वार्षिक प्रतिवेदन
Annual Report 2025






भा.कृ.अनु.प. – भारतीय कृषि अनुसंधान संस्थान - झारखण्ड

ग़ौरिया करमा (खेरौन), हजारीबाग– 825405, झारखण्ड, भारत

ICAR - Indian Agricultural Research Institute - Jharkhand

Gauria Karma (Kheron), Hazaribagh – 825405, Jharkhand, India

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Gauria Karma-825405, Hazaribagh, Jharkhand, India

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Preface

Agriculture remains a vital sector of the Indian economy, contributing nearly 18% to the national GVA and supporting livelihoods of around 46% of the population. As one of the world's leading agricultural producers, India depends on this sector for food and nutritional security, rural employment, and inclusive economic growth. Amid emerging challenges such as climate variability, declining natural resources, and increasing production demands, highlight the need for innovative research, technologies, and sustainable agricultural practices.

ICAR-IARI Jharkhand, under the aegis of the Indian Council of Agricultural Research, plays a significant role in advancing agricultural research, education, and extension in eastern India. The institute conducts multidisciplinary, climate-resilient research in crop production and improvement, natural resource management, livestock production, aquaculture, and sustainable farming systems. Through extension activities, it promotes technology transfer, capacity building, and skill development among farmers, rural youth, and women. The institute is emerging as a center for agricultural education with an annual intake of 66 undergraduate students. To support its mandate, the institute has established essential infrastructure, including administrative buildings, laboratories, smart classrooms, hostels, a guest house, and residential quarters.

During the year under report, the institute made notable progress in education, research, extension, and infrastructure development. On the academic front, 19 M.Sc. students successfully completed their degrees in diverse disciplines, with around 250 students currently enrolled across undergraduate and postgraduate programs. The RAWE (Students' READY) and ELP programs were introduced for the first time in the institute for its UG program. The institute also organized its annual students' sports meet and cultural events. Significant advances were achieved in research with genetic resource development in different fields, as well as horticultural crops. Efforts have been focused on developing natural resource maps, identifying efficient cropping zones in Jharkhand, evaluating feeding and management systems for milch bovines and goats, evaluating fish performance under various stocking densities, and studying soil microbial diversity. Progress was made in improving aluminium toxicity tolerance and phosphorus use efficiency under acidic soils.

Six projects under the Rashtriya Krishi Vikas Yojana (RKVY), with a cumulative outlay of ₹21.88 crore, were approved in 2025 for infrastructure and asset development, along with a collaborative project with Birsa Agricultural University. The institute strengthened its extension and outreach activities through training programs, input distribution programs, and awareness campaigns. Programs under the Scheduled Castes Sub-Plan (SCSP) and the Tribal Sub-Plan (TSP) were actively implemented, and the institute participated in the national flagship initiative, Viksit Krishi Sankalp Abhiyan 2025. Infrastructure additions included a farm building, an animal science field laboratory, cattle shed, and a farmers' hostel, while construction of a new examination hall, an indoor stadium, a dispensary, a shopping complex, and twenty-four residential quarters is nearing completion. The institute also maintains cattle, goats, and fish units. During the reporting year, the institute celebrated its 11th Foundation Day on June 28, 2025, marking a decade of agricultural research, education, and innovation, and utilized nearly 99% of its allocated budget under the EFC.

The achievements highlighted in this Annual Report reflect the collective efforts of the institute's scientists, students, technical, administrative, and supporting staff. The continued guidance and support from the Indian Council of Agricultural Research, collaborating institutions, state departments, and farmers are gratefully acknowledged.

I express my sincere gratitude to the Secretary, DARE, and the Director General, ICAR, Dr. Mangi Lal Jatji, for his inspiring guidance and continuous support. I also thank Dr. D.K. Yadavaji, DDG (Crop Science), ICAR for his encouragement and cooperation.

Finally, I place on record my deep appreciation for the Annual Report Editorial Team for their hard work in bringing out this report in a timely manner, and I hope this annual report provides useful information to different stakeholders.

(Ch. Srinivasa Rao)
Director & Vice Chancellor
ICAR-IARI-Jharkhand

Executive Summary

ICAR-IARI, Jharkhand continues to strengthen its academic excellence and pioneering research in the field of crop improvement, natural resource management, and livestock-fishery sciences, fostering knowledge dissemination to address agricultural challenges in Eastern India.

Academic

The IARI, Jharkhand hub offers undergraduate (B.Sc. Agriculture) and postgraduate (M.Sc. Agriculture) programs. In the current academic session (2025-26), 59 students have been enrolled in B.Sc. (Agriculture) program through all-India entrance examinations and presently, 228 students are pursuing their undergraduate studies at this institute. The postgraduate program has been running since 2015, and currently 18 students have been enrolled across four disciplines (Genetics and Plant Breeding, Soil Science, Fruit Science, and Vegetable Science). Mr. Arijit Chowdhuri, M.Sc. (Soil Science), received the Dr. S.P. Raychaudhuri Gold Medal for his best M.Sc. thesis and the Dr. K.N. Synghal Memorial Gold Medal for being adjudged the Best M.Sc. student of ICAR-IARI.

Research

One entry of pigeonpea, *Vanshika (IPA 15-21)*, and three entries of maize, *Bhadrika maize hybrid-1 (DMRH 1419), Bhadrika maize hybrid-2 (IMH-8-101)* and *Bhadrika quality maize hybrid-1 (IQPMH-18-2)*, were identified by the Local Variety Release Committee (LVRC) for *Kharif* rainfed/irrigated areas of the state and recommended for consideration by the State Variety Release Committee (SVRC), Jharkhand.

The lentil variety, *Pusa Avantika (PDL-1),* and maize hybrid, *Shalimar Maize Hybrid-5 (IMH 221),* were recommended by the Local Variety Release Committee for consideration by the State Variety Release Committee (SVRC), Jharkhand, for area expansion in the state.

In pigeonpea, two varietal MAGIC populations, *viz.,* VM-1 (42 lines) and VM-2 (35 lines), were evaluated, out of which 13 and 12 promising lines from VM-1 and VM-2, respectively, were selected and maintained for further evaluation under rainfed conditions.

A diverse set of 150 accessions of lentil were screened for low phosphorus tolerance to identify ten promising lines: IC98384, IC201529, IC62523, IC20559, IC201543, IC78376, IC201549, IC22664, IC201566, and IC201569. Differential expression analysis of phosphate-transporter genes was done in selected efficient and inefficient genotypes to show Pi starvation triggered upregulation of root phosphate transporters and that the magnitude of induction was gene- and genotype-dependent.

Seventeen diverse cross combinations of chickpea, developed at ICAR-IIPR Kanpur and received at early segregating generations, have been advanced through single plant selection with meticulous maintenance of pedigree records.

Screening of 250 tropical maize inbred lines has been conducted to assess aluminium toxicity tolerance at the seedling stage to identify QTL hotspots and candidate genes for aluminium tolerance. A total of 44 significant SNPs across eight chromosomes and 33 functionally relevant genes associated with stress tolerance mechanisms were identified.

Eighty-two okra genotypes have been evaluated to identify the promising lines- such as Hisar Unnat, Gayatri, and VRO-125 for higher fruit count per plant, and Kashi Pragati, Hisar Unnat and Kashi Lalima for enhanced fresh pod yield per plant under Jharkhand conditions.

Elite varieties of fruit crops like mango, papaya, guava, jamun, litchi, ber, sapota, custard apple, bael, citrus, mulberry and aonla have been collected for regional evaluation.

A novel CRISPR vector has been developed for efficient genome editing in plants. A floral gene, *CcCEN-like 2* in pigeon pea, has been functionally validated and found to be responsible for delayed flowering. *Methyltransferase* and *demethylase* genes controlling epigenetic regulation in pigeon pea have been identified, with their expression dynamics analyzed under biotic and abiotic stress environments.

Seed production activities were undertaken to generate quality seeds of major crops. The initiative focused on maintaining varietal purity and enhancing productivity through systematic seed multiplication practices. The paddy variety MTU 1010 recorded a seed yield of 4,100 kg, whereas IR 64 produced 650 kilograms. In pigeon pea, the variety P 151 yielded 80 kg quality seeds.

In collaboration with IASRI New Delhi, a copyright (IPR) has been registered on 'MethSemble-6mA: 6mA prediction tool,' a tool to detect methylation patterns at the genome level particularly developed for plant systems with ROC Number SW-19863/2024 under the computer software category.

A natural resource map of IARI-Jharkhand has been developed to highlight its land-use patterns, water resources, and soil characteristics. It indicated that 35% of the area is under forest tree cover with highly eroded land and ravines, and 3.5% of the area is subjected to waterlogging from the *Kharif* to mid *Rabi* season. Water bodies such as Bahadur Dam and Kevalia Dam, along with other farm ponds, cover ~6% of the area. The soils exhibited considerable variation in colour, texture, depth, and profile, with the majority being acidic, with pH values between 4.5 and 7.4.

The *Bacillus* sp. MKS-6 has been reported to significantly enhance chickpea growth, nodulation, physiological traits, and yield in acidic soils, highlighting its strong potential as an efficient bio-inoculant under Jharkhand conditions.

Among the natural farming treatments, the highest yields were recorded in the RDF group, while the lowest were observed in the control group. Application of Ghanjeevamrit + Jeevamrit resulted in yields 55-80% lower than RDF treatment across all cropping systems. However, yield reduction was notably lower (only 25-60%) in the treatment combination of Ghanjeevamrit + Jeevamrit + FYM + Sesbania biomass mulching.

Evaluation of electric field-thermal modulation of starch gelatinization kinetics modelling using real-time spectrophotometric transmittance indicated that moderate electric fields (MEF) in the range of 25-35 V/cm act as a controllable and energy-efficient tool for precision starch processing, with promising applications in clean-label food development, biopolymer engineering, and the development of thermally responsive functional materials.

Survey in Hazaribagh district of Jharkhand indicated, milk yield ranged from 0.5-2, 7-10 and 4-5 litres per day in indigenous, crossbred and crosses with indigenous cows, respectively. But indigenous buffaloes had higher yields (2-4 litres per day) compared to indigenous cows, while Murrah had 6-10 litres per day. However, overall status of dairy farming in the district is poor and suffers from various issues and constraints.

Based on baseline survey from three districts of Jharkhand, five distinct local strains of goats have been provisionally identified. Phenotypic (morphological) characterization of goats was carried out, including assessment of body weight, coat colour, presence or absence of horns, and beard characteristics.

Field survey identified three distinct indigenous cattle strains based on coat colour: pure white to light grey, white-brown to brown, and black with a whitish-brown ventral region. Morphometric characterization across different age groups revealed that these animals are generally small in size, with an average height of 3.5 ft and low productivity (milk yield: 2.5 L/day).

An aquaculture model has been developed to evaluate fish growth performance using five carp species stocked at varying proportions. Among the experimental species, catla and black carp exhibited better growth rates followed by rohu and common carp, attaining size ranges of 600-720 g and 420-575 g, respectively.

Outreach Activities

During 2025, ICAR-IARI Jharkhand significantly strengthened its extension efforts through a range of farmer-centric programs aimed at enhancing agricultural productivity, livelihood security, and technology adoption. Under the Viksit Krishi Sankalp Abhiyan, the institute reached rural farmers in 127 villages across Hazaribagh district through awareness campaigns, demonstrations, and farmer-scientist interactions. Under the Scheduled Castes Sub Plan (SCSP), more than 20,000 farmers from 16 blocks of Hazaribagh and 6 blocks of four neighbouring districts benefited from the distribution of 2,520 quintals of quality seeds, 21,400 vegetable seed kits, 1,500 farm tools, and 1,550 fruit plant saplings. The institute also organized a large no. of Kisan Goshthis, 20 nos. of capacity-building training programs, an animal health camp, and a scientist–farmer interface meeting, collectively benefiting over 5000 farmers and promoting the adoption of improved agricultural technologies. Under the Tribal Sub Plan (TSP), training-cum-input distribution programs, Vanaraja chick distribution, Kisan Goshthis, and a Janjatiya Kisan Mela were organized, benefiting more than 3,000 tribal farmers directly and indirectly. In addition, the institute collaborated with the State Government and other agencies to conduct gardener training programs, ATMA-sponsored training programs, and farmer exposure visits. These initiatives substantially enhanced farmer awareness, skill development, technology dissemination, and livelihood opportunities among farming communities of Jharkhand and adjoining regions.

कार्यकारी सारांश

भा. कृ. अनु. प. - भारतीय कृषि अनुसंधान संस्थान, झारखंड अपनी शैक्षणिक उत्कृष्टता के साथ-साथ फसल सुधार, प्राकृतिक संसाधन प्रबंधन और पशुधन-मत्स्य विज्ञान के क्षेत्रों में अग्रणी अनुसंधान को निरंतर सुदृढ़ कर रहा है। यह संस्थान पूर्वी भारत की कृषि चुनौतियों के समाधान हेतु ज्ञान के प्रसार को प्रोत्साहित कर रहा है और विशेषकर झारखण्ड राज्य के कृषि अनुसंधान से संबंधित कार्यों में एक महत्वपूर्ण भूमिका निभा रहा है।

शैक्षणिक

भा. कृ. अनु. प. - भारतीय कृषि अनुसंधान संस्थान, झारखंड स्नातक (बी.एस.सी. कृषि) और स्नातकोत्तर (एम.एस.सी. कृषि) के पाठ्यक्रम संचालित करता है। वर्तमान शैक्षणिक सत्र (2025-26) में बी.एस.सी. (कृषि) कार्यक्रम में अखिल भारतीय प्रवेश परीक्षा के माध्यम से 59 छात्रों का नामांकन हुआ है और वर्तमान में 228 छात्र इस संस्थान में स्नातक अध्ययन कर रहे हैं। स्नातकोत्तर कार्यक्रम 2015 से संचालित हो रहा है और वर्तमान में चार विषयों (आनुवंशिकी एवं पादप प्रजनन, मृदा विज्ञान, फल विज्ञान और सब्जी विज्ञान) में 18 छात्रों का नामांकन हुआ है। एम.एस.सी. (मृदा विज्ञान) के छात्र अरिजीत चौधुरी को उनकी सर्वश्रेष्ठ एम.एस.सी. थीसिस के लिए डॉ. एस.पी. रायचौधुरी स्वर्ण पदक और आईसीएआर-आईएआरआई के सर्वश्रेष्ठ एम.एस.सी. छात्र के रूप में चुने जाने पर डॉ. के.एन. सिंघल मेमोरियल स्वर्ण पदक से सम्मानित किया गया।

अनुसंधान

अरहर की एक नई किस्म. वंशिका (IPA 15-21), और मक्के की तीन नई किस्मों, भद्रिका मक्का संकर-1 (DMRH 1419), भद्रिका मक्का संकर-2 (IMH-8-101) तथा भद्रिका क्वालिटी मक्का संकर-1 (IQPMH-18-2), को राज्य के स्थानीय किस्म विमोचन समिति (LVRC) द्वारा खरीफ वर्षा आधारित/सिंचित क्षेत्रों के लिए नामांकित किया गया और इन्हें झारखंड की राज्य किस्म विमोचन समिति (SVRC) द्वारा विचार हेतु अनुशंसित किया गया।

मसूर की किस्म - पूसा अवंतिका (PDL-1) और मक्का की संकर किस्म शालीमार मक्का संकर-5 (IMH 221) को क्षेत्रीय विस्तार के लिए राज्य के स्थानीय किस्म विमोचन समिति (LVRC) द्वारा झारखंड की राज्य किस्म विमोचन समिति (SVRC) के विचार हेतु अनुशंसित किया गया है।

अरहर में दो तरह की MAGIC पॉपुलेशन - VM - 1 (42 लाइन) VM - 2 (35 लाइन) – का मूल्यांकन किया गया। इनमें से VM-1 से 13 और VM-2 से 12 उत्कृष्ट लाइनों का चयन किया गया जिनका आने वाले वर्षों में वर्षा आधारित परिस्थितियों में मूल्यांकन किया जाएगा।

मसूर में 150 जीनोटाइप में कम फॉस्फोरस सहनशीलता के परीक्षण के आधार पर दस कम फॉस्फोरस सहिष्णु जीनोटाइप - IC98384, IC201529, IC62523, IC20559, IC201543, IC78376, IC201549, IC22664, IC201566, IC201569 - को चयनित किया गया। चयनित कुशल और अकुशल जीनोटाइप्स में फॉस्फेट-ट्रांसपोर्टर जीन का विभेदक अभिव्यक्ति विश्लेषण किया गया जिससे यह स्पष्ट हुआ कि फॉस्फेट की कमी से जड़ फॉस्फेट ट्रांसपोर्टरों की अभिवृद्धि होती है तथा यह अभिवृद्धि मुख्यतः जीन और जीनोटाइप पर निर्भर करती है।

भा. कृ. अनु. प. - भारतीय दलहन अनुसंधान संस्थान कानपुर द्वारा विकसित चने की सत्रह विविध संकर संयोजनों को F2/F3 जनरेशन से एकल पौधा चयन विधि द्वारा F5/F6 जनरेशन में स्थापित किया गया | वंशावली अभिलेखों का सावधानीपूर्वक अनुरक्षण करते हुए उत्तम पौद्यों को उपज एवं अन्य विशेषताओं के आधार पर चयन किया गया |

उष्णकटिबंधीय मक्का की 250 इनब्रेड लाइनों का पौध अवस्था में एल्युमिनियम विषाक्तता के प्रति सहनशीलता का आंकलन किया गया तथा एल्युमिनियम सहनशीलता से संबंधित QTL हॉटस्पॉट्स और कैंडिडेट की पहचान की गई। इस अध्ययन में आठ गुणसूत्रों पर कुल 44 महत्वपूर्ण SNPs और 33 कार्यात्मक रूप से प्रासंगिक जीन पाए गए, जो तनाव सहनशीलता तंत्र से जुड़े हुए हैं।

भिंडी के 82 जीनोटाइप्स का मूल्यांकन किया गया तथा उपज सम्बन्धी विशेषताओं के आधार पर कुछ उन्नत जीनोटाइप की पहचान की गई। हिसार उन्नत, गायत्री और VRO-125 को प्रति पौधा अधिक फल संख्या के लिए चुना गया जबकि, काशी प्रगति, हिसार उन्नत और काशी लालिमा को झारखंड की परिस्थितियों में प्रति पौधा ताज़ी फलियों की अधिक उपज के लिए उत्तम पाया गया।

विभिन्न फलों जैसे आम, पपीता, अमरूद, जामुन, लीची, बेर, सपोटा, सीताफल, बेल, नींबू वर्गीय फल, शहतूत और आँवला की उत्तम प्रजातियों का क्षेत्रीय मूल्यांकन हेतु संग्रह कर प्रक्षेत्र में लगाया गया।

पौधों में जीनोम एडिटिंग को अधिक प्रभावी बनाने के लिए एक नवीन CRISPR वेक्टर विकसित किया गया है। अरहर में पुष्पीय जीन CcCEN-like 2 की कार्यात्मक पुष्टि की गई है। यह जीन फूल आने की प्रक्रिया को देर से शुरू करता है | अरहर में एपिजेनेटिक नियमन को नियंत्रित करने वाले मिथाइलट्रांसफरेज़ और डीमिथाइलेज जीन की पहचान की गई है जिनकी अभिव्यक्ति का विश्लेषण विभिन्न जैविक और अजैविक तनाव परिस्थितियों में किया गया है।

बीज उत्पादन के अंतर्गत 3.6 हेक्टेयर क्षेत्र में प्रमुख फसलों के गुणवत्तापूर्ण बीज का उत्पादन किया गया। धान की प्रजाति, MTU 1010 का 13,000 वर्गमीटर क्षेत्र में लगभग 4100 किग्रा बीज तथा IR64 का 4000 वर्गमीटर क्षेत्र में 650 किग्रा बीज उत्पादन किया गया। इसके अतिरिक्त अरहर की प्रजाति P 151 को बीज उत्पादन के लिए 19,000 वर्गमीटर क्षेत्र में लगाया गया |

भारतीय कृषि सांख्यिकी अनुसंधान संस्थान (ICAR-IASRI), नई दिल्ली के सहयोग से एक महत्वपूर्ण बौद्धिक संपदा (IPR) दर्ज की गई है। यह कॉपीराइट 'MethSemble-6mA: 6mA prediction tool' पर है, जो विशेष रूप से पौधों में जीनोम स्तर पर मिथाइलेशन पैटर्न का पता लगाने में सक्षम है।

भारतीय कृषि अनुसंधान संस्थान (IARI) झारखंड का प्राकृतिक संसाधन मानचित्र तैयार किया गया है, जिसमें भूमि उपयोग पैटर्न, जल संसाधन और मिट्टी की विशेषताओं को दर्शाया गया है। इस मानचित्र के अनुसार, कुल क्षेत्रफल का लगभग 35% हिस्सा वन वृक्ष आवरण के अंतर्गत है, जहाँ भूमि अत्यधिक कटावग्रस्त है और गहरी खाइयाँ (ravines) पाई जाती हैं। लगभग 3.5% क्षेत्र खरीफ से मध्य रबी मौसम तक जलभराव की समस्या से प्रभावित रहता है। बहादुर डैम और केवालिया डैम जैसे प्रमुख जलाशयों के साथ-साथ अन्य फार्म तलाब मिलाकर लगभग 6% क्षेत्र को आच्छादित करते हैं। मिट्टी में रंग, बनावट, गहराई और प्रोफ़ाइल में काफी विविधता पाई गई। अधिकांश मिट्टियाँ अम्लीय प्रकृति की हैं, जिनका pH मान 4.5 से 7.4 के बीच है। यह मानचित्र क्षेत्र की भूमि उपयोग योजना, जल प्रबंधन और मिट्टी सुधार रणनीतियों को समझने में सहायक होगा।

बेसिलस बैक्टीरिया की प्रजाति MKS-6 को अम्लीय मिट्टी में चना की वृद्धि, गांठ बनने की प्रक्रिया, शारीरिक गुणों और उपज को उल्लेखनीय रूप से बढ़ाने के लिए रिपोर्ट किया गया है। यह झारखंड की परिस्थितियों में एक प्रभावी जैव-इनोकुलेंट के रूप में प्रयोग किया जा सकता है |

प्राकृतिक खेती के अंतर्गत प्रयोग किए गए उपचारों में सबसे अधिक उपज RDF समूह में दर्ज की गई, जबकि सबसे कम उपज नियंत्रण समूह में पाई गई। घनजीवामृत + जीवामृत के प्रयोग से सभी फसल प्रणालियों में RDF उपचार की तुलना में उपज 55-80% तक कम रही। हालांकि, जब घनजीवामृत + जीवामृत के साथ FYM और सेसबानिया बायोमास मल्चिंग को मिलाकर प्रयोग किया गया, तो उपज में कमी अपेक्षाकृत कम (केवल 25-60%) रही।

स्टार्च जिलेटिनाइजेशन के विद्युत क्षेत्र-तापीय मॉड्यूलेशन के मूल्यांकन द्वारा यह प्रमाणित किया गया कि मध्यम विद्युत क्षेत्र (MEF) 25–35 V/cm स्टार्च जिलेटिनाइज़ेशन की गतिशीलता को नियंत्रित करने के लिए सबसे उपयुक्त एवं ऊर्जा-कुशल साधन है। वास्तविक समय स्पेक्ट्रोफोटोमेट्रिक ट्रांसमिटेंस के माध्यम से किए गए मूल्यांकन से यह स्पष्ट हुआ कि यह तकनीक प्रिसिजन स्टार्च प्रोसेसिंग के लिए उपयोगी है।

हज़ारीबाग ज़िले (झारखंड) में किए गए सर्वेक्षण से पता चला कि दूध उत्पादन में पशु नस्लों के बीच काफी भिन्नता है। देशी गायें 0.5–2 लीटर प्रति दिन, क्रॉसब्रेड गायें 7–10 लीटर प्रति दिन, देशी क्रॉस गायें 4–5 लीटर प्रति दिन, देशी भैंसें 2–4 लीटर प्रति दिन (देशी गायों से अधिक) तथा मुर्रा भैंस 6–10 लीटर प्रति दिन के औसत से दूध देती है। हालांकि, समग्र रूप से देखा जाए तो ज़िले में डेयरी फार्मिंग की स्थिति कमजोर है और यह कई समस्याओं एवं बाधाओं से जूझ रही है — जैसे कि पशु पोषण की कमी, स्वास्थ्य सेवाओं की अपर्याप्तता, बाज़ार तक सीमित पहुँच, और आधुनिक तकनीकों का अभाव।

झारखंड के तीन ज़िलों में किए गए बेसलाइन सर्वेक्षण के आधार पर पाँच अलग-अलग स्थानीय बकरी नस्लें अस्थायी रूप से पहचानी गई हैं। इन बकरियों का शरीर के वज़न, कोट के रंग, सींग की उपस्थिति, दाढ़ी आदि फेनोटाइपिक (आकृतिक) लक्षणों के आधार पर वर्णन किया गया।

झारखंड के तीन ज़िलों में किए गए फील्ड सर्वेक्षण से कोट के रंग के आधार पर तीन अलग-अलग देशी गाय की नस्लों की पहचान की गयी

है| मुख्य रूप से गायों में तीन तरह के कोट के रंग पाए गए - शुद्ध सफेद से हल्का स्लेटी, सफेद-भूरा से भूरा, काली कोट जिनका वेंट्रल क्षेत्र में सफेद-भूरा रंग का हो| मॉर्फोमेट्रिक कैरेक्टराइज़ेशन से पता चला कि ये पशु सामान्यतः छोटे आकार के होते हैं, औसत ऊँचाई लगभग 3.5 फीट है। इनकी उत्पादकता भी कम है — औसतन दूध उत्पादन केवल 2.5 लीटर प्रति दिन। यह निष्कर्ष बताता है कि झारखंड की देशी गायें स्थानीय परिस्थितियों के अनुरूप ढली हुई हैं, लेकिन उत्पादकता सुधार के लिए नस्ल सुधार, पोषण प्रबंधन और वैज्ञानिक पालन-पोषण की आवश्यकता है।

पाँच कार्प प्रजातियाँ अलग-अलग अनुपात में स्टॉक करके एक नए एक्वाकल्चर मॉडल बनाया गया ताकि मछली वृद्धि प्रदर्शन का मूल्यांकन किया जा सके। इन पाँच प्रजातियों में से कटला और ब्लैक कार्प की वृद्धि सबसे अच्छी आंकी गई और उनका औसत आकार 600–720 ग्राम तक पहुँचा। इसके बाद रोहू और कॉमन कार्प रहे, जिनका आकार 420–575 ग्राम तक दर्ज किया गया। यह परिणाम दर्शाता है कि विभिन्न कार्प प्रजातियों का संयोजन करके एक्वाकल्चर मॉडलिंग से उत्पादन क्षमता और वृद्धि दर का सटीक आंकलन किया जा सकता है। यह दृष्टिकोण न केवल मत्स्य पालन की दक्षता बढ़ाने में सहायक है, बल्कि प्रजाति-विशिष्ट प्रबंधन रणनीतियों को विकसित करने में भी मदद करता है।

कृषि विस्तार गतिविधियाँ

वर्ष 2025 के दौरान संस्थान ने कृषि उत्पादकता, आजीविका सुरक्षा और उन्नत प्रौद्योगिकी अपनाने को बढ़ावा देने के उद्देश्य से किसानों पर केंद्रित विभिन्न कार्यक्रमों के माध्यम से अपने विस्तार प्रयासों को काफी मजबूत किया। 'विकसित कृषि संकल्प अभियान' के तहत, संस्थान ने जागरूकता अभियानों, प्रदर्शनों और किसान-वैज्ञानिक संवादों के माध्यम से हजारीबाग जिले के 127 गांवों में किसानों तक अपनी पहुँच बनाई। 'अनुसूचित जाति उप-योजना' (SCSP) के अंतर्गत, हजारीबाग के सभी 16 ब्लॉकों और चार पड़ोसी जिलों के 6 ब्लॉकों के 20,000 से अधिक किसानों को 2,520 क्विंटल गुणवत्तापूर्ण बीज, 21,400 सब्जी बीज किट, 1,500 कृषि उपकरण और 1,550 फलों के पौधों के वितरण से लाभ पँहुचाया । संस्थान ने बड़ी संख्या में 'किसान गोष्ठियों', 20 क्षमता-निर्माण प्रशिक्षण कार्यक्रमों, एक 'पशु स्वास्थ्य शिविर' और एक 'वैज्ञानिक-किसान संवाद बैठक' का भी आयोजन किया; इन सभी से सामूहिक रूप से 5,000 से अधिक किसानों को लाभ पहुँचा और उन्नत कृषि तकनीकों को अपनाने को बढ़ावा मिला। 'जनजातीय उप-योजना' (TSP) के तहत, प्रशिक्षण-सह-सामग्री वितरण कार्यक्रम, 'वनराजा' चूजों का वितरण, किसान गोष्ठियाँ और एक 'जनजातीय किसान मेला' आयोजित किए गए, जिनसे 3,000 से अधिक जनजातीय किसानों को प्रत्यक्ष और अप्रत्यक्ष रूप से लाभ पहुँचा। इसके अतिरिक्त, संस्थान ने राज्य सरकार और अन्य एजेंसियों के सहयोग से माली प्रशिक्षण कार्यक्रम, ATMA-प्रायोजित प्रशिक्षण कार्यक्रम और किसानों के लिए 'एक्सपोजर विजिट' (क्षेत्र भ्रमण) आयोजित किए। इन पहलों ने झारखंड और आसपास के क्षेत्रों के किसान समुदायों के बीच जागरूकता, कौशल विकास, प्रौद्योगिकी के प्रसार और आजीविका के अवसरों में उल्लेखनीय वृद्धि की।

1

Introduction

Agriculture in eastern India holds immense significance for the country's future food, nutritional, and livelihood security owing to its vast natural resources, fertile soils, favourable agro-climatic conditions, abundant rainfall, rich biodiversity, and extensive livestock and fishery resources. The region possesses enormous untapped potential to increase agricultural productivity through diversified farming systems that integrate crops, horticulture, livestock, fisheries, and forestry. Eastern India is increasingly recognized as the future growth engine of Indian agriculture, particularly in the context of sustainable and climate-resilient agricultural development. Despite these advantages, the region has historically remained less productive compared to other parts of the country due to several constraints, including dependence on monsoon rainfall, inadequate irrigation infrastructure, fragmented landholdings, poor market accessibility, low mechanization, and limited adoption of advanced agricultural technologies. Although the Green Revolution transformed agricultural production in north-western India, its benefits were not fully realized in eastern India, leaving considerable scope for agricultural transformation and rural development.

The eastern region of India, comprising Bihar, Jharkhand, Odisha, West Bengal, and parts of Chhattisgarh, therefore emerged as a priority region for focused agricultural research, education, and technological interventions. Recognizing the need to harness the agricultural potential of this region and address its unique agro-ecological and socio-economic challenges, the Government of India envisioned the establishment of a world-class agricultural institution in eastern India. The primary objective behind establishing ICAR–Indian Agricultural Research Institute (IARI), Jharkhand, was to strengthen research, education, and extension activities tailored to the specific needs of eastern India.

According to the United Nations World Population Prospects (2022), India's population is projected to reach nearly 1.67 billion by 2050. Ensuring food and nutritional security for such a large population will require a second agricultural transformation, which can be achieved by effectively utilizing the untapped potential of eastern India through holistic management of land, water, crops, biomass, livestock, fisheries, horticulture, forestry, and human resources. In line with this vision, Shri Narendra Modi, Hon'ble Prime Minister of India, laid the foundation stone of ICAR-IARI, Jharkhand, on 28 June 2015 at Gauria Karma village in Hazaribagh district across an area of 1,000 acres. The institute was conceived to develop sustainable and climate-resilient agricultural technologies, improve productivity of crops, livestock, fisheries, and horticulture, promote integrated natural resource management, and generate skilled human resources capable of addressing emerging challenges in agriculture and allied sectors.

ICAR-IARI, Jharkhand, is mandated to conduct basic, strategic, and anticipatory research in frontier areas of agriculture and allied sciences while simultaneously developing quality human resources for academic excellence. At present, the institute operates through three schools: the School of Crop Sciences, the School of Natural Resource Management, and the School of Animal and Fishery Sciences (Fig. 1.1). The institute comprises 11 divisions with a sanctioned staff strength of 74 personnel, including 41 scientific, 22 technical, and 11 administrative positions. Currently, the institute has 35 scientific, 9 technical, and 8 administrative personnel. It possesses modern infrastructure facilities such as smart and virtual classrooms, advanced laboratories, a library, hostels, a dedicated FDRMC unit, an examination hall, agri-horticulture-cum-animal and fishery research farms, sports facilities, and guest house accommodations.

Over the last decade, the institute has been actively contributing towards addressing the agrarian challenges and complexities of eastern India through strong linkages with various stakeholders across the region. It has undertaken several research, education, and extension programs to develop quality human resources and generate farmer-friendly technologies aimed at enhancing agricultural productivity and farm income. The institute has been running its academic programs as a PG Outreach Institute under the Post Graduate School, ICAR-IARI, New Delhi, since 2015–16 in several disciplines, and initiated its undergraduate B.Sc. (Agriculture) program in the 2022–23 academic session. Currently, 18 students are enrolled in postgraduate programs, and 228 students are pursuing undergraduate studies. The institute is committed to developing highly skilled agricultural professionals and has achieved excellent placement records for postgraduate students in various government organizations. The first batch of undergraduate students is due to be awarded degrees shortly. To support career counselling and enhance job awareness among students, the institute has also established a dedicated placement cell.

The institute is actively engaged in conducting, coordinating, and consolidating systematic research in the fields of crop sciences, natural resource management, and livestock and fisheries sciences, as well as disseminating improved technologies to stakeholders. It undertakes both basic and applied research in diverse areas, including the improvement and management of cereal and pulse crops, horticultural crop management, natural resource management, crop production systems, livestock production, and fisheries development.

To address the issue of low productivity in crops, livestock, and fisheries in eastern India, the institute has undertaken several research projects at the institute, inter-institutional, and externally funded collaborative levels. Another important component of the institute's activities includes outreach programs implemented under SCSP, TSP, and NEH schemes to demonstrate improved agricultural technologies directly at farmers' doorsteps. It also organizes training programs for government and non-government organizations, trainers, farmers, forest officers, and other stakeholders. These programs have provided direct benefits to more than 50,000 tribal and scheduled caste farmers and other stakeholders across the region. In addition, the institute actively participates in various Government of India flagship programs such as *Viksit Krishi Sankalp Abhiyan 2025*. The revised budget estimate of the institute for 2025 was ₹1,874.50 lakhs.

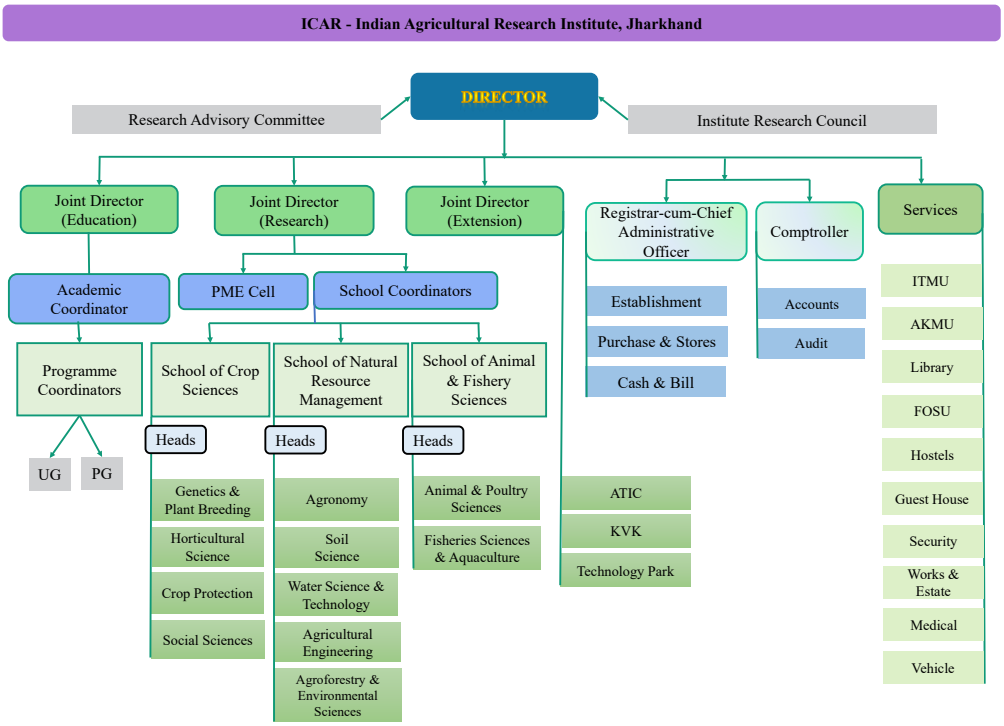

Fig. 1.1. Organogram of the Institute

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Academic Achievements

Undergraduate Program

IARI Jharkhand started its 4-year B.Sc. (Agriculture) degree program in the academic year 2022-23. In the current academic session (2025-26), 59 students have taken admission through all-India entrance examinations, CUET (ICAR-UG). At present, a total of 228 students are pursuing their undergraduate studies at this institute, belonging to more than 17 states of India, of which 34.7% are girl students (Table 2.1).

Table 2.1. Strength of UG students at the institute

Academic session	Intake capacity	Current enrollment
2022-23	66	54
2023-24	66	57
2024-25	66	58
2025-26	60	59

Glimpses of Students' READY program (UG)

The UG final-year batch (2022-26), comprising 54 students, has completed the following activities:

- **RAWE (Rural Agricultural Work Experience) program and KVK/Village attachment:** Conducted at KVK Ramgarh and nearby villages (Sep 22-Nov 14, 2025) for-
  - Exposure to farming systems
  - Rural livelihood practices
  - Extension activities
- **Agro-industrial attachment (Nov 16-Dec 15, 2025):** Students were attached to different agro-industries and renowned NGOs across India (Jan Jagran Kendra, Hazaribagh; Mobile Agricultural School and Services, Ranchi; Sustainable Human Development Association, Gorakhpur; PRADAN, across different locations of the country; Radhakrishna Impex Pvt. Limited, Muzaffarpur; Jain Irrigation, Jalgaon; etc.), leading to-
  - Exposure to agribusiness and processing industries
  - Skill enhancement and employability development

Fig. 2.1. Glimpses of students' participation in the RAWE program

Educational Tours and Exposure Visits

The educational tours and exposure visits are now

an integral component of the approved course curriculum (6th Dean Committee Report) of B.Sc. (Agriculture), and these are aligned with different practical course modules. The tours/exposure visits were organized to provide students with real practical exposure for enhanced experiential learning (Table 2.2).

