WE'RE NABL ACCREDITED LAB

ICAR-CIAE Newsletter

VOLUME: 35 (2) APRIL-JUNE, 2025

FROM DIRECTOR'S DESK

CIAE at the forefront of drone technologies

The applications of drones in agriculture have opened up a new horizon to increase the agriculture outputs and real-time access to high-quality information. Crop monitoring has become a simple task with the emergence of drone based data collection, replacing the traditional labour-intensive and time-consuming process. Drones can assist in precision agriculture by performing variety of agricultural tasks including soil health scanning, seed planting, fertilizer application, crop stress management, irrigation scheduling, weed management, crop yield estimation and weather analysis.

ICAR-CIAE, Bhopal has been contributing significantly to drone-based agricultural research by integrating its expertise in mechanization, automation, and precision farming with emerging UAV technologies. The research portfolio further extends to robotics, deep learning for crop maturity detection, and other precision agriculture technologies that together build an enabling ecosystem where drones can be seamlessly integrated with sensors, AI models, etc. In this context, some of the institute's recent achievements in drone-based agricultural research include investigations into UAV spraying dynamics, optimization of operational parameters and drift control in drone-assisted agro-chemical applications, evaluation of unmanned aerial sprayers across different cropping systems, and drone based yield estimation in orchards. The coordinated efforts of institute and AICRP on FIM highlight the institute's role in formulating scientific protocols for UAV based pesticide spraying for different cropping system to ensure efficiency in agro-chemical delivery, effective pest and disease control, and minimization of environmental risks.

Alongside technology development, the institute remains active in capacity-building through training programmes, workshops, and winter schools on aerial sensing, sensor integration, artificial intelligence, and machine learning - all of which form the foundation for UAV-based monitoring, decision support systems, and smart farm management. Collectively, these initiatives position CIAE at the forefront of India's efforts to harness drone technologies for localized farming systems, with a strong emphasis on balancing productivity gains and sustainability. Such milestones not only reinforce CIAE's leadership in precision agriculture research but also provide practical solutions to accelerate the adoption of drone technology at the farm level.

Visit of Union Minister of Agriculture and Farmers' Welfare

Hon'ble Union Minister of Agriculture and Farmers Welfare, Shri Shivraj Singh Chouhan ji visited the Institute on 22 June 2025. The event was graced by the presence of Dr. M.L. Jat, Secretary (DARE) & Director General, ICAR; Dr. S.N. Jha, DDG (Agricultural Engineering); Dr. AK Nayak, DDG (NRM); Dr. CR Mehta, Director, ICAR-CIAE; and Dr. M. Mohanty, Director, ICAR-IISS, Bhopal.

On this day, Dr. CR Mehta welcomed the dignitaries and briefed them on the institute's significant achievements and on-going innovations. The Hon'ble Minister addressed the scientists, students, and staff, and commended the institute's contribution to agricultural development, and highlighted the need for accelerated development of farmer-friendly technologies and bringing developed technologies to farmers, especially for smallholder farmers. Hon'ble Agriculture minister also witnessed and appreciated the recently developed technologies and products of the institute.

He also reviewed the work done by the institute in recent past and stressed the need to identify the demand of various regions of the country through the network of AICRPs of the institute and plan for mechanization interventions in next ten years so that country can take a giant leap towards Vikshit Bharat. He stressed the need to develop small engine operated or machinery operated by alternative sources of energy and promote sensor based systems to have inclusive development of all section of farmers. He desired to organize Farmer's fair at different locations in the country and a brain storming session

with all stakeholders to plan the roadmap of the mechanization of the country in near future. Apart from that he emphasized the importance of food safety, soil health, and effective lab-to-land transfer of technologies.

Dr. ML Jat, Secretary (DARE) & DG, ICAR highlighted ICAR's vision of harnessing science, innovation, and technology for farmers' welfare. He spoke about the role of CIAE in developing mechanization models for diverse agro-climatic zones, and stressed the importance of partnerships with state agriculture universities, Krishi Vigyan Kendras (KVKs), and industry for wider outreach.

Dr. SN Jha, DDG (Agricultural Engineering) spoke about the engineering innovations spearheaded by ICAR, including energy-efficient machinery, farm automation, and post-harvest engineering solutions. He pointed out that mechanization has contributed

significantly to reducing drudgery, improving efficiency, and enhancing productivity across Indian agriculture. He urged CIAE scientists to further accelerate work in robotics, artificial intelligence, and precision agriculture tools tailored to Indian farming conditions.

Dr. AK Nayak, DDG (Agricultural Extension) emphasized the need to translate technological innovations into field-level adoption. He highlighted the role of extension systems, KVKs, and farmers' producer organizations (FPOs) in bridging the lab-to-land gap. He urged CIAE to design training and demonstration modules that are farmer-friendly and easily replicable at the grassroots. He also stressed the importance of digital platforms, capacity building, and youth engagement in agricultural entrepreneurship.

Visit of Secretary (DARE) & DG, ICAR

Dr. ML Jat, Secretary (DARE) & Director General, ICAR, visited the Institute on 25 May 2025 to review the institute's research and development activities. In this occasion, Dr AK Nayak, Deputy Director General (Natural Resource Management) also visited the institute. During interaction with scientists, staff and students, DG, ICAR appreciated the institute's contributions in the fields of farm mechanization, post-harvest engineering, renewable energy and precision agriculture. He emphasized the need for farmer-centric, affordable and sustainable technologies, particularly suited to small and marginal farmers, and urged CIAE to accelerate innovations in climate-smart mechanization, digital agriculture, AI-driven tools and robotics. He stressed upon stronger collaborations with industry and start-ups to scale innovations and create rural employment. He called upon scientists to focus on energy-efficient and women-friendly technologies, strengthen value-addition and post-harvest solutions to reduce losses, and align research priorities with the government's vision of Atmanirbhar Krishi.

