



ICAR-CIAE Newsletter

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From Director's Desk

Innovating for a sustainable and resilient mechanised agriculture

The last quarter has been a period of meaningful engagement, innovation and technological advancement at the ICAR–Central Institute of Agricultural Engineering (CIAE), Bhopal. Guided by the vision of transforming agricultural engineering into practical solutions for farmers, the Institute continued to strengthen its efforts towards sustainable agriculture, renewable energy, climate resilience and smart mechanization.

CIAE actively participated in the Unnat Krishi Mela, providing an important platform for interaction with farmers, entrepreneurs, agricultural professionals and other stakeholders. Such outreach activities enable the Institute to take technologies beyond laboratories and research stations and understand the real-world challenges faced by the farming community. The participation also reinforced CIAE's commitment to promoting appropriate agricultural machinery and energy-efficient technologies among farmers.

As part of the Khet Bachao Abhiyan, the Institute also contributed to the larger objective of creating awareness about conservation-oriented agricultural practices and sustainable management of agricultural resources particularly fertilizers. The campaign provided an opportunity to engage with farmers and stakeholders on issues related to soil, crop residues, energy use and the adoption of improved agricultural technologies.

Some of the significant achievements during the quarter were the tractor-operated weeder-cum-furrow shaper for raised-bed cultivation, remote-controlled multi-crop planter for dryland crops, a hydrogen production plant based on methane pyrolysis, banana pseudo-stem cutter for handling banana residues, solar-powered hydroponic system for smart urban farming, etc. These initiatives collectively demonstrate the broad spectrum of research being undertaken at CIAE, from clean energy and hydrogen technologies to precision mechanization, residue management, hydroponics and farmer outreach. More importantly, they reflect an integrated approach in which agricultural engineering is viewed not merely as mechanization, but as an enabler of resource efficiency, sustainability, profitability and resilience.

As we move into the next quarter, the Institute will continue to translate scientific knowledge into practical, affordable and scalable technologies, strengthening the connection between innovation and the field. The ultimate measure of our success will be the extent to which these technologies improve the lives and livelihoods of farmers while contributing to a cleaner, more sustainable and resilient agricultural in future. From the field to the laboratory and from innovation to impact, CIAE continues its journey towards engineering a sustainable future for Indian agriculture.



RESEARCH

Tractor-operated weeder-cum-furrow shaper for raised bed cultivation

Weed management and maintenance of furrow geometry are major constraints in raised-bed cultivation, particularly during the kharif season. Intense rainfall causes soil from the raised beds to erode and accumulate in the furrows, impairing drainage and necessitating frequent furrow reshaping. To address this problem, a tractor-operated weeder-cum-furrow shaper was developed to perform simultaneous inter-row weeding, in-furrow weeding, soil loosening, earthing-up, and furrow reshaping in the broad bed and furrow (BBF) system. Vertically mounted rotary weeding units rotate along both sides of the furrow, uprooting weeds, pulverizing the soil on the furrow bed and sidewalls, and restoring the furrow profile. Simultaneously, adjustable sweep-type tynes mounted on the raised beds perform shallow inter-row cultivation for effective weed control with minimal crop disturbance. The machine was evaluated under field conditions in soybean and ginger cultivated on raised beds. It achieved an effective field capacity of 0.30 ha h^{-1} , with weeding efficiencies of 65% based on weed count and 60% based on weed dry matter, demonstrating satisfactory weed control and effective restoration of the raised bed-furrow profile.



Optimization of drone operational parameters for spraying in maize crop



This study evaluated and optimized key UAV spraying parameters, including flight height above the canopy (1, 2, and 3 m), forward speed (2, 3, and 4 m s^{-1}), and discharge rate (1.6, 2.0, and 2.4 L min^{-1}), using a factorial experimental design. Spray coverage and deposition were quantified using water-sensitive papers placed at different canopy zones, and cube-root transformed data were analyzed through ANOVA. Spray height, discharge rate, canopy zone, and their interactions significantly influenced spray performance, while forward speed had crop-specific effects. In maize crop, the maximum spray coverage (8.27%) and deposition

($1.09 \mu\text{L cm}^{-2}$) were achieved at flight height of 1 m, a forward speed of 3 m s^{-1} speed, and 2.4 L min^{-1} discharge rate. Multi-response desirability optimization identified this parameter combination as the optimum, providing the highest overall desirability by maximizing spray coverage and deposition while minimizing variability across canopy zones.

Battery operated impact type coffee harvester

The battery-operated impact finger type coffee harvester consists of a DC motor, a 9 splines shaft, a vibrator unit, two sets of impact fingers, a connecting rod, a handle and 21 V-4 Ah rechargeable lithium-ion battery. The total weight of the unit is 5 kg. Power from the battery drives an electric motor, which rotates the vibrator unit to generate high-frequency vibrations. The device uses these vibrations to strike the coffee-bearing branches. These operations result in an impact force that detaches the fruits from the coffee branches, causing them to fall to the ground. During the evaluation, it was observed that two finger impact



type coffee harvester performed well, achieving an average field capacity of 33.56 kg/h and a fruit damage of 4.3% in Robusta variety. In the Arabica variety, it achieved a field capacity of 23.36 kg/h, a fruit damage of 5.3% and a harvesting efficiency of 92%.

Pilot plant for hydrogen generation from bio-methane

A pilot-scale methane pyrolysis system was optimized for clean hydrogen production by evaluating different bio-methane flow rates (1, 2, and 3 m³/h) and catalyst regeneration performance. The reactor achieved nearly 100% bio-methane conversion at the start of operation under all conditions, with conversion gradually declining over time due to catalyst deactivation caused by carbon deposition. While the 1 m³/h flow rate maintained the highest and most stable methane conversion of 85–90%, increasing the flow rate significantly enhanced hydrogen production. The highest hydrogen yield of 1.20 kg was obtained at 3 m³/h, accompanied by the lowest specific energy consumption of 16.5 kWh per kg of H₂, compared with 37.5 kWh/kg of H₂ at 1 m³/h. Operating at higher methane throughput substantially improved hydrogen productivity and overall energy efficiency, despite a slight reduction in methane conversion and carbon recovery. The study also confirmed the feasibility of catalyst regeneration and reuse. Recycled catalysts retained good catalytic activity, with hydrogen production decreasing only marginally from 1.28 kg using the fresh catalyst to 1.22 kg and 1.18 kg after the first and second regeneration cycles, respectively.