Table 2.2. Educational tours and exposure visits of UG students

BAU, Ranchi & Green Garden Nursery (Jan 24, 2025)	   
NRC Litchi, RPCAU, Progressive Farm (May 23-24, 2025)	     

Sheep & Goat Farm, Chatra (Jul 10, 2025)	   
NISA, CTRTI & KVK Ranchi (Jul 22, 2025)	   
BAU & RCER Plandu (Jul 29, 2025)	 
Biodiversity Park & NBPGR (Aug 01, 2025)	   

Deeksharambh-2025

Deeksharambh-2025, the orientation-cum-induction program, was conducted from November 28 to December 11, 2025, for the newly admitted batch of 59 undergraduate students (23 girls and 36 boys) from 12 states. The program included orientation on academic regulations and curriculum, expert lectures by eminent scientists and industry leaders, and sessions on personality development, stress management, and career guidance. Students were also taken on exposure visits and familiarized with institutional facilities. Additionally, each student was assigned a scientist mentor from 16 houses to provide continuous academic guidance and support.

Fig. 2.2. Highlights from 14 days Deeksharambh program

ICAR Inter-zonal Sports Meet

ICAR Inter-zonal sports meet was organized at Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya, during April 15-20, 2025, where 15 students from this institute participated. Among them, 9 students were qualified for the zonal level.

Fig. 2.3. Team IARI Jharkhand at ICAR-Zonal Sports Meet at UAT, Kumarganj, Ayodhya

Student-Administration interaction

Students of ICAR-IARI Jharkhand had the opportunity to interact with the Director-cum-Vice Chancellor and JD(R) on 6 April 2025, followed by an interaction with the Dean and JD(E) on June 26-27, 2025. These sessions focused on key aspects, including academic regulations, institutional facilities, and student welfare. Emphasis was also laid on maintaining discipline, effective curriculum planning, and enhancing student engagement in academic and co-curricular activities.

Fig. 2.4. Glimpses from students interaction

Postgraduate Program

Academic progress

The institute has been offering the M.Sc. (Agriculture) program since its establishment in 2015. Currently, 18 students are enrolled in the PG program covering 4 disciplines (Genetics and Plant Breeding, Soil Science, Fruit Science, and Vegetable Science). Recently, 19 students (Batch 2023-25) received their degrees in these four disciplines.

Achievements

Mr. Arijit Chowdhuri, a postgraduate student of M.Sc. (Soil Science), received two prestigious gold medals in recognition of his outstanding academic performance.

Fig. 2.5. Mr. Arijit Chowdhuri with his Gold Medals and certificates

He was awarded the Dr. S.P. Raychaudhuri Gold Medal for his best M.Sc. thesis and the Dr. K.N. Synghal Memorial Gold Medal for being adjudged the Best M.Sc. student of ICAR-IARI. In 2025, five PG students (Genetics and Plant Breeding) have qualified for NET/ NET with JRF for further studies (Table 2.3). Notably, a few passed-out students have already established themselves in their professional careers (Table 2.4).

Table 2.3. List of students with academic achievements

Name of student	Discipline	Qualified	Batch
Ms. Pooja Belwal	GPB	CSIR-NET with JRF	2023-25
Mr. Arun M. Channapur	GPB	CSIR-NET with JRF	2023-25
Ms. Nayanika Guha	GPB	CSIR-NET	2023-25
Mr. Seshathri V.	GPB	CSIR-NET with JRF and GATE	2024-26
Ms. Yamini	GPB	CSIR-NET with JRF and GATE	2024-26
Mr. Arijit Chatterjee	GPB	CSIR NET	2024-26
Ms. Shilpa Singha	Vegetable Science	CSIR NET	2024-26
Ms. Prateeti Bharali	Soil Science	UGC NET	2024-26

Table 2.4. Professional achievements of the passed-out PG students in 2025

• Ms. Anubha Kumari, M.Sc. (Vegetable Science), Academic Year: 2023-2025, has joined as Block Agriculture Officer under the Government of Bihar.	
• Mr. Vinodh Kumar P. N., M.Sc. (Genetics & Plant Breeding), Academic Year: 2020-22, has been selected as Scientist B in the Central Silk Board of India. He is presently pursuing his PhD in Genetics at ICAR-IARI, New Delhi.	
• Mr. Subhajit Sarkar, M.Sc. (Soil Science), Academic Year: 2021-23, has been selected as Scientist B in the Central Silk Board of India. He is presently pursuing his PhD in Soil Science at ICAR-IARI, New Delhi.	

IARI Jharkhand Library & Information Centre

The Library & Information Centre at IARI Jharkhand continued to function efficiently during the year 2025 at a new hall with a larger capacity, providing essential academic and research support to students, faculty, and staff. The library services are operating regularly on the campus, maintaining a well-organized and accessible knowledge resource environment.

At present, the library holds a total collection of 2,633 publications, which includes a diverse range of materials such as textbooks, handbooks, encyclopedias, annual reports, newsletters, pamphlets, and other extension publications. In addition to its book collection, the library subscribes to six ICAR journals, ensuring access to current scientific literature relevant to agricultural research and education.

During the year 2025, the Library & Information Centre at IARI, Jharkhand, strengthened its digital access through the **ONOS (One Nation One Subscription)** initiative. This program facilitates centralized access to a wide range of high-quality e-journals, research articles, and scholarly databases across disciplines. Through ONOS, students, faculty, and staff members are able to access current and archival scientific literature more efficiently, significantly supporting academic, teaching, and research activities. The availability of these resources within the campus network has enhanced information accessibility and contributed to improved research output and learning outcomes at the institute.

The library remains open from 9:00 AM to 6:00 PM on all working days, providing ample time for users to access its resources. The user base of the library includes 246 undergraduate students, 36 M.Sc. students, and 40 staff members. Each registered user is entitled to borrow up to two books for a period of 15 days.

To support digital access and academic work, the library is equipped with seven computers and one heavy duty photocopy machine for user convenience. The reading hall is well-furnished and designed to offer a comfortable study environment, featuring 40 seating chairs and equipped with seven air conditioning units to facilitate users, particularly during extreme weather conditions.

Overall, the Library & Information Centre continues to play a vital role in supporting academic excellence and research activities at IARI Jharkhand.

Fig. 2.6. A view from the Library of the institute

3

Research Achievements

Crop improvement

Crop Varieties Identified in LVRC for Release from SVRC, Jharkhand

Pigeonpea

Vanshika (IPA 15-21): The variety was developed by Dr. Satheesh Naik by pedigree breeding method (NDA 1 X MAL 13) in ICAR-IIPR Kanpur and evaluated under All India coordinated varietal trials (IVT, AVT1, and AVT2) from 2019-20 to 2021-22. Although it performed well in all centres of Jharkhand, it could not be promoted in AVT 2 based on its average performance across all locations. The entry was evaluated in different zones of Jharkhand in coordination with Birsa Agriculture University, Ranchi (Fig. 3.1). The yield data of IPA 15-21 in different locations were recorded (Table 3.1) as follows:

Table 3.1. Jharkhand state varietal adoptive trial yield data for 2023-24 and 2024-25

Location	Years	Proposed	Check entries		
		IPA 15-21 (kg/ha)	BA 2 (Local check) (kg/ha)	IPA 203 (Zonal check) (kg/ha)	PA151 (Zonal check) (kg/ha)
BAU Kanke	2023-24	2053	1709	1893	1680
	2024-25	1945	2009	1840	1697
Centre mean		1999	1859	1867	1689
IARI, Gauria Karma	2023-24	1427	1123	1144	1030
	2024-25	1778	1356	1406	1298
Centre mean		1603	1240	1275	1164
ZARS, Chianki	2023-24	1585	--	1366	1275
Centre mean		1585	--	1366	1275
Weighted mean yield (kg/ha)		1729	1549	1503	1376
CV %		13.82	15.89	16.13	15.03
CD (P<0.05)		191	252	260	225
Weighted mean percent superiority over checks			(+) 11.60	(+) 15.06	(+) 25.61
Overall superiority of the proposed entry IPA 15-21 across all the checks (%)		1729	(+) 17.42%		

The variety IPA 15-21 was proposed for Jharkhand as 'Vanshika', and the proposal has been submitted in LVRC meetings held on Jan 16th, 2025 and June 16th, 2025, for the recommendation of SVRC for release in *Kharif* rainfed/irrigated areas of Jharkhand state. It is a long-duration variety (239-248 days) with a yield potential of 1.6 tons/ha. The pigeonpea variety Vanshika (IPA 15-21) is identified for *Kharif* rainfed/irrigated areas of the state and recommended for consideration by the state variety release committee (SVRC), Jharkhand.

ZRS, Chianki, Palamu

ICAR-IARI Jharkhand

BAU, Kanke

Fig. 3.1. State varietal multilocation trials

Maize

Bhadrika Maize Hybrid-1 (DMRH 1419): A medium-duration (90-92 days) maize hybrid with an average grain yield of 6.70 t/ha in Jharkhand (Fig. 3.2). It has shown an overall 8.28% & 10.90% superiority in grain yield over the national checks HM10 & BIO9637, respectively, during *Rabi* 2015-16 in coordinated trials in NEPZ and 6.90% yield superiority over national check DHM 121 in coordinated trial during *Kharif* 2016. In Ranchi, it had shown 19.07% & 8.73% yield superiority over both the checks DHM 121 & CMH-

08-292, respectively, in the coordinated trial during *Kharif* 2016. In state trials, it has given an overall yield of 6.70 t/ha, giving 22.09% superiority over the best checks across three seasons (*Kharif* 2022, *Kharif* 2023 & *Kharif* 2024). In minikit trials in two districts at different farmers' fields over two years, it showed 18.94% yield superiority over the national check (DHM 121). It showed a moderately resistant (MR) reaction to major insect pests and diseases. Bhadrika maize hybrid-1 was developed by Dr. Santosh Kumar, ICAR-IARI, Jharkhand, in collaboration with ICAR-IIMR, Ludhiana (Dr. Bhupendra Kumar et al.) by heterosis breeding (Parentage: UMI1210 X IML-102). The variety is identified for the rainfed *Kharif* condition of the Jharkhand state and recommended for consideration by the state variety release committee (SVRC), Jharkhand.

Fig. 3.2. Bhadrika Maize Hybrid-1

Bhadrika Maize Hybrid-2 (IMH-8-101): A medium maturity (93-95 days) maize hybrid proposed for Jharkhand with an overall average grain yield of 6.43 t/ha in Jharkhand (Fig. 3.3). It has shown yield superiority of 13.31% & 14.97% over national checks DHM121 & CMH-08-292, respectively in coordinated trial during *Kharif* 2018. It has also shown yield superiority in Sabour and Varanasi too (*Source: Annual Progress Report, Indian Institute of Maize Research, Ludhiana)*. In state trials, it has given an overall yield of 6.43 t/ha giving 17.12% superiority over the best checks over three seasons (*Kharif* 2022, *Kharif* 2023 & *Kharif* 2024). In Minikit trials, in two districts at different farmers' fields over two years, it showed 24.99% yield superiority over the national check (DHM 121). It showed moderately resistant (MR) reaction to major insect pests and diseases.

Fig. 3.3. Bhadrika Maize Hybrid-2

Bhadrika maize hybrid-2 was proposed by Dr. Santosh Kumar, ICAR-IARI, Jharkhand, in collaboration with ICAR-IIMR, Ludhiana (Dr. Vishal Singh et

al.) by heterosis breeding (Parentage: MIL 8-144 X LM14). The variety is identified for the rainfed *Kharif* condition of the Jharkhand state and recommended for consideration by the state variety release committee (SVRC), Jharkhand.

Bhadrika Quality Maize Hybrid-1 (IQPMH-18-2): A medium-maturity quality protein maize hybrid with an overall average grain yield of 6.54 t/ha in Jharkhand state (Fig. 3.4). It has shown 19.95% overall superiority in grain yield over the check recommended for NEPZ (HQPM-1) during four years of testing. Out of twenty-four trials, IQPMH 18-2 ranked 4 times in the top 3 for yield during *Kharif* 2018 to 2021. It has shown 9.69% overall superiority in grain yield over the recommended check for NEPZ (HQPM-5) during four years of testing. It has also shown 31.64% overall superiority in grain yield over the recommended check for CWZ (HQPM-1) in Zone V during four years of testing. (Source: Annual Progress Report Indian Institute of Maize Research, Ludhiana). In state trials, it has given an overall yield of 6.54 t/ha, giving 19.21% superiority over the best checks over three seasons (*Kharif* 2022, *Kharif* 2023 & *Kharif* 2024). In Minikit trials, in two districts at different farmers' fields over two years, it showed 25.97% yield superiority over National Check (HQPM-5). It showed Moderately Resistant (MR) reaction to major insect pests and diseases. Bhadrika Quality Maize Hybrid-1 was by Dr. Santosh Kumar, ICAR-IARI, Jharkhand, in collaboration with ICAR-IIMR, Ludhiana (Dr. Ramesh Kumar et al.) by heterosis breeding (Parentage: DLQ 2192 X QIL 4-2047). This QPM hybrid is identified for the rainfed *Kharif* condition of the Jharkhand state and recommended for consideration by the state variety release committee (SVRC), Jharkhand.

Fig. 3.4. Bhadrika Quality Maize Hybrid-1

Crop Varieties Identified for Area Expansion in Jharkhand State

Lentil

Pusa Avantika (PDL-1): PDL-1 was released by ICAR-IARI, New Delhi, by Dr. Dharmendra Singh for Haryana and UP. It was developed by selection from a heterogeneous population (ILL-7620 X 88522). Based on the yield performance in north-eastern zones of the state, Dr. Anima Mahato, Scientist, IARI Jharkhand, proposed PDL-1 in LVRC meetings held on January 16, 2025, and June 16th, 2025, for recommendation of SVRC for its area expansion in Jharkhand state. It is a small-seeded variety with a maturity period of 108-120 days and a yield potential of 10 Q/ha (Fig. 3.5). The variety outyielded the national check (HUL 57) by 13 percent (Table 3.3). There was no virtual appearance of disease under natural/farmers' field conditions. The variety is suitable for timely and medium-late sown in rice fallow conditions with a seed rate of 35-40 kg/ha. The lentil variety, Pusa Avantika, is recommended by the local variety release committee for consideration by the state variety release committee (SVRC), Jharkhand, for area expansion.

Table 3.3. Jharkhand state varietal adoptive trial yield data for 2022-23 and 2023-24

Yield data (kg/ha) of multi-location trials in *Rabi* 2022-23			
Locations	**BAU-Ranchi**	**IARI-Jharkhand**	**Mean**
Test entries			
PDL- 1	1072*(1)	1052* (1)	1062 [1]
PSL- 9	990 (3)	980 (2)	985 [2]
RNCL 15-02	925	966	946
RNCL 14-06	957	926	941
Checks			
IPL- 406 (Ch)	904	862	883
WBL 77 (Ch)	875	737	806
HUL- 57 (Ch)	990 (3)	975 (3)	982 [3]
DPL- 62 (Ch)	1004 (2)	918	961
CV%	6.33	8.47	
CD (P<0.05)	49.70	63.85	
SEM	16.23	20.85	
Yield superiority over best check (%)	6.77	7.89	

Yield data (kg/ha) of multilocation trials in *Rabi* 2023-24				
Location	**BAU-Ranchi**	**IARI-Jharkhand**	**ZRS-Darisai**	**Mean**
Entries				
PDL - 1	1150* (1)	1048 (1)	957 (1)	1052 [1]
PSL - 9	1082 (2)	936	830	949 [3]
RNCL 14-06	949	903	787	880
RNCL 15-02	1072 (3)	1038 (2)	817	976 [2]
RNCL 15-05	862	1004 (3)	763	876
RNCL 16-02	963	992	800	918
IPL- 406 (Ch)	941	782	833	852
WBL 77 (Ch)	1057	861	823	914
HUL- 57 (Ch)	889	968	847 (3)	901
DP - 62 (Ch)	951	794	900 (2)	882
IPL -220 (Ch)	938	887	837	887
CV%	9.45	6.38	6.09	
CD (P<0.05)	159.89	102.41	87.30	
SEM	53.81	34.47	29.39	
Yield superiority over best check (%)	8.79	8.26	6.33	

Fig. 3.5. Pusa Avantika (PDL-1) variety of lentil

Maize

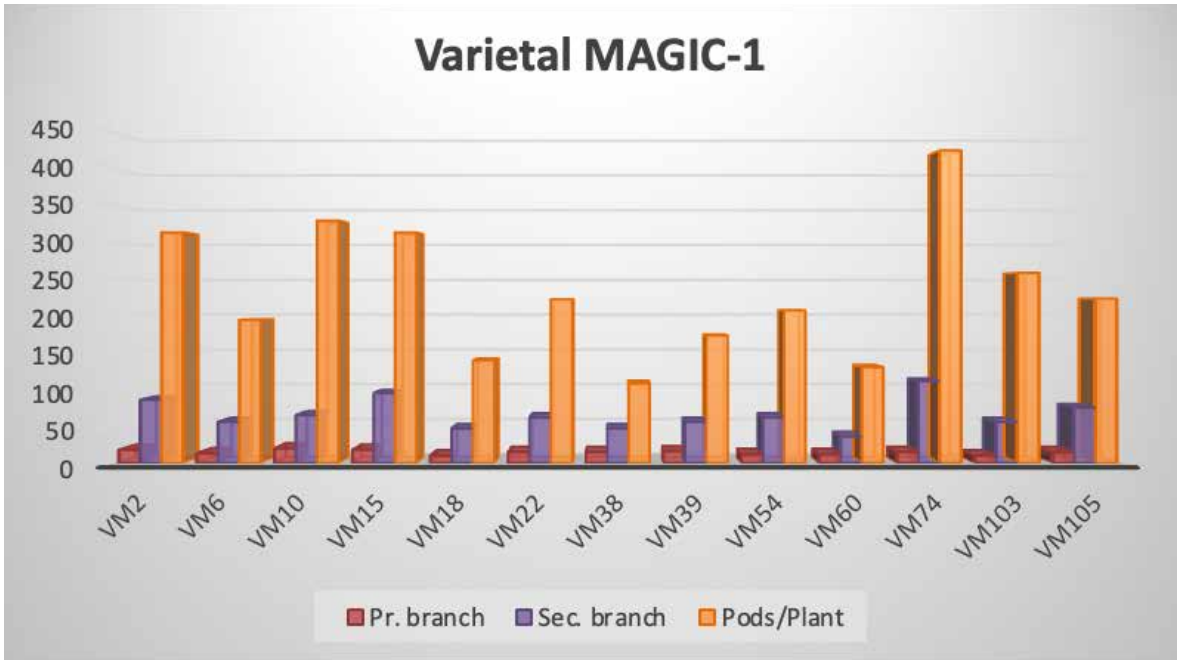
Shalimar Maize Hybrid-5 (IMH-221) (DMRH 1417): An early maturity maize hybrid proposed with an overall average grain of 6.34 t/ha in Jharkhand state (Fig. 3.6). It has shown overall 44.67%, 22.56%, and 50.83% superiority in grain yield over the National check PMH-5 in zones NHZ, NWPZ and CWZ, respectively, in coordinated trials. In state trials, it has given yield of 6.34 t/ha, giving 15.51 % superiority over best checks over three seasons (*Kharif* 2022, *Kharif* 2023 & *Kharif* 2024). In Minikit trials, in two districts at different farmers' fields over two years, it showed 10.10% yield superiority over National Check (DHM 121). It showed Moderately Resistant (MR) reaction to major insect pests and diseases. The variety, Shalimar Maize Hybrid-5 is recommended for consideration by the state variety release committee (SVRC), Jharkhand, for area expansion.

Fig. 3.6. Shalimar Maize Hybrid-5

Plant Genetic Resources

Evaluation and Maintenance of Pigeon Pea Advanced Breeding Lines

Two early segregating MAGIC populations, viz., Varietal Magic-1 (VM1) consisting of 42 lines and a second set named Varietal Magic-2 (VM2) consisting of 35 lines, were received from ICAR-IARI, New Delhi, during the cropping season 2021-22. Both MAGIC populations were evaluated for yield and associated traits, and based on their performance (Fig. 3.7), 13 and 12 lines in VM-1 and VM-2, respectively, were selected and sown in the cropping season 2025-26 for further evaluation.



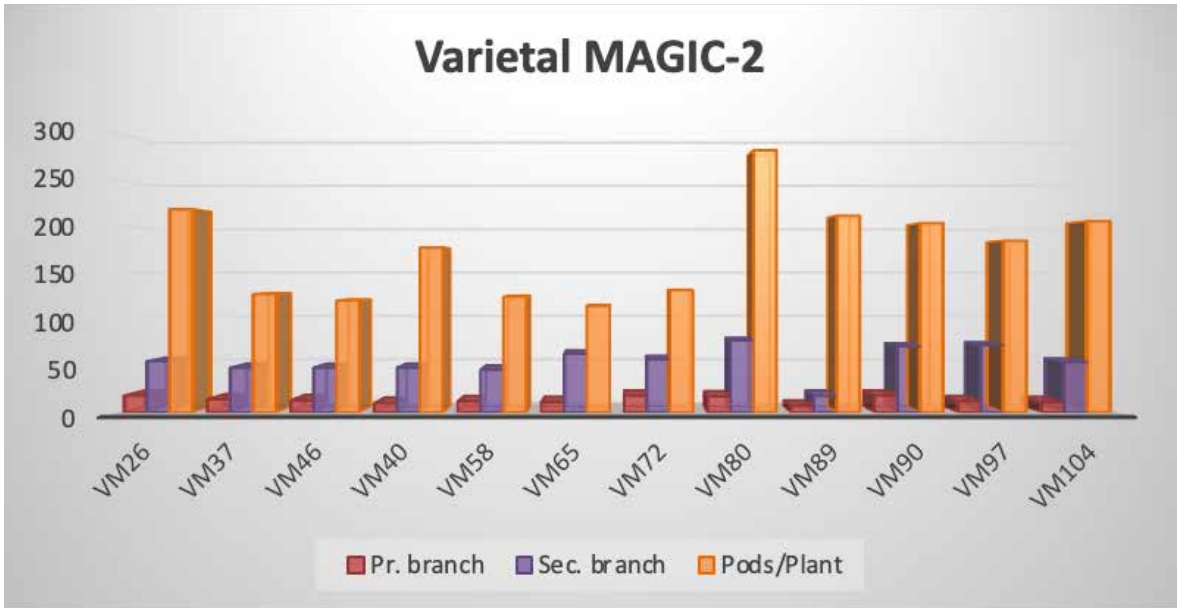


Fig. 3.7. Yield-attributing traits of selected lines in Varietal MAGIC-1 and Varietal MAGIC-2 during cropping season 2024-25

Chickpea

Seventeen diverse cross combinations of chickpea, developed at ICAR-IIPR Kanpur, were received in early segregating generations during *Rabi* 2021-22 (Table 3.2). These crosses were advanced through single plant selection with meticulous maintenance of pedigree records. The selection process focused on desirable traits such as early flowering, erect plant habit, tall plant type, two or more pods per peduncle, and other yield-attributing traits (Fig. 3.8).

Table 3.2. Number of crosses and selected lines maintained across different segregating generations in *Rabi* 2024-25

Sl. No.	Name of cross	Generation	Total number of selected lines/ progenies
1.	SG1	F6	21
2.	SG2	F6	13
3.	SG3	F6	03

Sl. No.	Name of cross	Generation	Total number of selected lines/ progenies
4.	SG4	F6	08
5.	SG5	F6	02
6.	SG6	F6	06
7.	SG7	F6	02
8.	SG8	F6	02
9.	SG9	F6	04
10.	SG10	F6	02
11.	SG11	F6	07
12.	SG12	F7	05
13.	BM 21-1	F5	15
14.	BM 21-2	F5	41
15.	BM 21-3	F5	27
16.	BM 21-4	F5	13
17.	BM 21-5	F5	29

Fig. 3.8. Evaluation of chickpea lines in experimental plots

Maintenance and Multiplication of Maize Inbred Lines

The maize inbred lines (~250 lines) were procured and sown during the *Rabi* 2025-26 for seed maintenance and multiplication. This activity was undertaken under an in-house project to ensure the availability of sufficient, uniform, and genetically pure seed material for first-year screening.

Evaluation and Characterization of Okra Germplasm

The research on the genetic improvement of okra has been initiated at ICAR-IARI, Jharkhand, with 82 diverse genotypes collected from different sources. The okra germplasms have been evaluated for different morphological (Figs. 3.9-3.10) and yield traits at the Experimental Farm of ICAR-IARI, Jharkhand (Tables 3.4-3.7).

Fig. 3.9. Variability observed for fruit colour in different genotypes of okra under evaluation

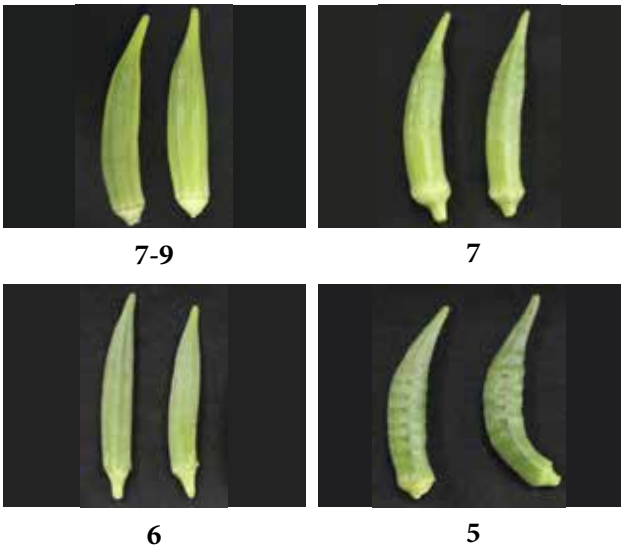


Fig. 3.10. Variability observed for the number of ridges on fruit: a key determining factor for consumer preferences

Table 3.4. Mean performance of the okra genotypes for different plant morphological, fruit, and yield traits

Sl. No.	Genotypes	Plant Height at 90 DAS (cm)	No of branches/ plants	Number of fruits per plant	Fruit length (cm)	Fruit width (cm)	Average fruit weight (g)	Yield per plant (g)
1	Vivek Bhindi-2	66.56	2.63	13.10	12.42	12.77	16.58	217.17
2	VRO-4	101.85	2.69	13.46	11.85	13.00	13.71	184.89
3	Kashi Chaman	90.58	2.62	16.49	10.30	12.67	16.99	280.10
4	HRB-55	69.62	4.53	15.10	11.82	12.27	16.14	243.84
5	VRO-106	62.43	3.30	12.15	11.69	12.66	11.03	133.85
6	VRO-110	74.71	2.10	13.05	9.82	13.28	13.46	175.70
7	No. 315	34.97	2.67	13.31	12.01	14.56	16.46	219.13
8	SB-6	82.26	2.30	12.63	11.07	13.47	12.50	158.03
9	P5	75.44	2.45	13.56	11.40	13.38	15.37	208.50
10	VRO-5	67.84	2.58	13.93	12.26	11.42	15.09	210.41
11	VRO-178	66.41	2.55	15.23	12.35	12.32	16.02	243.70
12	VRO-416-10-1	39.37	2.71	18.10	14.17	12.10	18.18	329.10
13	VRO-136 Thin	79.21	2.10	14.28	12.56	13.03	15.51	221.91
14	PK	75.34	2.75	14.94	11.42	17.53	14.40	214.86
15	Kashi Vardhan	100.26	3.36	11.72	10.85	14.43	14.48	169.80
16	Laram-1	75.33	3.80	11.59	13.06	14.38	14.51	168.51
17	Pusa Makhmali	95.83	4.05	13.85	11.94	14.80	14.91	206.70
18	Kashi Kranti	78.58	3.89	12.71	10.95	13.83	11.06	140.55
19	Punjab Padmini	61.62	3.30	13.08	12.43	13.67	13.22	176.01
20	VRO-118	62.76	2.62	13.38	11.22	13.90	10.92	146.18
21	VRO-103	82.16	2.77	11.99	9.07	16.35	9.99	124.24
22	VRO-114	76.02	2.73	12.63	11.72	17.35	14.98	192.24
23	Azad Bhindi-2	69.93	2.52	12.90	14.25	14.35	11.83	150.38
24	Arka Anamika	98.56	2.07	12.88	11.00	16.75	12.86	165.51
25	VRO-104	66.00	2.76	12.16	10.57	16.20	9.40	114.38
26	VRO-107	81.93	2.76	12.74	11.15	16.40	12.49	159.19
27	VRO-105	79.42	3.00	12.80	9.77	14.18	11.06	141.57
28	VRO-115	81.60	1.89	12.03	10.59	15.34	9.73	117.13
29	VRO-113	78.71	2.30	13.28	10.32	16.18	16.38	217.69
30	VRO-6	80.78	2.60	13.61	12.15	14.22	14.02	190.72
31	Kashi Utkarsh	54.36	2.60	13.04	10.55	13.96	11.47	149.31
32	Kashi Sahishnu	85.45	2.00	13.04	11.22	14.44	14.04	182.90
33	Kashi Prakram	76.10	1.75	13.75	11.56	15.80	15.81	217.45
34	VRO-108	101.91	1.81	12.63	12.80	14.46	17.81	224.26
35	VRO-121	87.90	2.61	13.83	11.35	15.43	14.57	201.64
36	VRO-117	94.61	3.46	14.47	12.44	15.52	15.55	224.95

Sl. No.	Genotypes	Plant Height at 90 DAS (cm)	No of branches/ plants	Number of fruits per plant	Fruit length (cm)	Fruit width (cm)	Average fruit weight (g)	Yield per plant (g)
37	VRO-119	79.52	2.73	14.60	12.35	15.36	15.35	224.17
38	VRO-122	80.48	2.25	15.53	12.11	15.51	13.67	212.34
39	VRO-116	66.87	2.35	16.30	12.72	14.22	13.85	225.93
40	VRO-102	99.14	3.20	15.55	11.84	15.32	15.71	244.45
41	VRO-109	99.15	3.30	15.51	10.97	15.64	12.93	200.71
42	VRO-112	94.76	2.73	19.06	10.97	11.90	17.68	336.48
43	VRO-125	80.84	3.21	19.54	12.45	10.72	17.50	342.08
44	VRO-128	100.76	2.77	15.31	11.47	12.81	15.99	244.74
45	VRO-123	98.75	1.30	16.53	13.12	12.00	15.02	248.17
46	VRO-146	73.20	3.565	14.17	12.24	14.56	15.11	214.16
47	VRO-126	93.80	3.21	14.28	12.48	14.96	15.52	221.70
48	VRO-124	60.59	2.89	13.65	11.24	14.48	15.65	213.66
49	VRO-147	78.81	5.10	14.12	10.72	14.73	13.70	193.10
50	VRO-120	94.02	4.05	18.50	11.36	13.24	19.64	363.44
51	VRO-129	86.52	2.29	13.69	11.51	15.45	14.83	202.96
52	VRO-101	60.34	5.55	14.58	13.36	14.83	14.39	209.69
53	VRO-132	91.72	4.50	13.17	11.44	12.96	13.89	183.59
54	Sushtira-1	99.79	3.79	12.49	10.54	15.90	13.12	164.01
55	VRWTTP-19	35.39	3.37	18.60	4.48	18.74	5.11	92.79
56	VRTP-32	45.43	2.79	18.42	3.90	19.47	4.69	86.44
57	VRTP-35	36.14	2.15	18.81	4.00	20.19	4.71	88.75
58	Kashi Lalima	108.59	4.05	19.04	12.65	13.08	18.59	353.91
59	Kashi Pragati	98.01	3.35	19.03	12.70	12.28	19.68	374.62
60	Kashi Satadhari	84.32	2.62	14.33	14.82	11.63	19.82	284.04
61	Azad Bhindi-1	114.74	2.78	14.15	12.74	13.38	17.41	245.94
62	Pusa Swani	92.77	3.57	15.47	12.39	15.33	14.98	231.70
63	Hisar Unnat	84.64	4.38	21.64	13.59	13.98	16.63	359.99
64	Gayatri	77.83	3.59	20.41	12.34	13.17	16.90	344.68
65	Azad Bhindi-3	111.61	4.05	15.10	13.44	13.48	14.83	223.90
66	Pusa Bhindi-5	88.89	3.61	12.33	7.44	11.69	12.52	154.51
67	Local Collection from Arunachal Pradesh	94.81	2.25	13.93	11.95	15.06	13.48	187.94
68	Pusa Lal Bhindi	77.14	3.30	11.11	10.44	13.23	13.36	148.38
69	Selection from Kashi Lalima	87.44	4.26	13.04	12.48	12.66	12.30	160.26
70	Radhika (F_1)	62.57	4.45	14.44	12.58	14.73	12.38	178.80
71	Local Collection from Meghalaya	47.70	3.85	13.02	8.10	12.53	11.05	178.80

Sl. No.	Genotypes	Plant Height at 90 DAS (cm)	No of branches/ plants	Number of fruits per plant	Fruit length (cm)	Fruit width (cm)	Average fruit weight (g)	Yield per plant (g)
72	Selection from Pusa A5	50.87	4.41	11.10	13.75	12.31	10.15	112.79
73	Diya Desi Bhindi	54.59	4.80	11.08	7.11	12.33	10.12	111.85
74	Parbhani Kranti	56.81	3.59	11.40	8.11	13.43	7.53	85.57
75	Arka Abhay	52.87	3.25	13.89	13.25	12.63	7.25	100.69
76	Jhar Bhindi	55.29	2.45	14.54	8.44	12.76	9.93	147.69
77	Midnapore 5 Sira Bhindi	59.91	3.02	12.57	9.15	13.63	8.24	100.35
78	Satdhara Bhindi	60.12	3.66	12.39	10.97	14.10	12.76	156.11
79	Barsati Bhindi	57.27	2.56	13.25	10.50	16.06	9.64	130.33
80	Dev Sanm Bhindi	62.93	2.66	12.51	12.02	14.60	11.77	146.92
81	Rudra Bhindi	64.35	2.80	12.78	11.46	14.96	9.13	119.65
82	IR-8 Bhindi	61.61	4.00	11.71	8.63	13.76	11.75	141.07
	CD (P<0.05)	7.58	1.18	0.91	0.89	0.80	0.78	8.98
	SEM ±	2.71	0.42	0.32	0.31	0.28	0.28	3.21
	SE (d) ±	3.83	0.59	0.46	0.45	0.40	0.39	4.54
	CV	6.13	19.29	3.96	4.90	3.50	3.58	2.83

Table 3.5. List of five superior genotypes for yield and their contributing traits in okra

Sl. No.	Characters	Best five genotypes
1	Plant height at 30 days (cm) (maximum)	Rudra Bhindi, IR-8 Bhindi, Midnapore 5 Sira Bhindi, Satdhara Bhindi, Dev Sanm Bhindi
2	Plant height at 60 days (cm) (maximum)	Kashi Lalima, Pusa Sawani, Azad Bhindi-3, Azad Bhindi-1, Pusa Makhmali
3	Plant height at 90 days (cm) (maximum)	Kashi Lalima, Azad Bhindi-3, Azad Bhindi-1, VRO-4, VRO-108
4	Internodal length (cm) (minimum)	Genotype No. 315, Hisar Unnat, VRO-416-10-1, Local Collection from Meghalaya, VRO-147
5	Number of fruits per plant (maximum)	Hissar Unnat, Gayatri, VRO-125, VRO-112, Kashi Lalima
6	Number of branches per plant (maximum)	VRO-101, VRO-147, Diya Desi Bhindi, HRB-55, VRO-132
7	Fruit length (cm) (maximum)	Kashi Satadhari, Azad Bhindi-2, VRO-416-10-1, Hisar Unnat, Selection from Pusa A-5
8	Fruit width (mm) (minimum)	VRO-125, VRO-5, Kashi Satadhari, Pusa Bhindi-5, VRO-112
9	Average fruit weight (g) (maximum)	Kashi Satadhari, Kashi Pragati, VRO-120, Kashi Lalima, VRO-416-10-1
10	Yield per plant (g) (maximum)	Kashi Pragati, VRO-120, Hissar Unnat, Kashi Lalima, Gayatri

Table 3.6. Estimates of genetic parameters for plant morphological, fruit yield, and yield-attributing characters in okra genotypes under evaluation

Characters	Phenotypic coefficient of variation (PCV)	Genotypic coefficient of variation (GCV)	Heritability (Broad sense) (h^2; %)	Genetic advance	GAM/ Genetic Gain (%)
Plant height at 30 DAS (cm)	23.61	22.32	89.41	10.34	43.49
Plant height at 60 DAS (cm)	24.60	23.74	93.14	28.89	47.20
Plant height at 90 DAS (cm)	24.52	23.74	93.74	36.27	47.35
Number of branches per plant	31.60	29.44	86.81	1.77	56.51
Length of the 5th Internode (cm)	23.54	21.74	85.24	1.35	41.34
Number of fruits per plant	16.57	16.09	94.27	4.59	32.18
Fruit length (cm)	18.51	17.85	92.99	3.99	35.47
Fruit width (cm)	12.74	12.25	92.43	3.45	24.27
Average fruit weight (g)	24.16	23.89	97.79	6.60	48.67
Yield per plant (g)	34.87	34.75	99.34	140.25	71.36

DAS: Days After Sowing

Table 3.7. Genotypic and phenotypic correlation coefficients# for different morphological and yield traits in different genotypes of okra evaluated in the present study

Characters	Plant height at 30 DAS	Plant height at 60 DAS	Plant height at 90 DAS	Length of the 5th internode	Number of fruits/ plant	Number of branches /plant	Fruit length	Fruit width	Average fruit weight	Yield per plant
Plant height at 30 DAS	1.000	-0.157*	-0.154*	0.512**	-0.311**	-0.250**	-0.097	-0.191**	-0.287**	-0.284**
Plant height at 60 DAS	-0.109	1.000	0.969**	0.088	0.049	0.240**	0.449**	-0.211**	0.568**	0.455**
Plant height at 90 DAS	-0.114	0.932**	1.000	0.087	0.088	0.212**	0.394**	-0.156*	0.569**	0.464**
Length of the 5th Internode	0.436**	0.037	0.05	1.000	-0.392**	-0.381**	-0.172**	-0.088	-0.281**	-0.359**
Number of fruits/ plant	-0.276**	0.046	0.088	-0.334**	1.000	0.427**	0.019	0.014	0.315**	0.687**
Number of branches/ plant	-0.220**	0.224**	0.194**	-0.332**	0.386**	1.000	0.024	0.046	0.287**	0.394**
Fruit length	-0.073	0.420**	0.379**	-0.147*	0.02	0.019	1.000	-0.452**	0.681**	0.540**
Fruit width	-0.169**	-0.199**	-0.146*	-0.083	0.01	0.033	-0.423**	1.000	-0.445**	-0.400**
Average fruit weight	-0.272**	0.544**	0.546**	-0.266**	0.297**	0.271**	0.650**	-0.423**	1.000	**0.**893**
Yield per plant	-0.265**	0.437**	0.449**	-0.332**	0.673**	0.370**	0.518**	-0.382**	0.886**	1.000

**(P<0.01); *(P<0.05); #In the above table, correlation coefficients at the genotypic level are presented in the upper diagonal, while those at the phenotypic level are shown in the lower diagonal.