Addressing the scientists, Dr. A.K. Nayak, DDG (NRM), appreciated the Institute's efforts in promoting

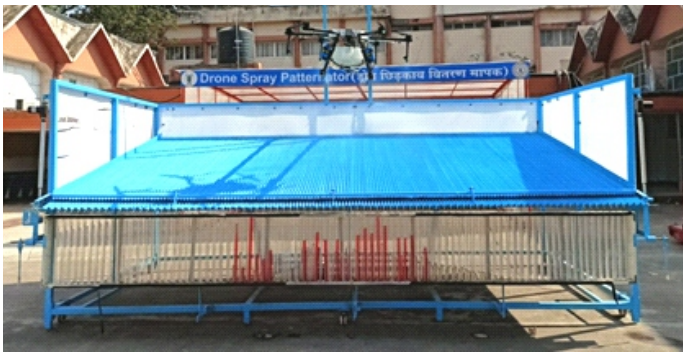
resource-efficient and conservation-oriented mechanization. He encouraged scientists to integrate natural resource management principles with engineering innovations to enhance soil health, water-use efficiency, and carbon neutrality in agriculture. Dr. Nayak also emphasized the need for interdisciplinary research, leveraging the synergy between biological and engineering sciences to tackle emerging challenges of climate change, resource degradation, and sustainability.

Earlier, Dr. C.R. Mehta, Director, ICAR-CIAE, welcomed the dignitaries and presented an overview of the institute's achievements, recent innovations and ongoing projects, assuring that CIAE will continue to play a leading role in advancing agricultural engineering for the welfare of farmers.

Research and Development

Drone spray patternator

The drone spray patternator was developed to study the effect of multi-rotor downwash on spray distribution. Measuring 5 × 3 m, it includes 192 V-channels (25 × 28 mm) at 26 mm spacing, directing water into 180 glass tubes (200 ml each) mounted in an aluminium frame. A flip mechanism controls water flow, while a handle assembly enables easy emptying. The unit, equipped with six wheels for mobility, is housed under a 6.5 × 4.5 × 3 m shed with polycarbonate sheets for protection. This set up enables precise evaluation of spray uniformity under varying drone heights and discharge rates.



Drone-based variable rate fertilizer applicator

A UAV-based variable rate fertiliser broadcast system was developed to apply urea depending on crop need. The applicator has a micro-processor (Raspberry pi), electronic stability control, battery-eliminating circuit and GPS and it is controlled by a decision-making algorithm. It was evaluated in wheat crop at four levels of nitrogen application i.e N1: Healthy, N2: Moderate, N3: Low and N4: Very low as independent parameters and NDVI, spray coverage (%), droplet density (droplets/ cm2) and in swath spray deposition (µl/cm2) as dependent parameters. There was 31.3% saving of urea with UAV-VRA as compared to a normal UAV based broadcasting system.

Immersive virtual reality (VR) environment for operating remotely controlled 2-wheel paddy transplanter

A virtual reality (VR)-based system was developed to operate a 2-wheel paddy transplanter remotely, making rice transplanting easier and more comfortable for farmers **(PAU Ludhiana centre AICRP on ESAAS)**. The operator can control the machine from outside the muddy field using a mobile or computer, viewing real-time video from front and rear cameras. This new system helped to increase the working speed from 1.75 km/h to 2.0 km/h. Although the overall area covered remained the same due to turning time. The

Research and Development

major benefit was reduced physical stress. Farmers using the remote system had 45–89% less discomfort and used less energy (7.56–9.72 kJ/min) as compared to walking behind the machine (8.20–27.67 kJ/min). This technology helps to improve work conditions, saves energy, and encourages modern, stress-free farming.

Tractor operated orchard grass cutter

A tractor-operated orchard grass cutter has been developed to address the need for an efficient weed management in fruit orchards (FIM centre, MPKV, Rahuri). A key design requirement was the development of an adjustable working width to suit various row-to-row spacings. The orchard grass cutter features cutting blades with two movable drums. The machine is operated by PTO through a gearbox that rotates the shafts and blades mounted on adjustable drums. This mechanism allows for adaptable working width tailored to specific orchard layouts. The effective field capacity of the developed prototype is 0.6 ha/h with a field efficiency of 79%. The cost of operation was found to be Rs. 1100 per hectare, resulting in a cost saving of 82% when compared to traditional manual methods.

Study on work fatigue analysis of agricultural workers to improve working efficiency

A study was undertaken to address the intense physical strain experienced by agricultural farm workers, particularly women, during paddy transplanting. The study on paddy transplanting revealed severe physical strain among farm workers, especially women. Using Body Part Discomfort Score (BPDS), Overall Discomfort Rating (ODR) and Nordic Musculoskeletal Questionnaire (NMQ) ratings, 100% reported lower back pain, 96.6% knee pain, and 91.6% shoulder pain within a day, with over 93% experiencing chronic back pain. Chi-square tests linked MSDs to age, experience, and BMI. RULA (7) and REBA (9) indicated high ergonomic risk. EMG showed intense lower back muscle activity, with heart rate at 115 bpm and energy expenditure of 18.16 kJ/min. based on analysis of data, a schedule of 35 minutes work, 5 minutes rest, plus a lunch break was recommended to reduce fatigue and improve efficiency.

Jackfruit De-Seeder

The sticking latex milk and unusual morphological properties restrict the easy processing operation of jackfruits. A power operated jackfruit de seeder has been developed which eases the de seeding operation. The developed unit has a de-seeding assembly, which comprises of two counter rotating rollers, fixed at top

Research and Development

and bottom. The clearance between the two rollers can be adjusted with the help of spring-loaded nut which is connected between top support and centre stud. The equipment is powered by 0.5 hp electric motor. Jackfruit bulbs are passed in between the two rollers and due to shear, breaking of jackfruit bulb takes place resulting in seed separation. The equipment has capacity of 60 kg/h with a deseeding efficiency of 86%.

Millet polisher

Polishing of millets especially minor millets like kodo, kutli, foxtail millets etc. is one of the important unit operations of millet processing. Small and variable size of millets poses a challenge to polishing operation. Removal of bran increases the appearance of the millets and also increases its shelf life. To address these issues a millet polisher has been developed. A centrally mounted emery rollers and the perforated casing are the principle components of the machine. The polishing occurs in the annular space between rollers and perforated drum by means of shearing and abrasion actions. Developed machine has been tested for polishing of foxtail millets. The polishing efficiency of the machine was recorded to be 82% with only 4 % broken grains at an operating speed of 800 rpm. Machine is operated by a 1.5 kW electric motor and has a capacity of 60 kg/h.

