

FROM THE DIRECTOR'S DESK



The fusion of sensors and artificial intelligence is heralding a new era for Indian agriculture. The integration of these technologies into farm machinery is transforming traditional farming practices, promising to enhance efficiency, productivity, and sustainability. By embedding sensors in tractors, harvesters, and other agricultural machinery, farmers can access real-time data on a multitude of factors, including soil moisture, nutrient levels, crop growth stages, and weather conditions. These data, when processed through sophisticated AI algorithms, generate actionable insights that can be leveraged to optimize various farming operations. For instance, precise irrigation scheduling,

tailored fertilization plans, and early detection of pests and diseases can significantly improve crop yields while conserving precious resources. Moreover, Al-powered machinery can automate tasks such as planting, weeding, and harvesting, reducing labor costs and increasing efficiency. Autonomous tractors, guided by GPS and sensor data, can operate with precision, minimizing soil compaction and optimizing crop coverage.

However, realizing the full potential of sensor and AI technology in Indian agriculture requires addressing several challenges. There is a need for robust research and development efforts to develop AI models specifically tailored to Indian agricultural conditions. Local knowledge and expertise should be integrated into these models to ensure their effectiveness. By overcoming these challenges and fostering a conducive ecosystem for innovation, India can harness the power of sensors and AI to transform its agriculture sector. This transformation will not only enhance food security but also create new economic opportunities and improve the livelihoods of millions of farmers. The integration of sensors and AI into farm machinery is a strategic imperative for India. By embracing this technological revolution, the country can leapfrog into a future of sustainable, efficient, and profitable agriculture.

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CIAE Bhopal is at the forefront of agricultural innovation, leveraging AI, ML, and drone technologies to transform Indian farming. Through research, development, and capacity building, the institute is creating solutions for automated farming, precision agriculture, and efficient resource management. By developing precision machines for various agricultural tasks, designing AI/ML powered systems for crop monitoring and management, and promoting these technologies among farmers, CIAE Bhopal is significantly contributing to increased agricultural productivity, reduced costs, and sustainable farming practices. Some of the notable achievements like Sensor based spot fertilizer applicator for grape vineyard, Micro-controller based automatic poultry feed dispenser, software for monitoring, mapping of agricultural farms using GIS, etc are presented in this issue of CIAE Newsletter.





RESEARCH & DEVELOPMENT

Sensor based spot fertilizer applicator for grape vineyard

The machine has been developed for application of granular fertilizer in grape vineyards with precision. The applicator is structured into four primary sub-units viz fertilizer metering system, furrow openers, sensing unit, and fertilizer dispensing unit. It can deliver 84 g SSP per plant for an application dose of 1500 kg SSP per hectare. Field testing had been done in grape vineyard planted at 2.70 × 1.80 m spacing and area covered during testing was 0.5 ha. The effective field capacity of applicator is 0.72 ha/h with 77.6% field efficiency. The prototype applicator costs around ₹60,000 and have an operating cost of ₹2600/ha.



Tractor operated brush type cotton harvester

The low-cost indigenous brush and rubber bat-type cotton stripper was designed and developed to strip the cotton from open cotton bolls. It consisted of a pair of counter-rotating rollers with three brush strips and three rubber bats. A centrifugal blower is used for conveying the seed cotton from the delivery ends of both screw augers to a storage tank through an air duct. The effective field capacity of the machine is 0.1 ha/h at a field efficiency of 80% at a forward speed of 1.35 km/h. The



picking efficiency of the machine is 89.8% with a trash content of 29%. The net seed cotton output with the machine ranged from 150 to 217 kg/h.

Micro-controller based automatic poultry feed dispenser

Poultry rearing involves unhygienic work and spreads infectious diseases from birds to humans and vice versa. An automatic dispenser has been developed for unmanned poultry feeding. It has a feed hopper, handle, PLC, main frame, screw auger, stepper motor, delivery pipe, feed trough, and transport wheels. The developed dispenser is equipped with a stepper



motor driven by micro-controller. The capacity of the feed hopper is 62 kg. Four rollers are provided for easy movement. The capital cost and the operating cost of the machine per 100 feed are Rs. 50000/- and Rs. 2.30, respectively. The machine can achieve 65–70% saving in time and cost of feeding as compared to the manual circular feeding.