Evaluation of Breeding Lines of Okra for Yield and Quality Traits

A total of 128 advanced breeding lines (F3 and F4 generations) were evaluated using an augmented block design to assess morphological, yield, and nutritional traits (Fig. 3.11). Observations were observed for different horticultural and yield parameters, including the first flowering node, days to first flowering, days to 50% flowering, plant height at 30, 60, and 90 days after sowing (DAS) (cm), length of the 8th-9th internode, pod yield per plant (g), number of fruits per plant, fruit length (cm), fruit width (cm), average fruit weight (g), and YVMV disease incidence at 30, 30,60 and 90 days after sowing (DAS) (percentage), 100 seed weight (g) and biochemical parameter includes total phenol content (mg GAE/100mg), Antioxidant activity (mg AEAC/100g), Vitamin-C (mg/100mg) and Total micronutrient (Zn, Cu, and Fe).

Analysis of variance revealed significant genotypic variability for most traits. High-yielding genotypes included SNO-40 (1312 g), SNO-61 (1108 g), and SNO-47 (1082 g), while SNO-6 and SNO-18 were early maturing and high yielding under Jharkhand conditions. Fruit length (0.45) and average fruit weight (0.85), number of pods per plant (0.68), and plant height showed strong positive correlations with yield per plant, while copper and phenol content showed negative associations for the summer season (Tables 3.8-3.10).

Fig. 3.11. Screening plot of okra

Among biochemical traits, zinc and copper displayed very high heritability (99.45% and 88.81%) and substantial genetic advance, offering additive gene action and high potential for direct selection. Recorded significant and negative correlations of copper (r=-0.25) and phenol contents of the pods at edible maturity with yield per plant. Total phenols and vitamin C showed moderate variability, while iron and antioxidant activity were largely influenced by environmental factors. The study demonstrates considerable genetic variability in okra breeding lines, providing valuable insights for selection and crop improvement. The identified superior genotypes with enhanced yield and nutritional quality, particularly for zinc and copper accumulation, can be utilized in future breeding programs aimed at developing high-yielding and nutritionally enriched okra cultivars.

Table 3.8. List of best-performing lines for important yield-attributing characters (Rainy season)

Traits	Genotype
Days to first flowering	SNO-6, SNO-13, SNO-10, SNO-8, SNO-5, SNO-3
First flowering node	SNO-18, SNO-34, SNO-22, SNO-67, SNO-42, SNO-35
Days to 50% flowering	SNO-6, SNO-9, SNO-13, SNO-10, SNO-5, SNO-3
8th-9th Internodal length	SNO-63, SNO-66, SNO-94, SNO-95, SNO-68,
Plant height 30DAS (cm	SNO-119, SNO-121, SNO-74, SNO-110, SNO-104,
Plant height 60DAS (cm)	SNO-116, SNO-119, SNO-121, SNO-117, SNO-110
Plant height 90DAS (cm)	SNO-116, SNO-119, SNO-121, SNO-126, SNO-98,
Pod length (cm)	SNO-51, SNO-65, SNO-39, SNO-68, SNO-80
Pod width (mm)	SNO-21, SNO-20, SNO-108, SNO-55, SNO-111
Pod weight (g)	SNO-52, SNO-39, SNO-8, SNO-10, SNO-112,
No. of pods per plant	SNO-83, SNO-42, SNO-82, SNO-35, SNO-94
Pod yield per plant (g)	SNO-40, SNO-61, SNO-47, SNO-44, SNO-95

Table 3.9. List of best-performing lines for important yield-attributing characters (summer season)

Traits	Genotype
Days to first flowering	SNO-7, SNO-38, SNO-57, SNO-15, SNO-50,
First flowering node	SNO-18, SNO-112, SNO-113, SNO-117, SNO-24

Traits	Genotype
Days to 50% flowering	SNO-6, SNO-9, SNO-13, SNO-115, SNO-10, SNO-3
8th-9th Internodal length	SNO-63, SNO-66, SNO-94, SNO-95, SNO-68,
Plant height 30DAS (cm)	SNO-13, SNO-3, SNO-16, SNO-17, SNO-128,
Plant height 60DAS (cm)	SNO-13, SNO-128, SNO-3, SNO-16, SNO-17
Plant height 90DAS (cm)	SNO-56, SNO-44, SNO-127, SNO-128, SNO-100

Traits	Genotype
Pod length (cm)	SNO-54, SNO-17, SNO-45, SNO-12, SNO-25
Pod width (mm)	SNO-97, SNO-45, SNO-86, SNO-85, SNO-95
Pod weight (g)	SNO-103, SNO-55, SNO-93, SNO-8, SNO-4
No. of pods per plant	SNO-97, SNO-22, SNO-92, SNO-70, SNO-35
Pod yield per plant (g)	SNO-103, SNO-92, SNO-55, SNO-6, SNO-93

Table 3.10. Mean performance of 26 selected okra segregating lines for nutritional parameters

GENOTYPE	Vit-C (mg/100g)	Antioxidants (mg/100g)	Total Phenol contents	Cu (mg/100g)	Fe (mg/100)	Zn (mg/100g)
SNO–1	0.35	389.04	1750.71	65.80	18.86	53.03
SNO–2	0.30	197.92	845.88	57.10	18.63	58.50
SNO–3	0.31	256.62	516.69	64.40	27.36	74.23
SNO–5	0.16	397.76	587.49	87.60	21.53	64.66
SNO–11	0.30	208.61	573.24	44.40	24.90	56.36
SNO–14	0.37	336.78	639.90	55.70	18.76	50.06
SNO–15	0.36	139.14	884.04	59.30	17.60	48.83
SNO–17	0.21	326.51	539.21	52.20	21.23	40.16
SNO–21	0.26	246.33	706.57	35.90	22.63	56.60
SNO–22	0.30	217.56	630.25	66.00	17.10	40.20
SNO–24	0.30	253.92	703.81	48.26	17.00	42.83
SNO–25	0.35	372.39	724.04	17.10	22.13	58.83
SNO–26	0.33	297.28	643.12	58.73	21.36	31.93
SNO–35	0.36	254.94	783.81	47.83	20.90	43.73
SNO–42	0.20	194.94	718.98	102.50	14.90	74.66
SNO–47	0.30	235.37	755.31	65.90	20.06	53.76
SNO–48	0.25	197.16	673.01	29.10	21.26	54.36
SNO–57	0.30	414.20	596.69	37.60	16.30	51.36
SNO–66	0.23	296.14	1014.16	111.10	25.46	65.06
SNO–74	0.20	204.35	790.71	83.96	11.10	57.56
SNO–91	0.20	302.13	607.26	41.00	20.03	52.60
SNO–95	0.30	332.19	513.01	85.60	18.70	141.60
SNO–96	0.31	367.34	576.00	37.60	15.13	87.70
SNO–118	0.30	366.09	661.05	35.90	19.30	60.66
SNO–127	0.26	262.05	604.50	39.30	22.50	862.03
SNO–128	0.23	245.88	493.24	76.50	22.16	61.70

Genetic Improvement of Pointed Gourd/ Parwal for Yield and Quality Enhancement

To identify the suitable and best-performing genotype of pointed gourd for the Jharkhand condition, a total of 18 diverse germplasm of pointed gourd have been collected and procured from the farmers' fields and research institutions (Fig. 3.12). Data were recorded for vegetative and reproductive traits during two consecutive years, and potential genotypes were identified. In the field evaluation, a wide range of variations were recorded for agronomic and yield traits. Traits like the number of fruits/plants, pulp weight, pulp seed ratio, number of seeds, and seed weight are important traits having the potential to enhance pointed gourd fruit yield, while early flowering habit, harvest frequency, pericarp thickness, seed shape, and colour pattern are the desirable traits that need to be focused on from the farmer's perspective besides yield.

A range of variations was recorded in the evaluated genotypes:

- Vine length (54.3-456.9 cm)
- Node number to bear the first flower (4-17)
- Internodal Length (3.5-10.3 cm)
- Leaf length (4.4-6.5 cm)
- Leaf breadth (4.0-7.4 cm)
- Fruit length (3.1-8.3 cm)
- Fruit girth (5.1-10.6 cm)
- Fruit weight (10.2-42.9 g)
- Seed number per fruit (4.2-12.1)
- Fruits per plant (9.1-45.2)

Fig. 3.12. Collected germplasm of pointed gourd

The average performance of the pointed gourd clones (genotypes) was evaluated as follows:

- The vine length of most of the clones was medium (1-2 m).
- Most of the clones bore medium-length (5-8 cm) and medium-weight (15-30 g) fruits.
- Days to seedling emergence: 25 DAS
- Days to first female flowering: 130 DAS
- Days to first fruit harvest: 145 DAS
- Fruit Shape: Spindle, Oval
- Fruit colour: Light Green, Green, Dark Green
- Skin pattern: Striped, Uniform

At the prevailing field condition of the institute genotypes, Rajendra Parwal 2, Swarna Rekha, HARP 63, GKP 3, HARP 18, and GKP 2 performed better to advance the material and were used in breeding programs (Fig. 3.13). Crossing was made, and viable seeds of the F1 generation were obtained that are planted and are in the seedling stage.

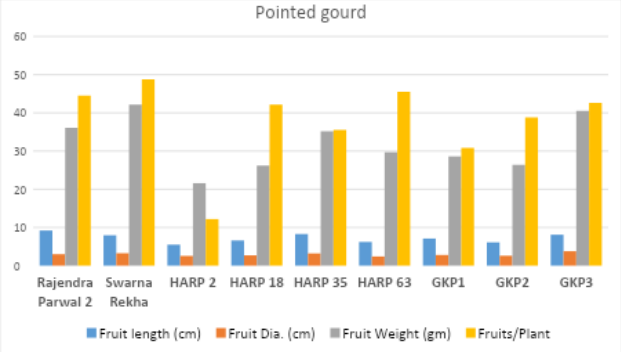


Fig. 3.13. Performance evaluation of collected pointed gourd germplasms

Screening of Heat Tolerant Varieties for *Kharif* Potato-Wheat Cropping System

Eight potato varieties were selected for experimental trials this year, *viz.*, Kufri Lima, Kufri Lauvkar, Kufri Pukhraj, Kufri Khyati, Kufri Chandramukhi, Kufri Jyoti, Kufri Jawahar, Kufri Surya procured from CPRI, RS, Patna. Field screening of these varieties is in progress.

Evaluation of Fruit Crops and Varieties

Elite planting materials of various potential fruit crop varieties have been collected from various parts of the country (Table 3.11) and established at the research farm of ICAR-IARI Jharkhand. The evaluation of collected genotypes is under progress for suitability in the region based on growth and fruit-quality attributes. Further, the local germplasms

of mango (seedlings), lemon, and custard apple have been collected to assess the diversity of perennial fruit crops in the region. Soil samples from different depths have also been collected for determination of changes in soil properties in perennial fruit orchards.

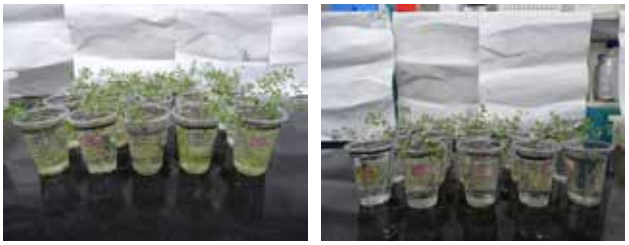
Table 3.11. Details of crops and their varieties collected from different parts of the country

Crop	Varieties
Mango (41 genotypes)	Variety (1) Totapuri, (2) Swarnarekha, (3) Banganapalle, (4) Neelam, (5) Chausa, (6) Dashehari, (7) Langra, (8) Malda, (9) Kesar, (10) Arka Neelachal Kesari, (11) Zardalu, (12) Bombay Green, (13) Himsagar, (14) Kisan Bhog, (15) Sukul, (16) Imam Pasand, (17) Raspuri, (18) Alphonso, (19) PaharpurSindhuria (20) Lal Sundari (21) Appemidi Hybrids (1) Manjeera, (2) Neeleshan, (3) Neeleswari, (4) Neelgoa, (5) Mahmood Bahar, (6) Arunika, (7) Ambika, (8) Amrapalli, (9) Mallika, (10) Pusa Arunima, (11) Pusa Sreshtha, (12) Arka Puneet, (13) Pusa Peetamber, (14) Pusa Lalima, (15) Pusa Pratibha, (16) Arka Uday, (17) Akra Suprabhat, (18) Pusa Manohari, (19) Pusa Deepsikha, (20) Arka Puneet
Guava (18 genotypes)	(1) Lucknow 49, (2) Allahabad Safeda, (3) Arka Kiran, (4) Arka Mridula, (5) Pusa Prateeksha, (6) Pusa Arushi, (7) CISH Lalit, (8) CISH Sweta, (9) CISH Dhawal, (10) CISH Lalima, (11) Arka Poorna, (12) Arka Rashmi (13) Safed Jam (14) Pant Prabhat (15) Hisar Safeda (16) Allahabad Surkha (17) Arka Amulya (18) Arka Poorna
Jamun (3 genotypes)	(1) CISH-J-37 Jamvant, (2) CISH J-42, (3) Dhupdal
Litchi (7 genotypes)	(1) Shahi, (2) Rose Scented, (3) China, (4) Gandaki Yogita, (5) Gandaki Sampada, (6) Gandaki Lalima, (7) Late Bedana
Ber (3 genotypes)	(1) Apple Ber, (2) Gola, (3) Umran
Sapota (6 genotypes)	(1) Cricket Ball, (2) Kalipatti, (3) Murabba, (4) DSH-1, (5) DSH-2 (6) PKM -1
Custard apple (3 genotypes)	(1) Akra Neelachal Vikram, (2) Arka Sahan, (3) Balanagar
Jackfruit (2 genotypes)	(1) Siddhu, (2) Shankara
Citrus (35 genotypes)	*Lemon (1)*: Kagzi Kalan Sweet orange (10): Mosambi, Pusa Round and Pusa Sharad, Mosambi Nucellar, Cutter Valencia, JSO1 (Hamlin), JSO2 (Westin), JSO 3 (Natal), JSO-4 (Pera), JSO 5 (Valencia) *Lime (12)*: Seedless, Kagzi lime, Pusa Abhinav, Pusa Udit, Phule Sarbati, Jaidevi, Parmalini, Sai Sarbati, PDKV Bahar, NRCC-7, NRCC-8, Balaji *Mandarins (3)*: Kinnow, Coorg Mandarin, Nagpur Mandarin, *Pummelo (6)*: Arka Ananatha, Arka Chandra, Pusa Arun, Devanhalli, Pummelo-5, Pummelo US-145, *Other (3)*: Kumquat, Calamondin, Pearl Tangelo
Grapes (4 genotypes)	(1) Pusa Aditi, (2) Pusa Trishar, (3) Pusa Navrang, (4) Pusa Urvashi
Bael (5 genotypes)	(1) CISH B1, (2) CISH B2, (3) NB 5, (4) NB9, (5) Swarna Vasudha
Aonla (6 genotypes)	(1) Chakaiya, (2) Kanchan, (3) Krishna, (4) NA-6, (5) NA-7, (6) NA 10
Dragon fruit	(1) Pink Pulp, (2) White Pulp
Mulberry	(1) Swarna Rasraj, (2) Thar Harit, (3) Thar Lohit, (4) Local Collection 1

Breeding for Abiotic Stress Tolerance

Screening of Lentil Genotypes for Low Phosphorus Tolerances at Seedling

A diverse set of 112 lentil accessions procured from ICAR-NBPGR, New Delhi, and representing a broad geographical range, encompassing low phosphorus regions of India, was utilized for the experiment. The 5-day-old seedlings were transferred to Hoagland solution. The optimum and low phosphorus conditions were maintained by preparing stock solution of $NH_4H_2PO_4$ with concentrations of 250 mM and 3 mM, respectively. Observations on root and shoot architectural traits were recorded in 24-day-old seedlings. Root scanning was performed using the EPSON XL 1000 professional scanner to capture high-resolution images, followed by image analysis using WinRhizo software. The experiment was conducted in coordination with ICAR-IIAB, Ranchi. The software provided detailed root trait data, including total root length (TRL, cm/plant), total root surface area (TSA, cm^2/plant), total root volume (TRV, cm^3/plant), and root average diameter (RAD, cm). Additionally, primary root length (PRL, cm/plant) and Primary shoot length (PSL, cm/plant) were measured manually using a meter scale and Root/Shoot ratio was calculated. Most root system metrics exhibited significant reductions under low phosphorus conditions except for primary root length and root-to-shoot ratio, which showed 21.6% and 33.45% increases, respectively, under low P conditions over optimum P condition (Fig. 3.14-3.15). The results clearly indicated that there is greater biomass partitioning to roots under a P stress environment.



(a) Optimum P **(b) Low P**

Fig. 3.14. Seedlings grown under optimum and low P conditions

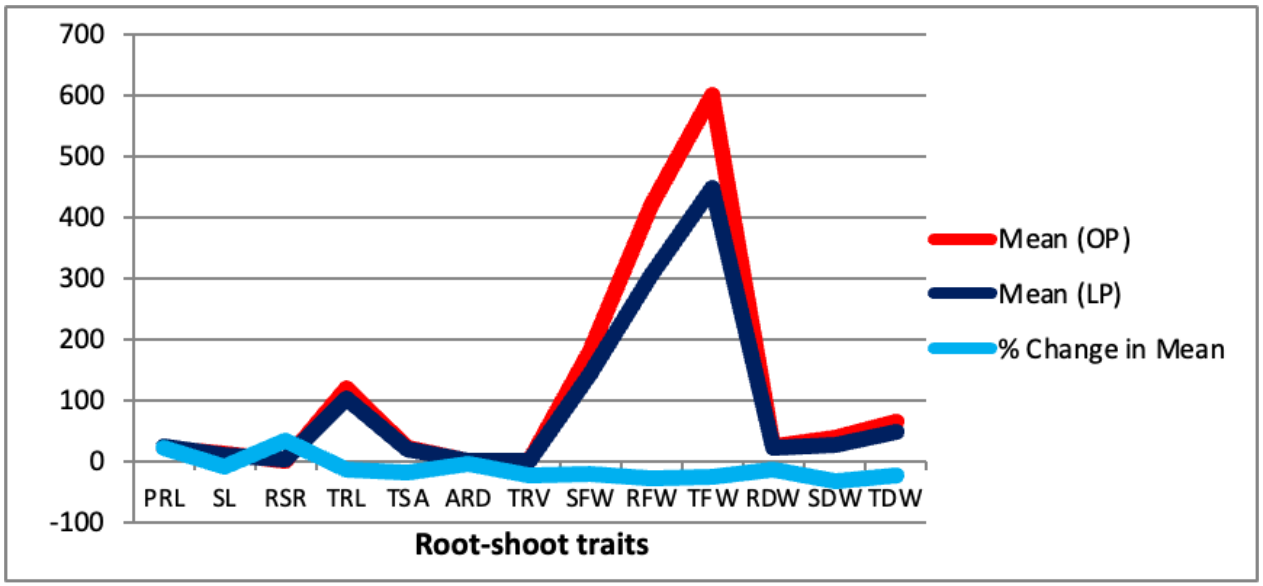


Fig. 3.15. Mean value and percent change in mean of root-shoot traits under optimum and low P conditions

Identification of Efficient and Inefficient Genotypes for Low Phosphorus Tolerance in Lentil

The 112 lentil genotypes were classified into 3 groups: (E)-Efficient (genotype mean >μ+SD), (M)-Medium efficient (genotype mean between μ–SD to μ+SD), (I)-Inefficient (genotype mean <μ-SD) based on root and shoot architectural traits studied during hydroponic evaluation, maintaining two different phosphorus regimes (optimum and low phosphorus condition; Fig. 3.16-3.18).

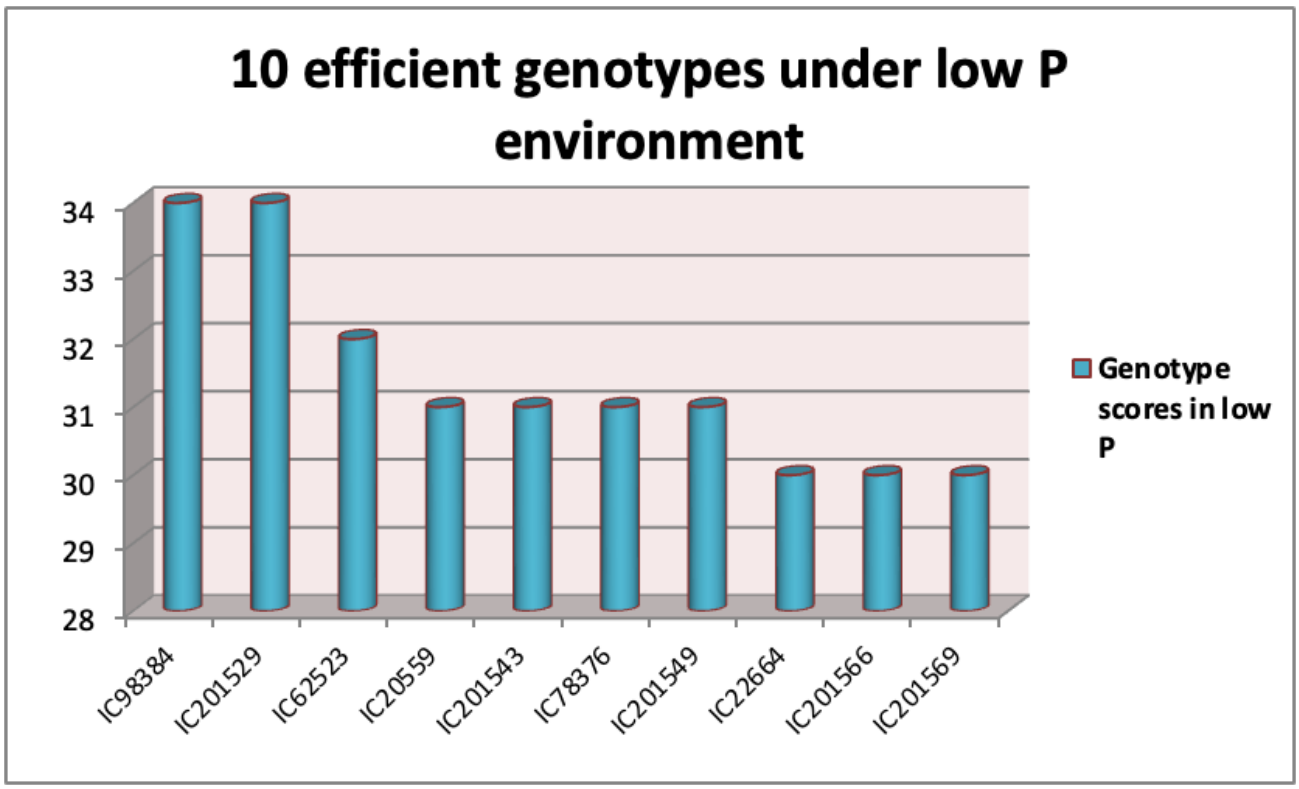


Fig. 3.16. Ten efficient genotypes under low P condition

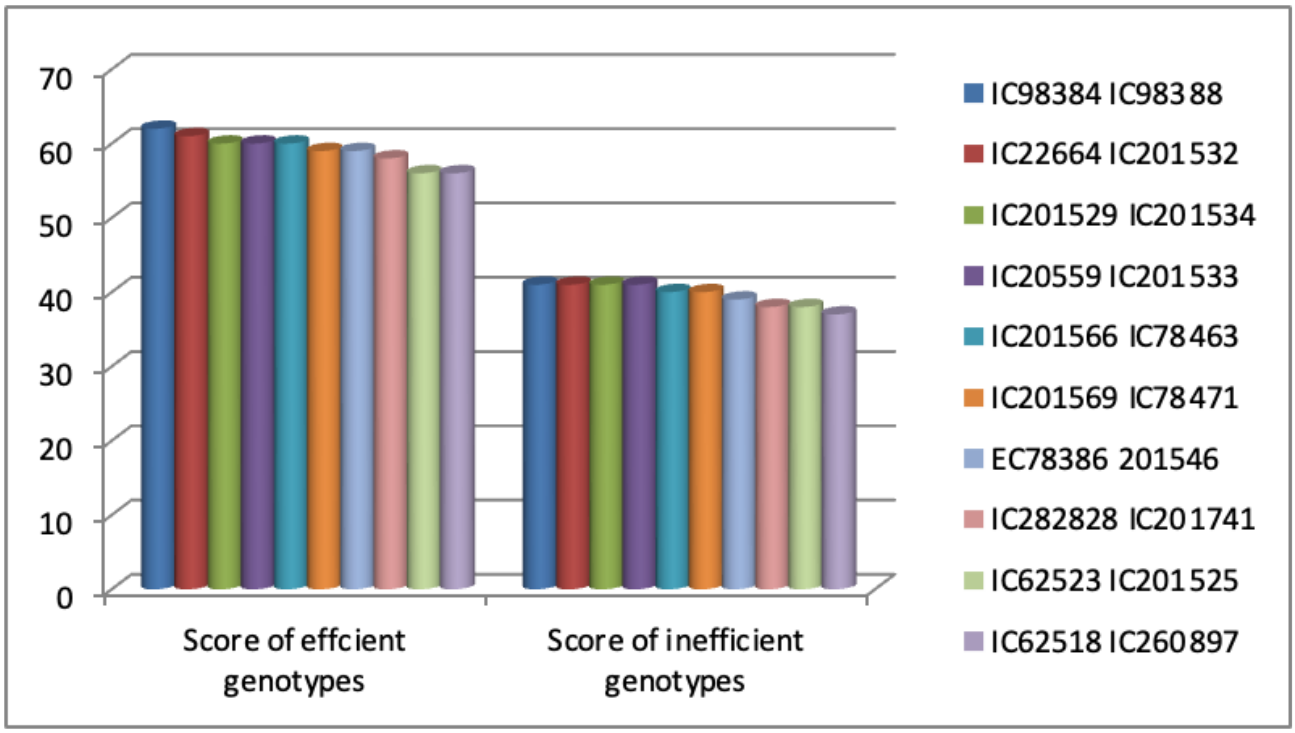


Fig. 3.17. Ten efficient and inefficient genotypes based on overall scoring

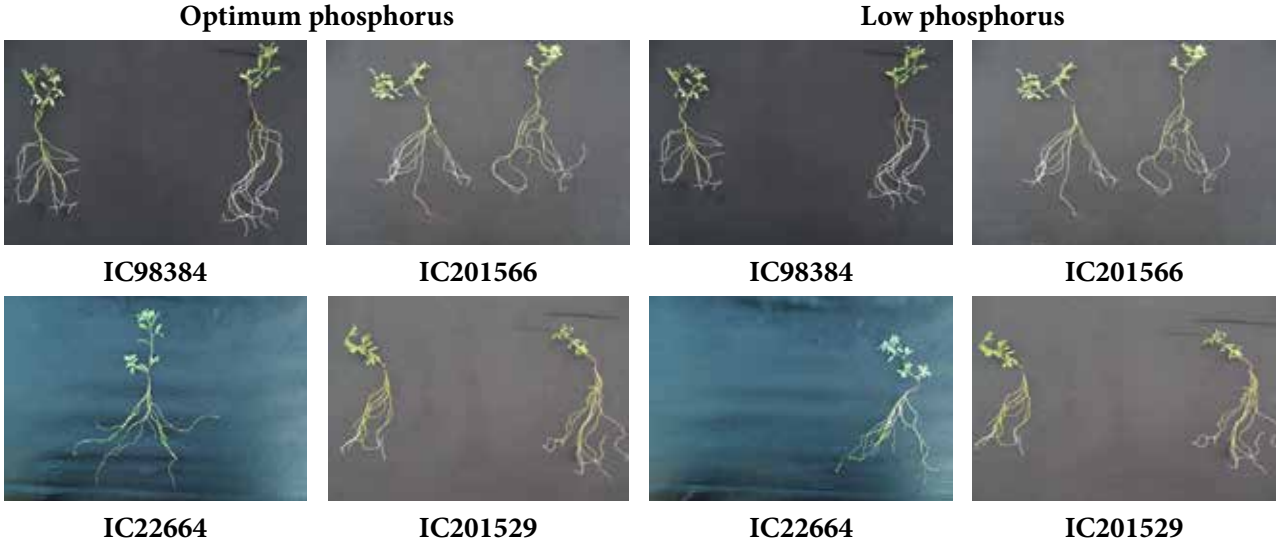


Fig. 3.18. Growth performance of P-efficient lentil genotypes under contrasting phosphorus conditions

Differential Expression Analysis of *PHT* and *PSTOL1* Genes in Lentil Genotypes

The two efficient/semi-efficient lines (IC22664 and IC98384) demonstrated strong, treatment-induced upregulation of the majority of phosphate-transporter genes, while the inefficient lines (IC260897 and IC201525) only displayed weak or inconsistent responses. This pattern became evident when all genotypes were compared to the efficient check L-4602. In particular, after the low-P treatment, *GmPHT1* ortholog was significantly stimulated in IC22664 and IC98384, but IC260897 showed minimal change, and IC201525 showed a slight but noteworthy rise. *MtPHT6* and *MtPT1* orthologs were among the most substantially upregulated genes in IC22664 and IC98384. *VrPT17* ortholog had a similar trend, with a relatively slight elevation in the other genotypes and a substantial induction in IC22664 and IC98384. *PSTOL1* and *CcPT1* orthologs were significantly elevated in IC22664, but IC201525 and IC260897 showed negligible or no alterations. Under both circumstances, L-4602 (the efficient check) maintained low baseline expression, indicating that the significant fold-changes seen in IC22664 and IC98384 are indicative of treatment-responsive P-acquisition pathway activation (Fig. 3.19).

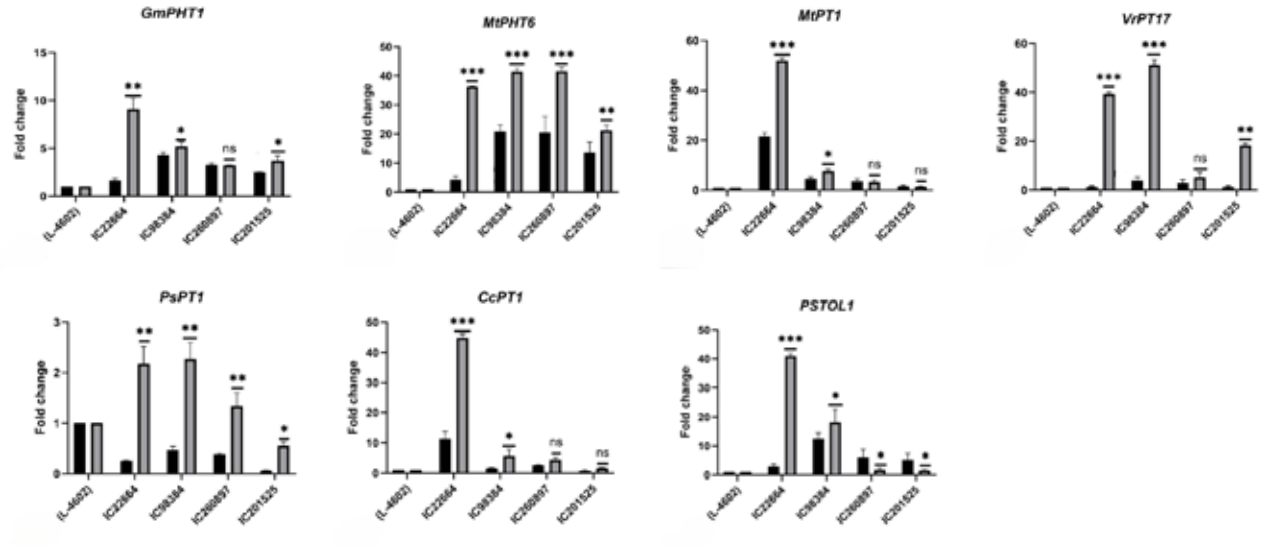


Fig. 3.19. Differential expression analysis of *PHT* ortholog genes in lentil genotypes with reference to efficient check L-4602

Hydroponic Screening and Identification of Aluminium Toxicity Tolerant Maize Genotypes

Aluminium (Al) toxicity is a major constraint to maize productivity in acidic soils, primarily due to its inhibitory effects on early root growth and establishment. To address this, a high-throughput hydroponic screening protocol was optimized using modified Magnavaca-II nutrient solution and applied to a diverse panel of 250 tropical maize inbred lines. Five key root traits, namely total root length (TRL), root surface area (RSA), root volume (RV), average root diameter (AD), and number of root tips (NRT), were quantified using the WinRHIZO imaging software. Aluminium tolerance was assessed using the Relative Root Tolerance Index (RRTI) and percent reduction metrics. Optimization experiments involving seven elite inbred lines exposed to graded $AlCl_3$ concentrations (0-1500 µM) identified 300 µM $AlCl_3$ at 11 days after germination as the most effective condition for differentiating genotypic responses. Under this optimized condition, highly significant genotypic variation and genotype × treatment interactions were observed across all traits. Aluminium stress resulted in a 10-40% reduction in TRL, RSA, RV, and NRT, while AD increased, indicating compensatory root thickening. Wide variability in tolerance indices was recorded, with RRTI values ranging from 3.83 to 533.88, reflecting diverse adaptive responses among genotypes. Multivariate analyses, including principal component analysis and composite indices, identified IMR292, IMR592, IMR463, IMR621, IMR546, IMR534, IMR629, and IMR395 as highly tolerant genotypes due to their ability to maintain root elongation and branching under stress, whereas IMR388, IMR33, IMR58, IMR349, and IMR446 were identified as highly susceptible.

Three-way factorial ANOVA further revealed highly significant effects of genotype, aluminium concentration, and exposure duration for all root traits, with aluminium concentration exerting the strongest influence, particularly on TRL and NRT. Significant genotype × aluminium interactions confirmed differential stress responses among genotypes, while exposure duration played a critical role in modulating stress expression, especially for RSA and AD. Overall, TRL, RSA, and NRT emerged as the most responsive and reliable traits for aluminium tolerance screening. Further integration of traits through the Multi-Trait Genotype–Ideotype Distance Index (MGIDI) effectively summarized genotypic performance. RRTI-based MGIDI analysis identified IMR592, IMR621, IMR546, IMR463, IMR579, IMR43, IMR629, IMR534, and IMR292 as closest to the ideotype, reflecting strong multivariate tolerance, whereas IMR33, IMR58, IMR388, and IMR446 were consistently identified as least tolerant (Tables 3.12-3.13). Stress-based MGIDI analysis further highlighted genotypes such as IMR621, IMR534, IMR665, IMR546, IMR561, IMR629, and IMR581 for their superior absolute performance under stress conditions. Factor analysis indicated that elongation and branching traits (TRL, RSA, and NRT) contributed most to variation, while AD and RV represented secondary compensatory mechanisms. Positive selection differentials across traits, particularly for RV, RSA, and TRL, demonstrated the effectiveness of MGIDI in identifying superior genotypes. Overall, the study established a robust, scalable phenotyping framework and identified promising genetic resources for breeding aluminium-tolerant maize suited to acid soil regions.