Evaluation of Seed-cum-fertilizer drill with E-vehicle



A seed-cum-fertilizer drill compatible, with a Multi-Utility E-Vehicle (MUEV) has been evaluated for sowing of wheat crop. The equipment has a weight of 120 kg. It is equipped with seven furrows fitted with shoe-type furrow openers, and requires a 6 kW power source for operation. Sowing depth is regulated through the vehicle's hydraulic system. Current consumption during wheat sowing operation was observed as 35-40 Ah for a 0.50 ha field. This technology achieves an energy saving of about 8% (approximately 162 MJ/ha) in wheat sowing as compared to conventional farming systems, resulting in an approximately 9% reduction in carbon emissions (about 2.6 kg CE/ha).

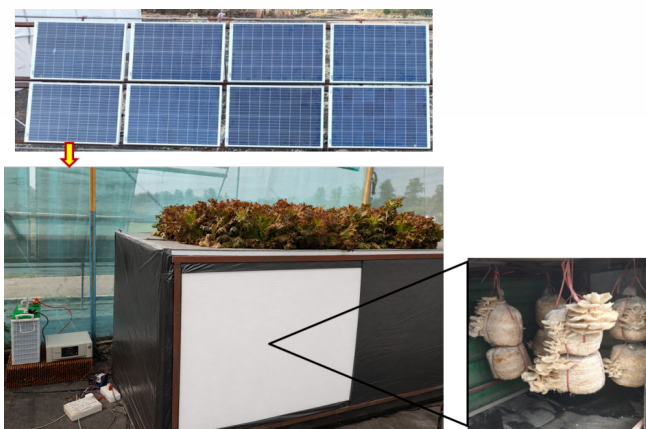
Banana pseudo-stem cutter

For easy separation of banana pseudo-stem sheaths during fiber extraction, the pseudo-stem needs to be splitted. This preliminary operation simplifies handling, improves sheath separation, and enhances the overall efficiency of fiber extraction. The main components of the developed equipment are the main frame, pseudo-stem feeding guide, feeding trough, power transmission system, electrical control panel, cutting blade, banana pseudo-stem holding frame and electrical motor. The cylindrical part of the stem is placed in the banana pseudo-stem holding frame. The feeding guide pushes pseudo-stem towards the cutting blade and ensures controlled and uniform feeding. As the pseudo-stem moves, the cutting blade cuts



the stem into two equal halves longitudinally thereby facilitating easy separation of the sheaths for subsequent fiber extraction. The production capacity of the equipment is 30 banana pseudo-stems per hour. Total operating cost and fixed cost are Rs 150/h and Rs 30/h, respectively.

Solar powered hydroponic system for smart urban farming



The technology is a solar-powered hybrid hydroponic system integrated with root zone climate control for simultaneous cultivation of leafy vegetables and mushrooms under controlled conditions. An insulated chamber with a fan-pad cooling system and solar-powered automation maintains the root zone temperature at 18–28°C and the relative humidity at 60–90%. The controlled environment significantly improved lettuce growth, yielding up to 410 g plant⁻¹ with a water productivity of 0.184 kg L⁻¹ in a 15 m² unit accommodating 360 lettuce plants using 75 mm diameter PVC pipes and clay balls as the growing medium. The same structure also produced 28.44 kg of mushrooms, enhancing land-use efficiency and overall

productivity. The technology improves resource-use efficiency, maximizes production per unit area, and is well suited for protected agriculture and urban farming.

Evaluation of ML based DSS for micro-irrigation scheduling

Performance of the developed **ML-based Decision Support System (DSS)** for micro-irrigation scheduling was evaluated under sprinkler-irrigated wheat (HI 1544). The experiments were conducted during 2023–24 and 2024–25 rabi seasons. Four irrigation treatments (10%, 30%, and 50% maximum allowable depletion (MAD), and flood irrigation) were evaluated in a randomized block design with three replications. The net and gross irrigation requirements for wheat crop under sprinkler irrigation were found to be 326.1 mm and 407.7 mm, respectively. The highest grain yield (4.73 t ha⁻¹) was obtained under 30% MAD, which was statistically at par with 10% MAD. DSS predictions closely matched observed irrigation requirements. The developed DSS may help the decision makers to irrigate the crops efficiently by providing accurate irrigation schedules.



Biofilms for water and milk packaging



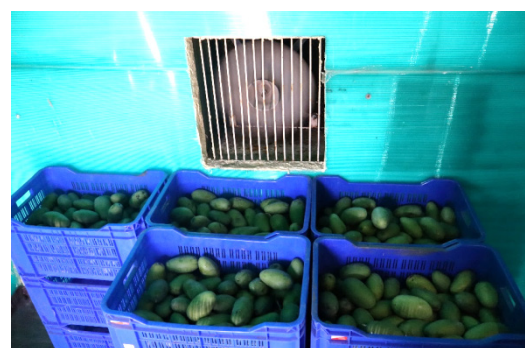
The use of plastic-based films has contributed to severe environmental pollution and ecological harm due to their non-biodegradability, persistence in ecosystems. Keeping this in view suitable biodegradable films for water and milk packaging have been developed using renewable materials, such as polysaccharides, proteins, and biopolymers. The characterization of the developed two types of biofilm including biofilm for water packaging and biofilm for milk packaging have been carried out as per IS 15609: 2005, IS 11805: 2024 and ASTM standards. The biofilm for water packaging represented thickness of 58.80 µm and a width of 429.67 mm. The overall migration value was 1.46 mg/dm², indicating low migration and suitability for food-contact applications. The slip value was 0.24, suggesting acceptable surface friction characteristics. The water vapour transmission rate was 688.731 g/m²/24 h at 38°C and 90% RH.



The biofilm sample used for milk packaging showed a thickness of 64 μm and a width of 731 mm. The dart impact resistance was measured as 58.08 gf and overall migration value was 1.22 mg/dm², confirming low migration behavior and suitability for food-contact use. The slip value was 0.24. The water vapour transmission rate was 678.351 g/m²/24 h at 38°C and 90% RH. FTIR spectra confirmed polymer blend characteristics. Based on the comparative evaluation of both the types of biofilms samples for water and milk packaging against the relevant BIS standards.