Coulter based six rows tractor operated liquid urea injection machine

Foliar application of liquid nitrogen may cause evaporation loss. Application of liquid nitrogen in subsoil is suggested to improve nutrient use efficiency. This machine is developed for application of liquid nitrogen in sub-soil. Copper capillary tubes were attached with

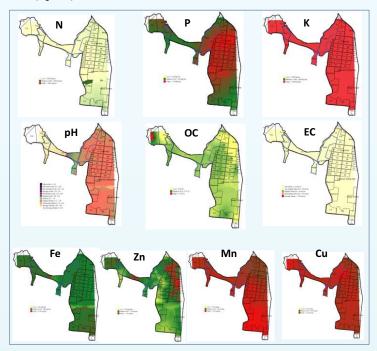


RESEARCH & DEVELOPMENT

straight tynes on a spring-loaded coulter assembly for liquid urea injection into sub-soil. The actual field capacity of the machine is 0.15 ha/h. At par wheat yield was recorded at 75% of recommended dose of urea applied with the machine.

Monitoring and mapping of agricultural farms using GIS

A GIS-based tool/Decision Support System (DSS) has been developed to enhance monitoring and mapping of agriculture farms. The DSS maintains farm records and assists users or stakeholders in crop production by generating alerts at appropriate intervals, following the recommendations from the Package of Practice (POP) for a specific crop. The tools also generate reports on individual field operations with cost economics and energy requirement for each field operation. The thematic maps for 10 parameters viz., N, P, K, Fe, Mn, Cu, EC, pH, Zn, and organic carbon (OC), were prepared using GIS (QGIS) software from data of CIAE.



High-clearance vehicle for unmanned tea leaf harvesting

An indigenous, self-propelled, hydraulically actuated high clearance vehicle was developed to carry out tea leaf plucking and pruning operations. Its components include a hydraulically driven transmission, cooling, differential, and a disc-type negative brake system. It features 1.4 m of ground clearance and a track width that can be adjusted between 1.4 and 2.0 meters. The highest designed on-road speed of operation was 20 km/h and a turning radius was 4 m. The performance of the vehicle alone was satisfactory at tea garden of TTRI, Jorhat.



Application of drone for spraying pre and post emergence herbicide in wheat crop

Ludhiana center of AICRP on FIM has conducted study on drone-based spraying system for the application of pre & post-emergence herbicide for wheat crop. The drone was operated at a forward speed of 2.0-3.0 m/s and at a height of 2.0-3.0 m above the sprayed field. The following observations were recorded:

- The droplet size (VMD) of spray using drone with flat fan anti-drift nozzle was 425-600 μm as compared to 700-1500 μm in knapsack sprayer.
- ii) The droplet size increased when adjuvant was added @ 0.1% of water application dose in the spray solution.
- iii) NMD for drone spraying was 200 μm as compared to 600-1000 μm in knapsack sprayer.
- iii) The droplet density for drone spraying was 12-32 drops/cm² (knapsack sprayer was 13-39 drops/cm²)



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iv) The drone sprayer controlled broad leaf weed population up to 70-86% whereas it was 83-94% for knapsack spraying.

Radio frequency controlled pesticide applicator

TNAU centre of AICRP on FIM has developed RF-controlled pesticide applicator. This sprayer consists of four main parts viz RF Module, sprayer module having a pump (19 l/min), spray boom, nozzle and chemical tank, driver module and trolley with wheels to support the sprayer. The machine moves using wheels powered by 24 VDC motors. The RF module ensures reliable communication over long distance. During field trials, the machine covered 0.5 hectares per hour with a 2.65-meter boom and 12 nozzles, achieving 65-70% efficiency at 3 km/h forward speed. However, uneven terrain affected the speed.