Table 3.12. Most tolerant maize genotypes under aluminium stress identified by RRTI and/or % reduction

Entry	Composite RRTI	Composite % reduction	Identified by RRTI and/or % reduction	Remarks
IMR292	175.53	–78.71	Both	Tolerant
IMR534	144.18	–29.74	Both	Tolerant
IMR463	155.33	–27.64	Both	Tolerant
IMR621	155.07	–20.34	Both	Tolerant
IMR546	151.73	–20.02	Both	Tolerant
IMR592	162.11	–11.75	Both	Exceptionally high AD thickening

Entry	Composite RRTI	Composite % reduction	Identified by RRTI and/ or % reduction	Remarks
IMR629	138.38	–12.38	Both	Balanced performer
IMR395	129.47	–11.78	Both	Retains biomass and tips
IMR585	–	–7.74	% Reduction only	Moderate tolerance
IMR230	–	–6.98	% Reduction only	Moderate tolerance
IMR579	136.76	–	RRTI only	High AD and RV, lower TRL
IMR43	134.21	–	RRTI only	High AD, moderate TRL

Table 3.13. Most susceptible maize genotypes under aluminium stress identified by RRTI and/or % reduction

Entry	Composite RRTI	Composite % reduction	Identified by RRTI and/ or % reduction	Notes
IMR33	33.15	76.95	Both	Extreme reduction of TRL and RSA
IMR58	37.72	68.81	Both	Extreme reduction across all traits
IMR388	30.71	68.34	Both	Extreme reduction of RV and RSA
IMR446	44.26	63.88	Both	Extreme reduction despite moderate AD
IMR349	41.30	59.95	Both	Lower TRL & NRT
IMR493	–	64.16	% Reduction only	Severe TRL and NRT loss
IMR641	–	58.63	% Reduction only	Moderate reduction across traits
IMR175	–	58.12	% Reduction only	Extreme reduction of TRL and RSA
IMR8	–	57.47	% Reduction only	High NRT reduction
IMR50	–	56.07	% Reduction only	TRL loss >65%
IMR452	37.19	–	RRTI only	Low RV, low NRT
IMR368	37.50	–	RRTI only	Low RSA
IMR27	40.21	–	RRTI only	ReducedTRL
IMR76	42.18	–	RRTI only	ReducedTRL
IMR441	43.22	–	RRTI only	ReducedRSA and RV

a.

b.

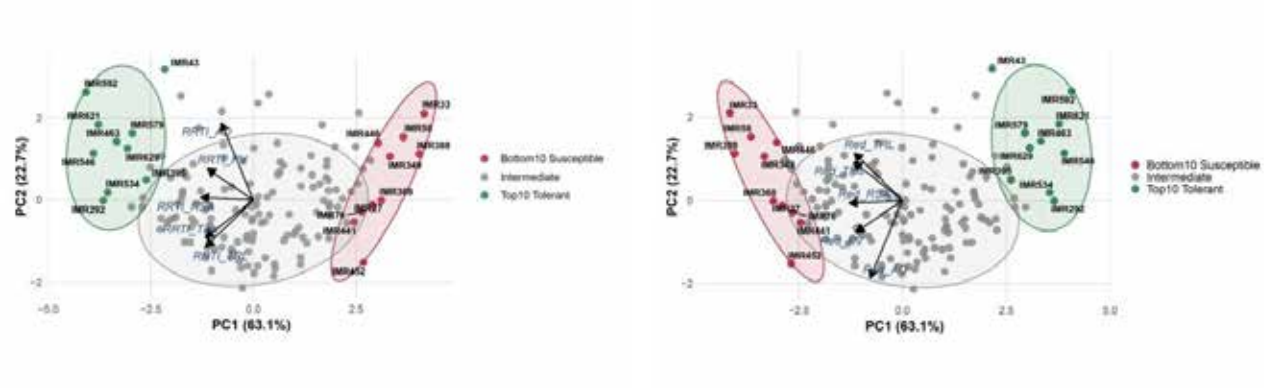


Fig. 3.20. Principal component analysis (PCA) of maize genotypes under Al stress based on (a) relative root tolerance index (RRTIs) and (b) % reduction

Scatter plot of the first two principal components (PC1: 63.1% variance; PC2: 22.7% variance) showing the distribution of top ten tolerant (green), bottom ten susceptible (red), and remaining genotypes (grey; Fig. 3.20). Distinct clustering highlights genetic differentiation between Al-tolerant and susceptible groups. Genotypes with lower MGIDI values (highlighted in red) were closer to the ideotype, reflecting superior tolerance (Fig. 3.21). FA1 primarily represented elongation and branching traits (TRL, RSA, NRT), while FA2 captured biomass and thickening traits (RV, AD).

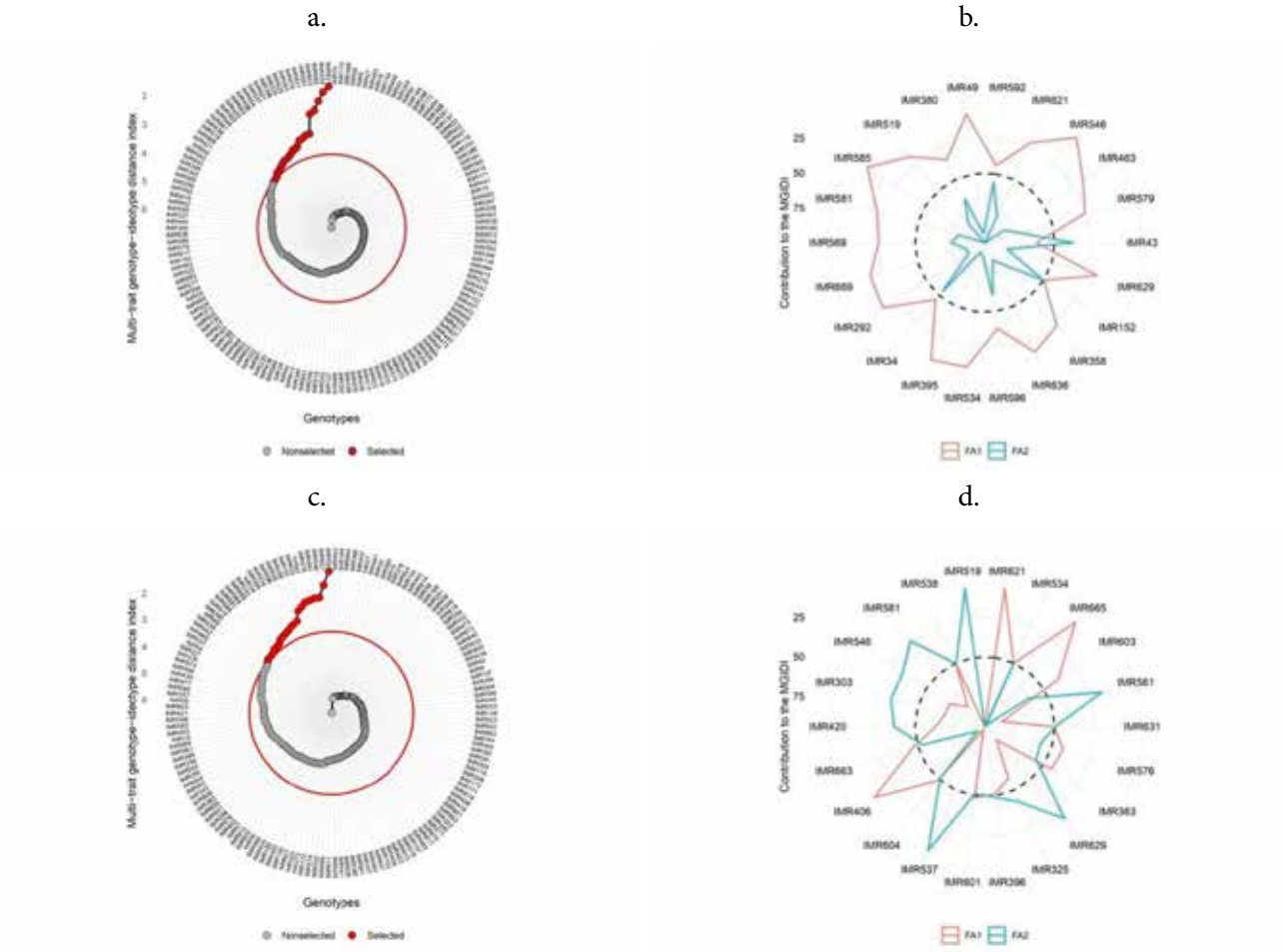


Fig. 3.21. Multi-trait genotype-ideotype distance index (MGIDI) analysis integrating root architectural traits of maize under aluminium (Al) stress; (a-b) MGIDI ranking and factor contribution plots based on RRTI; (c-d) Corresponding plots derived from absolute stress conditions

Genetic Improvement of Fruit Crops

Evaluation of an Improved Grafting Method in Mango

An experiment on improved grafting methods in the case of mango has been initiated in the nursery, where different-day-old and varied-girth mango rootstocks were used for a similar-age scion, and data on the success rate of established grafts have been recorded. Grafting on 45-60-day-old seedlings was practiced in a low-cost net house with an 80-90% success rate (Fig. 3.22). The growth parameters were observed from the grafted plant at different durations at 60-day intervals.

Fig. 3.22. Grafting on 45-60-day-old seedlings of mango

Genetic Improvement of Papaya for Yield and Quality Enhancement

A total of 37 types of local papaya genotypes were collected from hot spot regions of papaya (Jharkhand and Bihar). These germplasms were evaluated for fruit physical traits (fruit weight, length, width, girth, peel thickness, number of seeds, and TSS; Fig. 3.23). The promising types among the collected germplasm were maintained in isolation to maintain genetic purity and controlled pollination among selected genotypes.

Fig. 3.23. Local papaya germplasms evaluated for fruit physical traits

Biotechnological Approaches in Crop Improvement

Functional Characterization of *CEN-Like Protein 2* in Flowering Regulation of Pigeon Pea

The study investigated the role of CEN-like protein 2 from pigeon pea, a homolog of the well-known floral repressor *Terminal Flower 1* (*TFL1*), in regulating flowering and plant development. Using molecular and transgenic approaches, the gene was constitutively expressed in tobacco (*Nicotiana tabacum*) to functionally characterize its impact on developmental transitions. Key findings revealed that transgenic tobacco lines with 2- to 8-fold elevated expression of *CcCEN-like 2* exhibited a significant delay in flowering, retarding floral transition by 26-32 days compared to wild type. This delay was accompanied by enhanced vegetative growth, altered floral morphology, and changes in fruit set parameters, indicating that the gene influences multiple developmental traits beyond flowering time. *In silico* protein analysis demonstrated the conservation of substrate-binding sites across angiosperms, although a nuclear binding domain was absent, suggesting a regulatory mechanism distinct from classical transcription factors. Expression profiling of key flowering-related genes revealed that upstream floral inducers such as

APETALA1 (AP1) and *LEAFY (LFY)* were strongly downregulated in overexpressing lines, confirming repression of the floral activation network. Overall, the findings support that *CcCEN-like 2* functions as a floral repressor, extending the vegetative phase by modifying the expression of central flowering pathway genes (Fig. 3.24). Controlled manipulation of this gene holds potential to refine flowering time and advance breeding strategies in pigeon pea and related crops.

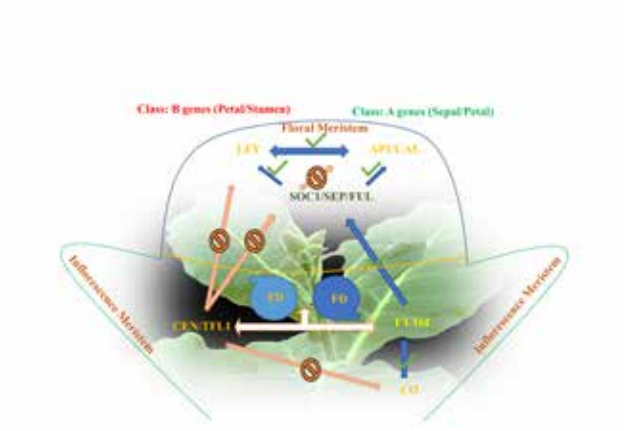


Fig. 3.24. Role of *CcCEN-like 2* gene in regulating the reproductive transition and flowering

Genome-Wide Identification and Stress-Responsive Profiling of *Methyl Transferase* and *Demethylase* Genes in Pigeon Pea

We conducted the first comprehensive genome-wide analysis of *methyltransferase* (*MT*) and *demethylase* (*ALKBH*) gene families in pigeon pea (*Cajanus cajan*), focusing on their potential roles in regulating N^6-methyladenosine (m^6A) RNA methylation- a key epigenetic modification implicated in plant growth, development, and stress responses (Fig. 3.25). Using Arabidopsis sequences as references, two methyltransferase genes (*CcMTA* and *CcMTB*), two *methylation adaptor protein* genes (*CcFIPA* and *CcFIPB*), and ten *demethylase* (*ALKBH*) genes were identified in the pigeon pea genome. Structural analyses, including phylogenetics, gene structure, chromosomal distribution and motif/domain prediction, categorized *MTs* and *FIPs* into distinct groups and grouped ALKBH members into four subfamilies, indicating evolutionary conservation and diversity. Expression profiling revealed tissue-specific patterns: all identified *MTs, FIPs* and *ALKBHs* showed the highest expression in leaf tissue and the lowest in root, suggesting their involvement in fundamental cellular processes. Under abiotic (heat, drought, salt) and biotic (*Helicoverpa armigera* infestation) stresses, several demethylase genes—notably *CcALKBH8*, *CcALKBH10A* and *CcALKBH10B*—exhibited strong induction, while *CcMTA* and *CcMTB* also responded to stress signals. These findings provide critical baseline data on epigenetic regulators in pigeon pea and highlight candidate methylation/demethylation genes for future functional characterization and stress tolerance improvement via advanced genomics and breeding strategies.

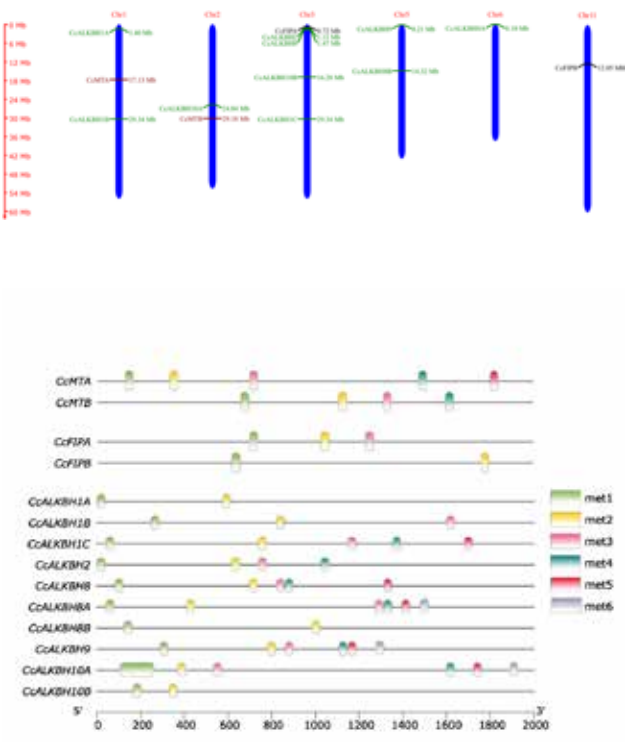


Fig. 3.25. Chromosomal map and epigenetic sites identified *methyl transferase* and *demethylase* genes in pigeon pea

Seed Production

Seed production activities were successfully undertaken at ICAR-IARI, Jharkhand during the *Kharif* season of 2025 and *Rabi* season 2025-26 for the production of quality seeds of major crop varieties. Two paddy varieties, MTU 1010 and IR 64, were taken up for seed production. MTU 1010 recorded a seed yield of 4,100 kilograms, while IR 64 produced 650 kilograms (Fig. 3.26). In pigeon pea, the variety P 151 yielded 80 kg quality seeds.

MTU 1010 IR64

Fig. 3.26. Seed production of two rice varieties (MTU 1010 and IR 64)

Natural Resources Management and Crop Production

Natural Resource Mapping and Land Use Pattern

Land use map of IARI-Jharkhand: The existing land use map of IARI Jharkhand has been developed, followed by the analysis and mapping of land-related properties (Fig. 3.27). About 35% of the area is under forest tree cover, with highly eroded land and ravines. About 3.5% of the area is subjected to waterlogging from *Kharif* to the mid-*Rabi* season. The residential and office premises are spread over about 5.5% land. Water bodies, mainly Bhadoor Dam and Kevalia Dam, in addition to small farm ponds, cover about 6% of the area. About 10% of the area is still in use by the Animal Husbandry Department, Government of Jharkhand. Approximately 20% of the area has been brought under field and horticultural crop experimentation over the period.

Water resources: Bahadur Dam and Kevaliya Dam are two major surface water bodies present on the campus. Bhadur Dam has spread over about 14 ha and has shallow water depth and is main source of irrigation for the research trials during *Rabi* season. Kevalia Dam is spread over about 95 ha of land; out of these, about 10 ha fall under the boundary of IARI-J.

Soil of IARI-Jharkhand: Large variations have been found in the physico-chemical properties of the soil of IARI-Jharkhand due to the presence of undulating topography. The majority of soil is acidic in nature with a pH between 4.5 and 7.4, except in a few lowland areas where the pH is around neutral conditions. The soil greatly varied in colour, texture, depth, and profile. The soil depth of the farm varied from shallow (<50 cm) to moderately deep (50-90 cm) soil. Soil texture varies from sandy loam to sandy clay loam depending upon the topo-sequence. The soils exhibited low to medium available Nitrogen (80-400 kg/ha), Phosphorus (03-23 kg/ha), and Potassium (50-250 kg/ha). The characteristics of soil profiles greatly vary among the various landforms. On the basis of colour, the deepest soil horizon has four distinct horizon layers (Fig. 3.28).

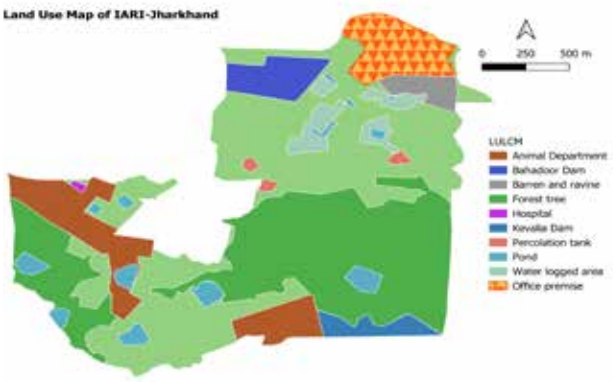


Fig. 3.27. Land use map of IARI-Jharkhand

Fig. 3.28. Three distinct soil profiles of IARI-Jharkhand

Weather characteristics: IMD in the premises of the IARI-Jharkhand farm area has installed an automatic weather station; different parameters/attributes related to weather are recorded (Fig. 29).

Fig. 3.29. Weather station installed at IARI-Jharkhand

Nutrient Status of Agricultural Farm

Soil samples collected from the Agricultural Farm of ICAR-IARI, Jharkhand, were analyzed to assess the physicochemical properties and nutrient status of the farm and to identify fertility constraints for sustainable crop production. The results revealed considerable spatial variability in soil properties across the farm (Table 3.14). Soil pH ranged from acidic to alkaline, indicating diverse soil reaction classes that can influence nutrient availability and crop performance. Acidic soils require liming to improve soil reaction, nutrient availability, and crop productivity. Electrical conductivity values were mostly within the non-saline to slightly saline range, suggesting that salinity is not a major constraint for crop production. Organic carbon content varied from low to medium, highlighting the need for regular application of organic manures, compost, green manuring, and residue recycling to improve soil health.

Available nitrogen content showed wide variation, reflecting differences in soil fertility across fields. Available phosphorus ranged from low to medium, indicating potential phosphorus limitation in certain areas and the need for soil test-based phosphorus management. Available potassium was largely in the medium range, suggesting that potassium fertilization may be required for high-yielding and potassium-exhaustive crops. Available sulphur ranged from low to medium, which may lead to sulphur deficiency under intensive cropping systems, particularly in soils with low organic matter. Calcium carbonate content was low, confirming the non-calcareous nature of the soils. Cation exchange capacity values ranged from low to high, indicating moderate nutrient retention capacity.

Micronutrient analysis showed that available zinc ranged from deficient to marginal in several samples, while iron, manganese, and copper were generally present in adequate amounts. Available boron ranged from low to adequate, suggesting the need for boron supplementation in deficient areas. Overall, the soil is suitable for crop production but requires site-specific nutrient and soil management practices for sustained productivity.

Table 3.14. Details of soil attributes of agricultural farm, IARI-Jharkhand

Sl. No.	Soil parameters	Range
1.	pH (1:2)	4.52-8.39
2.	EC (dS m^{-1})	0.05-1.76
3.	Organic carbon (%)	0.11-0.91
4.	Available nitrogen (kg ha^{-1})	84.10-565.0
5.	Available phosphorus (kg ha^{-1})	1.02-83.70
6.	Available potassium (kg ha^{-1})	52.10-243.0
7.	Available sulphur (mg kg^{-1})	3.12-39.30
8.	Available boron (ppm)	0.09-1.24
9.	CEC (cmol(p^{+}) kg^{-1})	8.30-79.60
10.	Available zinc (ppm)	0.16-0.88
11.	Available copper (ppm)	0.12-3.36
12.	Available iron (ppm)	1.96-56.00
13.	Available manganese (ppm)	1.90-161.50

Identification of Efficient Cropping Zones in Jharkhand

A comprehensive data-driven assessment was made at the ICAR-IARI, Jharkhand, in collaboration with ICAR-NBSSLUP, Nagpur, during 2024-25 to identify efficient cropping zones for major field and horticultural crops across Jharkhand (Fig. 3.30). The analysis utilized district-level data on area, production, and productivity for the years 2022-23 and 2023-24. To assess crop suitability, two widely accepted indices, namely the Relative Yield Index (RYI) and the Relative Spread Index (RSI), were computed. Districts exhibiting high values of both indices were categorized as the most efficient cropping zones, indicating optimal productivity and wider adoption.

Among the field crops, chickpea exhibited moderate suitability across several districts, indicating its adaptability to diverse agro-ecological conditions. Among horticultural crops, bael, ber, and aonla (gooseberry) demonstrated high suitability, particularly in marginal and dry regions, highlighting their potential in climate-resilient agricultural systems. These crops offer viable options for diversification in areas constrained by soil and moisture limitations. Fruit crops such as mango and litchi exhibited relatively restricted zones of high efficiency, suggesting their dependence on specific climatic conditions such as temperature and humidity. Similarly, papaya and lemon showed moderate suitability in selected districts, indicating scope for expansion with improved management practices. Seasonal crops like watermelon and muskmelon displayed localized suitability, particularly in areas with well-drained sandy soils, which are conducive to their growth and development.

The study also identified instances where certain districts exhibited high RSI but low RYI, indicating that crops are widely cultivated despite lower productivity. This suggests that farmers often prioritize market demand and economic returns over agro-ecological suitability, resulting in sub-optimal yields. Such findings underline the importance of promoting scientific crop planning and awareness among farmers.

Regionally, the central plateau zone (including Ranchi and adjoining districts) emerged as a relatively efficient region for multiple crops, while eastern districts such as Dumka and Pakur showed crop-specific suitability. In contrast, several western districts exhibited comparatively lower efficiency for many crops, emphasizing the need for targeted crop diversification and improved management interventions.

Overall, the integration of geospatial tools with RYI and RSI provides a robust framework for location-specific crop planning. The findings of this study can support policymakers, extension agencies, and farmers in optimizing crop selection, improving resource use efficiency, and promoting agricultural sustainability in Jharkhand.

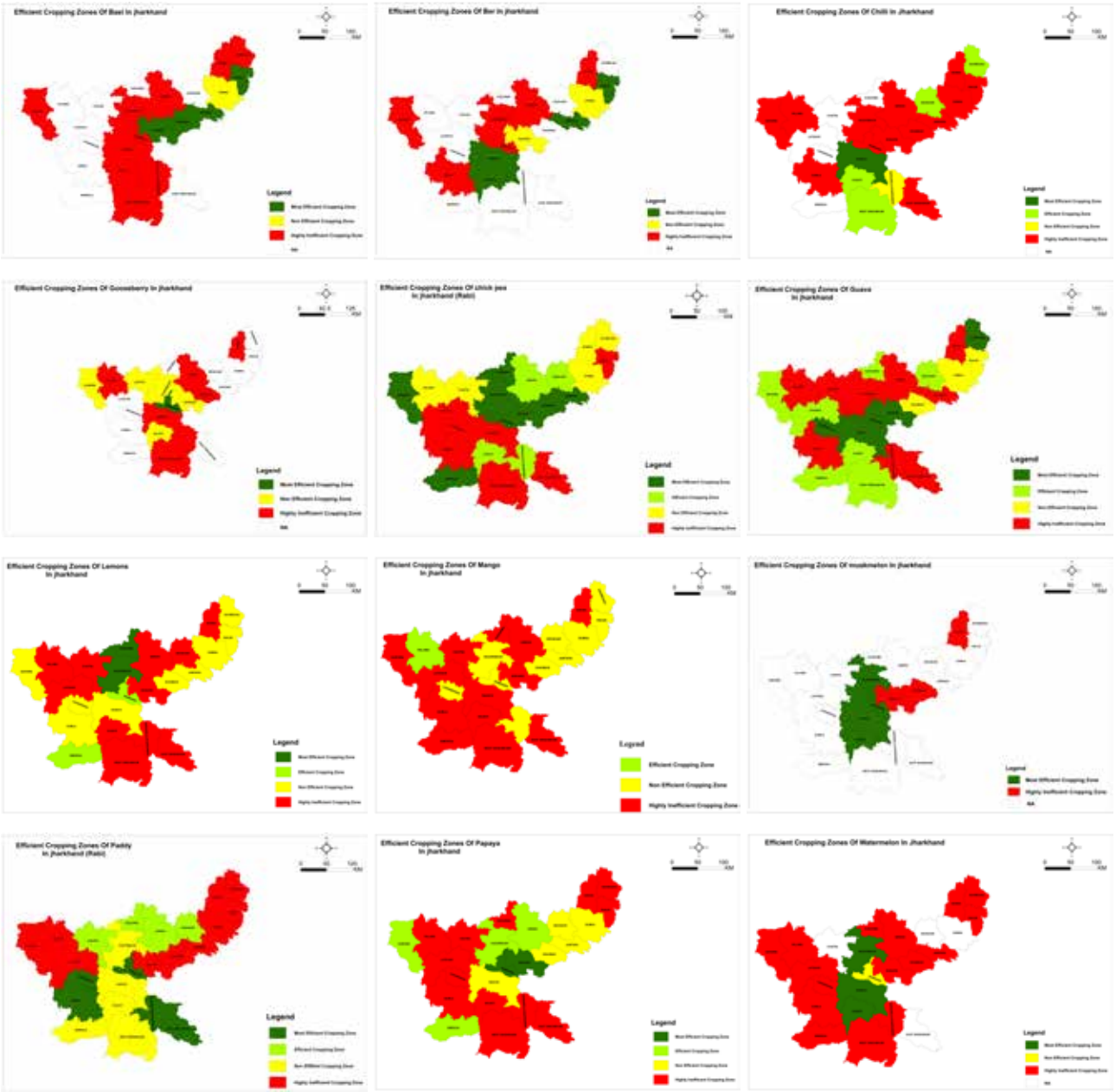


Fig. 3.30. Maps representing efficient cropping zones of different crops in Jharkhand

Natural Farming and Management of Problematic Soil

Development of Sustainable Natural Farming Practice

A study was carried out to assess the influence of different organic sources under sustainable natural farming practices. The data revealed significant variations among treatments in terms of yield and yield-attributing characters of pearl millet (Fig. 3.31). Among the treatments, 75% RDF + 25% through FYM (T3) recorded the highest values for all major yield attributes, i.e., Seed weight per head (13.0 g) & Test weight (9.94 g). These values were significantly higher than most other treatments, indicating better grain development and nutrient availability under T3. The application of 50% RDF+ 50% through FYM (T4) (11.5 g, 8.24 g) and (T8) 100% GJA at sowing + Spray of Jeevamarit (at 15 and 30 Days) (9.82 g, 8.67 g) also performed well and remained statistically at par with T3 for some parameters. The lowest values were observed in the control, suggesting poor

nutrient supply or lower efficiency of the organic treatment applied. Straw yield and grain yield showed significant differences among treatments. Maximum straw yield and grain yield were found with T3 (59.36 q ha^{-1} & 19.3 q ha^{-1}). T3 remained statistically at par with T4 and T8, but significantly superior to lower-performing treatments like T1, T7, and T9.

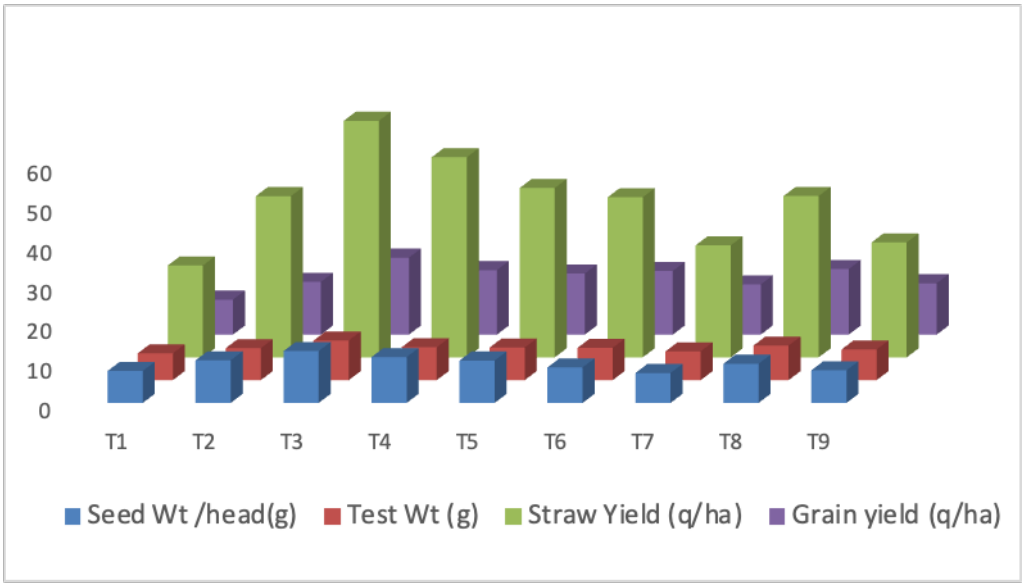


Fig. 3.31. Effect of different organic nutrient management on yield and yield-attributing characters of pearl millet

Performance of Crop Varieties Under Natural Farming Practices

During *Kharif* 2023, ten varieties of rice (Abhishek, Anjali, CR Dhan 107, CR Dhan 320, CR Dhan 415, Hazaridhan, Sadabahar, Sahbhagi, Vandana, and Virendar) and two varieties of finger millet (BM-1 and A-404) were evaluated under direct seeding in natural farming conditions. Among the rice varieties, the highest yield was recorded in Sahbhagi (504-722 kg/ha), followed by Virendar (467-570 kg/ha), Vandana (376-584 kg/ha), and CR Dhan-415 (418-631 kg/ha). The recorded yields for finger millet varieties A-404 and BM-1 were 825-925 kg/ha and 655-775 kg/ha, respectively.

During *Rabi* 2023-24, nine varieties of wheat (Awnless, DBW-187, HD-2967, HD-3226, HD-3249, HD-3271, Mandia, PBW-154, and Sonamukhi) and eight varieties of potato (Ganga, Himalini, Jyoti, Kesar, Lalit, Lohit, Nilkanth, and Mohan) were evaluated under natural farming conditions. Among the wheat varieties, the top performers were Mandia (480-672 kg/ha), Awnless (425-705 kg/ha), and DBW-187 (408-645 kg/ha). For potatoes, Nilkanth (7,115-8,858 kg/ha), Ganga (6,630-7,005 kg/ha), Himalini (5,967-6,443 kg/ha), and Kesar (5,953-6,525 kg/ha) were the highest-yielding varieties.

Performance of Cropping System Under Natural Farming Practices

During 2023-24, six cropping systems were evaluated using eight nutrient management treatments (Fig. 3.32). These treatments included various combinations of Jeevamrit, Ghanjeevamrit, FYM, and mulching (sesbania green biomass, crop residue, weed biomass, and biochar), as well as a recommended dose of fertilizer (RDF) and an absolute control. The paddy equivalent yield (PEY) ranged from 900 to 6,600 kg/ha under natural farming treatments, while yields under the RDF treatment ranged from 3,370 to 16,275 kg/ha.

Among the cropping systems, PEY was significantly higher in CS-4 (Finger Millet-Potato), CS-2 (Rice-Potato), and CS-6 [(Pigeon pea-fallow)/(R-W)] across all nutrient management treatments. Regarding the treatments themselves, the highest yields were consistently recorded in the RDF group, while the lowest were found in the control group. The application of Ghanjeevamrit + Jeevamrit resulted in yields 55–80% lower than the RDF treatment across all cropping systems. However, the yield reduction

was notably lower (only 25-60%) in the treatment combining Ghanjeevamrit + Jeevamrit + FYM + Sesbania biomass mulching.

Fig. 3.32. View of natural farming research plots

Management of Acid Soils

Acidic soils are prevalent in the eastern, northeastern, and coastal regions of the Indian Peninsula and have low soil fertility. They are associated with iron toxicity in the lowland and aluminium toxicity in the uplands, with depletion of Ca, Mg, and K, and deficiencies in B, Mo, and Si. These soils also fix large amounts of soluble P, which reduces crop yields. Management practices include liming to correct soil acidity, balanced use of P, K, and silicate, and organic fertilizers, as well as the cultivation of tolerant cultivars. The genotypes Uma and Vasundhara (Moncompu) were evaluated under eight sets of nutrient management treatments *viz.*, i) NPK (RD), ii) NPK (RD) + Silixol spray (at vegetative, booting, and grain filling stage), iii) NPK (RD) + Rice husk ash, 250 kg/ha during land preparation, iv) NPK (RD) + Dolomite 250 kg/ha 30 days after transplanting, v) NPK (RD) + Silixol spray (at vegetative, booting, and grain filling stage) + Dolomite 250 kg/ha, 30 days after transplanting, vi) NPK (RD)+ Rice husk ash, 250 kg/ha during land preparation + Dolomite 250 kg/ha, 30 days after transplanting, vii) Potassium Silicate solution- Four sprays at 15-day intervals starting from 15 DAT (days after transplanting) and viii) RDF + Dolomite + Potassium Silicate solution (Four sprays at 15-day intervals starting from 15 DAT).The first-year data revealed that acid soil management practices did not significantly influence the yield parameters and yield (Fig. 3.33). The plant height of Vasundhara ranged between 94.2 and 102.6 cm. The maximum number of tillers/hill (22), length of panicle (21 cm), straw yield (37.96 q/ha), and grain yield (27.47 q/ha) were found with treatment NPK (RD) + Silixol spray (at vegetative, booting, and grain filling stages) + Dolomite 250 kg/ha, 30 days after transplanting in comparison to other treatments. The soil of trial was acidic in nature (5.42), salinity (0.66 dS/m) suitable for crops & phosphorus (21.39 kg/ha) was low, organic carbon (0.57%), nitrogen (282 kg/ha), and potassium (170 kg/ha) were in medium. The soil texture was sandy loam of the experimental plot.

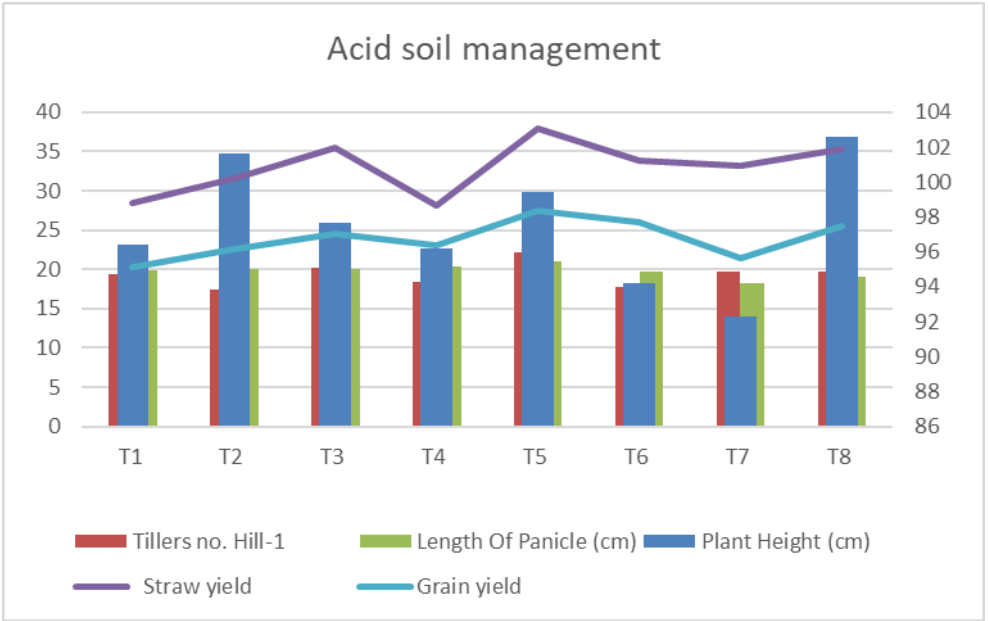


Fig. 3.33. Representation of yield-attributing traits under different nutrient management treatments

Co-Benefits of Biochar and Enhanced Rock Weathering (ERW) Application

This project is funded by Carbon Removal India Alliance (CRIA) and commenced in November 2025. The evaluation focuses on the impact of four types of biochar (rice straw, *Lantana camara*, cashew nutshell, and cotton stalk) applied at two doses (500 and 1,500 kg/ha), alongside enhanced rock weathering (ERW) at two doses (10 and 25 tonnes/ha), on crop yield and soil properties. The experiment began during the *Rabi* season of 2025 with the sowing of mustard and wheat under these various treatments (Fig. 3.34).

Fig. 3.34. Representation of activities undertaken for conducting the experiment in field conditions.

Soil Microbiology

Influence of Promising Osmotolerant Bacterial Cultures on Chickpea

A field experiment was conducted at ICAR-IARI, Jharkhand, during the *Rabi* season to evaluate the effect of three promising osmotolerant bacterial cultures, namely *Bacillus* sp. MKS-6, *Bacillus* sp. MRD-17, and *Bacillus aryabhattai* NRSSS-1 under three irrigation regimes and two soil amendment conditions (lime and no lime) on the growth, physiology, nodulation, and yield of chickpea variety PUSA 3043 grown under acidic soil conditions (Fig. 3.35). The treatments comprised three irrigation levels, namely, one irrigation at the early vegetative stage, two irrigations at pre-flowering and podding stages, and three irrigations at early vegetative, pre-flowering, and podding stages, in combination with four inoculation treatments: uninoculated control, *Bacillus casamancensis* MKS-6, *Bacillus* sp. MRD-17, and *Bacillus aryabhattai* NRSSS-1 (Table 3.15).