Steamed Raw Banana Peeler

This equipment is designed for peeling steamed raw bananas intended for further processing. It features a main frame, polyurethane roller assembly, knife assembly, outlets for both peeled bananas and banana peels, and a control panel. Food-grade polyurethane button rollers are used to guide and push the bananas downward during operation. An adjustable sliding mechanism integrated with the PU rollers allows the machine to accommodate bananas of varying sizes. Circular knives made of high-speed steel (HSS) are mounted with springs to enable a swinging motion, ensuring continuous contact with the banana for effective peel cutting. A knife positioned at the base of the polyurethane rollers further aids in detaching the skin. Additionally, a scraper is installed at the base to clean the rollers. Peeling efficiency is 70-86 % and the capacity is 100 kg/h. The cost of operation of the machine is Rs. 0.75/kg.

Pulsed UV light system for fresh Fruits and Vegetables

A 4 kW pilot-scale PUV system was developed for strawberries and cherry tomatoes (4–5 kg/batch), consisting of a sample holder, RPM controller, PUV controller, and treatment chamber. The system delivered 60 ± 2 pulses per minute (≈1 pulse/s), with 4000 J energy and 1.624 J/cm² fluence per pulse. Using Response Surface Methodology, exposure time and lamp-to-sample distance were optimized. Optimal conditions were 70–08 mm for 15 min in strawberries and 80–100 mm for 15–20 min in cherry tomatoes. PUV treatment inactivated *Botrytis cinerea* within 15–20 min. Under refrigeration, shelf life increased to 16 days for strawberries and 20 days for cherry tomatoes.

Research and Development

Natural pigment (beetroot peel) based smart indicator

The natural dye was extracted from beetroot peel using various advanced extraction methods and evaluated its application as a pH-sensitive intelligent indicator. Three extraction methods were compared: Ultrasonication-Assisted Extraction (UAE), Microwave-Assisted Extraction (MAE), and a conventional aqueous method. Among all methods, MAE yielded the highest pigment concentration, reaching 7.5 mg/g dry weight, demonstrating superior efficiency, shorter processing time, and better preservation of pigment integrity. The extracted pigment displayed clear pH-dependent color changes. At acidic pH (<7), the dye appeared deep red to pink, turned purple at neutral pH (7), and shifted to yellowish-brown under alkaline conditions (>7). This strong pH sensitivity highlights its potential use as a natural pH indicator.

To explore this application, the pH-sensitive indicator was applied onto Whatman filter paper. The developed indicator was tested with sapota *(Manilkara zapota)* and strawberry under various storage conditions. In sapota, ripening and spoilage were observed at ambient temperature, with respect to storage time by a gradual color change in the indicator. At day 1, the pH of sapota 5.86 and Indicator color was Light yellow when it was fully fresh, at day 8, pH was 6.24 and indicator color was also light yellow when it was still fresh and at day 16, pH decreased towards the end of the storage period, i.e 5.32 and Indicator color was light pink, when sapota gets spoiled. Similarly, strawberries ripened quickly within 3–4 days at room temperature, resulting in a visible shift in the indicator color from deep red to yellowish.

Machine learning based decision support system (DSS) for micro-irrigation management

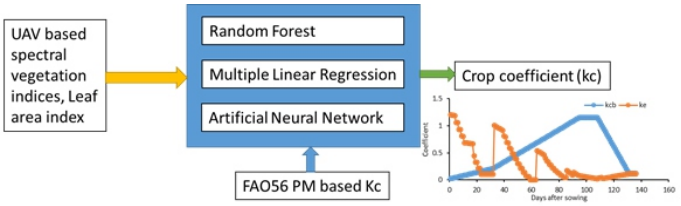
A machine learning based Decision Support System (DSS) was developed for efficient micro-irrigation scheduling. The DSS consists of three modules. In module 1, a web application was developed using Python and HTML to predict reference evapo-transpiration (Eto). The Random Forest (RF) algorithm was used for ETo prediction, as it outperformed Support Vector Regression and Artificial Neural Networks. The RF model uses inputs such as maximum and minimum temperature, relative humidity, and wind speed, and predicts ETo with high accuracy ($R^2 = 0.98$, RMSE = 0.46 mm/day). Furthermore, real-time weather forecasts were integrated to provide 5-day lead ETo predictions. In module 2, a database containing weather, soil, and crop data was linked to estimate crop water requirements. In module 3, the irrigation scheduler guides the user on when and how much to irrigate for crops grown under a micro-irrigation system.

Wheat crop coefficient estimation using UAV imagery for irrigation scheduling

An estimation of crop coefficients for different crop growth stages was done using UAV imagery. The leaf area index (LAI) and multi-spectral vegetation indices (VIs) obtained by an unmanned aerial vehicle (UAV) were used for estimating the Kc value for a wheat crop on a field scale. The performance of the machine learning algorithms (random forest (RF), multiple linear regression (MLR), and artificial neural network (ANN) with ground-based LAI and UAV-based multispectral VIs (NDVI, SAVI, GNDVI, TCARI, RTVI) as input was evaluated for estimation of daily wheat Kc under

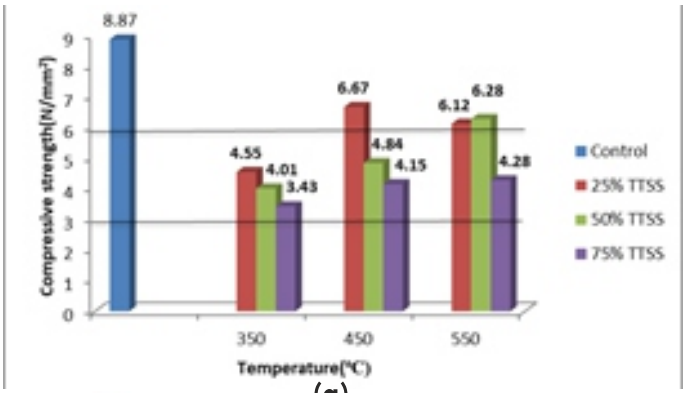
Research and Development

multiple irrigation conditions during the entire cropping cycle. Maize RFR with VIs-LAI-based ET was compared to FAO-56-based ET. The Random Forest model with vegetation indices and ground truth (LAI) as input was better (R^2 = 0.81, RMSE = 0.124) than other models for wheat crop coefficient estimation. Add some information about irrigation scheduling.