Paddy straw based insulating box

An eco-friendly and sustainable technological value addition for paddy straw was done by manufacturing a box with the use of paddy straw blocks made from paddy straw, clay and seed lac. The size of the



insulating box was 300 mm x 300 mm x 300 mm. Thermal conductivity of the insulating block is 0.08 W/mK. It is laminated with white emulsion heat reflective coating (solar reflectance - 0.88 and emissivity - 0.91). About 3 kg vegetable can be stored inside the box. The temperature reduction inside the box was $10-12^{\circ}$ C from ambient. The cost of the box is Rs.600.

Liquid fuel from paddy straw

An attempt was made to synthesize drop-in fuel from paddy straw through thermo-chemical route. Paddy straw was pyrolysed to prepare bio-crude through slow pyrolysis at 450°C and 500°C. Bio-crude recovery was 21% at 450°C and 25% at 500°C. The recovered



organic phase of bio-crude was distilled at vacuum pressure in three different temperature zones of <120°C, 120°C to 180°C and 180°C to 240°C. The highest calorific value of 38 MJ/kg was recorded with the fraction recovered from 180°C to 240°C. The residual part was considered as bio-pitch which had the similar properties of coal tar.

Linear move irrigation system

An indigenous linear move irrigation system suitable for small farms was developed using a guiding arrangement. It is suitable for crop height up to 1.5 m. The developed system takes about 12 hours to irrigate 0.4 hectare area with a 50 mm irrigation depth. Using timer controllers and single- and three-phase electric circuits, the developed system moves at a forward speed of 0.2 km/h and operates semi-automatically to apply the scheduled depth of irrigation on a stop-and-go mode as per the pre-set duration. The cost of the developed system is approximately Rs.1.00 lakh. It achieved distribution uniformity of 78.5% and coefficient of uniformity of 86.2%.

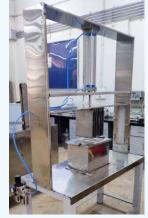




RESEARCH & DEVELOPMENT/ TRAINING

Cutting cum anti-browning system for peeled tender jackfruit

The tender jackfruit is highly vulnerable to enzymatic browning once it is cut and exposed to the aerobic environment. Manual cutting is a risky and cumbersome operation. Considering all these facts, a cutting cum anti-browning treatment system has been developed. The vertically mounted cutting blades are operated with pneu-



matic system. A stainless steel container contains the anti-browning solution (ascorbic acid of 1.5% conc.) to avoid the browning of cut pieces of jackfruit. In operation, the peeled jackfruit has to be kept in the container with the anti-browning solution where it is cut and treated simultaneously. The effective time to cut one peeled jackfruit is 5 second. The output capacity of the cutting system including the time of loading and removal is about 250-270 kg/h of cut tender jackfruit.

Grain handling, treatment cum bagging system

The drying of food-grains up to desired moisture content is vital in mills and other grain processing units. The open sun drying is highly laborious, time consuming and cumbersome operation. The mechanized self-propelled grain handling cum bagging system has been developed to address these issues. In the developed mechanized system, two counter rotating screw conveyors gather the spread grains. The specially designed inclined bucket



elevators pick the grain from flour and convey to overhead hopper. The conveying deck contains about 4.5 kg of grains (wheat) at a time. The conveying deck is also equipped with overhead array of 05 infrared heaters (1000 W each) to give in-situ surface treatment for an early stage disinfestation of grains. The grains are further collected in the attached bag at the discharge outlet of the deck. The machine has a bagging capacity of 0.6 tonne/h free flowing grains.

Millet based nutri-protein mixture

The millet-based health mixture includes millet grains, pulses (such as green gram, chickpeas, and peas), nuts and seeds, dried fruits, cocoa powder/vanilla powder, and soy milk powder. The nutritional value of this mixture per 100 gram is approximately 18.5 g of protein, 60 g of carbohydrates, 14 g of fat, 149



mg of calcium, and 5.0 mg of iron. Combining millet, pulses, nuts, and soy milk powder ensures a complete amino acid profile. The product also has enhanced digestibility due to different protein sources and the presence of fiber, which aids in overall digestion and benefits from fermentation. The evaluation of the mixture shows high acceptability, scoring well on the 9-point hedonic scale.