Table 3.15. Treatment details of the field experiment in chickpea

Treatments	Details
T_1	One Irrigations- Uninoculated (I_1C_0)
T_2	One Irrigations- *Bacillus casmancensis* MKS 6 (I_1C_1)
T_3	One Irrigations- *Bacillus* sp. MRD 17 (I_1C_2)
T_4	One Irrigations- *Bacillus aryabhattai* NRSSS-1 (I_1C_3)
T_5	Two Irrigations- Uninoculated (I_2C_0)
T_6	Two Irrigations- *Bacillus casmancensis* MKS 6 (I_2C_1)

Treatments	Details
T_7	Two Irrigations- *Bacillus* sp. MRD 17 (I_2C_2)
T_8	Two Irrigations- *Bacillus aryabhattai* NRSSS-1 (I_2C_3)
T_9	Three Irrigations- Uninoculated (I_3C_0)
T_{10}	Three Irrigations- *Bacillus casmancensis* MKS 6 (I_3C_1)
T_{11}	Three Irrigations- *Bacillus* sp. MRD 17 (I_3C_2)
T_{12}	Three Irrigations- *Bacillus aryabhattai* NRSSS-1 (I_3C_3)

Among all treatments, T10 (three irrigations + *Bacillus* sp. MKS-6) consistently outperformed others across growth, physiological, and yield parameters under both lime and no-lime conditions (Tables 3.16-3.17). It recorded maximum shoot length (24.92 and 27.36 cm), shoot fresh weight (10.24 and 15.46 g), and shoot dry weight (2.14 and 3.16 g) under lime and no lime, respectively. Root growth was also superior, with the highest root length (16.77 and 20.58 cm), root fresh weight (1.38 and 2.27 g), and root dry weight (0.349 and 0.932 g), indicating enhanced root development. Nodulation was significantly improved, with T10 recording the highest nodules per plant (29.78 and 30.22), nodule fresh weight (1.10 and 1.66 g), and nodule dry weight (1.03 and 0.347 g). Leaf pigment content was also enhanced, with maximum chlorophyll a (2.00 and 2.38 mg g^{-1} FW), chlorophyll b (0.806 and 0.887 mg g^{-1} FW), total chlorophyll (1.57 and 1.74 mg g^{-1} FW), and carotenoids (2.89 and 3.63 mg g^{-1} FW), reflecting improved photosynthetic efficiency (Fig. 3.36). Biochemical responses indicated reduced oxidative stress, with lower lipid peroxidation in inoculated plants, while proline, phenol (8.69 and 8.72 mg g^{-1} FW), and ascorbic acid (3.34 and 4.17 mg g^{-1} FW) were significantly higher, indicating enhanced antioxidative defence. Yield attributes were also highest in T10, with maximum primary branches (4.80), secondary branches (5.73 and 5.00), pods per plant (54.67 and 57.73), seeds per plant (1.80 and 1.93), and 100-seed weight (20.28 and 23.61 g). Grain yield was highest under three irrigations with MKS-6, reaching 1450.90 kg ha^{-1} (lime) and 1751.73 kg ha^{-1} (no lime). Pod yield (2737.53 and 2584.77 kg ha^{-1}), biological yield (5933.33 and 3733.33 kg ha^{-1}), and straw yield (4775.83 and 2493.67 kg ha^{-1}) were also maximum under this treatment. Harvest index was highest under no lime with NRSSS-1 (47.31%), followed by MKS-6 (46.92%). Overall, *Bacillus* sp. MKS-6 under three irrigations significantly enhanced growth, nodulation, physiological traits, and yield of chickpea in acidic soils, indicating its strong potential as an efficient bio-inoculant for Jharkhand conditions.

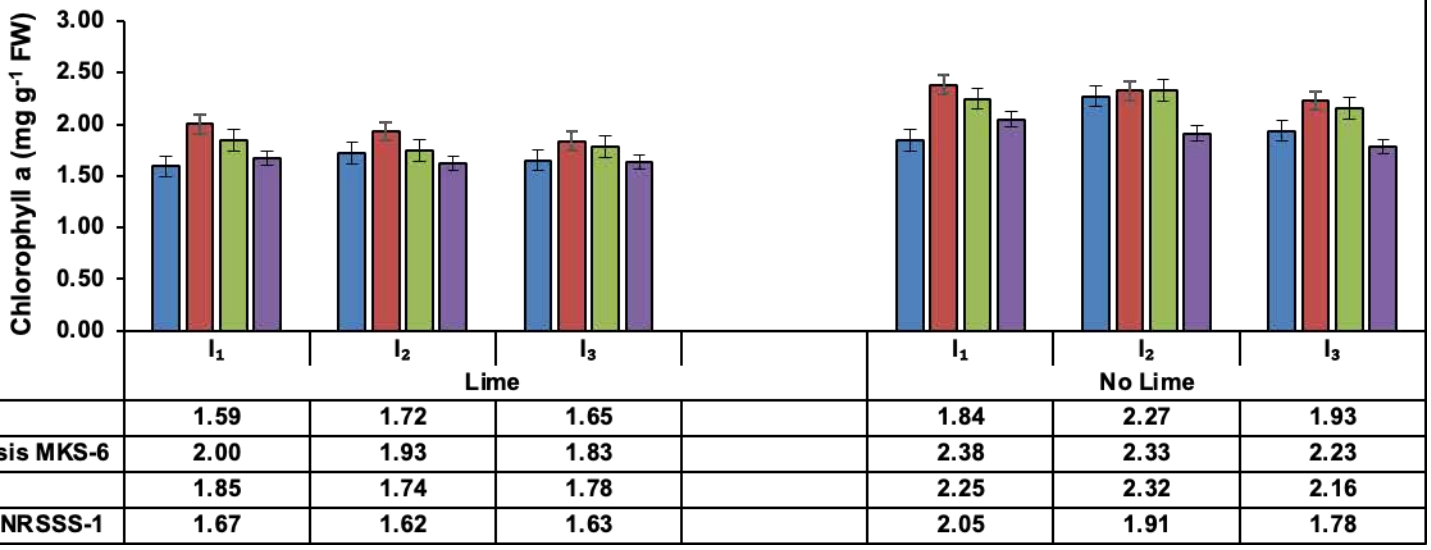
Fig. 3.35. View of experimental plot treated with osmotolerant bacterial cultures

Table 3.16. Effect of microbial inoculation on chickpea plant growth under different irrigation regimes and lime application

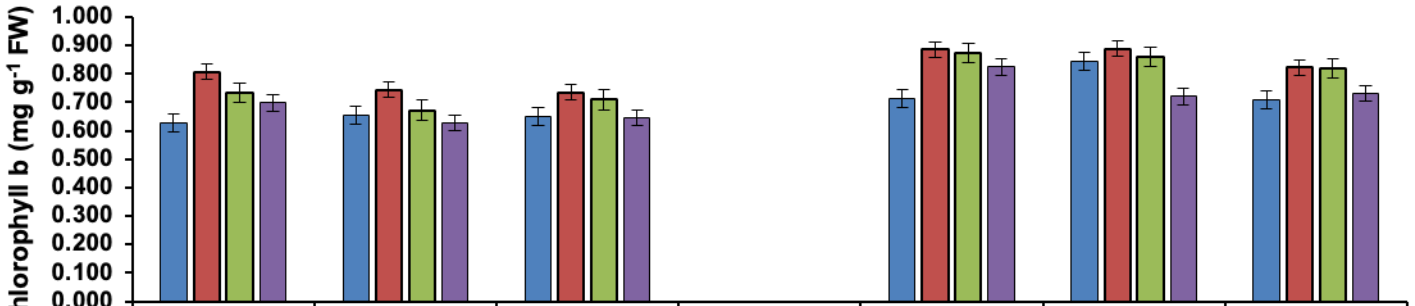
Treatments	Shoot length (cm)		Shoot fresh weight (g)		Shoot dry weight (g)		Root length (cm)		Root fresh weight (g)		Root dry weight (g)	
	Lime	No lime	Lime	No lime	Lime	No lime	Lime	No lime	Lime	No lime	Lime	No lime
T1: Uninoculated (I_1C_0)	18.68	22.27	5.72	7.43	1.35	1.98	14.31	15.13	0.49	0.77	0.21	0.34
T2: *Bacillus* sp. MKS 6 (I_1C_1)	20.94	23.19	6.24	9.74	1.47	2.30	14.63	15.63	0.70	1.19	0.26	0.36
T3: *Bacillus* sp. MRD 17 (I_1C_2)	20.61	23.81	6.29	8.68	1.56	2.20	14.50	15.59	0.65	1.14	0.24	0.35
T4: *Bacillus aryabhattai* NRSSS-1 (I_1C_3)	20.42	27.66	6.81	7.60	1.51	2.19	14.37	15.14	0.57	1.09	0.24	0.34
T5: Uninoculated (I_2C_0)	21.03	24.41	6.52	10.00	1.57	2.23	14.71	16.00	0.75	1.26	0.26	0.41
T6: *Bacillus* sp. MKS 6 (I_2C_1)	23.31	27.36	6.93	11.69	1.92	2.36	15.98	17.53	0.91	1.72	0.28	0.51
T7: *Bacillus* sp. MRD 17 (I_2C_2)	23.03	26.39	6.69	11.07	1.83	2.42	15.50	16.99	0.82	1.48	0.27	0.48
T8: *Bacillus aryabhattai* NRSSS-1 (I_2C_3)	22.09	25.17	6.72	10.88	1.76	2.49	14.98	16.09	0.82	1.45	0.27	0.47
T9: Uninoculated (I_3C_0)	23.49	24. 93	8.47	11.69	1.97	2.66	15.04	17.84	1.02	1.92	0.29	0.52
T10: *Bacillus* sp. MKS 6 (I_3C_1)	24.92	28.02	10.24	15.46	2.14	3.16	16.77	20.58	1.38	2.27	0.34	0.93
T11: *Bacillus* sp. MRD 17 (I_3C_2)	23.77	26.96	9.27	11.95	2.05	3.15	16.53	18.50	1.05	2.11	0.30	0.64
T12: *Bacillus aryabhattai* NRSSS-1 (I_3C_3)	23.60	26.62	9.61	11.97	1.98	3.01	15.62	17.78	1.07	2.01	0.30	0.54
CD ($P \leq 0.001$)	1.52	1.37	1.65	1.49	0.23	0.39	1.31	1.53	0.12	0.36	0.06	0.09
SEM	0.52	0.47	0.56	0.51	0.08	0.13	0.44	0.52	0.04	0.12	0.02	0.03
CV	4.04	3.15	12.95	7.69	7.80	8.98	5.03	5.33	8.10	13.83	13.25	10.88

Table 3.17. Effect of microbial inoculation on chickpea nodulation and yield-attributing parameters under different irrigation regimes and lime

Treatments	No. of Nodules		Nodule fresh weight (g)		Nodule dry weight (g)		100 seeds wt. (g)		Harvest Index (%)	
	Lime	No lime	Lime	No lime	Lime	No lime	Lime	No lime	Lime	No lime
T1: Uninoculated (I_1C_0)	18.11	18.22	0.47	0.46	0.11	0.16	17.39	19.40	34.69	33.37
T2: *Bacillus* sp. MKS 6 (I_1C_1)	16.11	22.00	0.56	0.78	0.12	0.18	19.19	19.68	36.10	33.03
T3: *Bacillus* sp. MRD 17 (I_1C_2)	18.22	21.78	0.44	0.85	0.14	0.22	19.09	20.47	26.78	29.78
T4: *Bacillus aryabhattai* NRSSS-1 (I_1C_3)	17.00	20.00	0.32	0.83	0.11	0.26	18.06	19.98	24.63	35.20
T5: Uninoculated (I_2C_0)	18.22	24.67	0.64	0.85	0.15	0.27	18.48	20.21	25.72	39.87
T6: *Bacillus* sp. MKS 6 (I_2C_1)	24.11	25.33	0.75	1.14	0.18	0.29	19.45	21.11	25.25	45.28
T7: *Bacillus* sp. MRD 17 (I_2C_2)	21.44	24.33	0.74	1.16	0.17	0.29	18.34	20.87	24.10	43.46
T8: *Bacillus aryabhattai* NRSSS-1 (I_2C_3)	21.22	22.44	0.70	0.90	0.15	0.29	17.95	20.45	26.58	38.97
T9: Uninoculated (I_3C_0)	24.56	25.67	0.81	1.36	0.18	0.42	19.30	21.24	21.59	46.04
T10: *Bacillus* sp. MKS 6 (I_3C_1)	29.78	30.22	1.10	1.66	1.02	0.34	20.28	19.40	34.69	33.37
T11: *Bacillus* sp. MRD 17 (I_3C_2)	18.11	18.22	0.47	0.46	0.11	0.16	20.18	19.68	36.10	33.03
T12: *Bacillus aryabhattai* NRSSS-1 (I_3C_3)	16.11	22.00	0.56	0.78	0.12	0.18	19.78	20.47	26.78	29.78
CD ($P \leq 0.001$)	1.68	1.84	0.28	0.48	0.02	0.07	NS	NS	8.36	13.77
SEM	0.57	0.62	0.09	0.16	0.01	0.02	0.79	0.91	2.83	4.66
CV	4.50	4.47	23.80	26.30	6.26	15.50	7.27	7.59	17.75	19.55



	Lime				No Lime		
	I_1	I_2	I_3		I_1	I_2	I_3
Control	1.59	1.72	1.65		1.84	2.27	1.93
Bacillus casmancensis MKS-6	2.00	1.93	1.83		2.38	2.33	2.23
Bacillus sp. MRD-17	1.85	1.74	1.78		2.25	2.32	2.16
Bacillus aryabhattai NRSSS-1	1.67	1.62	1.63		2.05	1.91	1.78



	Lime				No Lime		
	I_1	I_2	I_3		I_1	I_2	I_3
Control	0.626	0.654	0.649		0.714	0.843	0.708
Bacillus casmancensis MKS-6	0.806	0.744	0.734		0.887	0.887	0.822
Bacillus sp. MRD-17	0.734	0.672	0.709		0.873	0.859	0.820
Bacillus aryabhattai NRSSS-1	0.699	0.627	0.646		0.824	0.721	0.731

Fig. 3.36. Effect of microbial inoculation on chickpea leaf pigments under different irrigation regimes and lime application

Microbial Consortia-Based Bioinoculants for Rice Growth and Soil Health

A field study was carried out at ICAR-IARI, Jharkhand, during *Kharif* 2025 to evaluate the effectiveness of selected microbial consortia for enhancing rice productivity and soil health under acidic soil conditions using direct-seeded rice (DSR) (Fig. 3.37a) and transplanted rice (TPR) systems (Fig. 3.37b). The study was conducted on rice variety *Swarna Shreya* with a total of 12 treatments laid out in a randomized block design with three replications. Four microbial formulations were evaluated using vermiculite + paddy straw compost (1:1) as carrier material. The consortia included: C1 (cyanobacterial consortium comprising *Anabaena torulosa* BF1, *Nostoc carneum* BF2, *Nostoc piscinale* BF3 and *Anabaena doliolum* BF4), C2 (biofilm consortium of *Anabaena torulosa* + *Trichoderma viride*), C3 (BF-1-Tr + *Pseudomonas nitroreducens* B3) and C4 (*Anabaena laxa*). These were evaluated in combination with 75% recommended nitrogen (N) and 100% phosphorus (P) and potassium (K) fertilizers under both DSR and TPR systems. Observations on seed germination and vigour indices were recorded under laboratory conditions. In the field, plant and soil samples were collected at 2 growth stages, including maximum tillering and panicle initiation. Microbial inoculation significantly influenced plant physiological parameters such as chlorophyll content, carotenoids, indole-3-acetic acid (IAA), and nitrogen assimilatory enzymes (NR and GS). Soil biological and biochemical properties, including available N and P, soil organic carbon (SOC), microbial biomass carbon (MBC), acetylene reduction activity (ARA), dehydrogenase and phosphatase activities were also enhanced in inoculated treatments. Among the treatments, microbial consortia-based applications in combination with reduced nitrogen levels (75% N + 100% PK + inoculants) showed superior performance over uninoculated controls. The treatments receiving consortia C1, C2 and C3 exhibited better improvement in plant growth parameters, nutrient uptake, and soil enzymatic activities across both establishment methods. Notably, these treatments also contributed to improved yield attributes such as number of tillers and panicles per unit area, grains per panicle, test weight, and ultimately grain and straw yield.

Fig. 3.37a. Experimental plot view of paddy under DSR method

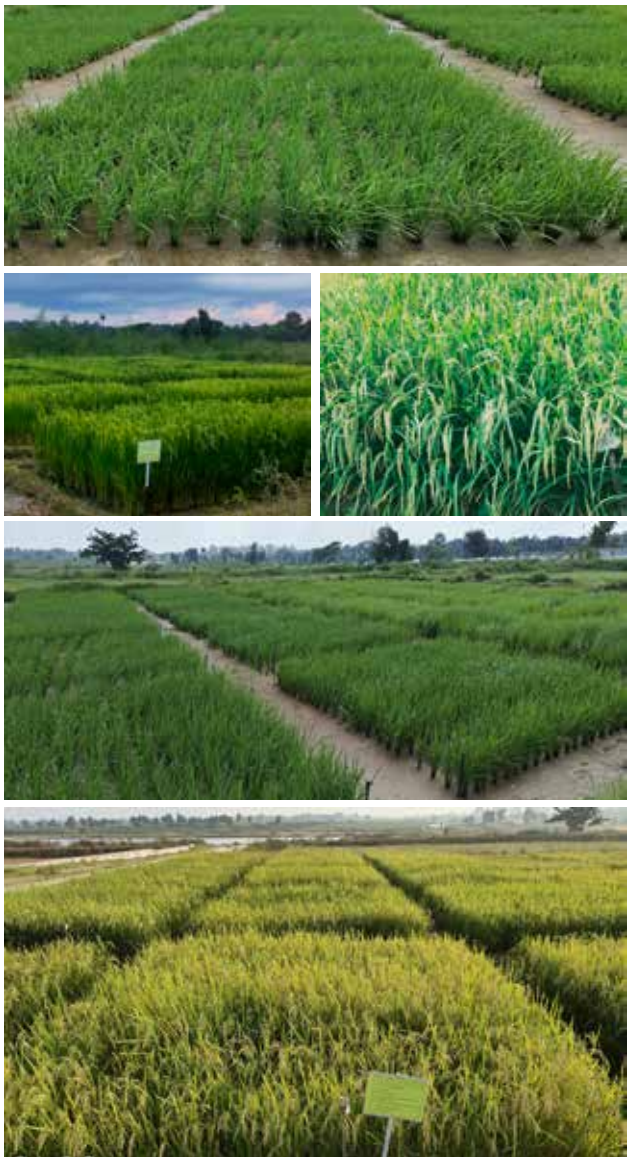


Fig. 3.37b. Experimental plot view of paddy under Transplanted method

Field Evaluation of Osmotolerant Bacterial Consortia in Wheat

Field experiments were conducted at ICAR-IARI, Jharkhand during the 2024-25 *Rabi* season (Fig. 3.38) to evaluate three osmotolerant bacterial consortia [(Consortium 1: MKS-6 + *Azotobacter* W5), (Consortium 2: MRD-17 + *Azotobacter* W5), (Consortium 3: MKS-6 + MRD-17 + *Azotobacter* W5)] under three irrigation regimes (3, 4, and 5 irrigations) in two wheat varieties- HD 2967 (drought susceptible) and HD 3171 (drought tolerant) grown in acidic soil (pH 5.7). The experiment followed a randomized block design with 24 treatments and three replications. Data on physiological, biochemical, and yield parameters revealed that Consortium 3 with five irrigations (T12) recorded the highest shoot length, root length, root volume, and flag leaf area. At maturity, T12 showed maximum plant height (85.27 cm & 95.93 cm), productive tillers m^{-2} (391 & 481), spike length (14.79 & 16.77 cm), grains $spike^{-1}$ (56.87 & 51.73), 1000-grain weight (56.87 & 39.67 g), grain yield (4.49 & 4.67 t ha^{-1}), and biological yield (10.07 & 10.97 t ha^{-1}) in HD 2967 and HD 3171, respectively. Overall, HD 3171 responded best to bio-formulation inoculation.

Fig. 3.38. View of experimental plot treated with osmotolerant bacterial consortia

Microbial Inoculants Improved Growth and Yield in Wheat

A field experiment was undertaken (Fig. 3.39) with five wheat varieties (HD 2967, PBW826, DBW187, HI 8777, HD 3226), which were inoculated with microbial formulations of Diazotrophs (*An-Tr* and *BF1-BF4*), PSB inoculant (*Pusa Biophos*), NPK Consortia (*Pusa Sampoorna*), and VAM (*Pusa Mycorrhiza*). Microbial inoculation effects on wheat plant were measured in terms of plant biometric parameters (plant height, fresh weight and dry weight at vegetative stage and yield attributing parameters (plant height, productive tillers, spike length, grains per spike, 1000-grain weight, grain yield, biological yield and harvest index). Results depicted significantly enhanced plant growth and yield in microbial formulations inoculated treatments over the uninoculated control treatment.

Fig. 3.39. View of experimental wheat plots treated with microbial inoculants

Post-Harvest Management

Evaluation of Electric Field-Thermal Modulation of Starch Gelatinization Kinetics

This study investigated the gelatinization kinetics of jackfruit seed starch (Fig. 3.40) under moderate electric field (MEF)-assisted enzymatic hydrolysis using a real-time spectrophotometric transmittance approach (Fig. 3.41). MEF intensities (0-45 V/cm), temperatures (50-70 °C), and treatment times (10-40 min) were varied to assess their impact on gelatinization behaviour. Gelatinization temperatures onset (To), peak (Tp), and end (Te) were extracted from % transmittance (%T) curves and analyzed using first-order, Box-Lucas, and Weibull models. MEF significantly modulated gelatinization behaviour. Compared to the control at 0 V/cm (Tp = 71 °C, Te = 77 °C, %Tmax = 99.9%), MEF at 25-35 V/cm delayed to by up to +5 °C, Tp by +12 °C, and Te by +9 °C, while reducing %T max by 3-13%, indicating enhanced structural stability and delayed granule swelling (Fig. 3.42). The Weibull model best described the kinetics (R^2 = 0.977-0.998), with λ (time to 63% gelatinization) increasing from 6.05 to 8.04 min and the shape parameter (n) decreasing from 6.76 to 3.99 under moderate MEF, indicating slower but more uniform transitions. At 45 V/cm, the shape parameter n sharply increased (15.19), and λ extended to 8.19 min, indicating a shift towards abrupt and inhibited gelatinization. Activation energy (Ea), estimated from the temperature dependence of 1/λ, increased from 7.37 to 12.37 kJ/mol at 35 V/cm, then declined to 7.02 kJ/mol at 45 V/cm, indicating a threshold beyond which MEF becomes inhibitory (Fig. 3.43). Thermogravimetric (TGA) and differential thermal analyses (DTA) revealed delayed mass loss and broadened endotherms in MEF-treated starches (Fig. 3.44), confirming improved thermal

resilience. These results demonstrate that MEF offers a tunable, energy-efficient strategy for modulating starch gelatinization through synergistic electro-thermal-enzymatic mechanisms, with promising applications in clean-label food processing and functional biopolymer design.

Fig. 3.40. Jackfruit seed starch for moderate electric field treatment

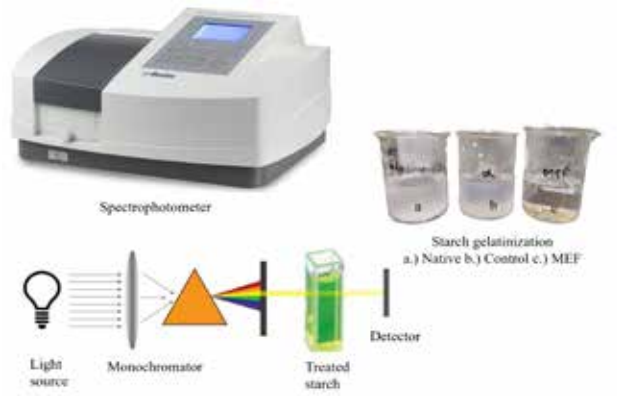


Fig. 3.41. Real-time spectrophotometric transmittance of jackfruit seed starch

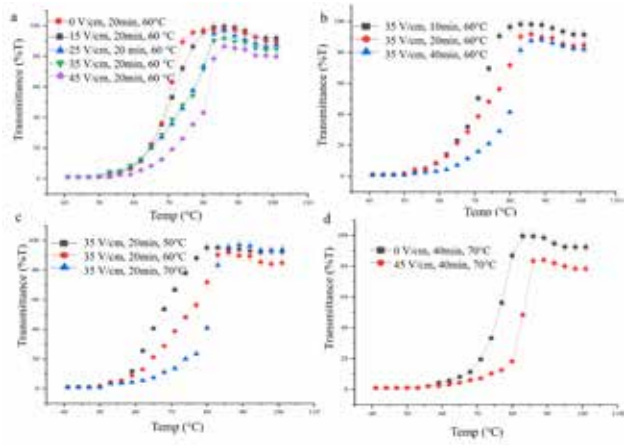


Fig. 3.42. Transmittance (%T) profiles of jackfruit seed starch gelatinization under various moderate electric field (MEF) strengths, times and temperatures measured using spectrophotometric monitoring at 620 nm; (a) Effect of MEF intensity (0, 15, 25, 35, and 45 V/cm) at 60 °C for 20 min, (b) Effect of treatment time (10, 20, 40 min) under 25 V/cm at 60 °C., (c) Effect of temperature (50, 60, 70 °C) under 25 V/cm for 20 min., (d) Comparison between control (0 V/cm) and high-field treatment (45 V/cm) at 70 °C for 40 min, highlighting inhibition effects. Data represent mean values ± standard deviation (n = 3)

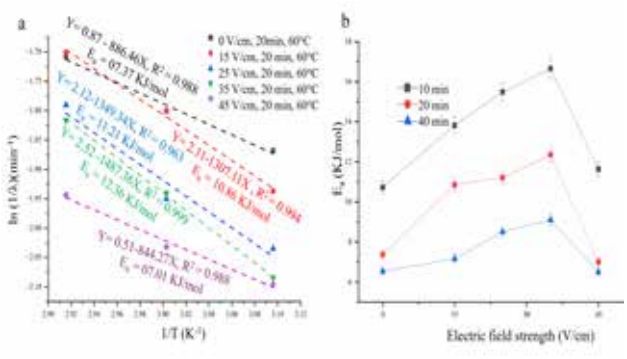


Fig. 3.43. Arrhenius plots (ln(1/λ) vs. 1/T) used to calculate activation energy (Ea) for selected MEF intensities at 20 min, showing field-dependent shifts in thermal sensitivity; (b) Effect of MEF intensity (0-45 V/cm) and treatment duration (10, 20, 40 min) on Ea (peak at 35 V/cm) reflects optimal field-enhanced stabilization

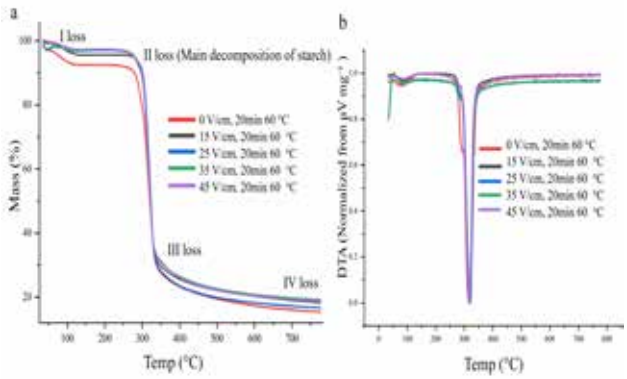


Fig. 3.44. Thermogravimetric (TGA) and differential thermal (DTA) analysis of MEF-treated native jackfruit seed starch; (a) TGA curves showing mass loss vs. temperature; (b) Normalized DTA peaks indicate the rate of degradation; Samples treated at 25 V/cm and 35 V/cm exhibit delayed thermal degradation compared to the control (0 V/cm), indicating enhanced structural stability before gelatinization.

Livestock and Fish Production

Livestock Production and Management

Dairy Farming in Hazaribagh District of Jharkhand

Base line information on dairy farming was collected from villages like Kedaru, Bandarvella, Kutma and Kundwa under Hazaribagh district through survey. Different categories of farmers were contacted, including landless labourers. Hazaribagh district possesses 6.18 lakh heads of dairy animals, comprising cattle (5.48 lakhs) and buffalo (0.70 lakhs). In all the villages, where the survey was conducted, around 90% of rural households, irrespective of tribe or ethnicity, rear indigenous cattle, which provide draught power for the cultivation of crops, but less than 5% have crossbred cattle (Fig. 3.45). Specific communities and the higher-class Hindu community traditionally rear high-yielding (crossbred) cattle for milk production. Around 20% of households keep buffalo, mainly poor yielding indigenous breed, the males of which are used for draught purposes.

Fig. 3.45. Rearing of local indigenous cattle at rural households

Traditional grazing systems continue to dominate the management of dairy animals. Generally, it was only specialized dairy cattle and buffalo that were stall-fed. More than 90% of cattle and buffalo are reared under semi-scavenging conditions. Animals are kept in the homestead during the night, and during the day, they are let loose to graze. During the time of grazing, family members take care of the animals. The majority of households have cattle sheds or use a part of the house for keeping cattle and/or buffalo. The structure is made with locally available materials, with or without side walls. Households without cattle shed confine the animals in home premises by tying them to a post with a short rope throughout the night. In the evening, the cattle are offered paddy straw or a feed mixture mainly constituted from kitchen waste and crop by-products (rice polish, wheat bran) and without any purchased concentrate feed ingredients. Around 10% of animals are stall-fed and confined throughout the day and night in cattle sheds or home premises. These types of stall-fed animals are invariably high-yielding cattle or buffalo kept for commercial milk production. Milk yield from indigenous cows ranged from 0.50 to 2.00 litres per day, while milk yield of crossbred cows was around 7-10 litres per day. Milk yield of crosses with indigenous cows was around 4-5 litres per day. The households keep cows for 6-7 lactations and then sell them. But the milk yield of indigenous buffaloes was higher than that of indigenous cows, which was 2-4 litres per day, while Murrah buffalo yielded around 6-10 litres of milk per day.

Survey studies have indicated that the productivity of animals and the overall status of dairy farming in the district are poor. The study identified various issues and constraints, *viz*. dominance of low-yielding non-descript cattle, dependency on grazing and crop residues utilization, lack of veterinary services, supremacy of middlemen in marketing, poor scientific knowledge of livestock farmers, etc.

ICT-Based, Location-Specific Animal Advisory Services

Primary livestock-related data were collected from districts representing three agro-climatic zones of Jharkhand, namely the central and north eastern plateau zone, the western plateau sub-zone, south eastern plateau sub-zone. The collected data were systematically analyzed to identify and prioritize major region-specific livestock problems. It was observed that in the Central and North Eastern Plateau Zone, no well-defined breeds of cattle or goats are reared by farmers (Fig. 3.46). The majority of farmers maintain non-descript cattle characterised by poor production performance. A limited number of crossbred cattle, particularly Jersey and Red Sindhi, are reared in larger commercial farms. Goats are distributed across all zones and are predominantly crossbreds of Black Bengal. In the southeastern plateau sub-zone, local pig breeds are commonly reared. Due to inadequate irrigation facilities, fodder cultivation is minimal across the surveyed regions. Animals are largely dependent on open grazing systems, and no systematic feed supplementation is practised owing to limited awareness of scientific livestock nutrition. Proper housing management is also lacking, with most farmers following traditional

housing systems such as the "Macha" system. In the western plateau sub-zone, although some farmers provide concentrate feed to large ruminants and are aware of azolla cultivation and fodder preservation, they lack technical knowledge regarding feed formulation, scientific azolla production, and improved fodder conservation techniques. The most prevalent diseases reported during the survey include: foot and mouth disease (FMD), hemorrhagic septicemia (HS), black quarter (BQ) in cattle, peste des petits ruminants (PPR), enterotoxaemia, FMD in goats and swine fever and FMD in pigs. Recently, a significant outbreak of lumpy skin disease was reported, affecting a large population of cattle in several surveyed areas. Based on the prioritised livestock challenges identified through field analysis, ICT-based, location-specific animal advisory services are being developed to address the region-specific needs of livestock farmers. To ensure timely and farmer-friendly dissemination of advisories, multiple ICT platforms are being developed and piloted (Fig. 3.47), including: A dedicated YouTube channel for video-based livestock advisories; WhatsApp groups and broadcast channels for real-time information sharing; and a radio podcast platform to deliver audio advisories in local dialects.

Fig. 3.46. Non-descript cattle and goat identified while surveying

Fig. 3.47. Different ICT-based advisory tools developed at ICAR-IARI Jharkhand

Following the identification and prioritization of challenges, advisory scripts have been prepared, and recording is currently in progress for dissemination through these platforms thereby improving productivity, enhancing disease management, and promoting scientific livestock practices across different agro-climatic zones of Jharkhand.

Initiation Of Scientific Studies on Black Bengal Goats

Goat farming plays a vital role in the rural economy of Jharkhand by providing meat, milk, and a steady source of income to small and marginal farmers. According to the 2019 Livestock Census, the state has about 9.1 million goats, ranking eighth in India in terms of goat population. Among the various breeds reared in the region, the Black Bengal goat is highly valued for its jet-black coat, high prolificacy, early maturity, excellent meat quality, adaptability, and good twinning ability. Well-suited to the agro-climatic conditions of eastern India, this breed is an important genetic resource for the region. However, in Jharkhand, the population of pure Black Bengal goats has been declining due to indiscriminate breeding and uncontrolled crossbreeding, leading to dilution of its genetic purity and loss of desirable traits.

To address this issue, the institute has initiated a research project aimed at the study and conservation of Black Bengal goats (Fig. 3.48). The project focuses on systematic evaluation of their morphological, reproductive, and productive traits under controlled management conditions, along with studies on feeding, breeding, health, growth and population management. Through scientific breeding strategies and close collaboration with farmers, the initiative seeks to conserve and improve the pure Black Bengal goat population in Jharkhand, thereby protecting this valuable genetic resource while supporting sustainable livelihoods for rural communities.

Fig. 3.48. Experimental Black Bengal goats

Baseline Documentation of Local Goat Genetic Resources

Baseline surveys and preliminary data analysis have been initiated in selected districts of central and north-eastern plateau sub-zone of Jharkhand to document the population structure, production systems, and management practices of local goat genetic resources. Three districts-Hazaribagh, Chatra, and Koderma were selected for the study. In each district, two blocks with a high concentration of goat population were identified for detailed baseline surveys and data recording to help determine the breeding tract of locally identified goat germplasm. In Hazaribagh district, the blocks of Barhi and Katkamsandi were selected. Within these blocks, villages with a substantial population of local goats targeted for characterization were identified. To ensure adequate representation, a minimum of 50 samples per village were collected for the study. Based on the baseline survey, five distinct local strains were provisionally identified (Fig. 3.49). Phenotypic (morphological) characterization of goats was carried out, including assessment of body weight, coat colour, presence or absence of horns, and beard characteristics. Detailed morphometric measurements were also recorded, such as height at withers, body length, chest girth, pelvic girth, rump length, and rump width (Fig. 3.50). In addition, important reproductive parameters including age at maturity, age at first kidding, service period, kidding interval, and litter size were documented. Productive traits such as slaughter weight, dressing percentage, and milk production were also recorded for further statistical analysis.

Simultaneously, delineation and geo-mapping of breeding tracts of indigenous goat populations have been initiated to understand their spatial distribution and ecological adaptation. Based on the collected information, a comprehensive database is being developed using standardized data recording formats. This will support systematic documentation, future breed registration, and long-term conservation and genetic improvement planning.

Fig. 3.49. Local goat germplasm

Fig. 3.50. Baseline survey and body measurement recording during field survey

Documentation of Indigenous Cattle and Managemental Practices

The present study was conducted to explore and document indigenous cattle and associated management practices in the central and north-eastern plateau of Jharkhand. The findings provide quantitative insights into the phenotypic and productive performance of local cattle populations. The field survey identified three distinct indigenous cattle strains based on coat colour: pure white to light grey, white-brown to brown, and black with whitish-brown ventral region (Fig. 3.51) Morphometric characterization across different age groups (calves <1 year, growing cattle 1-3 years, and adults & gt; 3 years) revealed that these animals are generally small in size, with an average height of 3.5 ± 0.3 ft (range: 3.0-4.0 ft). Production traits indicated low productivity under existing management conditions. The birth weight of calves averaged 11.0 ± 0.8 kg (range: 10-12 kg), suggesting moderate growth potential. Average milk yield was 2.5 ± 0.4 L/day (range: 2-3 L/day), reflecting poor lactational performance. In addition, udder development was qualitatively assessed as low to moderate, supporting the observed milk yield trends.

Despite these limitations, the indigenous cattle exhibited strong adaptability to local agro-climatic conditions and were maintained under low-input production systems, highlighting their importance for smallholder and resource-poor farmers. The study further documented several indigenous technical knowledge (ITKs) and traditional management practices related to feeding, breeding, and animal health care. These practices contribute significantly to sustaining livestock productivity under field conditions. Therefore, strategic interventions such as genetic improvement, balanced nutrition, and scientific management practices are essential to enhance productivity while conserving their resilience.

Fig. 3.51. Herd of indigenous cattle of Jharkhand

Fish Production and Management

Performance Evaluation of Important Freshwater Fish Varieties

Following the development of six fish ponds where research activities are ongoing, the scientific design and construction of an additional aquaculture complex comprising four ponds is currently in progress. The scientifically designed aquaculture model was developed, consisting of rectangular earthen ponds based on proper site suitability assessment, layout planning and systematic construction. A concept was developed for efficient water management through well-designed inlet and outlet systems including monk structures fitted with metallic sheets and wire mesh screens to regulate water flow. Further, a methodology was developed to maintain appropriate pond geometry including shape and size, bottom slope, water depth and freeboard. The pond dykes/embankments were constructed with suitable top width, bottom width and slopes, ensuring that the inner (water-side) slope is steeper than the outer (land-side) slope for better stability. The aquaculture model was developed to evaluate fish growth performance using five carp species stocked at varying proportions. For efficient feed utilization, a prototype was developed in the form of an indigenously designed floating bamboo frame, which helps in localized feeding and prevents feed drifting and loss (Fig. 3.52).