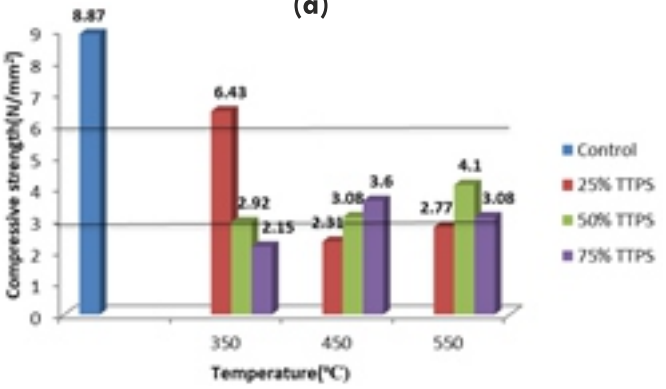


Development of plastering material using paddy/soybean biomass

Thermally treated (350, 450 and 550°C) soybean and paddy straw (TTB) based plaster of different combination (1:2:1, 1:1:2 and 1:0:3) of cement, sand and biomass was developed for wall plastering application. The sand portion in control mortar was replaced with thermally treated biomass of soybean and paddy and compared with standard. The ratio of biomass based mortar was optimized and mechanical as well as thermal properties were evaluated for the ratio. Compressive strength (6.28 MPa) and flexural strength (1.25MPa) were found better in TTB of soybean as compared to TTB of paddy straw based mortar. The compressive strength and flexural strength for conventional mortar plaster (1:3) varied between 3-6 MPa and 1-5MPa respectively. Thermal conductivity of optimized ratio (TTSS) was found as 0.73W/mK better than that of TTPS (0.93 W/mK) of same mix.



(a)



(b)

Patents/Design registration/Copyright applied or granted:

S.No.	Intellectual Property	Name of the Technology	Status
1.	Design registration	Unmanned track-type vehicle for agriculture	Granted (Design no. 422403-001) on 30.06.2025
2.	Design registration	Motorized girdling tool for litchi orchard	Granted (Design number 445360 -001), date: _____
3.	Design registration	Linear move irrigation system for small farms	filed on 23.06.2025
4.	Patent Application	Solar-Powered IoT-enabled floating axial flow pump for surface water lift	Filed on 11.06.2025
5.	Patent Application	Self-propelled vertical spring tyne rotary weeder for closely spaced row crops like onion and garlic	Filed on 18.06.2025
6.	Patent Application	Fermented Tofu whey and ripe tomato based coagulant composition for Tofu and method of producing Tofu using the same	Filed on 20.06.2025
7.	Copyright Application	Smart Farm Management: Monitoring, mapping and development of Agricultural Farms using GIS	Filed on 29.05.2025

Training

Training on value chain development of soybean and pulses

A five-day sponsored training program titled "Value Chain Development of Soybean and Pulses" was organized during 21-25 April, 2025 for DIU SMART Buldana. A total of 26 participants from various FPOs under DIU SMART Buldana participated in the program. The training aimed to build capacity among stakeholders by providing technical know-how on value chain development, processing, food safety, packaging, marketing, and machinery related to soybean and pulses.

Hands-on training on soybean processing and utilization for food uses

Hands-on training programs on soybean processing and utilization for food uses was organized during 26–28 May, 2025 and 24–26 June, 2025. Six trainees from Madhya Pradesh and Uttar Pradesh participated in these programs. The training module primarily consisted of practical demonstrations and hands-on sessions, supported by relevant theoretical concepts. The programs covered a wide range of topics, including the preparation of soy-based food products, soymilk and tofu, an introduction to soy processing equipment, project planning, storage and packaging, quality standards, and marketing of soy products. The sessions also included discussions on the health benefits of soybeans and their nutraceutical properties.

Hands on training for officials from MA&FW

Two separate training programmes were organized for officials from the Ministry of Agriculture & Farmers Welfare (CFMTTI, Budni) during May 2025. The first programme, held from 5-30 May 2025 focused on imparting knowledge on testing and development of agricultural machinery. The second programme, conducted from 19-30 May 2025 emphasized the operation and maintenance of tractors and agricultural implements. Both programmes combined classroom sessions with practical exposure, and participants were provided hands-on training through CIAE's advanced laboratories and state-of-the-art testing facilities, enabling them to strengthen their technical skills and practical understanding of modern agricultural mechanization.

Training for B.Tech (Agricultural Engineering) students

Training programmes were organized for B.Tech (Agricultural Engineering) students during May to October 2025. A total of 78 students participated in different programmes, which included two batches of one-month summer training (01–30 May 2025 with 31 students, and 01–30 June 2025 with 39 students), and two batches of four-month summer training (16 June–16 October 2025 with 4 students, and 23 June–24 October 2025 with 4 students). The students were placed in different divisions of the institute, namely the Agricultural Mechanization Division (AMD), Agricultural Produce Processing Division (APPD), Irrigation and Drainage Engineering Division (IDED), and Agricultural Energy and Power Division (AEP). The training focused on providing practical exposure to the design, testing, and development of agricultural machinery and technologies, enabling the students to gain valuable hands-on experience and applied learning in various aspects of agricultural engineering.

Training

Demonstration programmes for Farmers of Rajgarh district

The demonstration of seed-cum-fertilizer drill was arranged in Mau, Chaturkhedi, Sarangpur and Gwada villages of Rajgarh district in kharif season under DBT Kisan Hub Phase-II Project. Total five demonstrations were held on five different farmers' fields. They were briefed on the use of seed-cum-fertilizer drill, also highlighted its benefits in reducing labour and improving productivity. High-quality soybean seed, fertilizer, herbicide and seed-cum-fertilizer drill were provided to the farmers. During the field visit, the scientists also emphasized the importance of seed cum fertilizer drill and broad bed furrow technologies and their benefits.