Storage and shelf life enhancement of the mango under hybrid evaporative cooling based on-farm storage system

Fresh fruits and vegetables, owing to their highly perishable nature, are particularly susceptible to substantial postharvest losses, especially in warm and dry regions. The developed low-cost, low energy consuming indirect-direct hybrid evaporative cooling (HECS) based on-farm storage was evaluated with mango. The system was able to achieve sub wet-bulb temperatures to dew point and improved storage conditions compared to conventional evaporative coolers. At the optimum operating conditions, storage system maintains air temperature minimum up to 18.3°C and 85.7 $\pm$ 1.4% of RH from about 40 $\pm$ 2°C initial inlet temperature and 25 $\pm$ 2% RH of



the air. The effect of the storage system was evaluated with storage study of the mango (Cv. *Dasheri*). The comparative study was also carried with respect to control (room temperature) and refrigerated storage conditions in terms of shelf life and selected quality attributes. Based on the maximum 10% of PLW criteria, the HECS storage system fetches the highest shelf life of mango up to 16 days with respect to 14 days in refrigerated and 3-4 days in control storage conditions which can provide sufficient buffer period for retailing and marketing.

IoT-based smart solar dryer for agro-produce

An IoT-based Smart Solar Dryer (1 tonnes capacity) was developed. The dryer consists of a tunnel-type drying chamber fitted with tray assemblies for loading produce and covered with a 200-micron transparent polyethylene sheet to maximize solar heat utilization. During evaluation conducted in May 2026, the dryer maintained temperatures of around 60°C during daytime and 40°C during night time with auxiliary heating at night time, while the relative humidity ranged between 30 and 70%. The average air velocity inside the dryer was maintained between 1.0 and 1.5 m/s, creating favourable drying conditions. The entire system was automated using an IoT control unit integrated with temperature and humidity sensors. Drying conditions can be monitored and controlled remotely through an IoT



platform. For green chilli drying, the maximum permissible temperature and relative humidity were set at 45°C and 40%, respectively. The developed dryer was evaluated for drying 250 kg of fresh green chilli. The moisture content was reduced from 89% (wet basis) to 5.6% within 4 days, whereas conventional open sun drying required approximately 7 days to achieve a similar moisture level, resulting in nearly 43% reduction in drying time.

Grape drying structure with aeration system

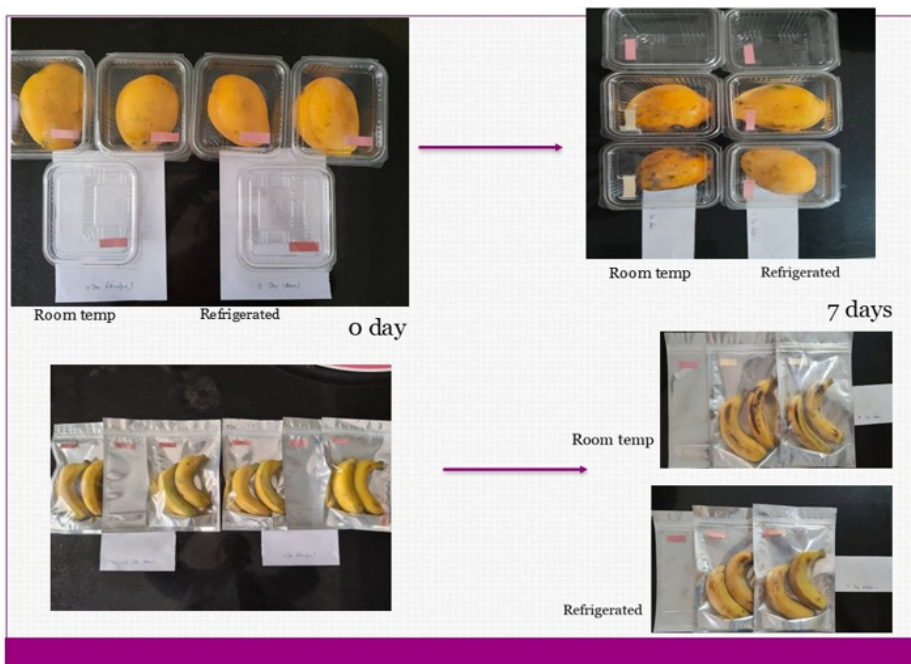


A grape drying system with aeration was developed to overcome the limitations of conventional rack-type shade drying, which requires 13–20 days for raisin production. The dryer consisted of a mild steel structure (3 m × 1.5 m) with 10 layers spaced 300 mm apart. Wire mesh trays were used for loading chemically and abrasively treated grape bunches. The dome-shaped roof was covered with 75 μ black polyethylene, and a 300 mm plenum was provided along the roof length for humid air exhaust. An overhang of 0.5 m protected the produce from direct sunlight. The aeration system comprised two axial flow fans (250 m³/min), providing air velocity of 1.5–2 m/s across the layers. The internal

temperature ranged from 34 to 42°C during daytime. The dryer was evaluated using Thompson Seedless grapes for raisin production. Abrasive-treated grapes dried faster, producing raisins within 7 days, while chemically treated grapes required 10 days.

Development of natural pH-sensitive indicator strips from beetroot peel betacyanin

Beetroot peel was utilized as a source of natural betacyanin pigment. The extracted betacyanin (750 mg/100 g dry weight) exhibited distinct pH-dependent colour changes from red/pink in acidic conditions to yellowish-brown in alkaline conditions. The developed strips effectively monitored freshness in mango, banana and blueberries. In mango, ripening and spoilage occurred within 5 days at 30°C, accompanied by an increase in TSS (8.0–20.8°Brix), a decrease in titratable acidity (0.65–0.22%), an increase in pH (3.8–5.2), and a reduction in ascorbic acid (32–15 mg/100 g), with corresponding indicator colour changes. Bananas ripened within 3–4 days and spoiled after 6 days under ambient conditions, while refrigeration extended shelf life to 14 days.



Microwave-assisted foam mat drying for value addition of soybean okara

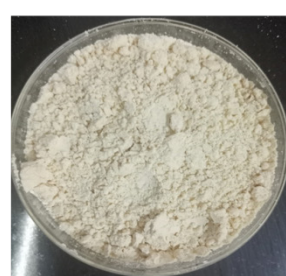
Soy okara, the nutrient-rich residue generated during tofu production, is often underutilized because of its high moisture content, rapid spoilage, and the presence of oligosaccharides and enzyme inhibitors. To address these challenges, a microwave-assisted foam mat drying process was developed to convert fresh okara into a shelf-stable, value-added powder with improved functional and nutritional properties. The foaming conditions were optimized at 48% okara, 2.60% egg white powder, 2.90% malto-dextrin, and 3.50 min whipping time, yielding stable foam with 0.323 g mL⁻¹ foam density, 95.98% foam stability, and 208% foam expansion. The optimized foam facilitated rapid and uniform microwave drying, significantly reducing drying time while improving product quality. Compared with the non-foamed control, the foam-dried powder exhibited lower bulk density (0.381 vs. 0.449 g mL⁻¹), higher water solubility index (33.34 vs. 30.66%), and lower moisture content (5.07 vs. 5.67%) at 600 W. Foam drying also produced a brighter powder, reduced the browning index, and enhanced retention of total phenolic content and antioxidant activity.



