3.
- Satyam, **Priya, H.,** Devi, N.B. and Ojha, A., 2025. *Agricultural Microbiology: Harnessing Microbial Innovations for Sustainable Farming.* Stella International Publication, Haryana, India. pp.1–403. ISBN No. 978–93–48909–87–9.

## Book Chapters

- Dutta, B., **Bhattacharjee1, S.,** Biswas, K., Singh, B.K., Bhowmick, R., Das, C., Singh, P.K. and Paul, K., 2025. Genetic Engineering to Enhance the Oilseed Crops Yield. In: Suryawanshi, Y., Shahnawaz, M., Parihar, J., Dar, R.A., Samyal, S. and Ade, A.B. (eds.). *Oilseed Crops*. Scrivener Publishing, Beverly, MA. pp.469–494.
- Kumar, R., Prasad, I. and **Pal, S.** 2025. Genetic Resources of Chilli (*Capsicum annuum* L.). In: Kalia, P. (eds.). *Vegetable Crops*. Handbooks of Crop Diversity: Conservation and Use of Plant Genetic Resources. Springer, Singapore. pp. 101–142.
- Maurya, B.K., Karmakar, P., Singh, D.P., Singh, H., Singh S., **Pal, S.,** Kumar, R. and Rai, N. 2025. Mechanism of Hybrid Development and Quality Seed Production in Okra. In: Lamichaney, A., Parihar, A.K., Bohra, A., Karmakar, P., Naik, S.J.S. (eds.). *Hybrid Seed Production for Boosting Crop Yields*. Springer, Singapore.pp.505–553.
- Meena, R.S., Praneetha S., Meena, N.K., Bagra, S.K., Ravi, Y., Pradeepkumara, N., Vinay, N.D., **Pal, S.,** Subhasmita, S., Nirankar and Bhargavi, H.A. 2024. Genetics, Genomics, and Breeding of Coriander: A Review. In: Kole, C. (eds.). Genetics, *Genomics and Breeding of Seed Spices. Concepts and Strategies in Plant Sciences*. Springer, Singapore. pp.45–57.
- **Priya, H.,** Satyam, Krishna, V. and Kumar, P. 2025. Advances in Rhizosphere Microbiology. In: Satyam, Priya, H., Devi, N.B. and Ojha, A. (eds.). *Agricultural Microbiology: Harnessing Microbial Innovations for Sustainable Farming*. Stella International Publication, Haryana, India. pp. 58–98.
- Satyam, **Priya, H.,** Ojha, A. and Bagul, V.K. 2025. Role of Microbes in Soil Health and Fertility. In: Satyam, Priya, H., Devi, N.B. and Ojha, A. (eds.). *Agricultural Microbiology: Harnessing Microbial Innovations for Sustainable Farming*. Stella International Publication, Haryana, India. pp. 24–57.

## Abstracts

- **Chaudhary, M.,** Chaudhary, R.S., Somasundram, J., Sinha, N.K., and Vishwakarma, S.K. 2025. Impact of Organic, Inorganic and Integration System of Crop Cultivation on Soil Aggregation and Soil Organic Carbon. In: *Proceedings of the International Conference on'Innovation, Entrepreneurship, Incubation in Agriculture Science, Commerce and Social Sciences*' (March 7–8, 2025) at Janta College, Bakewar, Etawah, UP.

- **Nuzaiba, P.M.,** Haridas, P.C., Ravichandran, R., Xavier, K.A.M. & Chatterjee, N.S. (2025). Evaluation of metabolomic alterations in ice–stored Indian white shrimp (*Fenneropenaeus indicus*) using LC–HRMS. In International Conference on Fisheries Biotechnology: Abstract Book (pp 206). ICAR–Central Institute of Fisheries Education, Mumbai. pp. 76.
- **Pavithra, K.N.** and Gaddi, G.M. 2025. Economic Evaluation of Vegetable–based Farming Systems in Koramangala–Challaghatta Valley Project Area. In: *Proceedings of the 38th National Conference on Agricultural Marketing* (January 9–11, 2025) at Institute of Agribusiness Management, University of Agricultural Sciences, Bangalore.
- **Pavithra, K.N.,** Gaddi, G.M. and **Sinha, P.K.** 2025. Resource Use Efficiency of Farming Systems in Koramangala–Challaghatta Valley Project Area, Karnataka. In: *Proceedings of Progressive Agriculture – Viksit Bharat: Preparedness for Eastern Region* (February 21–23, 2025) at ICAR–RCER, Patna.
- Sinha, P.K. Pavithra, K. N., Patel, A., Tigga, P., Kumar, N., Prakash, K. and Gupta, D.K. 2025. Impact of Farmer Producer Organizations (FPOs) on Income Enhancement in Jharkhand: Opportunities and Challenges. In: *Souvenir, National Seminar on Progressive Agriculture –Viksit Bharat: Preparedness for Eastern Region* (February 21–23, 2025) at ICAR–RCER, Patna, Bihar, India. pp.247.

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