Training and Demonstration

Training and demonstration session on Biochar preparation

A two-day training program was organized to equip cotton farmers in the Satpuda Pench corridor with the knowledge and skills for bio-char production and



TRAINING

application during 19-20 February, 2024. The program, was led by Dr. Sandip Mandal, Senior Scientist and organized by Dr. Prateeksha Mehera from WWF-India, aimed to address challenges like lantana proliferation through sustainable agriculture practices. Day one was focused on classroom sessions on biochar fundamentals and benefits, followed by practical demonstrations at two sites. Day two was entirely on hands-on demonstrations at two locations.

Online training session for farmers

On May 1, 2024, the DBT Kisan Hub Phase-II project conducted an online training session on "Conservation Agriculture and Crop Residue Management Machinery." The aim of the training was to create awareness among participants about managing crop residue by adopting conservation agricultural practices and off-the-field utilization of crop residues for different purposes. During the first session, Dr. Dushyant Singh discussed about "Conservation Agriculture (CA)" and the management of crop residue in the field using machinery. In the second session, Dr. Harsha Wakudkar made presentation on "Economical options for crop residue management". Total 33 farmers participated in this training.



Training for Drivers

A training on 'Auto-mobile Maintenance, Road Safety and Behavioural Skills' was organized for regular drivers of Agricultural University, Kota during 27-31 May,



2024. The aim of the programme was to make the participants aware of new knowledge of the vehicle

materials, advanced technologies in vehicles, traffic rules, safety measures, vehicle insurance system, first-aid management and driving behaviour. Seventeen drivers from the university participated in the training.

EDP on Soybean Processing

An entrepreneurship development training program titled "Soy-Milk, Tofu & Soy-based Confectionary Products" was conducted for the upcoming entrepreneurs during June 10-14, 2024 (Batch 205). Three trainees from Maharashtra state participated in the event. The training module primarily consisted of practical demonstrations and hands-on training supported by theoretical aspects. The training covered various topics, including soy-based food products, soymilk and tofu preparation, soy processing equipment, project planning, storage and packaging, quality standards, and the marketing of soy products.



Students' Training

Twenty-eight B.Tech Agricultural Engineering students from four SAUs across India participated in a comprehensive four-week summer practical training program at the institute from June 1 to 30, 2024. Hailing from JAU, Junagarh, Gujarat, CAUAT, Etawah, and ANDUAT, Ayodhya, the students gained invaluable hands-on experience through rotations across four key divisions of the institute: Agricultural Mechanization





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Division, Agricultural Processing and Post-Harvest Division, Irrigation and Drainage Engineering Division, and Agricultural Energy Power Division. Under the mentorship of four experienced scientists, these aspiring engineers were immersed in real-world agricultural engineering challenges, fostering their practical skills and theoretical knowledge.

एनआईसी मेल एक्टिवेशन विषय पर तकनीकी प्रशिक्षण कार्यक्रम तथा हिन्दी कार्यशाला का आयोजन

संस्थान के 22 नविनयुक्त तकनीशियन श्रेणी-1 एवं 6 एसएमएस/विषय विशेषज्ञ कर्मचारियों के लिए दिनांक 20 जून 2024 को एनआईसी मेल एक्टिवेशन विषय पर प्रशिक्षण का आयोजन किया गया, जिसमें श्री अभिषेक यादव, मुख्य प्रशासनिक अधिकारी ने प्रतिभागियों को एनआईसी मेल एक्टिवेशन, ईएचआरएमएस, वेबमेल, ईऑफिस आदि अकाउंट को एक्टिवेट करने, उसका प्रयोग करने आदि के बारे में प्रशिक्षित किया। दिनांक 20 जून 2024 को ही उपरोक्त 28 कर्मचारियों के लिए "सरकारी कामकाज में राजभाषा हिन्दी का प्रयोग" विषय पर एक हिन्दी कार्यशाला का आयोजन किया गया, जिसमें उप निदेशक (राजभाषा) राकेश कुमार ने प्रतिभागियों को राजभाषा नीति, नियमों एवं व्यवस्थाओं की प्रारंभिक जानकारी देते हुए सरकारी कामकाज के दौरान हिन्दी राजभाषा हिन्दी का प्रयोग करने एवं इस दौरान आने वाले समस्याओं के बारे में प्रशिक्षण प्रदान किया।