Okara



Foamed Okara



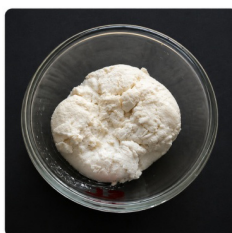
Foam Mat Dried Okara powder

Soy soft cheese for enhanced health and wellness

Soy soft cheese is an innovative plant-based alternative to conventional dairy soft cheese developed from fermented soy milk using selected functional starter cultures. The optimized process produces a soft, creamy product with a desirable texture, mild flavour and excellent spreadability, closely resembling traditional soft cheese. Four different nutritional variants of soy soft cheese were developed and standardized, namely (A) probiotic soft cheese, (B) prebiotic soft cheese, (C) synbiotic soft cheese and (D) vegan soft cheese. The probiotic soft cheese was prepared using beneficial probiotic cultures to support digestive health. Microbiological and functional quality characteristics of the developed products were evaluated. The synbiotic formulation showed the highest LAB viability (8.95 ± 0.05 log CFU/g), indicating excellent probiotic survival and functional potential. Aerobic plate counts were 5.80 ± 0.12 , 5.50 ± 0.10 , 5.25 ± 0.09 and 4.90 ± 0.08 log CFU/g, respectively, with the synbiotic formulation showing the lowest count and better microbial stability. The synbiotic soy-soft cheese also exhibited the highest viscosity (2150 ± 50 cP) and gelling strength (190 ± 4 g/cm²), compared with 1650 ± 35 cP and 120 ± 5 g/cm² in vegan cheese, respectively. Overall, the synbiotic soy-soft cheese demonstrated superior microbiological stability, probiotic viability, viscosity and gel strength, making it a promising functional and safe plant-based alternative to conventional soft cheese.



Prebiotic soft cheese



Probiotic soft cheese



Synbiotic soft cheese



Vegan soft cheese

Technologies from AICRP centres AICRP on FIM

Walk behind type small power sprayer for vegetable/horticultural crops

SHUATS, Prayagraj has developed a walk-behind type small power sprayer for vegetable and horticultural crops. The equipment was designed for faster, easier and more efficient application of fertilizers and pesticides, particularly for farmers with small plots. The developed sprayer achieved a field capacity of 0.034 ha/h at an average forward speed of 2.3 km/h in brinjal crop with 1.07 m row spacing. The sprayer helped in 17% savings and reduced spray material usage by 45% compared to an air-assisted boom sprayer and 25% saving compared to a knapsack sprayer. The estimated cost of the developed sprayer is ₹40,000.



Battery operated finger millet transplanter



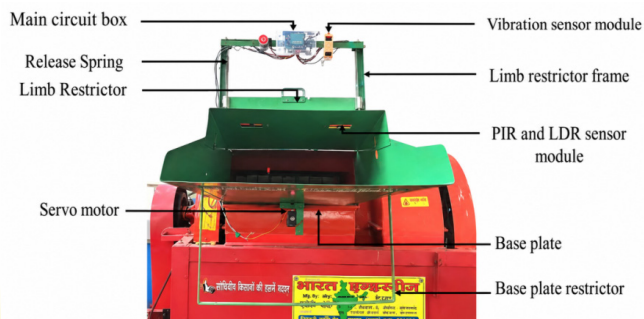
A battery-operated two-row millet transplanter has been developed by BAU, Ranchi for transplanting root-washed seedlings using a four-bar linkage mechanism. The transplanter consists of a picking mechanism, transplanting mechanism, seedling tray, nursery holding mechanism, power transmission system, erector, handle, main frame, etc. Seedling pick up and release were achieved using cam-operated fork picking fingers with rubber pads. Power was provided by a 12 V, 17 W DC wiper motor, with a handle mounted switch for control. Performance evaluation under laboratory and field conditions indicated that 20-25 day old seedlings were suitable for transplanting. The developed



transplanter achieved an average effective field capacity of 0.045 ha/h with a field efficiency of 78%, requiring 45 man-h/ha and an operating cost of ₹2,580/ha, which was significantly lower than ₹25,000/ha required by traditional methods, resulting in approximately 89% cost saving. For 25-day-old seedlings, the percentage of missing hills and visible damage were 15.5% and 3.5%, respectively.

AICRP on ESSA

Sensor-based hand restrictor in thresher chute for injury prevention



The AICRP on ESAAS at ICAR-IARI, New Delhi centre developed an AI-integrated sensor-based thresher chute to prevent injuries. Two safety modification systems were implemented namely a hinged base plate and a spring-loaded limb restrictor that restricts accidental limb intrusion into the rotating cylinder during operation without impeding normal feeding. In the hinged base plate system, a section of the lower chute was replaced with a downward-opening hinged flap actuated by a servo motor via a mild steel linkage. The base plate opens automatically when the AI

system detects a “Class 3” hazard, thereby ejecting lodged material quickly. In the spring-loaded limb restrictor system, a protective curtain-like barrier is mounted on the top of the chute. When a high-risk event is detected, the servo motor releases the restrictor to prevent limb access to the rotating drum. Both systems are triggered by a hazard detection unit comprising PIR, LDR, dust, vibration, and DHT sensors. Experimental validation showed the AI model achieved a mean accuracy of 97.7%, with high-risk cases correctly identified (recall 0.96). Actuation was rapid, with LED and buzzer response in 0.010–0.016 s and servo motor actuation within 1–2 seconds, effectively preventing limb contact with the rotating drum.

AICRP on MAH

Design and development of a low cost grooming brush for animals_

The GBPUAT, Pantnagar Centre of MAH developed a low-cost grooming brush for dairy animals to improve animal hygiene and welfare. It features simultaneous vertical and horizontal brush rotation through a transmission system connecting perpendicular shafts. This multi-directional brushing action increases the contact area between the brush and the animal, resulting in more effective cleaning and improved stimulation of blood circulation and skin health. The grooming unit is mounted on a rigid wall-supported frame. The cylindrical grooming brush is fitted with uniformly distributed flexible bristles, providing safe yet effective grooming without causing discomfort to the animals. The total cost of the developed grooming system is ₹31,250.