इछावर में माननीय कृषि मंत्री का दौरा – विकसित कृषि का संकल्प

'विकसित कृषि संकल्प अभियान' के अंतर्गत 7 जून को माननीय कृषि मंत्री का सीहोर जिले के इछावर क्षेत्र में आगमन हुआ। इस अवसर पर क्षेत्र के सैकड़ों किसान भाई-बहन एकत्र हुए और उन्होंने उत्साहपूर्वक कार्यक्रम में भाग लिया। माननीय मंत्रीजी ने किसानों के साथ आत्मीय संवाद स्थापित किया तथा आधुनिक कृषि तकनीकों, जल संरक्षण, प्राकृतिक खेती, और कृषि विविधीकरण पर विस्तार से चर्चा की। उन्होंने कहा कि –

"किसान सशक्त और समृद्ध बनें, यही हमारा संकल्प है। आत्मनिर्भर भारत की दिशा में आत्मनिर्भर किसान ही वास्तविक शक्ति हैं।"

कार्यक्रम में स्थानीय प्रशासनिक अधिकारी, कृषि विभाग के अधिकारी, वैज्ञानिकों एवं जनप्रतिनिधियों ने भी सहभागिता की। मंत्रीजी ने किसानों को नवीन योजनाओं की जानकारी दी, जैसे कि प्रधानमंत्री किसान सम्मान निधि, फसल बीमा योजना, ड्रिप सिंचाई, जैविक खेती, और कृषि यंत्रीकरण सहायता कार्यक्रम। उन्होंने किसानों से आग्रह किया कि वे नई तकनीकों को अपनाएँ, प्राकृतिक संसाधनों का संरक्षण करें, और कृषि को लाभकारी उद्यम के रूप में विकसित करें।

मंत्रीजी ने यह भी कहा कि राज्य सरकार किसानों के कल्याण के लिए निरंतर कार्य कर रही है और **"इछावर की धरती पर विकसित कृषि का संकल्प"** इसी दिशा में एक महत्वपूर्ण कदम है। अंत में, कार्यक्रम का समापन किसान भाइयों के धन्यवाद ज्ञापन और भविष्य के लिए सहयोग के संकल्प के साथ हुआ।

Viksit Krishi Sankalp Abhiyan

Fifty-two Scientists of the Institute participated in Viksit Krishi Sankalp Abhiyan 2025 (29 May to 12 June, 2025) and carried out a series of structured awareness and educational activities aimed at empowering farmers and rural families with knowledge on improved agricultural practices, value addition, nutrition, and livelihood enhancement. These activities were tailored to local conditions and farmer needs in Bhopal, Sehore, Dewas, Rajgarh, Ujjain, Narmadapuram, Raisen, Harda, Sagar, Seoni, and Vidisha districts of Madhya Pradesh and Erode District of Tamil Nadu.

This program facilitated the dissemination of improved agricultural engineering technologies covering the entire agricultural cycle from sowing to harvesting, residue management, and post-harvest processing. The presence of a multi-disciplinary expert team helped in addressing a wide range of agricultural and livelihood issues faced by the farming community. Farmers were apprised with the importance of agricultural mechanization and use of appropriate machines for different farm activities to enhance crop production and to reduce cost of production. The VKSA successfully strengthened the interface between farmers and agricultural institutions, deepened the outreach of government programmes, and promoted a knowledge-based, sustainable approach to farming. It marked a collaborative step forward in empowering farmers for the upcoming kharif season. The initiative reinforces the government's commitment to doubling farmers' income through technology adoption and mechanization. The overall response from the field was highly encouraging, and several farmers showed keen interest in adopting the discussed technologies and schemes.

Test Reports of Commercial Machinery released

	No. of Test Reports Released
Farm Machinery	18
Post-harvest machinery	09

Media Activities

Sl. No.	Presenter	Date	Title	Media
1	Dr Uday R. Badegaonkar	27 April 2025	समसामयिक कृषि कार्य एवं आगामी फसल की तैयारी	AIR, Bhopal
2	Dr. Dipika Agrahar Murugkar	12 June 2025	सोयाफूड है स्वास्थ्य और पोषण का ख़जाना	AIR, Bhopal

Participation in Exhibitions

Exhibition	Venue	Date
5th Asia Agri, Horti & Food Tech Expo	MSME Exhibition Center, Bhopal	14-16 May, 2025

KVK News

On Farm Testing (OFT) and Frontline Demonstration (FLD)

Sl. No.	Crop/ Technology	Villages	No. of farmers	Area (ha)	Yield
On Farm Testing					
1.	Assessment of supplementation of nutritious Ragi-Barley Laddu on nutritional profile of pre-school children through Anganwadi centers	Raipur	10	-	-
2.	Assessment of intake of bio-fortified variety of wheat: HI 1633 (Pusa Vani) on nutritional status of farm family	Raipur	5	2	34.3 q/ha
Frontline Demonstration					
1.	Reaper cum binder for wheat harvesting	Gondarmau	1	0.60	-
2.	Laser land leveller for land levelling	Acharpura	4	1.25	-
3.	Demonstration of Soybean var. JS-2098	Khajuri Ratatal, Gondarmau, Ratatal, Raipur, Mungaliya Haat, Nipaniya Jaat, Barrichirr Kheda	19	8.0	-
4.	Demonstration of *Poshan Vatika* for production of vegetables at household level	Raipur, Gondarmau, Kacchi Barkheda	5	1250 sqm	213 kg

KVK News

Trainings organized

Sl. No.	Title of the training programme	Date	No. of participants
1.	Sowing and transplanting machinery for rabi and kharif crops	4-5 April, 2025	26
2.	Soil testing and integrated nutrient management	7-8 April, 2025	36
3.	Scientific cultivation of vegetable crops	7-8 April, 2025	26
4.	Healthy dietary guidelines and dietary diversity	15-22 April, 2025	40
5.	Household food security	17-21 April, 2025	86
6.	Fruit orchard management	19-20 May, 2025	22

Events of KVK

- Poshan Pakhwada during 9-22 April 2025, focusing on promoting nutrition and health awareness among rural communities. The participants included farm women, Anganwadi workers, and caregivers from the SOS Foundation and the Welspun Company.
- Extension activities including OFT input distribution for the preparation of Ragi-Barley Laddu, promoting nutritional security through value addition.

As part of the DAESI Diploma Program, a lecture cum visit was conducted in collaboration with ATMA, Bhopal, and a field visit was facilitated for participants from COA, Ganjbasoda to enhance practical understanding of agri-extension services. Additionally, FLD inputs on Soybean (JS-2089) were distributed to farmers, along with advisory on improved cultivation practices to boost productivity and sustainability.

Human Resource Development

Dr. Deepak S. Thorat, Scientist, successfully participated in a specialized training program on ANSYS (Structural) held from 15th to 30th May 2025 at Central Tool Room & Training Centre (CTTC), Bhubaneswar. The program was designed to enhance technical knowledge and analytical skills in the field of structural analysis using ANSYS software, with a focus on practical applications, simulation techniques, and problem-solving approaches relevant to engineering projects.