Among the experimental species, Catla and Black carp exhibited better growth rates followed by Rohu and common carp, attaining size ranges of 600-720 g and 420-575 g respectively (Fig. 3.53). The hydro-chemical parameters including temperature, dissolved oxygen (DO), pH, alkalinity, hardness and electrical conductivity (EC) were regularly monitored and found to be within the desirable range. To evaluate natural productivity, plankton samples were collected using plankton nets and analyzed both qualitatively and quantitatively. Mixed populations of phytoplankton and zooplankton were observed. Regular liming with limestone is being carried out as part of the management methodology developed (Fig. 3.54), primarily to maintain optimal pH and to disinfect the ponds by controlling pathogens and disease-causing organisms.

Fig. 3.52. Floating bamboo frame as feeding implement for fishes

Fig. 3.53. Sampled sizes of experimental carps

Fig. 3.54. Lime solution preparation followed by application in fish ponds

4

Outreach Programs

Viksit Krishi Sankalp Abhiyan (VKSA) Campaign

The ICAR-Indian Agricultural Research Institute (IARI), Jharkhand, actively participated in the Viksit Krishi Sankalp Abhiyan (VKSA) in Hazaribagh district from May 29 to June 12, 2025. During the campaign, institute teams visited 127 villages and reached 14,923 farmers covering all 16 blocks. Notably, around 60% of the beneficiaries were women, indicating strong female participation. Twelve multidisciplinary teams comprising scientists, ATM and BTM officials, technical staff, and students conducted daily outreach activities. These included demonstrations on micro-irrigation, seed germination testing, natural farming, bird perching, intercropping, and promotion of region-specific crop varieties and disease management practices, with special focus on mushroom value chain development. The campaign identified key challenges such as water scarcity, acidic soils, inadequate irrigation infrastructure, and limited access to quality seeds and government schemes. These insights helped define research priorities, including water harvesting for undulating terrains, management of Fusarium wilt in acidic soils, optimization of fertilizer use in nutrient-deficient soils, promotion of climate-resilient and stress-tolerant crop varieties, strengthening seed production and distribution systems to improve access to quality seeds, capacity building and awareness programs to increase farmers' access to government schemes and modern technologies. VKSA activities gained wide visibility through local media, Facebook, and WhatsApp platforms. Regular updates, photographs, and success stories enhanced farmer engagement and facilitated real-time coordination among field teams. Media coverage further amplified outreach by highlighting field demonstrations and farmer experiences. Overall, VKSA in Hazaribagh demonstrated a collaborative, grassroots approach to agricultural development, integrating scientific interventions with effective communication strategies and laying a strong foundation for future initiatives.

Fig. 4.1. VKSA outreach teams with local stakeholders in Hazaribagh villages

Tribal Sub Plan (TSP)

A. Training and Input Distribution Program

As part of the Tribal Sub-Plan (TSP), ICAR-IARI, Jharkhand, is actively working to improve the socio-economic status of tribal farmers by enhancing agricultural productivity and farm income. Under this initiative, Farmer Training-cum-Seed Distribution Programs were conducted on 'Improved Agricultural Practices for *Kharif* and *Rabi* Crops' across several villages and blocks in the districts of Hazaribagh,

Chatra, Khunti, Ranchi, Gumla, and Simdega. In the Bishnugarh and Chauparan blocks of Hazaribagh district, training and seed distribution programs were conducted in villages including Kharna, Alkhari, Jarva, Jamnizara, Jagodihnima, Pipra, and Dayhar, benefiting a total of 109 farmers. A specialized training program on "Advanced Gardening Techniques" was also organized on September 12, 2025 in collaboration with the Pradhan, Bokaro, where 95 farmers participated and received hands-on training along with input support. In addition, Scheduled Tribe (ST) farmers from multiple blocks including Daru, Ichak, Barhi, Katkamsandi, Tatijhariya, Sadar, Bishnugarh, Barkatha, Chauparan, Dadi and Churchu (Hazaribagh district); Giddhour (Chatra district); and selected blocks of Khunti, Ranchi, Gumla and Simdega districts were provided technical training on improved cultivation practices for *Kharif* and *Rabi* crops (Table 4.1 & 4.2). Overall, 1,429 farmers benefited from these programs. Following the training sessions, seed kits of paddy (10q), pigeon pea (5q), maize (10q), wheat (48.75 q), mustard (20 q), lentil (19.61 q), chickpea (24.46 q), and vegetable seed kits (2000 packets) were distributed as handholding support to promote adoption of improved agricultural practices and strengthen sustainable livelihoods among tribal farming communities.

Table 4.1. Details of training cum *Kharif* seed distribution program under TSP (June 25-July 17, 2025)

S. No.	Date	Target Place	Resource Person/Organizing Committee
1	25/06/2025	Bishnugarh	Dr. Abhay Giri, Dr. Krishna Prakash, Arun Kumar Rajak
2	02/07/2025	Dadi	Dr. Pankaj, Dr. Mukesh Tiwari, Arun Kumar Rajak
3	03/07/2025	Chouparan	Dr. Manoj, Dr. Asha Kumari, Arun Kumar Rajak
4	04/07/2025	Digwar, Phuphundi, Ichak	Dr. Himani, Dr. Kashinath, Dharmendra
5	05/07/2025	Katkamsandi	Dr. Shilpi, Dr. Vandana, Dharmendra
6	07/07/2025	Daurwa, Barhi	Dr. Nuzaiba, Dr. Dipak, Arun Kumar Rajak
7	10/07/2025	Churchu	Dr. Priti Tigga, Dr. Mukesh Tiwari, Dharmendra
8	11/07/2025	Gidhaur, Chatra	Dr. Saheb Pal, Dr. Pavithra, Dharmendra
9	14/07/2025	Tatijharia	Dr. Narendra, Dr. Anima, Dharmendra
10	15/07/2025	Bishnugarh	Dr. Sougata, Dr. Niranjan, Dharmendra
11	16/07/2025	Katkamsandi	Dr. B.N. Mandal, Sushil Marandi, Arun Kumar Rajak
12	17/07/2025	Dadi	Dr. Pankaj, Dr. Nirmal, Dharmendra

Table 4.2. Details of training cum *Rabi* seed distribution program under TSP (November 06-15, 2025)

S. No.	Village/Block/District	Resource person
1	Kundwa	Dr. Shilpi, Dr Priti Tigga, Dr Vandana Yadav
2	Bishnugarh, Tatijhariya	Dr. Saheb, Dr. Anima, Dr. Mukesh Tiwari
3	Barkatha	Dr. Saugata, Dr. Dipak, Dr. Narendra
4	Giddhour	Dr. Pankaj, Dr. Nirmal, Dr. Ranjit
5	Dadi	Dr. Asha Kumari, Dr. Saheb, Dr. Prabhat
6	Ichak	Dr. Mukesh, Dr. Vandana, Dr. Santosh,
7	Chouparan	Dr. Priti Tigga, Dr. Abhay, Dr. Kashinath
8	Daurwa	Dr. Shilpi, Dr. Nuzaiba, Dr. Kashinath
9	Sadar	Dr. Ranjit, Dr. Narendra, Dr. Asha Kumari
10	Katkamsandi	Dr. Pankaj, Dr. Himani, Dr. Nirmal

Fig. 4.2. Training-cum-Seed Distribution Program team with tribal beneficiaries

B. Kisan Goshthi -cum Seed Distribution Program

Kisan Goshthi was organized in farmers' villages, and direct input supply to needy tribal farmers significantly contributed to enhancing their income through increased agricultural productivity. This impact was recorded during scientists' field visits to monitor crop performance, seed distribution, and collect farmers' feedback. The Institute's efforts in supplying quality seeds under the Tribal Sub Plan (TSP) were highly appreciated by the beneficiary farmers. There is strong demand for high-quality seeds across all seasons, reflecting the effectiveness and acceptance of the intervention.

Fig. 4.3. Kisan Goshthi cum seed distribution Program under TSP at the village level

C. Janjatiya Gaurav Varsh Pakhwada 2025

As part of the nationwide observance of Janjatiya Gaurav Varsh Pakhwada, a special 15-day program (November 1-15, 2025) focusing on 'livelihood and entrepreneurship development' was organised at different tribal villages of Hazaribagh district under the Tribal Sub-Plan. A training and awareness camp was organized as per the activity schedule provided. The event aimed to empower tribal youth, women, and farmers by introducing sustainable livelihood opportunities and strengthening local entrepreneurship skills. The program was combined with the seed distribution cum training program under TSP.

Fig. 4.4. Community gathering highlighting participation in Janjatiya Gaurav Varsh Pakhwada

D. Kisan Mela Cum Kisan Sanghosthi to Empower Tribal Farmers

ICAR-IARI, Jharkhand, organized *Janjatiya Gaurav Varsh Pakhwada 2025* from November 1 to 15, 2025, to commemorate the 150th birth anniversary of Bhagwan Birsa Munda, focusing on tribal empowerment through agriculture and allied activities. Programs were conducted across tribal-dominated villages of Hazaribagh district. A Kisan Mela-cum-Sangoshthi was held on November 13, 2025, at Daurwa village, Barhi block, with Shri Anand Sharma, IAS (probationer), as Chief Guest. The event included an agricultural exhibition showcasing improved crop varieties, livestock technologies, soil and water management practices, and value-added products. Scientists conducted interactive sessions on crop production, climate-resilient agriculture, pest and disease management, livestock rearing, and agri-entrepreneurship. More than 200 farmers participated in the program. Farmers' queries were addressed through expert discussions, and vegetable seed kits were distributed. The institute also proposed adopting Daurwa village for targeted interventions to enhance livelihoods and incomes.

Fig. 4.5. Glimpses from Kisan Mela-cum-Sangoshthi

E. 2500 Vanaraja Chicks Distributed to Trained Tribal Farmers

To support rural livelihoods, 2,500 Vanaraja chicks were distributed to 50 trained tribal farmers, enabling them to expand their 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 Program 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.

Fig. 4.6. Trained tribal farmers with Vanaraja chicks

Success Story: Transforming Tribal Livelihoods Through Vanraja Backyard Poultry Farming

In the remote tribal villages of Jharkhand, where agriculture remains largely subsistence-based and livelihood opportunities are limited, a simple yet impactful intervention, backyard poultry farming with Vanraja birds, has emerged as a game changer. Tribal households traditionally rear desi poultry under low-input systems. However, poor productivity, high mortality, and lack of improved breeds often limit income generation. Recognizing this gap, the introduction of Vanraja poultry under the Tribal Sub Plan (TSP) initiative of ICAR-IARI, Jharkhand, the Backyard Poultry Production System aimed to enhance income, nutritional security, and women's empowerment. Vanraja poultry, developed for rural and backyard conditions, has proven highly beneficial for tribal and smallholder farmers under low-input systems. Its adaptability, productivity, and dual-purpose nature (meat + eggs) make it an ideal choice for livelihood improvement. When compared to Indigenous birds, Vanraja have faster growth, higher egg production under backyard conditions, and better survivability and disease resistance. Other economic benefits include earnings from both eggs and meat, low input cost, better market price due to larger body size, colored birds preferred by consumers, and eggs provide regular cash flow (daily/weekly income). Indeed, the introduction of Vanraja variety under the backyard poultry initiative under TSP has proven to be a low-investment, high-return livelihood model for tribal farmers (Table 4.3). It not only generates regular income but also improves nutritional security and empowers rural households in tribal regions. However, few constraints/challenges were observed across tribal poultry farmers (Table 4.4).

Table 4.3. Performance indicators of tribal poultry farmers

Indicator	Achievement (General trend)
Chicks received	50 per household
Mortality	Very low (often negligible with proper care)
Adult weight	Above 2 kg
Egg production (No./year)	80-120+ per season
Income source	Meat and egg sales
Selling price	₹220-₹300/kg (meat), ₹20-₹30/egg

Table 4.4. Constraints commonly observed across tribal poultry farmers

Challenge	Scientific implication
Cold stress	Increased chick mortality
Poor housing	Heat loss, disease susceptibility
Limited awareness	Improper brooding and feeding
Lack of vaccination	Higher risk of infectious diseases

Fig. 4.7. Beneficiaries of TSP program with Vanaraja birds

From Risk to Resilience: Improving Tribal Livelihoods Through Sahbhagi Dhan

In the rainfed uplands of Jharkhand, tribal farmers frequently face challenges such as erratic rainfall, recurrent drought stress, and low productivity under traditional paddy cultivation systems. These constraints significantly affect food security and household income. A tribal farmer cultivating 1-2 acres of upland rainfed land traditionally relied on local paddy varieties, which yielded only 8-10 q/ha and were highly prone to crop failure. Under the TSP support from the institute, the farmer adopted Sahbhagi Dhan, a drought-tolerant rice variety specifically developed for rainfed conditions. Sahbhagi Dhan is an early-maturing variety (≈105-110 days), well-suited for upland and rainfed ecosystems, with a yield potential of 20-25 q/ha. The crop performed significantly better under field conditions, showing no major incidence of insect pests or diseases. Farmers also reported good grain quality and taste, which further encouraged its adoption (Table 4.5).

Table 4.5. Performance evaluation of Sahbhagi Dhan under rainfed conditions

	Before adoption	After adoption
Yield	8-10 quintal/ha	18-22 quintal/ha
Crop failure risk	High	Low
Production stability	Low	High
Income	Low	High

The adoption of Sahbhagi Dhan has emerged as a climate-resilient solution for tribal farmers in Jharkhand, leading to improved yield stability, enhanced income, and strengthened livelihood security under rainfed conditions.

Fig. 4.8. Media Coverage of The Institute's TSP Programs in 2025

Scheduled Caste Sub-Plan (SCSP)

In 2025, ICAR-IARI Jharkhand effectively implemented the SCSP project, benefiting Scheduled Caste farmers across Hazaribagh and nearby districts of Jharkhand and Bihar. Various extension activities, including Kisan Goshthi, awareness camps, demonstrations, and animal health camps, were conducted to enhance farmer awareness and outreach. Over 20,000 farmers were supported through the distribution of 2,520 quintals of quality seeds, 21,400 vegetable seed kits, 1,500 farm tools, and 1,550 fruit plant saplings. Additionally, an animal health camp was conducted, benefiting more than 100 farmers through free animal health check-ups, treatment, deworming, and feed supplementation. Hands-on off-campus training programs on horticulture and entrepreneurship development were also organized for interested farmers to enhance practical knowledge and skill development.

A. Beej Se Samriddhi: Mega Seed Distribution Program for SC Farmers

During the *Kharif* and *Rabi* seasons of 2025, the institute implemented a large-scale seed distribution program under SCSP to promote improved agricultural productivity and livelihood enhancement among beneficiary farmers. Distribution of approx. 105 tonnes of quality seeds during the *Kharif* season 2025 and 143 tonnes during *Rabi* 2025 contributed significantly to strengthening food security, improving productivity, and enhancing the socio-economic conditions of the farming community, touching the hands of approx. 9000 scheduled caste farmers during *Kharif* and 12500 farmers during *Rabi* in the year 2025 (Table 4.6). The seed distribution program of the institute initiative covered all 16 blocks of Hazaribagh district, three blocks of Koderma, two blocks each of Chatra, Dhanbad, Bokaro, and Ramgarh, one block of Deoghar district of Jharkhand, and two blocks of Patna district in Bihar. Overall, the program effectively addressed the critical need for quality seeds among SC farming communities, resulting in increased crop productivity, improved farm incomes, and greater confidence in modern agricultural technologies. The enthusiastic participation of beneficiaries and the rapid adoption of improved varieties reflect the program's relevance and impact. By ensuring timely availability of high-quality seeds, the initiative has contributed to strengthening livelihood security, enhancing agricultural resilience, and fostering sustainable growth among Scheduled Caste farmers in the region of Eastern India.

Table 4.6. Input distribution (quality seed, fruit plant saplings, small farm tools, etc.) to farmers during 2025

Sl. No.	Crop season	Quantity of input distributed	Distribution districts (No. of blocks)	Farmers benefitted (Nos.)
1	Summer season	Moong (15 Q), Maize (50 Q), Vegetable kits (1800 Nos.)	Hazaribagh (4), Chatra (2)	1800
2	*Kharif* season	Paddy (745 Q), Moong (8 Q), Pigeon pea (23 Q), Maize (270 Q), Ragi seeds (0.6 Q), Vegetable kits (8605 Nos.), Fruit plant saplings (1300 Nos.),	Jharkhand: Hazaribagh (16), Chatra (2), Bokaro (2), Ramgarh (2), Koderma (2), Deoghar (1), Bihar: Patna (1)	9000
3	*Rabi* season	Wheat (1150 Q), Mustard (95 Q), Lentil (95 Q), Chickpea (80 Q), Pea seeds (10Q), Onion seeds (250 Kg), Vegetable kits (12250 Nos.), Fruit plant saplings (250 Nos.)	Hazaribagh (14), Chatra (2), Dhanbad (2), Bokaro (2), Koderma (3) Bihar: Patna (2)	12500

Fig. 4.9. Highlights from the mega seed distribution Program under SCSP

B. Strengthening Rural Livelihoods through Horticulture, Farm Tools, and Allied Agricultural Inputs

The scheduled caste farmers were given a set of fruit plant saplings of improved varieties of suitable fruit crops like Mango, Guava, Litchi and Sapota to promote fruit cultivation in the area. More than 1500 seedlings were distributed among 300 farmers of the Hazaribagh district. The farmers were also supported with other farm inputs like small farm tools and implements like knapsack sprayer, water can, spade, sickle, fawda, spade, khurpi etc. Approx. 6000 nos. of these tools were distributed directly to the needy households during training programs in 2025. The rural households of the community were also supported with poultry chicks, livestock medicines, mineral mixtures, organic and biofertilizers, vermi-bed, pots, portraits, etc., to strengthen their agricultural activities.


Fig. 4.10. Glimpses from Horticulture, Farm Tools, and Allied Agricultural Input Distribution Program

C. Strengthening Farmer–Scientist Linkages Through Kisan Goshthi cum Seed Distribution at Farmer's Village

During the year 2025, ICAR-IARI Jharkhand organized several one-day Kisan Goshthi-cum-seed distribution programs under SCSP across different locations. These programs aimed to disseminate knowledge of improved crop cultivation methods and promote the adoption of scientific agricultural practices among farmers. The events served as an effective platform for providing need-based training on crop management, the use of quality seeds, and modern production technologies. Along with technical guidance, seeds of improved varieties were distributed to participating farmers to support practical implementation in their fields.

An important component of these programs was the interactive session, where farmers shared feedback and experiences from previous cultivation seasons. This exchange helped identify field-level challenges and refine future interventions accordingly. Overall, these initiatives strengthened farmer-scientist interaction, enhanced awareness of improved agricultural practices, and contributed to better planning and productivity at the grassroots level.




Fig. 4.11a. Glimpses from Kisan Goshthi cum seed distribution program

The following major programs were conducted during the peak cropping season of 2025:

1. Training and seed distribution for cultivation of *Kharif* crops using scientific methods to achieve higher productivity among Scheduled Caste farmers (June 20 – July 14, 2025)

Table 4.7. Training and *Kharif* seed distribution program under SCSP

S. No.	Date	Place	Block (district)	Resource person
1	20-06-2025	Gayapahadi, Malkoko	Barkatha	Dr. Manoj Chaudhary, Dr. Krishna Prakash, Mr. Dharmendra K Yadav
2	21-06-2025	Bahera, Karma	Chouparan	Dr. Dipak K. Gupta, Dr. Krishna Prakash
3	22-06-2025	Chandwara, Kanko	Chandwara	Dr. Krishna Prakash, Mr. Arun Kumar Rajak
4	25-06-2025	Rasoiya Dhamna, Bendgi, Pachmadho	Barhi	Dr. Krishna Prakash, Mr. Arun Kumar Rajak, Mr. Satyam Kumar
5	02-07-2025	Kariyatpur, Kajra	Barhi	Dr. Shilpi K., Dr. Vandana, Mr. Arun Kumar Rajak
6	03-07-2025	Chanda, Jalondh	Ichak	Dr. Krishna Prakash, Mr. Arun K. Rajak
7	03-07-2025	Medhkuri, Digwar	Daru	Dr. Pankaj K. Sinha, Dr. Mukesh Tiwari
8	04-07-2025	Keredari, Pipradih, Peto	Keredari, Badkagaon	Dr. Asha Kumari, Dr. Prabhat Guru, Mr. Arun K. Rajak
9	05-07.2025	Katkamsadi	Katkamsadi	Dr. Krishna Prakash, Mr. Arun Kumar Rajak
10	05-07-2025	Karon, Navadih	Navadih (Devghar & Bokaro)	Dr. Krishna Prakash
11	07-07-2025	Sadar	Sadar (Hazaribagh)	Dr. Nirmal kumar, Mr. Arun Kumar Rajak
12	09-07-2025	Dadi, Patratu	Dadi, Patratu	Dr. B. N. Mandal, Dr. Himani Priya, Dr. Vandana
13	10-07-2025	Mayurhand, Gidhor, Tandwa	Mayurhand, Tandwa(Chatra)	Dr. Abhay K. Giri, Dr. Saheb Pal, Mr. Arun Kumar Rajak
14	11-07-2025	Barka khurd	Ichak	Dr. Pankaj K. Sinha, Dr. Asharani Patel, Mr. Arun K Rajak
15	12-07-2025	Mahmadpur	Bakhatiyarpur (Patna, Bihar)	Dr. Krishna Prakash
16	14-07-2025	Godhiya, Bishnugarh, Tatijhariya	Bishnugarh, Tatijhariya,	Dr. Asha Kumari, Dr. Saugata B., Mr. Arun K Rajak

Program Coordinators: *Dr. Vishal Nath & Dr. S.K. Mahanta*

Training Coordinators: *Dr. Krishna Prakash (Nodal Officer, SCSP) and assisted by SCSP committee*

Fig. 4.11b. Glimpses from Kisan Goshthi cum seed distribution program (*Kharif* crops)

2. Training and distribution for *Rabi* crop cultivation using scientific methods to achieve higher productivity among Scheduled Caste farmers (October 19– December 30, 2025).

Table 4.8. Training and *Rabi* seed distribution program under SCSP

S. N.	Date	Place	Block/ District	Resource Persons
1	17.10.2025	Gurhet	Sadar	Dr. Asha Kumari, Mr.Arun Kumar Rajak
2	30.10.2025	Rasoiya Dhamna, Purhara, Bendagi	Barhi	Dr. Pavithra K.N., Mr. Arun Kumar Rajak
3	01.11.2025	Bahera, Ratanpur, Belkhara, Nagwa	Chauparan	Dr. Krishna Prakash, Dr. Dipak K. Gupta, Mr. Shantesh Kamath
4	04.11.2025	Kariyatpur, Malkoko, Rohania	Barhi	Dr. Asha Kumari, Mr. Arun Kumar Rajak
5	07.11.2025	Pipradih, Ome, Peto	Badkagaon, Keredari	Dr. Asha Kumari, Mr. Akash A. Mr.Arun Kumar Rajak
6	08.11.2025	Sewai Khurd	Mayurhand	Dr. Manoj Chaudhary, Mr. Arun Kumar Rajak
7	10.11.2025	Medhkuri, Digwar	Daru	Dr. Krishna Prakash
8	10.11.2025	Godhiya, Bedmakka, Nawada, Banaso	Bishnugarh, Tatijhariya	Dr. Krishna Prakash, Dr. Prabhat Guru, Dr. Asha Kumari, Dr. Saheb Pal
9	12.11.2025	Beram	Tatijhariya	Dr. Kashinath G Teli, Dr. Priti Tigga
10	12.11.2025	Koderma KVK	Jainager, Koderma, Bhagandih	Dr. Pankaj Kr. Sinha, Mr. ShanteshKamath, Mr. Arun Kumar Rajak
11	14.11.2025	Bandachak	Chandwara	Dr. Pavithra K. N., Mr. Arun Kumar Rajak
12	14.11.2025	Chatra KVK	Chatra, Kullu	Dr. Pankaj Kr. Sinha, Dr. Ranjit Singh,Mr. Arun Kumar Rajak
13	15.11.2025	Ramgarh KVK	Udlu	Dr. Pankaj Kr. Sinha, Mr. Arun Kumar Rajak
14	16.11.2025	Bokaro KVK, Nawadih	Bokaro	Dr. Vishal Nath, Dr. Krishna Prakash, Mr. Shantesh Kamath
15	17.11.2025	Lonhri, Jalundh, Ashiya	Ichak	Dr. Vandana Yadav, Dr. Himani Priya,Mr. Arun Kumar Rajak
16	18.11.2025	Karma, Bahera, Basariya	Chauparan	Dr. Ranjit Singh, Mr. Arun Kumar Rajak
17	24.11.2025	Dhanbad Kvk	Dhanbad	Dr. Vishal Nath, Dr. Krishna Prakash
18	26.11.2025	Badh, Patna	Badh, Patna	Dr. Krishna Prakash
19	15.12.2025	Pakariya	Mayurhand	Dr. Krishna Prakash, Mr. Arun Kumar Rajak
20	30.12.2025	Basariya	Chaupran	Dr. Krishna Prakash, Mr. Arun Kumar Rajak

Program Coordinators: *Dr. S.K. Mahanta, Dr. Vishal Nath & Dr. Pankaj Kumar Sinha*

Training Coordinators: *Dr. Krishna Prakash (Nodal Officer, SCSP) and assisted by SCSP committee*

Fig. 4.12. Glimpses from Kisan Goshthi cum seed distribution program (*Rabi* crops)

D. Skill Development for Agricultural Excellence: A Capacity-Building Initiative Under SCSP

A series of 20 capacity-building training programs was organized on campus from January to December 2025 under the Scheduled Castes Sub Plan (SCSP) (Table 4.9). These sessions aimed to enhance agricultural skills and knowledge among selected beneficiaries. These programs enrolled 663 participants from the Hazaribagh district. The capacity-building initiatives included on-campus training programs of varying durations: one-day (7 programs), three-day (11 programs), and five-day (3 programs). 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. 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. Additionally, exposure visits were organized to enhance farmers' learning experiences. The practical demonstrations and exposure visits were particularly appreciated by the participants, as they provided firsthand experience of improved technologies and their field-level applications. Feedback collected from the trainees indicated a high level of satisfaction with the content, relevance, and delivery of the programs. Many participants reported increased awareness of scientific farming practices and expressed their willingness to adopt the recommended technologies in their farms and allied enterprises.

Table 4.9. Capacity building program for farmers under SCSP

Sl. No.	Name of the Training	Date	No. of Trainees	Trainees of the Block	Training Coordinator & Co-coordinators
1.	Biofertilizer Application for Promoting Organic Farming in Eastern India (One Day Training)	28.02.2025	50	Chauparan	Dr. Himani Priya & Dr. Dipak Kumar Gupta, Dr. Kashinath Teli, Dr. Akash A., Dr. Priti Singh
2.	Integrated Pest Management in crops (One Day Training)	03.03.2025	50	Barkatha, Barhi	Dr. Asharani Patel & Dr. Pankaj Kr. Singh, Dr. Pavitra K.N., Dr. Akash A.
3.	Vermicomposting of Agricultural Waste (One Day Training)	04.03.2025	43	Barhi	Dr. Dipak Kumar Gupta & Dr. Himani Priya, Dr. Narendra Singh
4.	Scientific Goat Production Practices (One Day Training)	07.03.2025	50	Barhi	Dr. Shilpi Kerketta & Dr. Monika M., Dr. Abhay Kr. Giri, Dr. Nuzaiba P.M.

Sl. No.	Name of the Training	Date	No. of Trainees	Trainees of the Block	Training Coordinator & Co-coordinators
5.	Seed Production Technologies in *Rabi* Crops (Five Days Training)	3-7 March 2025	25	Barhi	Dr. Priya Ranjan Kumar & Dr. Santosh Kumar, Dr. Saheb Pal, Dr. Himani Priya, Dr.Akash A.
6.	Cultivation of Important Freshwater Fish Varieties (One Day Training)	08.03.2025	42	Barhi, Padma, Mayurhand, Barkatha	Dr. Abhay K. Giri & Dr. Shilpi Kerketta, Dr.Monika M, Dr. Nuzaiba P.M.
7.	Weed Management Aspects in Crops (One Day Training)	10.03.2025	48	Barhi	Dr. Kashinath Teli & Dr. Himani Priya, Dr. Saheb Pal, Dr. Narendra Singh, Dr. Niranjan Singh
8.	Mushroom Cultivation and Value Addition Techniques (Three Days Training)	9-11 March 2025	30	Barhi	Dr. Pankaj Kumar Sinha & Dr. Asharani Patel
9.	Application of Microbial Biofertilizers in Crops for Sustainable Agriculture (Three Days Training)	17-19 March 2025	25	Barhi, Barkatha, Mayurhand, Padma	Dr. Himani Priya & Dr. Dipak Kumar Gupta, Dr. Kashinath Teli, Dr. Akash A.
10.	Livestock and Poultry Production and Management (Three Days Training)	19-21 March 2025	25	Ichak, Chandwara, Tatijariya, Padma	Dr. Shilpi Kerketta & Dr. Monika M., Dr. Abhay Kr. Giri, Dr. Nuzaiba P.M.
11.	Integrated Fish Farming for Sustainable Livelihood and Income Generation (Three Days Training)	19-21 March 2025	25	Ichak, Barhi, Mayurhand, Padma	Dr. Abhay K. Giri & Dr. Shilpi Kerketta, Dr.Monika M, Dr. Nuzaiba M., Dr. S. Bhatacharjee, Dr. Asha Kumari, Dr. Pavithra K.N.
12.	Nursery Management of Horticultural crops (Five Days Training)	24-28 March 2025	25	Padma, Barhi, Chauparan, Barkatha	Dr. Narendra Singh & Dr. Saheb Pal, Dr. Shantesh Kamath
13.	Scientific Vegetable Cultivation Practices (Five Days Training)	24-28 March 2025	25	Barhi, Chauparan, Barkattha	Dr. Krishna Prakash & Dr. Saheb Pal, Dr. Shanthesh Kamath, Dr Dipak Kumar Gupta, Dr. Narendra Singh
14.	Techniques of Vermicomposting for efficient management of Agricultural Waste (Three Days Training)	26-28 March 2025	25	Mayurhand, Barkatha, Badkagaon, Sariya	Dr. Dipak Kumar Gupta & Dr.Manoj Chaudhary, Dr. Himani Priya, Dr. Kashinath Teli
15.	Integrated Training on Millets Production, Processing and Value Addition (Five Days Training)	02-06 August, 2025	30	Barkatha, Barhi, Ichak	Dr. Asha Kumari & Dr. Pavitra K.N., Dr. Sougata Bhattacharjee, Dr. Kashinath G. Teli
16.	Integrated Farming System (One Day Training)	11.10.2025	50	Barhi, Barkatha	Dr. Asha Kumari & Dr. Pavitra K.N., Dr. Sougata Bhattacharjee, Dr.Kashinath G. Teli, Dr. Vandana Yadav

Sl. No.	Name of the Training	Date	No. of Trainees	Trainees of the Block	Training Coordinator & Co-coordinators
17.	Seed Production of *Rabi* Crops (Three Days Training)	13-15 October, 2025	30	Ichak	Dr. Akash A. & Dr. Santosh Kumar, Dr. Saheb Pal, Dr. Pavitra K.N.
18.	Entrepreneurship Development in Aquarium Fish Keeping (Three Days Training)	19-21 November, 2025	30	Tatijhariya, Padma, Barhi	Dr. Nuzaiba P.M. & Dr. Vandana Yadav, Dr. S.K. Mahanta, Dr. Shilpi Kerketta, Dr. Abhay Kr. Giri
19.	Scientific Livestock Production and its Management (Three Days Training)	26-28 November, 2025	30	Chauparan, Barhi	Dr. Vandana Yadav & Dr. S.K. Mahanta, Dr. Shilpi Kerketta, Dr. Abhay Kr. Giri, Dr. Nuzaiba P.M.
20.	Scientific Goat Farming Practices (Three Days Training)	01-03 December, 2025	30	Barhi	Dr. Shilpi Kerketta & Dr. S. K. Mahanta, Dr. Vandana Yadav, Dr. Abhay Kr. Giri, Dr. Nuzaiba P.M.

Organizing Secretary: *Dr. Krishna Prakash (Nodal Officer, SCSP), Dr. Pankaj Kumar Sinha (In Charge, ToT Cell) & Mr. Arun K. Rajak (Technical Assistance)*

Under the setup of the School of Crop Sciences at ICAR-IARI Jharkhand, the SCSP training program in 2025 was effectively planned and executed with a well-structured curriculum covering key areas such as seed production technologies in *Rabi* crops, integrated pest management, weed management, mushroom cultivation, and millet production, processing, and value addition. The program combined expert lectures, practical demonstrations, interactive sessions, and visit to the commercial setup, ensuring active participation and experiential learning. It proved highly useful in enhancing participants' knowledge and skills, particularly in adopting scientific crop management practices and exploring income-generating activities like mushroom cultivation and value addition. The training had a significant positive impact by promoting sustainable agricultural practices, improving participants' capacity for better decision-making, and creating opportunities for livelihood enhancement, thereby contributing to the socio-economic upliftment of the targeted beneficiaries. Under Horticultural crops, the training focused on key topics such as scientific vegetable cultivation practices and nursery management of horticultural crops that proved highly useful in enhancing the technical knowledge and practical skills in improved cultivation techniques, quality seedling production, and efficient nursery management. The program encouraged the adoption of scientific horticultural practices towards increasing the area under fruit cultivation, improving productivity and input efficiency, and creating opportunities for income generation through vegetable cultivation and nursery enterprises, thereby contributing to the overall livelihood improvement of the scheduled caste beneficiaries.

Under the School of Natural Resource Management, the 2025 SCSP training program focused on important themes such as vermicomposting of agricultural waste, application of microbial biofertilizers, and integrated farming systems. The program was organized through a combination of expert lectures, hands-on training, and interactive sessions, ensuring active participation and practical exposure for the trainees. It proved highly useful in enhancing participants' knowledge and skills in sustainable agricultural practices, particularly in waste recycling, soil health improvement, and eco-friendly nutrient management through the production and use of biofertilizers and natural farming resources like Jeevamrit, Ghanjeevamrit, Beejamrit etc. The program had a significant positive impact by encouraging the adoption of organic and integrated farming approaches, reducing dependence on chemical inputs, improving farm sustainability, and creating opportunities for cost-effective and environmentally sound agricultural practices, thereby contributing to the livelihood enhancement of the scheduled caste beneficiaries.

The SCSP Training Program of 2025, organized under the School of Animal Sciences and Fisheries, was systematically planned and effectively executed for various one-day and three-day trainings, covering

key areas such as livestock and poultry production and management, scientific goat farming practices, cultivation of important freshwater fish varieties, integrated fish farming for sustainable livelihood, and entrepreneurship development in aquarium fish keeping. The program was well organized with a balanced approach of expert lectures, practical demonstrations, interactive sessions, and visits, ensuring active participation and hands-on learning for the trainees. It proved highly useful in enhancing the technical knowledge and practical skills of participants in animal husbandry and fisheries-based enterprises. The program had a significant positive impact by promoting scientific management practices, improving productivity and resource utilization, and encouraging entrepreneurship and income generation opportunities, thereby contributing to sustainable livelihood development and socio-economic upliftment of the scheduled caste beneficiaries.

Fig. 4.13. Highlights from various training program organised under SCSP scheme

E. Livestock Wellness for Rural Prosperity: Veterinary Outreach Initiative Under SCSP

A one-day animal health camp was successfully organized under SCSP on March 29, 2025, at Nichitpur, Gauria karma. 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.

Fig. 4.14. Glimpses from animal health camp

F. Learning from Centres of Excellence: Off-Campus Training for Sustainable Livelihoods

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.

Fig. 4.15. Glimpses from Off-campus training on mushroom cultivation

At the conclusion of each training, the training organizing secretaries 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.

G. Strengthening Farmer–Scientist Linkages for Sustainable Agricultural Development

The institute organized a Scientist-Farmer Interface Meeting on 5 April 2025 at its campus. Dr. Ch. Srinivasa

Rao, Director and Vice-Chancellor of IARI, attended as the Chief Guest, while Dr. C. Viswanathan, Joint Director (Research), was the Guest of Honour. The event witnessed participation from 110 farmers (86 women and 24 men), along with 34 representatives from Farmer Producer Organizations (FPOs) and NGOs engaged in the agriculture sector, and 28 scientists from the institute. Participants represented 21 villages across 13 blocks of Hazaribagh and adjoining districts, including Chatra, Koderma and Ramgarh. During the meeting, Dr. Rao emphasized expanding the project to cover more beneficiaries across additional districts and neighbouring states. He also highlighted the importance of empowering farm women through training and support in kitchen gardening to improve household nutritional security.

Fig. 4.16. Glimpses of scientist-farmer interface meeting

Fig. 4.17. Media highlights on the institute's SCSP programs

Showcasing Research Innovations at Kisan Mela

The team from ICAR-IARI Jharkhand 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.

Fig. 4.18. IARI-Jh stall at the Kisan Mela at ICAR-NISA, Ranchi, Jharkhand

ICAR-IARI, Jharkhand Organized Divisional-Level Farmers' Fair

A one-day divisional-level "Farmer's Fair/Kisan Mela" was organized on 15 February 2025 at IARI-Jharkhand. The program was sponsored by the Department of Agriculture, Animal Husbandry and Cooperative, Government of Jharkhand. Smt. Shilpi Neha Tirkey, Hon'ble Minister for Agriculture, Animal Husbandry, and Cooperative, Government of Jharkhand, attended as the Chief Guest. The fair witnessed the participation of more than 150 farmers. Various exhibition stalls were set up to showcase improved technologies, agricultural practices, and innovations, providing farmers with valuable learning and exposure opportunities.