Solar powered sensor based poultry unit for laying birds



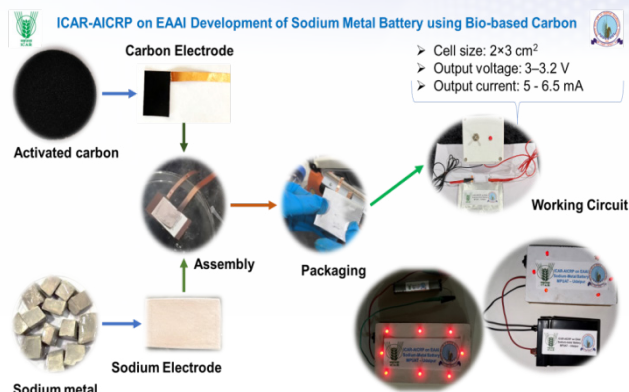
CIAE Centre has developed a sensor-based solar poultry unit for housing 100 BV-380 layer birds, equipped with temperature and humidity sensors, a fogger system, and controlled lighting. The birds received 16 hours of light (12 hours of natural light + 4 hours of artificial light) at 15–20 lux using white, red, and blue LEDs. The extended photo-period improved egg quality, with white and red LEDs producing the highest egg weight (63 g), shell thickness (0.41 mm), yolk index (0.47), and albumen index (0.141 and 0.140, respectively) under 4 h artificial lighting. Blue light showed comparatively lower performance. Maintaining 25–28 °C along with an extended photo-period, particularly

with white and red LEDs, improved laying performance and egg quality under controlled conditions.

AICRP on EAAI

Sodium-ion battery using activated carbon

The EAAI Centre of MPUAT, Udaipur has developed a sodium-ion battery using activated carbon made from sugarcane bagasse. The battery demonstrated an improved performance with better flow of electricity and reduced internal resistance, which helps in faster charging and more efficient energy use. The coulombic efficiency was in the range of 90–94% and remained stable at about 82–90% over 160 charge-discharge cycles. Similarly, the charge-discharge efficiency increased from 72–88% during the initial cycles to about 90–93%, achieving an overall efficiency of 94%, while maintaining capacity retention of approximately 80.18% after 160 cycles. Combined with the low R&D material cost of only ₹4.70–4.83 per $2 \times 3 \text{ cm}^2$ pouch cell, these results demonstrate the strong potential of biomass-derived bio-carbon electrodes for developing affordable, safe, and high-performance sodium-ion batteries suitable for large-scale energy storage applications.



Drying performance of solar dryer for agricultural commodities

PAU, Ludhiana centre of EAAI evaluated the solar dryer with thermal storage for drying turmeric, methi, lemon grass, garlic cloves, and giloy stems. From March to June, sliced turmeric and lemon grass were dried; in July, drying of lemon grass continued along with garlic cloves and giloy stems; and from July to November, garlic cloves and giloy stems were continuously dried in this dryer. A significant reduction in drying time and enhancement in quality of solar-dried products was reported compared to open sun drying.



Samples of dried methi leaves and turmeric were analysed for quality. Solar-dried fenugreek showed a light greener colour (L: 45.03, a: -8.70), higher chlorophyll content, and lower final moisture (7.50% wb) than open sun-dried samples (L: 44.93, a: -6.52; 9.11% wb). Solar-dried turmeric exhibited slightly higher curcumin and volatile matter contents with improved colour values (L: 55.6, a: 16.7, b: 34.7) compared to open sun-dried turmeric (L: 50.0, a: 15.4, b: 30.8), resulting in a lighter and yellower product. Overall, solar drying significantly reduced drying time and improved product appearance.

Patents/Design registration/Copyright granted

S. No.	Type	Title of the Patent / Design	Inventor(s) / Scientist(s)	Application / Patent / Design No.
1	Patent	A Mechanism for Cutting and Windrowing of Pigeon Pea Crop and Alike	B. M. Nandede, Dilip Jat, P. L. Pradhan, C. R. Mehta	Patent No. 591924 dated 11.06.2026
2	Design Registration	Shear Type Cashew Apple and Nut Separator with Twisting Mechanism	Manjunatha K., Ravindra Naik, D. Balasubramanian, J. D. Adiga	Design No. 437177-001, dated 17.06.2026

3	Design Registration	Automatic Poultry Feed Dispenser	UC Dubey, Abhijit Khadatkar	Design Registration No. 439480-001, dated 06.04.2026
4	Design Registration	Micro-aerobic Pre-treatment Reactor	Dr. G. Saravanapriya; Dr. R. Shreelavaniya; Dr. V. K. Bhargav; Sri Parasakthi	Design Application No. 505508-001, dated 12.06.2026
5	Copyright	Deep learning based intelligent web application for yield estimation	Subeesh A, Satya Prakash Kumar	SW-8972/2026-CO

Radio and Doordarshan Programmes

Date	Doordarshan/ Programmes	Expert	Title
22.05.2026	Doordarshan Bhopal	Dr. Samlesh Kumari, Sci	World Food Safety Day
08.05.2026	Swadesh News Channel	Sh. M. P. Singh (ACTO)	मृदा परीक्षण आधारित उर्वरक प्रबंधन
01.06.2026	Krishi Darshan, Doordarshan, Bhopal	Dr. Tejeshwari Satpute (SMS)	दुग्ध उत्पादन एवं पशुपालन, विश्व दुग्ध दिवस
06.06.2026	Akashvani Kendra, Bhopal	Dr. C R Mehta, Director	कृषि विकास एवं यंत्रीकरण में आकाशवाणी का योगदान
27.06.2026	Swadesh News Channel	Dr. R. K. Singh (PS & I/c)	Natural and Organic Farming
03.05.2026	Hello Gram Sabha-Live phone in program, Akashvani Kendra, Bhopal	Sh. M. P. Singh (ACTO)	Balanced Use of Fertilizers

TRAINING ORGANIZED

Entrepreneurship development program on soybean processing and utilization for food uses



A five-day Entrepreneurship Development Program on “Soybean Processing and Utilization for Food Uses” was held at CESPU during 13-17 April 2026 under Dr. Dipika Agrahar Murugkar (Course Director) and Dr. Samlesh Kumari (Course Coordinator). The programme aimed to enhance technical knowledge and entrepreneurial skills related to soy-based food enterprises. A total of 8 participants, including 7 males and 1 female, attended the programme from different states namely Maharashtra (1), Uttarakhand (1), Haryana (2), Madhya Pradesh (3), and Himachal Pradesh (1). Participants also visited

Bio-Nutrients India, Mandideep, Bhopal for industrial exposure.