Foreign Deputations

Dr. CR Mehta, Director, was deputed to Germany from 30 June to 4 July 2025 to participate in the Indo-German Exchange Tour on Energy Storage. The visit aimed at fostering international collaboration, gaining exposure to advanced technologies, and exploring opportunities for joint initiatives in the field of sustainable energy storage solutions.

Dr. Sandip Mandal, Senior Scientist was deputed to Slovakia from 6 May to 21 September 2025 to undertake a scholarship at the Slovak University of Technology, Bratislava. The deputation provided him with an opportunity to engage in advanced research, academic exchange, and collaborative learning in his area of expertise, thereby strengthening international cooperation and enhancing knowledge transfer between institutions.

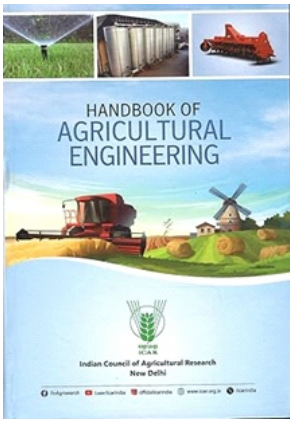
Awards and Recognitions

Dr. Nita Khandekar was conferred with the Soy Researcher 2025 Award during the Soy Foods for a Sustainable Future conference held on April 4–5, 2025, at Indore. The event was organized by the Soy Food Promotion and Welfare Association (SFPWA).

The Regional Station, Coimbatore was conferred with Best Regional Station by Agricultural Scientific Tamil Society, New Delhi during the 10th National Conference on Agricultural Scientific Tamil organized by Agricultural Scientific Tamil Society, New Delhi held at Madaras Veterinary College, TANUVAS Chennai on 4 April, 2025.

Publications

Book



ICAR DKMA published second edition of ***Handbook of Agricultural Engineering in 2025.*** The book serves as a comprehensive reference covering the latest developments and technologies in the field of agricultural engineering. It encompasses a wide range of topics including farm machinery and power, soil and water engineering, post-harvest technology, renewable energy, precision and digital agriculture, and environmental engineering. **CIAE Scientists contributed 36 chapters in this book.**

Citation: Handbook of Agricultural Engineering (second edition). Directorate of Knowledge Management in Agriculture, ICAR, New Delhi. ISBN: 9788171642861

U R Badegaonkar, C R Mehta, P.L. Singh, Adinath Kate, Ashutosh Pandirwar, Shashi Rawat and C. P. Sawant (Eds), Compendium of Agricultural Engineering Technologies, 2025.

Other Book Chapters published

Dawn, C.P. Ambrose & Annamalai, SJK, Introduction of processing equipment for turmeric & groundnut to farm women. Women Empowerment in Agriculture: A Pathway Towards Sustainable Development. ICAR-Agricultural Technology Application Research Institute, Zone 1V, Patna, Birsa Agricultural University, Ranchi, National Agriculture Development Cooperative Ltd. Baramulla. ISBN: 978-93-91995-65-2. Page: 255-265.

Kumari, S., Mallick, S., Channe, D.S., Kumar, N., Kumari, V., & Pothuraju, R. (2025). Significance of Millets in Gut Health. Traditional Foods, 52-69.

Murugkar, D.A., & Zanwar, A.A. (2025). Natural Fortification of Food Products with Omega-3 Fatty Acids: A Promising Approach for Improved Nutritional Health. In: Omega-3 Fatty Acids: Keys to Nutritional Health and Disease. Cham: Springer Nature Switzerland, pp. 313-321).

Pandey, A., Mishra, P.K., Chaudhary, S., Chowdhury, M., Ansh, A.K., Kumar, A., Bhojyareddy, G. R., Srivastava, D., & Singh, A.K. Technological Interventions: Mechanization and Post-production Technologies for the Stakeholders. Indian Agriculture: Challenges, Priorities and Solutions. Springer. ISBN: 978-981-96-5272-3, page: 243-281.

Tyagi, N.K., Srivastava, R.C., Brahmanand, P.S., Sena, D., Srivastava, S.K., Rao, K.V. Ramana, Sahoo, B. & Saxena, C.K. (2025). Water-Energy-Food-Ecosystem Nexus. In: Pathak, H., Joshi, P.K., Lakra, W.S., Singh, A.K., Baranwal, V.K. & Jain, R.K. (Eds.). Indian Agriculture by 2047: A Roadmap for Research, Education and Extension. National Academy of Agricultural Sciences, New Delhi, p xxiv+371. ISBN: 978-81-931524-8-5. 247-274.

Research Papers

Gatkal, N.R., Nalawade, S.M., Shelke, M.S., Deshmukh, M.S., Bhanage, G.B., More, N.M., Sahni, R. & Najser, J. (2025). Effect of operational parameters on spray performance and drift characteristics in UAV based agrochemical application in pigeon pea crop to control thrips. Frontiers in Plant Science, 16, 1570272.

Publications

Gatkal, N.R., Nalawade, S.M., Shelke, M.S., Sahni, R.K., Bhanage, G.B., More, N.M., Walunj, A.A., Kadam, P.B., & Singh, S.P. (2025). A comprehensive study on operational parameters optimization of quadcopter unmanned aerial vehicle-based spraying system in sugarcane. Sugar Tech, https://doi.org/10.1007/s12355-025-01586-2.

Guru, P.K., Sahu, P., Shukla, P., Diwan, P., Panwar, G., Tiwari, P., Nagori, A., Carpenter, G., Sanodiya, R., Meena, B.S., Kumar, M., Rani, A., Rath, I., Dey, D., Verma, N., Gangil, S., Khandai, S., & Yahaya, R. (2025). A critical review on rice cultivation and mechanization level in Indian perspective. Results in Engineering, 26, 105632. June.

Khadatkar, A., Sawant, C. P., & Magar, A. P. Agricultural Robots and Automated Machinery for Transplanting or Handling of Nursery Plants: Application of Robotics. Available at SSRN 4999115.

Khadatkar, A., Sujit, P.B., Agarwal, R., Viswanathan, K., Sawant, C.P., Magar, A.P., Chaudhary, V.P. (2025). WeeRo: Design, development and application of remotely-controlled robotic weeder for mechanical weeding in row crops for sustainable crop production. Results in Engineering, 10.1016/j. rineng.2025.105202.