Fig. 4.19. Smt. Shilpi Neha Tirkey inaugurating the divisional-level farmers' fair at IARI-Jharkhand

5

Training and Capacity Building

I. Training/workshop organised

National workshop on strengthening research and seed system

A national workshop on 'Strengthening research and seed system for enhancing livelihood and nutritional security in Jharkhand' was organized on June 25, 2025 at Nepal House, Ranchi by ICAR-IARI, New Delhi, in collaboration with ICAR-IARI, Jharkhand and the Department of Agriculture, Government of Jharkhand. The workshop brought together policymakers, scientists, seed sector stakeholders, and progressive farmers to deliberate on strategies for improving seed systems and enhancing agricultural productivity in the state. The program was inaugurated by Dr. Ch. Srinivasa Rao, Director, ICAR-IARI, along with Aboobacker Siddique P., Secretary (Agriculture), Government of Jharkhand, and other senior officials from the Government of Jharkhand and ICAR institutes.

Discussions focused on strengthening seed production systems, promoting quality seed availability, and developing regionspecific crop varieties suited to Jharkhand's agroclimatic conditions. Key issues such as decentralized seed production, the Seed Village concept, capacity building, and public–private partnerships were emphasized. A participatory seed production model tailored for Jharkhand was presented and well appreciated, and proposals for strengthening seed processing, testing, and farmer training facilities were discussed. The workshop concluded with a shared vision to develop a longterm strategy and policy framework for a sustainable and selfreliant seed system in the state. Dr. Santosh Kumar, Dr. Akash A and Dr. Saheb Pal served as Organizing Secretaries for the workshop.

Fig. 5.1. Glimpses from the National Workshop at Nepal House, Ranchi

Comprehensive 25 days (200 hours) Gardeners' Training Program

The institute organized '200-hour (25-day) certificate course on gardening training' for malis/gardeners from November 6 to December 4, 2025 in collaboration with the District Horticulture Office, Hazaribagh and Ramgarh. The program was designed to empower rural youth in the field of gardening and nursery

management through skill-building and livelihood diversification in the horticulture sector, a rapidly growing micro-enterprise with high demand in urban and peri-urban markets. A total of 31 participants, 24 from Hazaribagh and 7 from Ramgarh district, enrolled for this skill-oriented training program, designed in line with Agriculture Skill Council of India (ASCI), which aims to strengthen scientific gardening and horticulture skills.

Particulars	Details
Name of the Training	200 hours (25 Days) Certificate Course on Gardener Training
Sponsored by	District Horticulture Office, Hazaribagh/Ramgarh
Date	6 November to 4 December 2025
No. of participants	31
Total No. of Lectures	100
Course Director	Dr. Vishal Nath
Course Coordinator	Dr. Krishna Prakash
Course Co-coordinators	Dr. Narendra Singh & Dr. Shantesh R. Kamath
Resource Persons	All the scientists of ICAR-IARI, Jharkhand and guest lectures by other speakers from the state and national govt. institutions.

Over the 25-days duration, participants were trained in a wide range of topics of horticulture including nursery management, plant propagation techniques, lawn establishment, seasonal flower cultivation, plant protection measures, irrigation management, pruning and training operations, landscape designing and the use of modern tools and implements in gardening. Special emphasis was given on practical demonstrations, field-based learning, and hands-on exposure to horticultural operations. Field and industrial visits to commercial nurseries were also conducted, giving participants an opportunity to observe modern garden management techniques and interact directly with experts in the area. They also participated in various extension programs organized for the farmers at the institute and interacted with officials in-house and other institutions.

The training was concluded with a written qualifying exam on 4 December, where all the participants performed satisfactorily in the objective test paper, followed by valedictory ceremony in which certificate and kits (small gardening tools, organic supplements for the plants, vegetable seed kits and processed products besides literatures) were distributed. This is the third Gardeners' Training Program organized by ICAR-IARI, Jharkhand in the last three years, as sponsored by District Horticulture Office, Hazaribagh/Ramgarh. The initiative reflects the institute's continued commitment to capacity building and human resource development in the horticulture sector across Jharkhand.






Fig. 5.2. Participant engagement in various activities during the Gardeners' Training Program

Fig. 5.3 News Highlights of the Gardeners' training program

Five-day farmers' training program on 'Natural farming for sustainable agriculture and healthy soils'

A five-day farmers' training program on 'Natural farming for sustainable agriculture and healthy soils' was organised at the institute under the visionary leadership of Dr. Ch. Srinivasa Rao, Director cum Vice-Chancellor, IARI. The program was sponsored by the Agricultural Technology Management Agency (ATMA), Banka, Bihar and organized from December 15-19, 2025. A total of 17 farmers along with Mr. Ranjan Kumar, Assistant Technical Manager, ATMA were participated in this capacity-building initiative. Dr. S. K. Mahanta, Campus Incharge. IARI-J highlighted the growing concerns associated with excessive chemical use in agriculture and emphasized the relevance of natural farming as a sustainable pathway for maintaining soil health, environmental quality, and farm profitability. Dr. Manoj Chaudhary, Senior Scientist and Training Coordinator, briefed the participants on the comprehensive five-day schedule, which includes lectures, interactive sessions, and hands-on practical's covering soil health management.

Fig. 5.4. A Glimpse from the ATMA- Banka sponsored training program and its news highlights

II. Exposure visit conducted

Regional maize research and seed production centre, Begusarai

An exposure visit was organized for farmers under the SCSP training program- 'Seed production technologies in *Rabi* crops' to the Regional Maize Research and Seed Production Centre, ICAR-Indian Institute of Maize Research, Begusarai, on March 9, 2025. The visit aimed to provide practical insights into hybrid maize seed production technologies and enhance farmers' skills in quality seed production. The visit was coordinated by Dr. Priya Ranjan Kumar, Dr. Santosh Kumar and Dr. Akash A.

Fig. 5.5. Farmers visiting the Regional Maize Research and Seed Production Centre, ICAR-Indian Institute of Maize Research, Begusarai

Millet processing centre, Tilaiya

As part of the 5-day training program on 'Natural Farming' organized by ATMA, Bihar, ICAR–Indian Agricultural Research Institute, Jharkhand facilitated an exposure visit to the Millet Processing Centre, Tilaiya, Bazar Sameti on December 18, 2025. The visit aimed to provide practical insights into millet processing technologies and value addition opportunities for farmers and trainees. Dr. Asha Kumari and Dr. Manoj Chaudhary from the institute coordinated the visit.

Fig. 5.6. During the visit to the millet processing centre, Tilaiya

Institute visit for farmers of Purulia district, West Bengal

Institute facilitated an exposure visit for the farmers from Jhalda Development Block, Purulia district, West Bengal to the institute on September 18, 2025. The program was sponsored by ATMA Jhalda Development Block. A total of 25 farmers were participated and the Block Technology Manager accompanied the farmers. During the visit, farmers were oriented to the institute's facilities and technologies, and a technical lecture on 'Improved production technology and plant protection measures for early *Rabi* season vegetable crops' was delivered. The program was coordinated by Dr. Saheb Pal.

Table 5.1. Participation in training/conference/seminar/workshop

Host institute	Training/conference/seminar/ workshop	Duration	Host institute
Dr. Pavithra K.N.	38th National Conference on Agricultural marketing	09-11 Jan 2025	Institute of Agribusiness management, UAS, Bangalore.
Dr. Dipak Kumar Gupta	National Seminar on 'Technological innovations for transforming agriculture: the role of agrophysics'	23-24 Jan 2025	ICAR-Central Coastal Agricultural Research Institute, Goa
Dr. Kashinath G. Teli	Webinar on 'Hydrological modelling and simulation for watershed management'	24 Jan 2025	Centre of Excellence on Watershed Management, UAS, Bangalore
Dr. Sougata Bhattacharjee & Dr. Shilpi Kerketta	5 days Training Program on 'Pedagogical Competencies for Enhancing Agricultural Education'	28 Jan-01 Feb 2025	National Academy of Agricultural Sciences, New Delhi
Dr. Anima Mahato	21 days CAFT on 'Advanced breeding strategies for developing stress tolerance in plants under changing climatic conditions'	04-24 Feb 2025	Punjab Agricultural University, Ludhiana

Host institute	Training/conference/seminar/ workshop	Duration	Host institute
Dr. Kashinath G. Teli	Online Training on 'Bio-agents based sustainable weed management for healthy ecosystem'	10-12 Feb 2025	ICAR-Directorate of Weed Research, Jabalpur
Dr. Krishna Prakash	International Agriculture Conference on 'Navigating unique trends in agricultural research, innovation, engineering, nutrition, and technology' ('NUTRIENT-2025')	20- 21 Feb 2025.	Agri Meet Foundation Bharat
Dr. Kashinath G. Teli	Webinar on 'National hydrological model-india, NHM-I Version 3.0: features and applications'	20 Feb 2025	Centre of Excellence on Watershed Management, UAS, Bangalore
Dr. Pavithra K.N.	Progressive agriculture- viksit bharat: preparedness for eastern region	21-23 Feb 2025	ICAR- Research Complex for Eastern Region, Patna
Dr. Kashinath G. Teli	1st National Seminar on 'Agri-diversification and eco-regional farming'	04-05 Mar 2025	ICAR- Mahatma Gandhi Integrated Farming Research Institute, Mothihari, Bihar and Bihar Agricultural Management & Extension Training Institute, Patna, Bihar
Dr. Ashok Kumar	Annual Convention and National Conference on 'Emerging innovations in biochemistry and biotechnology for holistic development'	06-07 Mar 2025	Sher-e-Kashmir University of Agricultural Sciences & Technology, Jammu and ICAR-IARI, New Delhi, India.
A.K. Giri	Global Conference on 'Innovations to impact: gender transformative approach for sustainable agri-food system (IIGASA)' (Online mode)	08-10 Mar 2025	ICAR-Central Institute for Women in Agriculture, Bhubaneswar
Dr. Nuzaiba P.M.	International Conference on 'Fisheries biotechnology'	17-18 Mar 2025	ICAR-Central Institute of Fisheries Education, Mumbai
Dr. Santosh Kumar	68th Annual maize workshop of AICRP-Maize	10-12 Apr 2025	Tamil Nadu Agricultural University, Coimbatore
Dr. Kashinath G. Teli	National Conference on 'Accelerated development of horticulture for improved livelihood in Amritkaal'	28- 31 May 2025	Bihar Agricultural University, Sabour, Bhagalpur, Bihar.
Dr. Shilpi Kerketta	One-week online Training Program on 'Technological interventions for sustainable goat farming to augment productivity and profitability amid current agranrian crisis'	17-23 Jun 2025	College of Veterinary Science, Rampura Phul, GADVASU, Punjab.

Host institute	Training/conference/seminar/ workshop	Duration	Host institute
Dr. Sougata Battacharjee	Hindi Workshop on 'Advanced statistical techniques in ecological and environmental data analysis in agriculture'	21-30 June 2025	ICAR- Indian Agricultural Statistics Research Institute, New Delhi.
Dr. Nuzaiba P.M.	2nd Indian Fisheries Outlook 2025 on 'Envisaging blue transformation in indian fisheries and aquaculture'	12-14 Jul 2025	College of Fisheries, Rangailunda, OUAT, Berhampur
Dr. Nuzaiba P. M., Dr. Pavithra K.N. & Dr. Himani Priya	21-days Online Training Program on 'Advanced statistical and machine learning techniques for data analysis using open-source software for abiotic stress management in agriculture'	16 Jul- 05 Aug 2025	ICAR- National Institute of Abiotic Stress Management, Baramati
Dr. Shilpi Kerketta	Online national Webinar on 'Zero waste in livestock farming: sustainable use of animal resources'	31 Jul 2025	Karnataka Veterinary Animal Fisheries Sciences University, Karnataka and National Institute of Agricultural Extension Management, Hyderabad
Mr. Abhay K. Giri	Seminar on 'Mitigating climate change to the blue ecosystems: An integrated approach of science, community and nature' (Online mode)	05-06 Aug 2025	Institute for Social Sciences, New Delhi and ICAR-Central Marine Fisheries Research Institute, Kochi.
Dr. Shilpi Kerketta	21 Days National Training Course (online mode) on 'Recent technologies of agriculture, horticulture and livestock based integrated farming systems for doubling farmers income'	05-25 Aug 2025	Odisha University of Agriculture & Technology Bhubaneshwar, Odisha & National Agriculture Development Cooperative Ltd. Baramulla, J & K
Dr Prabhat Kumar Guru	How to Publish with Oxford Journals	19 Aug 2025	Oxford University Press
Dr. Kashinath G. Teli	10 Days National Training on 'Smart weed management for sustainable agriculture'	01-10 Sep 2025	Indian Society of Weed Science & ICAR-Directorate of Weed Research, Jabalpur
Dr. Vandana	X International Conference on 'Global research initiatives for sustainable agriculture & allied sciences' (GRISAAS-2025	05-07 Oct 2025	Maharana Pratap University of Agriculture and Technology, Udaipur, Rajasthan, India
Dr Prabhat Kumar Guru	Global DSR Conclave	05-07 Oct 2025	ISARC, Varanasi, Uttar Pradesh, India
Dr. Akash A.	National Conference in advances on 'Climate conscious crop science genetics genomics and breeding'	31 Oct-02 Nov 2025	Gandhi Krishi Vigyana Kendra, UAS, Bangaluru, India.

Host institute	Training/conference/seminar/ workshop	Duration	Host institute
Dr. Priti Tigga	12-days Training Program on 'Remote sensing and GIS for digital soil mapping'	01-12 Nov 2025	Indian Institute of Remote Sensing, ISRO, Dehradun
Dr. Mukesh Kumar Tiwari	59th Annual Convention of the Indian Society of Agricultural Engineers (ISAE) and the International Symposium on "Mechatronics and Robotics in Pre- and Post-Production Agriculture,"	10–12 Nov 2025	ICAR–CIAE, Bhopal
Mr. Abhay K. Giri	International Conference on 'Advances in agricultural, biological and biodiversity conservation for sustainable development' (ABCD-2025) (Online mode)	13-15 Nov 2025	University of Mysore, Mysuru, Karnataka and ATDS, Ghaziabad, UP
Dr. Kashinath G. Teli	6th International Agronomy Congress on 'Re-envisioning agronomy for smart agri-food systems and environmental stewardship'	24-26 Nov 2025	Indian Society of Agronomy, ICAR, IARI and NAAS, New Delhi
Mr. Arun K. Rajak, Mr. Vikash Kumar, Mr. Jayprakash Narayan, Mr. Rahul, Mr. Satyam Kumar and Mr. Rajendra K. Meena	Enhancing personal effectiveness of technical staff (T-1)	01-05 Dec 2025	ICAR-IARI, New Delhi
Mr. Abhay K. Giri	International Conference on 'Blue Horizon 2025: rethinking fisheries for sustainable future' (Online mode)	17-18 Dec 2025	Dr. MGR. Fisheries College and Research Institute, TNJFU, Nagapattinam, TN.
Dr. Kashinath G. Teli	National Citrus Symposium-2025	21-23 Dec 2025	Jain Irrigation Systems Ltd, Jalgaon, Maharashtra
Dr. Shilpi Kerketta	International Conference on 'Sustainable innovation in agriculture, veterinary and allied sciences' (Hybrid Mode)	29-31 Dec 2025	University of Agricultural Sciences, Raichur, Karnataka and National Agriculture Development Cooperative Ltd., Bramulla, J&K.

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List of Publications

Research/review articles

Abshiba, K., Chaudhary, M., Sinha, N.K., Singh, T., Rosin, K.G., Naik, S.K., Singh, P., Barnwal, P.P., Deepasree, A. and Kumar, S. 2025. Soil quality in diversified agricultural systems: Eastern plateau of India. *Environmental Earth Sciences*, 84(20): 566.

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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,* 31: 419-433.

Bhowmick, R., Bhattacharjee, S., Meena, J. K., Saakre, M., Tilgam, J. and Sreevathsa, R. 2025. Genome-wide characterization of BTB/POZ gene family in jute (*Corchorus* spp.) reveals key candidates for abiotic stress tolerance. *National Academy Science Letters*, 1-6.

Chavda, D., Sharma, N., Sharma, R. M., Khandelwal, A., Joshi, N., Singh, N., Vittal, H., Rana, V. S., Singh, D., Shivandu, S. K. and Dubey, A. K. 2025. Identification of novel interspecific citrus hybrids with high hesperidin content and favorable sensory quality. *Analytical Letters*, 1-15.

Chitranashi, Abhishek, G. A. Nandini, Mallesh Gampa, Ashok Kumar, Suneha Goswami, Vinutha T and Jain, Neelu. 2025. Nitrate sensor: characterizing the role of putative nitrate transporter1 (NRT 1) gene in augmenting the plasticity of wheat root and yield under eCO_2 and terminal heat. *Cereal Research Communications*, 1-13.

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Dalal, A., Varghese, C., Parsad, R., Harun, M. and Mandal, B. N. 2025. Algorithmic construction of Gerechte-based uniform designs. *Communications in Statistics-Simulation and Computation*, 1-25.

Das, A. K., Dixit, S., Bhamare, D., Kumar, R., KR, Y., Singh, S., Kumar, S. and Rakshit, S. 2025. Genetic diversity and structure analysis of white maize populations. *Range Management and Agroforestry*, 46(1): 62-69.

Dash, S., Singh, A. K., Mandal, B. N. and Parsad, R. 2025. Construction of designs for cropping sequence experiments in fractional replication. *Journal of Statistical Theory and Application*, 24: 1056-1063.

Divyadarshan, V., Naik, S. K., Dhakar, M. K., Purakayastha, T. J., Mahanta, D., Chaudhary, M., Mali, S. S., Kumar, R., Dash, A. K., Das, A. and Meena, R. S. 2025. Soil carbon dynamics and

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Guru, P.K., Sahu, P., Shukla, P., Diwan, P., Panwar, G., Tiwari, P., Nagori, A., Carpenter, G., Sanodiya, R., Meena, B.S. and Kumar, M., 2025. A critical review on rice cultivation and mechanization level in Indian perspective. *Results in Engineering*, 105632.

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Karki, S., Bhattarai, S., Singh, R. and 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.

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Kumar, S., Visakh, R. L., Shirsat, M. S., Kumar, B., Kundu, A., Singh, P. and Kumar, P. R. 2025. Multivariate analysis for grain yield and yield attributing traits in maize (*Zea mays* L.) inbred lines under acidic and neutral soil conditions. *Indian Journal of Genetics and Plant Breeding*, 85(04): 713-722.

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7

Approved Ongoing Projects

Institute projects

- **CRSCIARIJSIL2021001XXXXX:** Genetic improvement of pigeon pea for yield and yield attributing traits under Eastern Indian conditions [***Team:*** PI- Anima Mahto; Co-PIs- Kumar Durgesh, Dipak Kumar Gupta, Sougata Bhattacharjee, Satheesh Naik
- **CRSCIARIJSIL2021002XXXXX:** Genetic enhancement of maize for drought and soil acidity conditions [***Team***: PI- Santosh Kumar; Co-PIs- Preeti Singh, Ashok Kumar**,** Pankaj Kumar Sinha, Akash A]
- **CRSCIARIJSIL2021003XXXXX:** Genetic improvement for yield enhancement and resistance to abiotic stresses in mungbean and lentil [***Team***: PI- Anima Mahato; Co-PIs- Gyan Prakash Mishra, Dharmendra Singh, Dipak Kumar Gupta, Krishna Prakash, Prabhat Kumar Guru]
- **CRSCIARIJSIL2021004XXXXX:** Genetic improvement of papaya for yield and quality enhancement [***Team***: PI- Vishal Nath; Co-PIs- Santosh Kumar, Krishna Prakash, Ashok Kumar, Asha Kumari, Sougata Bhattacharjee, Narendra singh, Pavitra K N, Niranjan Kumar]
- **CRSCIARIJSIL2021005XXXXX:** Preparation of GIS based soil physico-chemical and biological map of ICAR-IARI, Jharkhand farm [***Team***: PI- Preeti Singh; Co-PIs- Manoj Chaudhary, Dipak Kumar Gupta, Pankaj Kumar Sinha]
- **CRSCIARIJSIL2021005XXXXX:** Preparation of GIS based soil physico-chemical and biological map of ICAR-IARI, Jharkhand farm [***Team***: PI- Preeti Singh; Co-PIs- Manoj Chaudhary, Dipak Kumar Gupta, Pankaj Kumar Sinha]
- **CRSCIARIJSIL2021006XXXXX:** Performance evaluation of milch bovines and goats under different feeding and management systems in Eastern India [***Team***: PI- S K Mahanta; Co-PIs- Shilpi Kerketta, Pankaj Kumar Sinha, Manoj Chaudhary, Vandana, Nuzaiba P M, Abhay Kumar Giri, Pavitra K N]
- **CRSCIARIJSIL2021008XXXXX:** Genetic improvement of Parwal/Pointed Gourd for yield and quality enhancement [***Team***: PI- Krishna Prakash; Co-PIs- Vishal Nath, Sougata Bhattacharjee, Ashok Kumar, Ranjit Singh, Saheb Pal, Narendra Singh, Bhawna]
- **CRSCIARIJSIL2022009XXXXX:** Assessment and mapping of natural resources of IARI-Jharkhand [***Team***: PI- Dipak Kumar Gupta; Co-PIs- Vishal Nath, Manoj Chaudhary, Preeti Singh, Krishna Prakash, Pankaj Kumar Sinha, Shilpi Kerketta, Kashinath Teli, Abhay Kumar Giri]
- **CRSCIARIJSIL2022010XXXXX:** Development and evaluation of bio-inoculum for abiotic stress and nutrient management for acidic soil conditions of Eastern India [***Team***: PI- Himani Priya; Co-PIs- Manoj Chaudhary, Asha Kumari, Ranjit Singh, Akash A]
- **CRSCIARIJSIL2022011XXXXX:** Identification of sustainable cropping systems under natural farming practices for medium land/upland of Eastern India [***Team***: PI- Dipak Kumar Gupta; Co-PIs- Anima Mahato, Shilpi Kerketta, Manoj Chaudhary, Himani Priya and Pankaj Kumar Sinha, Kashinat Teli, Pavitra K N, Narendra Singh, Saheb Pal]
- **CRSCIARIJSIL2022012XXXXX:** Development of ICT based location specific animal advisory service to livestock farmers of Eastern India [***Team***: PI- Shilpi Kerketta; Co-PIs- S K Mahanta, Pankaj Kumar Sinha, B N Mandal, Subrata Manna, Vandana, Nuzaiba P M, Abhay Kumar Giri]
- **CRSCIARIJSIL2023013XXXXX:** Performance

evaluation of fruit crops and varieties under edapho-climatic conditions [***Team***: PI- Narendra Singh; Co-PIs- Vishal Nath, Krishna Prakash, Dipak Kumar Gupta, Akash A and B N Mandal, Mukesh Kumar Tiwari, Chalvesh Kumar]

- Genetic improvement of okra (*Abelmoschus esculentus*) [***Team***: PI- Saheb Pal; Co-PIs- Krishna Prakash, Asharani Patel, Sougata Bhattacharjee, B N Mandal]
- **CRSCIARIJSIL2023015XXXXX:** Dissipation dynamics and residue analysis of Tembotrione and Pyroxasulfone in speciality corns [***Team***: PI- Niranjan Kumar; Co-PIs- Kashinath G Teli, Santosh Kumar, Himani Priya, Dipak Kumar Gupta, Pavithra K N, Suman Gupta]
- **CRSCIARIJSIL2023016XXXXX:** Performance evaluation of important freshwater fish varieties under captivity conditions of Eastern India [***Team***: PI- Abhay Kumar Giri; Co-PIs- Nuzaiba P M, Shilpi Kerketta, D K Gupta, P.K. Sinha, Pavithra K N, S K Mahanta]
- **CRSCIARIJSIL2023017XXXXX:** Evaluation of *Kharif* potato-wheat cropping system in Eastern India condition for productivity, biotic and abiotic stress tolerance [***Team***: PI- Asha Kumari; Co-PIs- Sougata Bhattacharjee, Sarla Yadav, B N Mandal, Manoj Chaudhary, Chandan Maharana, Himani Priya, Priya Ranjan Kumar]
- **CRSCIARIJSIL2023018XXXXX:**Identification, characterization and validation of early flowering and determinacy trait-associated genes in pigeon pea' [***Team***: PI- Sougata Bhattacharjee; Co-PIs- Durgesh Kumar, Anima Mahato, Akash A., Asha Kumari, Debasis Pattanayak]
- **CRSCIARIJSIL2025019XXXXX:** Genetic dissection of seed storability in maize (*Zea mays*) inbred lines [***Team:*** PI- Akash A., Santosh Kumar, Priya Ranjan Kumar, Sougata Bhattacharjee, Himani Priya, Abhijit K. P.]
- **CRSCIARIJSIL2025020XXXXX:** Identification and characterization of local goats of Eastern India [***Team:*** PI- Shilpi Kerketta; Co-PIs- S K Mahanta, Pankaj Kumar Sinha, B. N. Mandal, Vandana, Nuzaiba P M, Abhay Kumar Giri, Kannaka]
- **CRSCIARIJSIL2025021XXXXX:** Development and evaluation of improved grafting method for rapid propagation in mango [***Team:*** PI- Narendra Singh; Co-PIs- Vishal Nath, Saheb Pal, Shantesh Kamath, Krishna Prakash, Dipak Kumar Gupta, Pavithra K N]
- **CRSCIARIJSIL2025022XXXXX:** Evaluation of flower crops for growth, yield, and adaptability under agro-climatic conditions of Eastern India [***Team:*** PI- Shantesh Kamath; Co-PIs- Narendra Singh, Krishna Prakash, Dipak Kumar Gupta, Vishal Nath, Namita, Markandey Singh]
- **CRSCIARIJSIL2025023XXXXX:** Crop diversification in maize-based intercropping with leafy vegetables in the Chhotanagpur Plateau Region [***Team:*** PI- Kashinath G. Teli; Co-PIs- Saheb Pal, Dipak Kumar Gupta, Himani Priya, Preeti Singh, Pavithra K N]
- **CRSCIARIJSIL2025024XXXXX:** Dietary interventions to alleviate intensification induced abiotic stresses in selected fish species of Eastern India [***Team:*** PI- Nuzaiba P M; Co-PIs- Abhay Kumar Giri, S. K. Mahanta, Niranjan Kumar, Niladri S. Chatterjee, Shilpi Kerketta, Vandana and K N Mohanta.]
- **CRSCIARIJSIL2025025XXXXX:** Quantifying climate change impacts on soil carbon stocks in Hazaribagh: a Roth C based land use analysis [***Team:*** PI- Priti Tigga; Co-PIs- Dipak Kumar Gupta, Manoj Chaudhary, B. N. Mandal]
- **CRSCIARIJSIL2025026XXXXX:** Exploration and documentation indigenous cattle and its management practices in central and north-eastern plateau of Jharkhand [***Team:*** PI- Vandana; Co-PIs- S K Mahanta, Shilpi Kerketta, Brijesh Kumar, Nuzaiba P M]
- **CRSCIARIJSIL2025027XXXXX:** Development of efficient mechanization for small farmers in Eastern India [***Team:*** PI- Prabhat K Guru; Co-PIs- Dipak Kumar Gupta, B N Mandal, Manoj Chaudhary, Mukesh Kumar Tiwari, P K Sinha, Kashinath Teli, Akash A]
- **CRSCIARIJSIL2025028XXXXX:** Application of TOPSIS method for ranking best genotypes of custard apple in eastern region of India [***Team:*** PI- BN Mandal; Co-PIs- Narendra Singh, Vishal Nath]

External funded projects

- **CRSCIARIJCOP2022005XXXXX (ICAR-ATARI, Patna funded):** Agri-drone project [***Team***: PI- Pankaj Kumar Sinha; Co-PIs- Dipak Kumar Gupta, Monu Kumar, Krishna Prakash, Santosh Kumar, Ashok Kumar, Himani Priya]

- **CRSCIARIJCOP2021006XXXXX (AICMIP):** All India Coordinated Maize Improvement program, Voluntary Centre, IARI, Gauriakarma, Jharkhand [***Team***: PI- Santosh Kumar]
- **CRSCIARIJSOL2025007XXXXX (RKVY funded):** Economic upliftment of rural communities through sustainable Mahua cultivation, conservation and value addition [***Team:*** PI- Shantesh Kamath; Co-PIs- Dipak Kumar Gupta, Pankaj Kumar Sinha, Krishna Prakash, Niranjan Kumar**,** Narendra Singh, Saheb Pal, Akash A, Pavithra K N, Nirmal]
- **CRSCIARIJSOL2025008XXXXX (RKVY funded):** Establishment of advanced soil health laboratory for precision nutrient management in Jharkhand [***Team:*** PI- Preeti Singh; Co-PIs- Santosh Kumar, Himani Priya, Priti Tigga, Kashinath Teli, Akash A and Niranjan Kumar]
- **CRSCIARIJSOL2025009XXXXX (RKVY funded):** Enhancing farmers' income through tissue culture technology for quality planting material and scientific cultivation techniques of Banana and Strawberry [***Team:*** PI- Narendra Singh; Co-PIs- Sougata Bhattacharjee, Santhesh Kamath, Saheb Pal, Dipak Kumar Gupta, Krishna Prakash, Pankaj Kumar Sinha, Akash A, Pavithra K N]
- **CRSCIARIJSOL2025010XXXXX (RKVY funded):** Enhancing horticultural yield and quality through tissue culture-based planting material production [***Team:*** PI- Sougata Bhattacharjee; Co-PIs- Krishna Prakash, Narendra Singh, Saheb Pal, Asha Kumari, Anima Mahato, Shantesh Kamath]
- **CRSCIARIJSOL2025011XXXXX (RKVY funded):** Establishing a cutting-edge pesticide residue analysis laboratory in Jharkhand for its safe and judicious use [***Team:*** PI- Somashekhar V.G.; CCPI- Niranjan Kumar; Co-PIs- Nuzaiba P M, Preeti Singh, Saheb Pal, Kashinath G Teli, Himani Priya, Pavithra K N, Abhay Kumar Giri]
- **CRSCIARIJSOL2025012XXXXX (RKVY funded):** Promotion of entrepreneurial opportunities in millet-based value-added pre-cuts: Establishment of a primary millet processing unit at ICAR-IARI, Jharkhand [***Team:*** PI- Asha Kumari; Co-PIs- Pavithra K N, Mahendar Singh Bhinda, Pankaj Kumar Sinha, B.N. Mandal, Manoj Chaudhary, Ranjit Singh]
- **CRSCIARIJCOP2025013XXXXX (RKVY funded):** Production of quality planting materials and establishment of medicinal and aromatic plants nurseries in Jharkhand for Herbo -Agroforestry system, Bau Ranchi [***Team***: PI- Krishna Prakash, Co-PIs: Shantesh Kamat, Dipak Kumar Gupta; Nodal Officer- Vishal Nath]

Collaborative projects

- **CRSCIARISIL20210041326 (IARI, New Delhi):** Improving soil health for enhancing input use efficiency and productivity [CC-PI: Manoj Chaudhary]
- **CRIA Project Code No. 79-218 (IARI, New Delhi-Carbon Removal India Alliance (CRIA) funded):** Co-Benefits of Biochar and Enhanced Rock Weathering application to Cropped Soils [***Team:*** PI: Arti Bhatia, CC-PI- Dipak Kumar Gupta]
- **MOeFCC Project Code No. 26-12 (IARI, New Delhi- MOEFCC, GoI. funded):** Developing scaling factors of methane and nitrous oxide emissions from rice cultivation for inventory of methane from rice cultivation and nitrous oxide from agricultural soils [***Team***: PI- Arti Bhatia, CC-PI: Dipak Kumar Gupta]

8

Events and Meetings

Republic day celebrated

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 fervour. 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.

Fig. 8.1. Glimpses from the 76th Republic Day Celebrations

Institute hosts first-ever sports and games meet 'आभ्युदय'

Institute successfully hosted its first-ever annual sports and games meet, आभ्युदय, 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 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 100 m, 200 m, 400 m, 800 m, and 4 × 100 m relay, field events including discus, javelin, shot put throw, and long jump, aswell 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.

Fig. 8.2. Students During the Opening Ceremony of Annual Sports Meet

Festiverse 2025- students' cultural event

Students of the institute 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.

Fig. 8.3. Glimpses from the students cultural day cebration

Basant Panchami celebrated

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 staff/ student community to come together, reflect on the significance of knowledge, and appreciate the festive atmosphere.

Fig. 8.4. Basant Panchami Celebration at the Institute

World environment day celebration

Institute celebrated world environment day on June 5, 2025 with the theme '*Beat Plastic Pollution*'. On this occasion, a mass plantation drive was organized, during which 250 saplings of trees and fruit plants were planted in the office premises and farm area by staff and students. Awareness activities highlighted the adverse impacts of plastic pollution on health, biodiversity, and ecosystems. Students and staff were sensitized to minimize plastic use and encouraged to adopt sustainable practices such as using reusable products, proper waste segregation, recycling, reducing single-use plastics, and opting for eco-friendly alternatives. Agricultural scientists and students were also urged to focus on developing biodegradable alternatives and promoting minimum use of plastic in agriculture, reinforcing the collective commitment towards a cleaner and healthier environment.

Fig. 8.5. Plantation Drive and Sensitization Activities During the World Environmental Day Celebrations

Participation in ICAR-zonal sports tournament

A team of 17 players consisted of scientists, administrative, finance and technical staffs took participation in the ICAR-Zonal Sports Tournament-(Eastern zone)-2024 held at ICAR-IVRI, Izatnagar during May 06-09, 2025. The team was led by Dr Dipak Kumar Gupta as Chef de Mission. Institute participated in total 28 events consisting of both men and women events. All players actively participated in their respective games and sports events. The

team IARI-Jharkhand bring recognition and proud moment for the institute by winning runner up trophy of cricket tournament of eastern zone.

Fig. 8.6. Participation of Institute Staff in ICAR-Zonal Sports Tournament at IVAI, Izatnagar

All India Inter University Sports and Games Meet-2024-25

Students from ICAR-IARI, Jharkhand have participated in All-India Inter-University Sports and Games Meet 2024-25. Three students of B.Sc. (Agriculture) namely Riyanshi Kausik (Badminton), Khetra Jyoti Pegu (Javelin throw) and Tripti Verma (TT) participated in the XXII-All India Inter University Sports and Games Meet, 2024-25 held at Acharya Narendra Deva University of Agriculture and Technology, Kumarganj, Ayodhya during 02-05 May, 2025. All the three students played well and reached up to semi-final in TT and quarter final in badminton.

Fig. 8.7. Students' participation in All India Inter University sports and games meet, 2024-25 at Kumarganj, Ayodhya

Institute celebrated its 11th Foundation day

ICAR-IARI Jharkhand celebrated its 11th Foundation Day on June 28, 2025, under the chairmanship of Dr. Ch. Srinivasa Rao, Director & Vice-Chancellor. An audio-visual presentation showcasing the institute's decade-long journey and achievements was made. Chief Guest Padma Bhushan Dr. R.S. Paroda, former Secretary (DARE) and DG (ICAR), inaugurated the celebration with a tree plantation and distribution of fruit-bearing plants to farmers. In his foundation day lecture, he emphasized the need for a second green revolution from eastern India and highlighted IARI Jharkhand's key role. He called for empowering farmers through sustainable practices and motivated students to contribute to India's agricultural transformation. Dr. Viswanathan Chinnusamy, Joint Director (Research), IARI New Delhi, praised the integrated research, teaching and extension model of institute and assured continued support. Dr. Rao acknowledged IARI New Delhi's contributions to national agriculture and appreciated the rapid growth of Jharkhand campus. Guest of honour Dr. Dinesh Kumar Singh, Vice-Chancellor, Nilamber Pitamber University, commended the institute's regional impact. The event was concluded with the felicitation of scientists, students, farmers, and journalists for theiroutstanding contributions.

Fig. 8.8. Highlights from the 11th Foundation Day

Table 1. List of awardees

Category of Award	Name
Best scientist award (men)	Dr. Santosh Kumar, Dr. Narendra Singh
Best scientist award (women)	Dr. Preeti Singh
Best scientist (overall)	Dr. Pankaj Kumar Sinha
Best administrative award	Mr. Sonu Kumar

Category of Award	Name
Best technical officer	Mr. Sushil Kumar Marandi
Best technical assistant	Mr. Rajendra Kumar Meena
Best scientist for institutional building	Dr. Dipak Kumar Gupta
Best teacher (2025)	Dr. Asha Rani Patel
Best student of the year award (UG-1st year)	Sai Sikha Nayak
Best student of the year award (UG-2nd year)	Ishita Prakash
Best student of the year award (UG-3rd year)	K. Priyanka
Best student of the year award (PG-1st year)	Seshathri V. (GPB)
Best student of the year award (PG-2nd year)	Nayanika Guha (GPB)
Best cooperating state government official of the year award	Er. K.M. Hessa
Best press & media of the year award (national)	DainikJagran (Sh. Pramod Viswakarma)
Best press & media of the year award (local)	Nabin Mail (Sh. Jaideep Sinha)
Best farmer producer organisation institute of the year award	BarsotiAgri Producer Company Ltd.
Best farmer award (female)	Smt. Renu Devi
Best farmer award (male)	Shri Manoj Kumar

Inauguration of Ashwakarna farm complex

The Ashwakarna farm complex was inaugurated on June 26, 2025 by the Honorable Director and Vice Chancellor, Dr. Ch. Srinivasa Rao, in the presence of Dr. Viswanathan Chinnusamy, Joint Director (Research), Dr. Vishal Nath, Officer on Special Duty, IARI, Jharkhand, Associate Deans UG Affairs and UG Hubs & Sister Institutes, as well as staff members and students, and CPWD officials. The Ashwakarna Farm Complex comprises an animal laboratory and scientifically constructed animal sheds designed to enhance livestock research and care in addition to a store building and a training hall. The laboratory facilitates milk sample testing, veterinary treatment, and general health monitoring of farm animals. The Animal shed has a capacity to accommodate 50 cattle and 100 goats, structured for semi-intensive rearing conditions with manure collection and on-site treatment facilities, feed storage units, feeding mangers, and a dedicated water tank with ample capacity for drinking and cleaning purposes. The complex serves as a hub for advancing research in agriculture. It also strengthens livestock infrastructure and improves animal health facilities on campus.