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



A hands-on training program on soybean processing and utilization for food applications was organized during 16-18 June 2026. A total of 12 aspiring entrepreneurs from the states of Gujarat, Madhya Pradesh, Maharashtra, Telangana, and Uttar Pradesh participated in the program. The program covered a wide range of topics, including the preparation of soy-based food products, production of soymilk and tofu, introduction to soybean processing equipment, project planning, storage and packaging, quality standards, and marketing of soy products. The sessions also highlighted the nutritional and health benefits of soybeans, with particular emphasis on their nutraceutical properties.

Demonstration at Farmer's Fields

Sl. No.	Technology demonstrated	Date	No of participants	Name of the Place (CIAE/ AICRP centre/ Village)
1.	Multi Crop Thresher & Millet Dehuller demo	15.04.26	33	Nellivasalnadu Tirupattur Dist.
2	Multi Crop Thresher & Paddy Straw Baler demo	20.5.26	20	Karumandurai, Salem dist
3	Demonstration of banana injector	27.05.2026	21	Valukuparai, Coimbatore
4	Demonstration of CIAE RS technologies	03.06.2026	30	CIAE RS Coimbatore
5	Demonstration of banana injector	24.06.2026	14	Govindapuram, Coimbatore
6	Biochar and its effect on soil improvements	23.06.26	32	Badjhiri, Fanda, Sehore
7	Balanced fertilizer application	04.06.2026	25	Adampur

Test Reports of Commercial Machinery

	No. of Test Reports Released (April-June, 2026)	Revenue Generated, Rs (April-June, 2026)
Farm Machinery	13	25,88,242
Post-harvest machinery	06	12,96,518

KVK ACTIVITIES

Technology assessment, demonstration and capacity-building activities

- On-farm assessment of probiotic supplementation in neonatal calves was conducted in Ratatal, Mugaliyahat and Gondermau villages, involving 5 farmers and 20 calves.
- Frontline demonstration of vitamin E and selenium supplementation for mastitis management in dairy animals was conducted in Ratatal, Mugaliyahat and Gondermau villages, involving 5 farmers and 10 dairy animals.
- A hands-on training programme on vermi compost preparation was organized at Krishi Vigyan Kendra, Bhopal, under the Balanced Use of Fertilizers Mission on 20 May 2026. A total of 25 farmers participated in the programme. Practical demonstrations were conducted on vermicompost preparation techniques, and the participants were sensitized to the benefits of vermicompost in improving soil fertility, crop productivity, and sustainable nutrient management.
 
- Under the Balanced Use of Fertilizers Mission (April–May 2026), KVK Bhopal organized a series of farmer awareness programmes, Kisan Goshthis and educational activities in different villages of Bhopal district. The programmes focused on soil testing, balanced fertilizer application, integrated nutrient management, biofertilizers, organic manures, green manuring, biochar and natural farming for improving soil health and sustainable crop production. A brainstorming session was also organized at PM SHRI Kendriya Vidyalaya, Bangrasia, involving around 96 students, to create awareness on soil health and the importance of soil testing.
 

Mugaliya Hat, Madhya Pradesh, India
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- An exposure visit of Dairy Farming trainees from RUDSETI, Bhopal was organized at KVK, ICAR-CIAE, Bhopal on 4 June 2026. The trainees were exposed to scientific dairy farming and improved livestock management practices, contributing to enhancement of their technical and entrepreneurial skills.
- A One-Day Agri-Photovoltaic (APV) Farmers' Awareness Workshop was organized on 16 June 2026 at KVK, ICAR-CIAE, Bhopal by the National Skills Foundation of India (NSFI), in collaboration with the Agriculture Skill Council of India (ASCI) and with support from GIZ, with KVK Bhopal serving as co-organizer.
 
- On 14 June 2026, KVK Bhopal participated in the agricultural exhibition organized during the inauguration of Krishi Vigyan Kendra, Vidisha, where an exhibition stall was set up to disseminate information on agricultural innovations and technologies to farmers and visitors.
 



- KVK Bhopal facilitated the live webcast of the 23rd instalment of PM-KISAN Samman Nidhi on 20 June 2026 for about 100 farmers from Sagoni Kalan and Garenthia Dangi villages, with participation of State Government officials and KVK personnel.

AWARDS AND RECOGNITIONS

- **Dr. Muzaffar Hasan**, Scientist was appointed as an Associate Editor for journal *Frontiers in Food Science and Technology*.
- **Dr. M. K. Tripathi** Enlisted World's Top 5 % Scientists in the 2025 Sci Rank Global Registry based on rigorous bibliometric analysis by SciRank global.

Human Resource Development

- **Dr. R R Potdar**, Senior Scientist and **Dr. Sweeti Kumari**, Senior Scientist, attended a 5-day ICAR-approved training programme entitled "*Strengthening Agriculture Research with Gender Perspective for Sustainable Agri-Food System*" during 18-22 May 2026 at ICAR-Central Institute for Women in Agriculture (CIWA), Bhubaneswar.

PUBLICATIONS

Papers published in journals

Book

- Arora, A., Marwaha, S., Jain, R., & Parsad, R. 2026. *Harvesting Intelligence: The AI Revolution in Agriculture*. 15.2. Springer Publisher

Papers published in journals

- Kumar, M., Mehta, C. R., Agrawal, K. N., Sahni, R. K., Bhargav, V. K., Tripathi, M. K., ... & Jyoti, B. (2026). Droplet size distribution characteristics of *Bacillus thuringiensis* and *Beauveria bassiana* bio-pesticide solutions for hydraulic nozzles. *Scientific Reports*. <https://doi.org/10.1038/s41598-026-42771-x>
- Tiwari, S., Gujar, J. P., Kate, A., Tripathi, M. K., Modhera, B., & Mohapatra, D. (2026). Volatile biomarker signature of onion infected with *Aspergillus niger* and *Aspergillus flavus* under postharvest storage. *Journal of Food Measurement and Characterization*, 1-12. <https://doi.org/10.1007/s11694-026-04203-2>
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- Khadatkar, A., Sawant, C. P., Thorat, D., Jadhav, S. K., Gupta, A., Pandirwar, A., Verma, Y., & Gawande, D. (2026). Grapes production and its management with emphasis on plant protection, fertilizer application, harvesting, and residue management: A comprehensive review. *Discover Agriculture*, 4, 121. <https://doi.org/10.1007/s44279-026-00575-7>
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Popular Articles

- Anjana K. and Ravindra Naik. *Heat Pump Dryers: A Sustainable and Energy Efficient Revolution in Food Preservation*. Agri Gate Magazine, Vol. 6, Issue 4, pp. 737–744, April 2026.
- Aswathy T. and Ravindra Naik. *Banana Based By-Product as Sustainable Raw Material for Biodegradable Packaging*. Agri Gate Magazine, Vol. 6, Issue 4, pp. 920–926, April 2026.