Kumar, M., Rawat, S., Pandey, H.S., Kumar, M., & Goutam, M. (2025). Maturity stage prediction for cabbage harvesting using deep learning algorithms. Journal of Agricultural Engineering (India), 62 (2), https://doi.org/10.52151/jae2025622.1923.

Kumar, Manoj, Sahni, R.K., Kumar, Manish, Roul, A.K., Saha, K.P., Sahay, C.S., Jyoti, Bikram & Singh, S.K. (2025). Impact of roto-till drill on energy saving in wheat production using difference-in-difference method. Sustainable Energy Technologies and Assessments, 79, 104358.https://doi.org/10.1016/j.seta.2025.104358.

Kumar, T.S., Virdia, H.M., Patel, K.G., Chowdhury, M., Satya, S.C., Abdelmaksoud, S., Elbeltagi, A., Salem, A., Elwakeel, A., & El-Shinawy, D.M. (2025). Residual effect of summer legumes incorporation on soil nutrient status and nutrient use efficiency of kharif rice. Frontiers in Sustainable Food Systems, 9, 1535162. May.

Kumari, A., Yadav, R., Raheman, H., Sharma, M.K., & Sahni, R.K. (2025). Effect of velocity ratio of rotavator on tillage performance index (TPI) in sandy clay loam soil. International Journal of Agricultural Invention, 10(1): 101-106.

Kushwah, A., Sharma, P.K., Kushwaha, H.L., Sharma, B.B., Singh, N., Nag, R.H., Chowdhury, M., Pradhan, N.C., Carpenter, G., Mandal, S. & Salem, A. (2025). Image-based maturity detection for selective cauliflower harvesting in field condition. Smart Agricultural Technology, 11, 100985. May.

Magar, A.P., Nalawade, S.M., Walunj, A.A., Gaikwad, B.B., Shelke, G.N., Khadatkar, A., Sawant, C.P. & Modi, R.U. (2025). Development and optimization of an automatic transplanting device for plug tray vegetable seedlings using embedded system. Scientific Reports, 15(1): 22483. https://doi.org/10.1038/s41598-025-86421-0.

Nishad, P., & Kate, A. (2025). Mass and volume modeling of strawberry fruits (Arbutus unedo L) based on engineering properties and image processing approach. Journal of Agricultural Engineering (India), 62(2), https://doi.org/10.52151.

Prasad, Amit, Singh, R.K., Rao, K.V. Ramana & Saxena, C.K. (2025). Applicability of machine learning models for drought prediction using SPI in Kalahandi, Odisha. Journal of Agrometeorology, 27 (2): 216-220.

Saha, K.P., Singh, Dushyant, Senthilkumar, T., Singh, S.P., Jain, Rajni, Kumar, Manoj & Bhushana, Babu V. (2025). The impact assessment of mechanized transplanting of sugarcane settlings using economic surplus approach. Sugar Tech, 27 (4): 1269-1278.

Sahni, R.K., Sharma, M., Kumar, S.P., Thorat, D.S., Soni, S., Yumnam, C., Kumari, A., Kumar, S. & Sinha, M.K. (2025). Application of precision agriculture technologies for a sustainable future in Agriculture. International Journal of Agricultural Invention, 10(1): 136-147.

Sarkar, S., Upadhyay, P.K., Mitran, T., Rathore, S.S., Singh, R.K., Shekhawat, K., Babu, S., Rajput, S.K., Chowdhury, M., Patel, A. & Singh, A. (2025). The multifaceted role of zeolites in modern agriculture and

Publications

environmental management. Journal of Plant Nutrition, 1-28. June.

Schrader, M.J., Bhalekar, D.G., Sahni, R.K., & Khot, L.R. (2025). Unmanned aerial sprayers: evaluating platform configurations and flight patterns for effective chemical applications in modern vineyards. Smart Agricultural Technology, 101033.

Schrader, M.J., Sahni, R.K., & Khot, L. (2025). Near-field thermal losses of heated water sprays from disc-core hollow cone nozzles. Applied Engineering in Agriculture, 41(3): 319-328.

Shweta, M., Mohapatra, D., Kate, A., Giri, S.K., Tripathi, M.K., Singh, K., & Babu, Bhushana V. (2025). Machine learning approach for assessing lipid oxidation and deterioration in nutritional value in pearl millet due to Tribolium castenum infestation. International Journal of Advanced Biochemistry Research; 9 (5) : 364-371, DOI:https://www.doi.org/10.33545/26174693.2025.v9.i5e.4340.

Singh, S.P., Patle, Rita & Kumar, Manish. (2025). Application of sensor-based system for animal husbandry mechanization. RASSA Journal of Science for Society, 7 (1) : 35-47.

Thayumanavan, Shuprajhaa, Suresh, Kumar, Paramasivam, Subramaniyan, Pushpavalli, Su Anandakumar & Naik, Ravindra. (2025). Influence of additives on the development, mechanical, functional characteristics and biodegradability of banana starch based bio plastic films. International Journal of Biological Macromolecules, 295 (2025) 139544, https://doi.org/10.1016/j.ijbiomac.2025. 139544.

Tomar, M, Bhardwaj, R, Singh, P, Kaur, S, Singh, SP, Dahuja, A, Krishnan, V, Kansal, R, Yadav, V.K., John, R, & Singh, A.K. (2025). From grain to gain: bridging conventional methods with chemometric innovations in cereal quality analysis through near-infrared spectroscopy (NIRS). Food Control, 111482.

Wakudkar, H. & Sahu, P. (2025). Insight of biopolymeric degradation and kinetic triplets of corn cob and its biochar using thermogravimetric analysis. Thermochimica Acta, 748 and 179990. March.

Yumnam, C., Marak, A.B., Kumar, M., Khatri, S., Kumar, S., Soni, S., Kabil, K., Balaji, V., Sahni, R.K., Kumar, S. P. & Chaudhary, V.P. (2025). Utilising drones in agriculture: A review on remote sensors, image processing and their application. Modern Agriculture, 3(2), e70021.

Popular Articles

Ambrose, Dawn C.P. & Kiruba, K. (2025). Betel leaf: Processing and uses. (2025). Agro India, 34 (6): 36-37.

Ingle, P., Bhalekar, D., Khose, S., Gangil, S., & Sahni, R.K. (2025). Beyond the ground: UAVs as game changers in precision agriculture. Agriculture & Food, 7 (05) : 67-72.