Fig. 8.9. Inauguration of Aswakarna farm complex

Inauguration of Kachnar farmers' hostel

Institute added a new residential facility to its campus with the inauguration of the Kachnar Krishak Aawas (Kachnar Farmers' Hostel) on June 26, 2025. The hostel was inaugurated by the Honourable Director and Vice Chancellor, Dr. Ch. Srinivasa Rao, who appreciated its contribution to campus development and institutional infrastructure. The facility comprises 30 beds housed across five dormitories, each equipped with modern toilet and washroom facilities, a lounge, kitchen, and dining area. Thoughtfully designed to offer comfortable accommodation within the IARI premises, the hostel supports the institute's broader efforts to enhance amenities for campus visitors, trainees, and participants. The inauguration was attended by several dignitaries including Dr. Viswanathan Chinnusamy, Joint Director (Research), Dr. Vishal Nath, Officer on Special Duty, IARI, Jharkhand, Associate Deans Dr. Harshabardhan Chowdhury (UG Affairs) and Dr. Monika Joshi

Fig. 8.10. Inauguration of Kachnar farmers' hostel

International yoga day celebration

The students of IARI Jharkhand actively participated in the International Yoga Day celebration held on 21 June 2025. The event aimed to promote physical, mental, and emotional well-being through the practice of yoga. A yoga session was organized on campus under the guidance of trained instructors, where students, faculty, and staff performed various asanas and breathing exercises. The program began with a brief introduction on the significance of yoga in daily life by the OSD & Academic Coordinator, IARI Jharkhand, followed by a collective practice session. The enthusiastic participation of students reflected their commitment to a healthy and disciplined lifestyle. Faculties also participated in the session.

Fig. 8.11. Glimpses during the International Yoga Day

Institute Research Council meeting held at IARI-Jharkhand

The Institute Research Council (IRC) meeting, held from June 30 to July 1, 2025, under the chairmanship of Dr. Ch. Srinivasa Rao, Director and Vice-Chancellor, ICAR-IARI, convened scientists across disciplines along with Dr. C. Viswanathan, Joint Director (Research), IARI-New Delhi, to review ongoing projects, propose new research, and align institutional efforts with national priorities. Conducted in hybrid mode, the meeting emphasized strategic directions for research integration, outreach, and capacity building. On this occasion, newly joined scientists and senior researchers were warmly welcomed into the IARI-Jharkhand community. The meeting spotlighted strategic priorities such as supporting tribal farming systems tailored to regional agro-climatic needs. Emphasis was placed on refining project titles for broader relevance, embedding outreach components, and scaling youth and SHG-focused training programs. Scientists were encouraged to pursue copyrights, foster inter-institutional collaborations, and strengthen the institute's impact through innovative research.

Fig. 8.12. Glimpses from The IRC meeting

Parthenium awareness week celebration

In a significant initiative by ICAR '*20th Parthenium Awareness Week*' was celebrated at ICAR-IARI-Jharkhand August 16-22, 2025. On occasion of this event various activities like expert lectures (from awareness to action: tackling parthenium together and bio-control measures for parthenium management), debate competition for students on topic 'Parthenium could be used for beneficial purposes rather than being eradicated' and *Parthenium* cleaning drive to make IARI Jharkhand as Parthenium free were undertaken involving all staffs and students of IARI Jharkhand. Dr. Vishal Nath, OSD, IARI-Jharkhand delivered his insight regarding harmful and beneficial aspects of Parthenium.

Fig. 8.13. Active participation of students and faculties in Parthenium Cleaning Drive

Organizing hindi pakhwada-cum-workshop

The hindi pakhwada-cum-workshop was organized at ICAR-IARI, Jharkhand, from September 8-22, 2025 to promote the use of Hindi as the *Rajbhasha* (official language) of India. The event commemorated 14 September 1949, when Hindi in devanagari script was adopted as the official language of the Union. The program, inaugurated by Dr. Vishal Nath (OSD, ICAR-IARI, Jharkhand) with an oath-taking ceremony and address by chief guest Dr. Sunil Yadav, emphasized the importance of hindi as a unifying language of

the nation, its historical significance and promotion of Rajbhasha. Various activities, and competitions-such as poetry recitation, story writing, dictation, noting and drafting, quiz, and Antakshari were held for staff and students to enhance proficiency and interest in Hindi. Workshops were organized inviting various guest lectures providing comprehensive knowledge on hindi grammar, correct spelling, clarity of pronunciation, note making and the development of hindi. The fortnight program was successfully concluded with a valedictory ceremony and prize distribution. The celebration fostered enthusiasm for using Hindi in official and personal communication, reinforcing its cultural and national significance.

Fig. 8.14. Highlights from hindi pakhwada-cum-workshop

Swachhata Pakhwada 2025

1. Swachhata pakhwada (September 2025) and cleanliness Drive

As part of the nationwide *Swachh Bharat Mission*, ICAR–IARI, Jharkhand observed Swachhata Pakhwada from September 17 to October 1, 2025 with active participation of staff, students, and community members. The program promoted cleanliness, hygiene, and sustainable practices through diverse activities. A Swachhata Pledge Ceremony was organized, followed by the *Ek Ped Maa Ke Naam* plantation drive, where guava trees were planted in the residential area to foster environmental awareness.

Awareness programs were conducted at Government Middle School, Kheron, Barhi, sensitizing students on maintaining cleanliness at home, school, and public places. A Swachhata Marathon and human chain formation symbolized unity and collective commitment toward a clean environment. Cleanliness drives were carried out in temple premises and nearby public areas, and sanitation staff were felicitated by the OSD for their dedicated service.

On September 26, 2025, a Cleanliness Drive was jointly organized by the Swachhta Committee and the NSS Unit across the campus and adjoining village of Kheron. B.Sc. Agriculture students, faculty members, and NSS volunteers actively participated in cleaning pathways, common areas, and public spaces, alongside awareness campaigns. The initiative fostered social responsibility, discipline, and community engagement, motivating villagers to adopt sustainable hygiene practices.

Overall, the fortnight highlighted the power of collaborative action in driving positive social change, reinforcing the institute's commitment to the goals of the *Swachh Bharat Abhiyan*.

Fig. 8.15. Glimpses from various activities organised during the Swachhta Pakhwada (September 2025)

2. Swachhata Pakhwada (December 2025) and Shramdaan activities

The institute observed Swachhata Pakhwada from December 16-31, 2025 with enthusiastic participation

of students, staff, and stakeholders, reinforcing the values of cleanliness, sustainability, and resource efficiency.

Key activities included a Waste-to-Wealth demonstration, showcasing composting and vermicomposting of crop residues and conversion of hostel food waste into useful resources. Cleanliness and sanitation drives were conducted across the campus, nearby residential colonies, and local markets to promote waste segregation and hygiene awareness. A plantation drive and campaigns against single-use plastics encouraged eco-friendly practices, while Shramdaan activities at community spaces such as temples and Anganwadis enhanced sanitation and fostered community engagement.

The program coincided with Kisan Diwas, involving farmers and stakeholders in awareness activities, thereby strengthening collective responsibility and promoting sustainable living. Overall, the initiative fostered a culture of cleanliness, environmental stewardship, and positive social change in alignment with the Swachh Bharat Mission.

Fig. 8.16. Shramdaan activities during Swachhata Pakhwada (December 2025)

Launch of PMDDKY and Dalhan Aatmanirbhar Mission – Live Viewing

The Hon'ble Prime Minister of India, Shri Narendra Modi, inaugurated and laid the foundation stone for agricultural development projects worth over Rs 42,000 crore at the National Agricultural Science Complex, Pusa, New Delhi, and been telecast live October 11, 2025. The event, which included the launch of two flagship initiatives-Pradhan Mantri Dhan-Dhaanya Krishi Yojana (PMDDKY) and the Dalhan Aatmanirbhar Mission-was telecast live across the country.

At ICAR–IARI, Jharkhand, the live viewing was organized for farmers, with 233 participants attending the program. Farmers witnessed the Prime Minister's address and interacted with scientists to understand the benefits and implementation aspects of the newly launched schemes. The program was integrated with a one-day training on Integrated Farming Systems under the SCSP Project.

Nationwide, more than 2,100 projects related to agriculture, animal husbandry, fertilizers, and food processing were inaugurated or initiated. The event marked a significant step toward enhancing crop productivity, promoting pulse cultivation, reducing import dependence, and reinforcing India's agricultural development agenda.

Fig. 8.17. Highlights from the 'Launch of PMDDKY and Dalhan Aatmanirbhar Mission' Live telecasting at ICAR-IARI, Jharkhand

Kisan Samman Diwas Celebrated

ICAR-Indian Agricultural Research Institute, Jharkhand, celebrated Kisan Samman Diwas (National Farmers' Day) on December 23, 2025 to commemorate the birth anniversary of Chaudhary Charan Singh, India's fifth Prime Minister and a champion of farmers' welfare. The program recognized farmers as Annadatas and highlighted their crucial role in food security and rural development. Smt. Priti Kumari, Jila Parishad, attended as Guest of Honour, while Shri Johan Tudu,

S.D.O. (Barhi), was the Chief Guest for the event. The dignitaries emphasized the adoption of scientific farming practices, integrated farming systems, and biodiversity conservation for sustainable and self-reliant agriculture. Progressive farmers were felicitated for excellence in crop diversification, nursery management, and integrated farming. Technical sessions by IARI -Jharkhand scientists covered seed production, vegetable cultivation, livestock and fisheries, soil and water conservation, and biofertilizer use. The program concluded with the distribution of vegetable seed kits to promote nutri-gardening and nutritional security in Jharkhand.

Fig. 8.18. Kisan Samman Diwas Celebration at ICAR-IARI, Jharkhand

Scientific Exchange and Collaborative Dialogue with ICAR-CRRI, Cuttack

A team of eminent scientists from ICAR–CRRI, Cuttack visited ICAR–IARI, Jharkhand on 23 October 2025. The delegation included QRT team member of ICAR–CRRI, namely Dr. A. R. Sharma, Former Director, ICAR–DWR, Jabalpur & Former Director (Research), RLBCAU, Jhansi, Dr. Pratap Bhattacharyya, Head, Crop Production Division, ICAR–CRRI, Cuttack and Dr. N. P. Mandal, Head, ICAR–CRURRS (ICAR–CRRI), Hazaribagh, along with other scientists from CRRI-CRURRS.

An interaction meeting was held with the scientists of ICAR–IARI, Jharkhand, during which the ongoing activities and progress of the institute were presented. Dr. Sharma appreciated the institute's achievements in infrastructure development. The meeting was followed by detailed discussions to identify potential areas of collaboration, with emphasis on initiatives that would mutually benefit both institutes.

Fig. 8.19. When the team of scientists from CRRI, Cuttack visited the institute

Live Viewing of 21st Instalment of PM-KISAN

Institute organized a live viewing of 21st instalment of the PM-KISAN Samman Nidhi Scheme on November 19, 2025, benefiting over 150 farmers, including 82 women farmers, from nearby villages. The program formed part of a nationwide initiative to enhance farmer welfare through direct engagement and awareness. Smt. Meera Kumari, Mukhya of Gauria Karma village, graced the occasion and emphasized timely institutional support, sustainable farming practices, and inclusive development for small and marginal farmers. The live telecast connected farmers with national policy updates and success stories, while on-site registration and awareness sessions helped resolve queries related to PM-KISAN benefits. Technical sessions by IARI scientists on quality seed production, biofertilizers, soil health, value addition, and scientific goat farming were also conducted. The program concluded with the distribution of quality seeds for the *Rabi* season to enhance farm productivity.

Fig. 8.20. Glimpses from Live viewing of 21st instalment of PM-KISAN

Rashtriya Ekta Diwas Celebration

IARI Jharkhand celebrated Rashtriya Ekta Diwas on October 31, 2025 to commemorate the birth anniversary of Sardar Vallabhbhai Patel, the 'Iron Man of India'. The program highlighted the importance of national integration, unity, and security. The event commenced with a brief introduction on the significance of Rashtriya Ekta Diwas, followed by the Rashtriya Ekta Diwas Pledge, wherein all students, faculty members, and staff reaffirmed their commitment to preserving the unity, integrity, and security of the nation.

Fig. 8.21. Pledge taking during the celebration of Rashtriya Ekta Diwas by faculties (left) and students (right)

Constitution Day Celebration

Constitution day, also known as Samvidhan divas, was celebrated with great enthusiasm at ICAR- IARI, Jharkhand on November 26, 2025. The event aimed to highlight the significance of the Constitution of India, honour the vision of Dr. B. R. Ambedkar, and promote awareness about constitutional values among permanent staff, contractual workers and students. The program began with the collective reading of the Preamble to the Constitution by all staff members and students. The oath reinforced commitment towards justice, liberty, equality, and fraternity. Participants took a pledge to follow the Fundamental Duties and contribute positively towards society and the nation. The Campus In-charge, ICAR-IARI Jharkhand addressed the gathering, emphasizing on the historic significance of 26th November 1949, the role of Indian Constitution in safeguarding citizens' rights and contribution of agriculture institutions towards national development. A short lecture was delivered to students by faculty members on evolution and framing of the Constitution, key features such as federal structure, fundamental rights, and directive principles and relevance of constitutional values in agricultural research, extension, and rural development. The program saw active participation from staffs and students of Institute.

Fig. 8.22. Glimpses from Constitution Day Celebration at ICAR-IARI, Jharkhand

World Soil Day-Cum-Farmers' Training Program Organized

World soil day-cum-farmers' training program was organized on December 5, 2025 at the institute under the theme of 'Healthy Soil, Healthy Cities'. The program was conducted in the presence of the local village Mukhiya and institutional representatives. The program highlighted the importance of World Soil Day and emphasized the need for soil conservation to address challenges arising from rapid urbanization. Discussions focused on soil as a living natural resource essential for sustainable and quality food production to meet the needs of a growing population. Participants were encouraged to promote plantation of fruit and shade trees in urban parks and vacant areas to prevent soil erosion and improve environmental quality. The program also emphasized the role of healthy soils in supporting urban life by providing clean air, water, and a healthy environment. Farmers were sensitized on the importance of soil nutrients, soil health, and various soil conservation techniques relevant to both rural and urban ecosystems. The program concluded with an interactive session reinforcing the message that healthy soils are fundamental to healthy cities and sustainable agriculture.

Fig. 8.23. Glimpses from World Soil Day Celebration

NSS activities

The national service scheme (NSS) unit of ICAR-IARI, Jharkhand actively organized and participated in a series of community-oriented and environmentally significant activities during the year 2025-26. These activities were conducted under the guidance of NSS Coordinators and in collaboration with institutional committees, with the aim of promoting social responsibility, environmental sustainability, and community engagement among students.

The NSS unit initiated its activities with cleanliness drives in the institute campus and nearby villages such as Kheron, focusing on sanitation, waste management, and hygiene awareness. These drives witnessed enthusiastic participation from students and faculty, reinforcing the importance of community service and swachhata. On the occasion of Gandhi Jayanti (2nd October 2025), a special program was organized to commemorate the ideals of Mahatma Gandhi, emphasizing cleanliness and non-violence. The event included floral tributes, awareness talks, and a campus cleanliness drive, strengthening the spirit of the Swachh Bharat Abhiyan. Further extending its outreach, the NSS unit conducted a Cleanliness Awareness Campaign in Kheron village, where students organized rallies, interacted with villagers, and promoted waste segregation and environmental hygiene. This was followed by multiple cleanliness drives at key locations such as the Anganwadi Centre at Kheron and Vishal Sarovar within the campus, focusing on sanitation, ecological maintenance and water body conservation. In addition to cleanliness initiatives, a plantation drive was organized near the staff residential quarters to enhance greenery and promote ecological awareness. NSS volunteers actively participated in planting and nurturing saplings, contributing to environmental sustainability. Throughout the year, these activities successfully instilled a sense of discipline, teamwork, and social responsibility among students, while also benefiting the surrounding communities. The initiatives collectively contributed to improving environmental conditions, promoting public health awareness, and strengthening the institute's commitment to nation-building through community service.

Fig. 8.24. Highlights of institutes' NSS activities

9

Awards and Recognitions

- Dr. Ch. Srinivasa Rao, Director, ICARIARI, was 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. He has also been appointed as the Convener of the Agricultural Section at NASI, Prayagraj, U.P., further strengthening his leadership in agricultural science. In addition, Dr. Rao has been selected as a member of the National Adaptation Committee under the Ministry of Environment, Forest, and Climate Change, Government of India, where he contributes his expertise to national climate adaptation strategies.

Fig. 9.1. Dr. Ch. Srinivasa Rao is receiving N.S. Randhawa Award during the XVII Agricultural Science Congress 2025

- Dr. S.K. Mahanta, along with his team members, was conferred a certificate of recognition for successfully registering the Bundelkhandi breed of goat with the accession number INDIA_GOAT_BUNDELKHANDI_06041 through the Breed Registration Committee of the Indian Council of Agricultural Research on January 6, 2025.

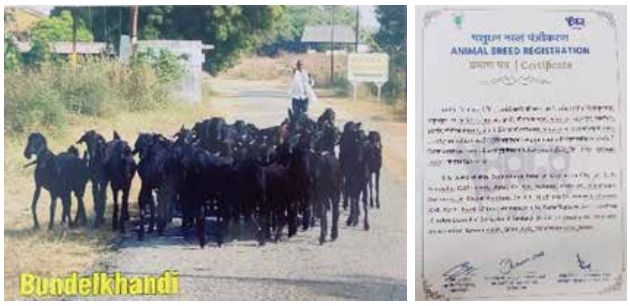

Fig. 9.2. Annual Seed Registration Certificate for registering the Bundelkhandi breed of goat

- Dr. Vandana, Senior Scientist (LPM) was conferred the Best Veterinarian Award by the award selection committee of GRIAST-2025 in recognition of her outstanding contribution in the field of Veterinary Science. The honour was presented during the 3-Day International Conference on Global Research Initiatives for Agriculture, Science and Technology (GRIAST-2025) jointly organized by Indira Gandhi Krishi Vishwavidyalaya (IGKV), Raipur, Chhattisgarh, and the National Agriculture Development Cooperative Ltd. (NADCL), Baramulla, J & K, held at IGKV, Raipur, from January 20-22, 2025.
- The 'Excellent in Research and Mentoring Award-2025' 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 Janta College, Bakewar, Etawah, UP.
- 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. Ranjit Singh received the Certificate of Excellence in Reviewing2025 from the European Journal of Nutrition & Food Safety on January 28, 2025, and from Archives of Current Research International on February 13, 2025, in recognition of his outstanding contribution to the quality and integrity of peerreviewed scientific publications.
- Dr. Himani Priya was recognized with Best Researcher Award by the Indian Society of Agriculture and Horticulture Research Development (ISAHRD) in Chandigarh, Punjab, India, during 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 10-12, 2025.
- Dr. Nuzaiba P.M., received the 'Dr. A.P. Sharma Young Scientist Award2025' from the Inland Fisheries Society of India (IFSI) during the 2nd Indian Fisheries Outlook held on July 12–14, 2025, at OUAT, College of Fisheries, Rangailunda, Brahmapur, Odisha. She was also recognized with the Young Scientist Award in Fisheries and Life Science Awards2025 by the Society of Fisheries and Life Sciences for her outstanding research contributions in the field of Fisheries and Life Science.

Fig. 9.3. Dr. Nuzaiba P.M., receiving Dr. A.P. Sharma Young Scientist Award2025 at 2nd IFO

- Dr. Saheb Pal, Scientist (Vegetable Science) was awarded with Young Scientist Award for his innovative contributions in Horticulture (Vegetable Science) by the Association of Plant Science Researchers (APSR), Dehradun, Uttarakhand, India on 31st Aug, 2025.
- 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 63rd Convocation held on 22nd March 2025.

Fig. 9.4. Dr. Narendra Singh is receiving IARI Merit Gold Medal during the 63rd Convocation of IARI, New Delhi

- Dr. Akash A. received Best Oral Presentation Award for the paper titled 'GWAS revealed distinct genetic architecture of natural and artificial ageing in soybean' at National Conference on 'Advances in climate-conscious crop science: genetics, genomics and breeding' held at GKVK, Bengaluru on 2nd Nov, 2025.

Fig. 9.5. Dr. Akash A. receiving Best Oral Presentation Award during a National Conference

- Dr. Pavithra K.N., Scientist (Agricultural Economics), received the Best Oral Presentation Award for her paper 'Resource Use Efficiency of Farming Systems in KoramanagalaChallaghatta Valley Project Area, Karnataka' during the National Seminar on Progressive Agriculture – Viksit Bharat: Preparedness of Eastern Region

organized by ICARRCER, Patna, held from February 21–23, 2025.

- Dr. Kashinath G. Teli, Scientist (Agronomy), was awarded the Dr. Vasanthrao Khuspe Gold Medal for standing first in Agronomy during his Ph.D. (Agriculture) at the 38th Convocation of Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri, Maharashtra, held on April 22, 2025. He was also conferred the MPKV- Ph.D. Gold Medal in Agronomy at the same convocation. In addition, Dr. Teli received the Best Oral Presentation Award for his paper 'Economics and Energetics of Modern Farming, Organic Farming and Natural Farming in Fruit CropBased Cropping System' at the National Seminar on AgriDiversification and EcoRegional Farming organized by ICARMGIFRI, Motihari, Bihar, during March 4-5, 2025.

Fig. 9.6. . Dr. Kashinath G. Teli is receiving University Gold Medals during 38th Convocation of MPKV, Rahuri

Table 9.1. Expert contributions by institute scientists

Name & designation	Contribution	Details	Venue & date
Dr. B.N. Mandal	Invited Lectures	Delivered lecture on 'Test of hypothesis in survey data using R' and correlation and regression analysis in surveys using R (Online mode	Training program on 'Advances in survey research and data analytics using open-source software' organized by ICAR- National Institute on Foot and Mouth Disease, Bhubaneswar, Odisha, India on 22 Sep 2025
	Invited Guest Lecture	Delivered lecture on 'Design of Experiments' in the Ten Days Winter School on Data Driven AI and Analysis using SPSS & R' [Online mode]	Society for Agricultural Research, Applied Technology and Environmental Sciences, Collaboration with International University of Business Agriculture and Technology, Bangladesh, KaruSphère Laboratory, Guadeloupe and Yugra State University, Russia from 06-16 Dec 2025
	Invited Guest Lecture	'Design of Experiments' via online mode on 10 days winter school on 'Data driven AI analysis using SPSS & R'	Birsa Agricultural University, Kanke, Ranchi, Jharkhand, India on 11-21 Dec 2025

Name & designation	Contribution	Details	Venue & date
	External Expert	Interview board for selection of Project Associate in an externally funded project	ICAR–NRRI Central Rainfed Upland Rice Research Station, Hazaribagh Jharkhand, India on 26 Aug 2025
	Invited Lectures	Delivered two online invited lectures on 'Test of hypothesis in survey data using R' and 'Correlation and regression analysis in surveys using R' during a training program on 'Advances in survey research and data analysis using open- source software'	ICAR- National Institute on Foot and Mouth Disease, Bhubaneswar, Odisha, India from 15-24 Sep 2025
Dr. Mukesh Kumar Tiwari	Guest Lecture	Delivered lecture on the topic 'Introduction to machine learning techniques in water resources engineering' during one-month in-plant training for M. Tech. (Soil and Water Conservation Engineering) students	ICAR–Indian Institute of Soil and Water Conservation Research Centre, Vasad, Gujarat, India from 1-30 Sep 2025
	Expert Member	Members in the selection committee for direct recruitment of teachers in (i) Soil and Water Engineering, (ii) Soil and Water Conservation Engineering	S D Agricultural University, Sardar Krushinagar, Gujarat, India on 14 Sep 2025
	Rapporteur	Recognised as Rapporteur for the Subtheme-I: Geospatial Technologies, during the 59th ISAE Annual Convention and International Symposium on "Mechatronics and Robotics in Pre- and Post-Production Agriculture"	Indian Society of Agricultural Engineers (ISAE) and ICAR–CIAE, Bhopal during 10–12 Nov 2025.
Dr. Vandana	Eminent Speaker	National Workshop cum Training Program on 'Recent advances in scientific interventions to enhance livestock productivity and farm profitability'	AISECT University, Hazaribagh, Jharkhand, India from 18-20 Sep 2025

Name & designation	Contribution	Details	Venue & date
Dr. Manoj Chaudhary	External Examiner	Thesis evaluation report on 'Optimization of phosphorus with fym, bio-consortia and nano zinc on yield of wheat and soil properties in Inceptisols'	Banda University of Agriculture and Technology, Banda during Nov 2025
Dr. Krishna Prakash	Expert	Expert talk on 'प्राकृतकि खेती' (Natural Farming) in 'Hello Kisan' live phone-in program on DD Kisan Channel on January 6, 2025, from 6:00-7:00 PM	'Hello Kisan' Live phone-in program of DD Kisan Channel on 06 Jan 2025
Dr. Ranjit Singh	Invited Lecture	Lead Talk on 'Green Processing Technologies: Revolutionizing Postharvest Management of Horticultural Crops'	Global Conference on Smart Horticulture for Prosperity and Nutritional Security 2025 held at the University of Horticultural Sciences, Bagalkot, India from 12–14 Feb 2025
Dr. Anima Mahato	External Examiner	Evaluated M Sc Thesis 'Genome wide association study of yield under suboptimal nitrogen and phosphorus fertilization in a subset of 3K rice panel'	Dr. Rajendra Prasad Central Agricultural University, Pusa, Samastipur, Bihar, India on 28 Aug 2025
Dr. Santosh Kumar	External Examiner	Thesis evaluation and viva voce examination of two postgraduate students at Birsa Agricultural University (BAU), Ranchi	Birsa Agricultural University (BAU), Kanke, Ranchi, Jharkhand, India on 30 Oct and 06 Dec 2025
	External Examiner	Thesis evaluation and viva voce examination of six postgraduate students from Odisha University of Agriculture and Technology (OUAT), Bhubaneswar	OUAT, Bhubaneswar from 29 Aug - 01 Sep 2025

Name & designation	Contribution	Details	Venue & date
Dr. Shilpi Kerketta	Expert Panel Member	Served as a expert panel member for the recruitment (Adv. No. 07/23)	Director Recruitment (Dairy Development), Jharkhand, India on 07 Nov, 2025
	Eminent Speaker	National Workshop cum Training Program on 'Recent advances in scientific interventions to enhance livestock productivity and farm profitability'	AISECT University, Hazaribagh, Jharkhand, India from 18-20 Sep 2025
Dr. Nuzaiba P.M.	Invited Lecture	Delivered lecture on the title 'Diversified aquaculture system: innovations and sustainable approaches' for Bachelor of Fisheries Science Students	College of Fisheries, KUFOS, Panagandu on 20 Jun 2025
	Rapporteur	Recognised as Rapporteur for the session *'Biotechnological Innovations for Aquatic Food/ Seafood Quality & Safety'* during the International Conference on Fisheries Biotechnology	ICARCentral Institute of Fisheries Education, Mumbai during 17–18 Mar 2025
Dr. Saheb Pal	Guest Speaker	Delivered lecture on the topic 'ICAR-AIEEA (PG) Examination in Vegetable Sciences'	College of Horticulture, Thenzawl, Mizoram under the Central Agricultural University, Imphal, Manipur from 22-23 Mar 2025
	External Examiner	Thesis evaluation and conduct of viva-voce examination of a student of M.Sc. (Ag.) in Horticulture	Birsa Agricultural University, Kanke, Ranchi on 03 Mar 2025 & 21 Nov 2025
	External Examiner	For the course breeding of cross-pollinated vegetable crops (VSC-506)	College of Horticulture, Thenzawl on 25 Sep 2025

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Administration and Accounts

1. Financial Statement (Rs. in Lakhs) of IARI, Jharkhand (2025-26)

Major heads	Sub-heads	BE 2025-26	RE-2025-26	Receipt	Expenditure	% Utilization of allocation
Main	Capital	1472.50	747.50	747.50	747.50	100.00
	General	450.00	450.00	450.00	450.00	100.00
	Total	1922.50	1197.50	1197.50	1197.50	**100.00**
NEH	Capital	0.00	0.00	0.00	0.00	0.00
	General	0.00	0.00	0.00	0.00	0.00
	Total	0.00	0.00	0.00	0.00	**0.00**
SCSP	Capital	418.00	418.00	418.00	418.00	100.00
	General	235.00	235.00	235.00	235.00	100.00
	Total	653.00	653.00	653.00	653.00	**100.00**
TSP	Capital	0.00	0.00	0.00	0.00	0.00
	General	24.00	24.00	24.00	24.00	100.00
	Total	24.00	24.00	24.00	24.00	**100.00**
Grand Total		2599.50	1874.50	1874.50	1874.50	100.00

2. Staff strength as on 31.12.2025

Cadre	Sanctioned	In position	Vacant
Research management			
Scientist	41	35	6
Technical	22	9	13
Administrative	11	7	4
Total	74	51	23

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Distinguished Visitors

- Dr. Rajendra Singh Paroda, Chairman, TAAS, Former Secretary, DARE and DG, ICAR, New Delhi
- Dr. Devendra Kumar Yadav, DDG (Crop Science), ICAR, New Delhi
- Dr. Sujay Rakshit, Director, ICAR-IIAB, Ranchi
- Dr. A. R. Sharma, Former Director, ICAR-Directorate of Weed Research, Jabalpur and Former Director Research, RLBCAU, Jhansi
- Dr. Ravinder Kaur, Former Director (Acting), ICAR-IARI, New Delhi
- Shri Bhor Singh Yadav, IAS, Director Agriculture, Government of Jharkhand, Ranchi
- Dr. Vishwanathan Chinnusamy, Joint Director (Research), ICAR-IARI, New Delhi
- Dr. Dinesh Kumar Singh, Vice-Chancellor, Nilamber-Pitamber University, Palamu, Jharkhand
- Dr. Vijay Pal Bhadana, Joint Director (Research), ICAR-IIAB, Ranchi
- Dr. K. K. Krishnani, Joint Director (Academics), ICAR-IIAB, Ranchi
- Dr. Awani Kumar Singh, Head, ICAR-RCER, FSRCHPR, Ranchi
- Dr. N. P. Mandal, Head, ICAR-CRURRS (ICAR-CRRI), Hazaribagh
- Dr. Pratap Bhattacharyya, Head, Crop Production Division, ICAR-CRRI, Cuttack
- Dr. Narendra Kumar Singh, Professor (Plant Breeding), Chairman, Monitoring Team, AICRP on Maize Improvement, GBPUAT, Pantnagar
- Dr. Harshavardhan Chaudhary, Associate Dean (UG), ICAR-IARI, New Delhi
- Dr. Monika Joshi, Associate Dean (Hubs), ICAR-IARI, New Delhi
- Dr. Gaurav Jha, Assistant Professor, Kansas State University, Manhattan, Kansas, United States

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List of Personnel

A. Current staff strength

Name	Designation
Research Management	
Dr. Ch. Srinivasa Rao	Director and Vice-Chancellor
Scientific	
Dr. Sanat Kumar Mahanta	Campus In-charge & Principal Scientist (Animal Nutrition)
Dr. Vishal Nath	Ex-OSD & Principal Scientist (Fruit Science)
Dr. B. N. Mandal	Pr. Scientist (Agricultural Statistics)
Dr. Mukesh Kumar Tiwari	Sr. Scientist (Land and Water Management Engineering)
Dr. Prabhat Kumar Guru	Sr. Scientist (Farm Machinery & Power)
Dr. Pankaj Kumar Sinha	Sr Scientist (Agricultural Extension)
Dr. Nirmal	Sr. Scientist (Agroforestry)
Dr. Vandana	Sr. Scientist (Livestock Production and Management)
Dr. Srinivsaraghavan A	Sr. Scientist (Plant Pathology)
Dr. Vijay Bahadur Chauhan	Sr. Scientist (Vegetable Science)
Dr. Manoj Kumar Chaudhary	Sr. Scientist (Soil Sciences)
Dr. Dipak Kumar Gupta	Sr. Scientist (Environmental Sciences)
Dr. Krishna Prakash	Scientist (Spices, Plantation, Medicinal and Aromatic Plants)
Mr. Abhay Kumar Giri	Scientist (Aquaculture)
Dr. Om Praksh	Scientist (Agricultural Structures and Process Engineering)
Dr. Ranjit Singh	Scientist (Agricultural Structures and Process Engineering)
Dr. Himani Priya	Scientist (Agricultural Microbiology)
Dr. Preeti Singh	Scientist (Soil Sciences)
Dr. Santosh Kumar	Scientist (Genetics and Plant Breeding)
Dr. Anima Mahato	Scientist (Genetics and Plant Breeding)
Dr. Asha Kumari	Scientist (Plant Physiology)
Dr. Ashok Kumar	Scientist (Plant Biochemistry)
Dr. Shilpi Kerketta	Scientist (Livestock Production and Management)
Dr. Sougata Bhattacharjee	Scientist (Agricultural Biotechnology)
Dr. Nuzaiba P M	Scientist (Fish Nutrition)
Dr. Saheb Pal	Scientist (Vegetable Science)

Name	Designation
Dr. Priti Tigga	Scientist (Agricultural Physics)
Dr. Narendra Singh	Scientist (Fruit Science)
Dr. Pavithra K N	Scientist (Agricultural Economics)
Dr. Akash A	Scientist (Seed Science and Technology)
Dr. Asharani Patel	Scientist (Plant Pathology)
Dr. Kashinath Gurushidappa Teli	Scientist (Agronomy)
Dr. Shantesh Kamath	Scientist (Floriculture)
Dr. Somashekhar V G	Scientist (Agricultural Entomology)
Dr. Archana H R	Scientist (Seed Science and Technology)
Technical	
Mr. Sushil Marandi	ACTO (Librarian)
Mr. Arun Kumar Rajak	T1 (Technician)
Mr. Jay Prakash Narayan	T1 (Technician)
Mr. Jitendra Kumar Mandal	T1 (Technician)
Mr. Vikash Kumar	T1 (Technician)
Mr. Satyam Kumar	T1 (Technician)
Mr. Dharmendra Kumar Yadav	T1 (Technician)
Mr. Rajendra Kumar Meena	T1 (Technician)
Mr. Rahul	T1 (Technician)
Administrative	
Mr. Prashant Kumar	Comptroller
Mr. Subodh Neeraj	CAO
Mr. Vikram Verma	AO
Mr. Surjit Kumar	AAO
Mr. Sonu Kumar	AAO
Mr. Omkar Pushp	Assistant
Mr. Abinash Kumar	Assistant

B. Staff transferred/ joined in other institutes

Name	Designation
Dr. Priya Ranjan Kumar	Principal Scientist (Genetics and Plant Breeding)
Dr. Monu Kumar	Scientist (Genetics and Plant Breeding)
Dr. Shannon Sangma	Scientist (Agricultural Chemicals)
Dr. Niranjan Kumar	Scientist (Agricultural Chemicals)
Dr. Monika M	Scientist (Poultry Science)
Mr. Rajnish Kumar	FAO


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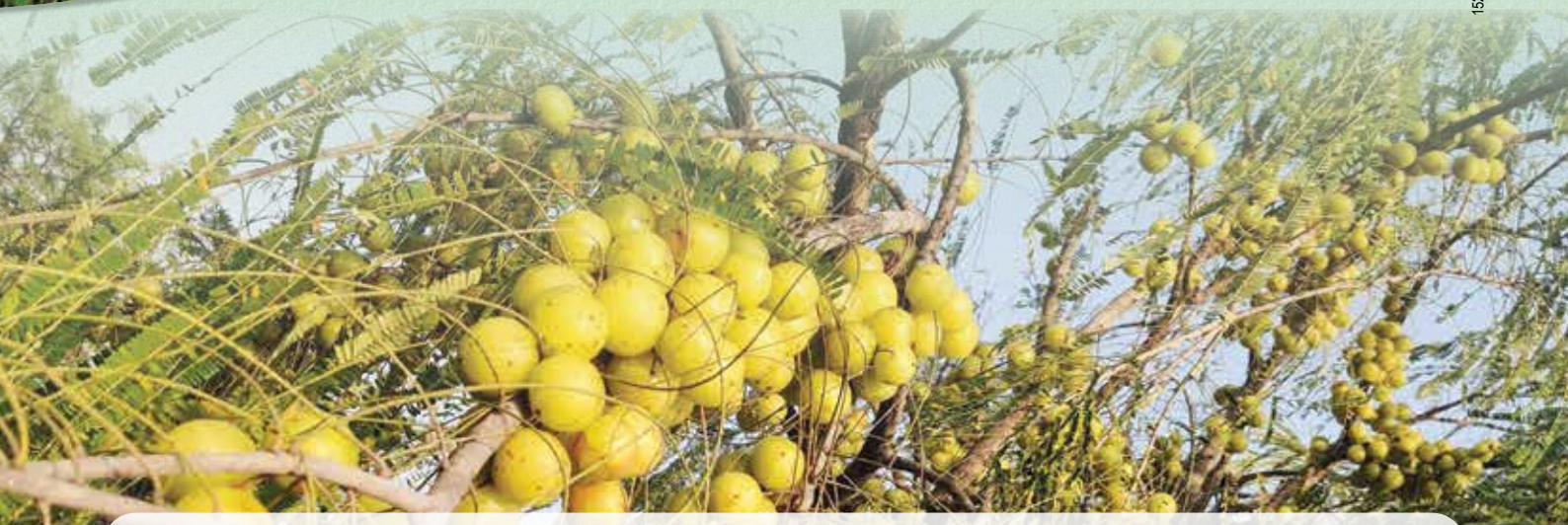

भा.कृ.अनु.प. – भारतीय कृषि अनुसंधान संस्थान - झारखण्ड

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