- Ahmad, D., Banerjee, N., Hasan, M., and Dinkar, V. *Biopriming: A Green Seed Priming Technology for Climate-Resilient and Sustainable Agriculture*. Food and Scientific Reports, 7(5), June 2026.
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- Swapnaja K. Jadhav and Sandip Gangil. *Algal Bio-refinery for Biofuel and Value-Added Products*. Agritech, 3(2), pp. 32–33, June 2026.
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Technical Bulletins/ Technical Reports/ Technical Manuals

- Jadhav S.K. and Gangil, S. 2026. ICAR-CIAE Battery operated biomass briquette based rapid combustion system 8 kW. ICAR-Central institute of Agricultural Engineering, Bhopal, MP. CIAE/AEP/2026/48.

Contract Project

- A Memorandum of Understanding (MoU) has been signed with SP Agro Innovations, C/o Shetkari Traders, Nagar Manmad Highway, Tal-Rahuri, Dist-Ahmednagar, Maharashtra, for the study of Ergonomic Interventions in Semi-Automatic Vegetable Transplanter for Enhancing Operator's Comfort.

Participation of Scientists in Conferences, Workshops, Symposia

Name & Designation	Title of Event Attended	Dates	Location / Place
Dr. A Subeesh, Scientist	Five-day workshop on “Hyperspectral Remote Sensing for Precision Agriculture, Crop Disease Detection, and Soil Analysis: Theory and Applications”	22 – 25 June, 2026	NIT Jalandhar, Punjab, India
Dr. Ajesh Kumar V	56th Annual Soybean Group Meeting of AICRP on Soybean	8 – 9 April, 2026	PJTAU, Hyderabad
Dr. Shubham Singh, SMS	Workshop on Natural Farming cum Krishak Sangoshthi	30 June, 2026	SIAET, Bhopal

EVENTS

Hon'ble Governor of Madhya Pradesh, Shri Mangubhai Patel, visited CIAE

The Hon'ble Governor of Madhya Pradesh, Shri Mangubhai Patel, visited ICAR-Central Institute of Agricultural Engineering (ICAR-CIAE) on 31 May 2026 on the occasion of the broadcast of Mann Ki Baat by the Prime Minister. The Director of the Institute Dr. C.R. Mehta warmly welcomed the Hon'ble Governor and briefed him about the Institute's mandate, major achievements, ongoing research activities, and contributions towards the advancement of agricultural engineering and mechanization in the country. During the event, the Hon'ble Governor addressed the gathering, which included participating farmers from various villages, and appreciated the Institute's efforts in developing and disseminating innovative technologies for the farming community. He also visited key laboratories, including the Drone Laboratory, and reviewed



the Institute's research facilities, infrastructure, and ongoing activities. The Governor expressed keen interest in research on agricultural mechanization, precision farming, and drone-based technologies and interacted with scientists and students on ongoing research projects and future initiatives.



Agriculture Development Committee visited CIAE



Agriculture Development Committee, a delegation of MLAs from Madhya Pradesh visited ICAR-Central Institute of Agricultural Engineering (ICAR-CIAE) on 18 May 2026 to understand the technologies available for crop residue management. They visited the drone laboratory, precision agriculture lab, energy enclave, processing laboratories and other research facilities of the Institute. The various technologies and facilities were demonstrated to the delegation, who reviewed the Institute's infrastructure, research capabilities, and on - going scientific activities.

The committee appreciated the efforts being undertaken by the Institute in advancing agricultural mechanization, precision farming, and energy technologies. They also interacted with scientists and students to gain insights into on-going research projects, technological innovations, and future initiatives being pursued at the Institute.



ICAR–CIAE Participated in Unnat Krishi Mahotsav 2026 at Raisen, Madhya Pradesh



ICAR–Central Institute of Agricultural Engineering (CIAE), Bhopal participated in the three-days National Unnat Krishi Mahotsav 2026, held from 11–13 April 2026 at Dussehra Maidan, Raisen, Madhya Pradesh. The national-level exhibition-cum-training programme was organized on the initiative of the Shri Shivraj Singh Chouhan, Hon'ble Union Minister of Agriculture and Farmers Welfare and Rural Development, in collaboration with the Government of Madhya Pradesh.

The Mahotsav was inaugurated on 11 April 2026 by Shri Rajnath Singh, Hon'ble Union Minister of Defence, in the presence of Shri Shivraj Singh Chouhan, Union Minister of Agriculture and Farmers Welfare, and Dr. Mohan Yadav, Hon'ble Chief Minister of Madhya Pradesh. Other distinguished dignitaries included Dr. M. L. Jat, Secretary, Department of Agricultural Research and Education (DARE) and Director General, ICAR, and Shri Atish Chandra, Secretary, Ministry of Agriculture and Farmers Welfare, Government of India, along with senior officials, public representatives, scientists and agricultural experts.



The Mahotsav brought together farmers, scientists, government departments, agricultural institutions, FPOs, entrepreneurs and technology developers on a common platform. Around 350 stalls showcased modern agricultural technologies and innovations, while thematic technical sessions and live demonstrations emphasized on precision agriculture, farm mechanization, crop-residue management, integrated farming, soil health, irrigation, drones and other emerging agricultural technologies.

ICAR–CIAE showcased and demonstrated its technologies with particular emphasis on precision farming, millet processing and value addition. The technologies and products attracted considerable interest from farmers, entrepreneurs, FPOs, SHGs, ministry officials and ICAR dignitaries. The event provided an important platform for direct interaction between CIAE scientists, farmers, entrepreneurs and other stakeholders, facilitating technology dissemination and gathering feedback on field-level requirements.

The Mahotsav concluded on 13 April 2026 in the presence of Shri Nitin Gadkari, Union Minister for Road Transport and Highways, and Shri Shivraj Singh Chouhan. The closing session emphasized modern agricultural technologies, water conservation, alternative energy, processing and strengthening the agricultural value chain from “seed to market.” The participation of ICAR–CIAE



in the Unnat Krishi Mahotsav provided an effective platform for showcasing indigenous agricultural engineering technologies, promoting millet-based enterprises and strengthening the Lab-to-Land approach, contributing to the larger objective of improving farm productivity, value addition and farmers' income.