Pandey, H.S., Sahni, R,K., Kumar, M, Kumar, V & Kumari, S. (2025). कृषि में नियोजित खेती का महत्व. Kheti, February, 43-46.

Sawant, C., Gaikwad, B.B., Magar A.P., & Khadatkar, A. (2025). ट्रैक्टरचलित प्लास्टिक मल्चिंग सह पेरानिचे यंत्र विकासित. Agrovan Sakal (Marathi Newspaper), 2 July 2025: 8.

Senthilkumar, T., Manikandan, G. Sarveshwar & Syed, Imran S. (2025). Mechanization options in fodder production systems. Agro India, 34 (5) : 17-20.

Senthilkumar, T., Syed, Imran S & Manikandan, G. (2025). Profitable sugarcane cultivation through mechanizing farm operations. Agro India, 35 (3) : 29-32.

Tiwari, Akshay, Chauhan, Pooja & Rajwade, Yogesh. (2025). ग्रेश्मकालीन कृष्ण क्रियान्ये: आधुनिक कृषि यंत्रो का महत्व. Krishak Jagat, Bhopal Edition, 9 June 2025: 7.

Tiwari, Akshay, Yadav, Dipika, Rathod, Divya, Rajwade, Yogesh & Rao, K.V.R. (2025). नये संसाधनो से करे काकाडी की खेती. Krishak Jagat, Bhopal Edition, 21 April 2025 : 6.

Technical Bulletins/ Manuals

Gangil, S, Mandal, S, Nagori, A, Guru P.K., Wakudkar, H & Carpenter, G. Progress Report (2024-25) of Bhopal Centre, AICRP on EAAI. Technical Bulletin No. CIAE/AEP/ EAAI/TR/2025/394.

Publications

Mandal, S., Wakudkar, H., Guru, P.K., Gangil, S., Bhargav, V.K., Vigneshwaran, N., Sahu, P., Diwan, P., Anshika Rani & Meena, B. Training Manual on Advances in hydrogen production for clean energy and environment. Technical Manual No. CIAE/AEP/TM/2025/73.

Potdar, RR, Kumari, Sweeti, Thorat, Deepak & Sanodiya, Rajeshwar. Progress Report (2024-25) of Bhopal Center, All India Coordinated Research Project on Ergonomics and Safety in Agriculture and Allied Sector (ESAAS). Technical Report No. CIAE/ESAAS/TR/2025/397.

Events organized

Live Demonstration workshop on cottage-level production of soymilk, tofu, and related products

A live demonstration workshop on cottage-level production of soymilk, tofu, and related products was held on 14th May 2025 to mark National Technology Day at Sam Global University, organized by the Bhopal chapter of the Association of Food Scientists and Technologists India (AFSTI) in collaboration with the Centre for Excellence on Soybean Processing and Utilisation (CESPU). The event was attended by around 100 students and faculty members. The objective of the workshop was to educate students about the nutritional value of soy products and promote cost-effective, sustainable food practices.

Eye Check-up Camp

A free eye check-up camp was organized by ASG Eye Hospitals, Bhopal on 25 April, 2025. The camp was organised as a part of an initiative to raise awareness about eye health and provided an essential eye care services to the Institute staff and their families. . A dedicated team of senior ophthalmologists and eye care professionals were present on-site to conduct thorough eye examinations, vision testing, and offer personalized consultations.

Fresher's' party

The second year Ph.D. and M.Tech. students of the Institute celebrated fresher's' party to welcome the new postgraduate students. The event was filled with enthusiasm, cultural performances, and interactive activities, creating a joyful atmosphere and fostering teamwork among students and faculties.

World Intellectual Property (IP) Day

The ICAR-Central Institute of Agricultural Engineering, Bhopal, enthusiastically celebrated World Intellectual Property (IP) Day on 2 May, 2025. The global theme for this year was 'IP and Music: Feel the Beat of IP.' The program was chaired by Dr. CR Mehta, Director, ICAR-CIAE. Esteemed guest speakers included Shri Rahul Bagga, Partner at Dentons Link Legal, and Mrs. R. Sakthiya Dakshi, Partner and Co-founder of TARU LEGAL.

New Selections

Dr. C.R. Mehta
Director
DOJ: 04.04.2025

Dr. Sandip Gangil
Head AEP
DOJ: 03.06.2025

Dr. N.S. Chandel
Sr. Scientist
DOJ: 09.06.2025

Dr. Abhijit Khadatkar
Sr. Scientist
DOJ: 09.06.2025

Our New Colleagues

Avinash Brahamwanshi
Senior Technician (T-2)
On transfer from ICAR-CRIDA, Hyderabad
DOJ: 28.04.2025

Gaurav Bhati
Senior Technician (T-2)
On transfer from ICAR-IISEC, Dehradun, Uttarakhand
DOJ: 02.06.2025

Ajay Kumar Gupta
Technician (T-1)
DOJ: 28.04.2025

Staff Promoted

Smt. Santosh Kumari Choudhary
Assistant
DOJ: 15.05.2025

Smt. Madhuri Umredkar
Assistant
DOJ: 15.05.2025

Smt. Manju Lohani
AAO
DOJ: 02.06.2025

Transfer of Staff

Dr. Prabhat Kumar Guru,
Scientist
DOT: 02.06.2025
Selected as Senior Scientist at ICAR-IARI, Hazaribagh

Staff Superannuated

Sh. Ravindra Singh
Chief Technical Officer (T-9)
DOS: 30.04.2025

Smt. Deepa Shinde
Assistant Administrative Officer
DOS: 31.05.2025

Sh. Ramakrishnan O.C.
Private Secretary
DOS: 31.05.2025

Chief Editor: Dr. Sandip Mandal, Senior Scientist
Editors: Dr. Adinath Kate, Dr. Ajesh Kumar, Dr. Abhishek Waghaye, Dr. Syed Imran and Dr. Bikram Jyoti
Word Processing: K. Shankar
Photography: Kalyan Singh
Publisher: Director, ICAR-Central Institute of Agricultural Engineering, Bhopal - 462 038
Phone: 91-755-2737191
Email: director.ciae@icar.org.in, directorciae@gmail.com
Web: https://ciae.icar.gov.in

हर कदम, हर डगर
किसानों का हमसफर
भारतीय कृषि अनुसंधान परिषद

Agrisearch with a human touch