CIAE participates in “Khet Bachao Abhiyan” to promote efficient use of agricultural inputs and soil health



ICAR-Central Institute of Agricultural Engineering (CIAE) and Krishi Vigyan Kendra (KVK) Bhopal actively participated in the month-long “Khet Bachao Abhiyan” campaign held from June 1 to June 30, 2026, to promote sustainable agricultural practices, improve soil health, and encourage the efficient use of agricultural inputs. The campaign was launched on June 1, 2026, at Village Ramsiya, Raisen, by the Hon'ble Union Minister of Agriculture & Farmers' Welfare, and concluded with a virtual valedictory programme on June 30, 2026. Throughout June, CIAE scientists and KVK Bhopal teams engaged local communities through extensive outreach, including farmer interactions, Krishak Sangoshthis, an Input



Dealers' Meet, school awareness programmes, and a Sarpanch Sammelan across Bhopal and surrounding locations like Rasuliya Pathar, Kalyanpur, Dobra, Chopda Kalan, Mugaliya Hat, Jamuniya Kalan, Gol, Berasia, and Borda, focusing on balanced fertilizer use, soil testing, green manuring, vermicomposting, and natural farming.

International Day of Yoga Celebrated at CIAE & CIAE-RS, Coimbatore



The institute celebrated the International Yoga Day 2026 on 21 June with great enthusiasm and participation of Shri Shivraj Singh Chouhan, Hon'ble Union Minister of Agriculture and Farmers Welfare, at the Institute. The programme emphasized the importance of yoga for maintaining physical fitness, mental well-being and a healthy lifestyle. The Hon'ble Minister participated in the yoga session along with scientists and staff of ICAR-CIAE and the ICAR-IISS, Bhopal. As a part of the celebrations, Hon'ble Minister also participated in a tree plantation

programme, highlighting the importance of environmental conservation and sustainable living. During his visit, he interacted with the scientists and staff of CIAE, appreciated the Institute's activities and encouraged them to continue contributing towards the advancement of agricultural research, technology development and farmers' welfare. The participation of staff from both CIAE and IISS made the occasion a



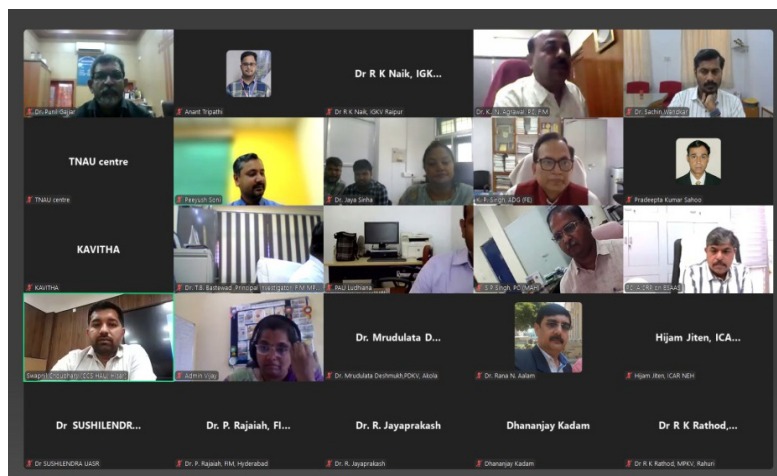


meaningful celebration that brought together the themes of health, environmental sustainability and agricultural development.

The Regional Station also celebrated International Yoga Day 2026 in collaboration with Vethathri Maharishi Spiritual Education (World Community Service Centre), Coimbatore, on 21 June 2026 at the CIAE-RS Campus. Scientific staff, technical personnel, internship students, and other members of CIAE-RS participated enthusiastically in the event.

Review Meeting for Research Project Proposals (RPPI)

The review meeting for research project proposals of AICRP on Farm Implements and Machinery was held on April 10, 2026 in online mode. The meeting was conducted under the chairmanship of Dr. K. P. Singh, ADG (Farm Engineering), ICAR, New Delhi, with Dr. C. R. Mehta, Director, ICAR-CIAE, Bhopal, as the Co-Chairman. Dr. S. P. Singh, Project Coordinator, AICRP on MAH; Dr. Sukhbir Singh, Project Coordinator, AICRP on ESA; Dr. Karan Singh, Principal Scientist, ICAR-CIAE, Bhopal, Project Investigators from all 25 centres and RAs and SRFs associated with the AICRP on FIM scheme were present at the meeting. A total of ten centres presented their research project proposals, which were revised based on the comments received at the 29th Annual Workshop.



Technology commercialization forum on “Building sustainable mango kernel value chains”



ICAR-NAARM, Hyderabad in collaboration with ICAR-CIAE Regional station, Coimbatore and IIPM, Bangalore, organized a Technology Commercialization Forum on “Building Sustainable Mango Kernel Value Chains” at Krishnagiri on 20 May 2026 under RuTAG 2.0. The forum was inaugurated by Dr. P.S. Harikrishnaraj, General Manager, NABARD, Tamil Nadu, with Dr. T. Damodaran, Director, ICAR-CISH, Lucknow, as Guest of Honour, and chaired by Dr. Gopal Lal, Acting Director, ICAR-NAARM. Around 80 participants from more than 35 institutions across five states, including representatives from industry, attended the event. The forum concluded with an interactive discussion on collaborative

approaches for technology commercialization, market linkages, value addition, and livelihood enhancement for mango-growing communities.



Interaction Meet on Agricultural Machinery Maintenance at Tribal Cooperative Societies



An interaction meet on agricultural machinery maintenance and efficient use of farm machinery was organized from 7 to 9 April, 2026 at Karumandurai, Vellimalai, Vazhakombai, Perappansolai and M.G. Pudur Societies. The programme was jointly organized by ICAR–CIAE Regional Station (CIAE-RS) in collaboration with the Directorate of Tribal Welfare. A total of 82 participants took part in the interaction meets. The programme focused on creating awareness among tribal farmers and members of cooperative societies regarding proper operation, routine maintenance, preventive care, troubleshooting and timely servicing of agricultural machinery, with the objective of reducing machinery downtime, improving operational efficiency and extending the service life of farm equipment.



Er. G. Murugananthan

STO, CIAE RS Coimbatore

superannuated on 30 April 2026

NOTES

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