Patent Granted

Continuous feed aloevera whole gel extraction equipment (Patent No.539121 dated 24/05/2024)

Continuous feed aloevera whole gel extraction equipment extracts whole gel, directly collects it in the food grade trays partially filled with clean water. The top and the bottom rinds are collected separately. Capacity of the equipment is about 200 - 225 kg/h (900 – 1000 leaves/h) when motorized and 100 kg/h (400 - 450 leaves/h) when operated manually. The saving in time and cost over conventional method is up to 70% and 50%, respectively.



Technologies Licensed

Technology Licensed	Firm	Date of License
SPAD Meter 2.0	M/s G T Bio Science Pvt Ltd, Coimbatore	01.05.2024
Process technology for dietary fibre extraction	M/s Kriti Nutrients Limited, Dewas	30.05.2024

Test Reports of Commercial Machinery

	No. of Test Reports Released	Revenue Generated, Rs
Farm Machinery	22	20,80,941/-
Post -harvest machinery	29	17,33,841/-

KVK NEWS

Machine demonstration at farmers' field

Sl. No.	Crop/ Technology	Place	Date
1.	Spiral grader for grading of soybean seed	Village-Chandpur	06.05.2024
3.	Power operated grain (wheat) cleaner	Village-Lambakheda	17.05.2024
4.	Groundnut decorticator	Villages- Ratatal, Agaria Parewakheda, Chanpur, Khajuri Ratatal, Entkhedi, Parwaliya sadak, and Barkhedi Hajjam	15.05.2024 29.05.2024 03.06.2024 05.06.2024 10.06.2024 11.06.2024

एक दिवसीय प्रशिक्षण

खरीफ फसलों की उत्पादन तकनीक विषय पर ग्राम - सगोनिया के 22 कृषकों हेतु 12.05.2024 में एक दिवसीय प्रशिक्षण का आयोजन किया गया

Exposure visit

Exposure visits of horticultural farmers of Bhopal district and Sirok Swayam Sewa Sasthan, Bhopal were conducted at KVK-CIAE, Bhopal and participated by 33 farmers.

Training cum workshop of Home Science experts of Madhya Pradesh and Chhattisgarh

Training-cum-workshop of Home Science experts of KVKs was organized by ICAR-ATARI, Jabalpur at ICAR-CIAE, Bhopal during June 13-14, 2024. Home scientists from KVKs of Madhya Pradesh and Chhattisgarh states presented their achievements & proposed the action plan for the year 2024-25. The workshop was graced by the presence of Dr. S.R.K. Singh, Director, ICAR-ATARI, Jabalpur, Dr. Shalini Chakraborty, Principal Scientist, ICAR-ATARI, Jabalpur, Dr. Neeta Khandekar, In-charge, Soybean Processing Unit, ICAR-CIAE, Bhopal, and Dr.



Dipika Agrahar Murugkar, Principal Scientist, Soybean Processing Unit, ICAR-CIAE, Bhopal. Thematic areas related to bio-fortified crops for nutritional security, nutritional kitchen garden, value addition, income generation, women empowerment, indigenous traditional knowledge, underutilized food sources, drudgery reduction, and management were highlighted in the workshop.

Training-cum-workshop of Agricultural Engineering experts of Madhya Pradesh and Chhattisgarh

A two-day training-cum-workshop for Agricultural Engineering Experts of KVKs was held at ICAR-CIAE, Bhopal, involving 30 participants. The workshop was inaugurated by Dr. CR Mehta, Director, ICAR-CIAE who also emphasized the role of Agricultural Engineer to increase the adoptability of farm mechanization among farmers. Dr. R. Selvarajan, Director, NRC-Banana, Tiruchirappalli emphasized the use of technologies in the cultivation of Banana for precise use of resources. Dr. SRK Singh, Director, ICAR-ATARI, Jabalpur gave a brief overview about the workshop and emphasized for the processing activities of all crops at KVK level.





TECHNOLOGY TRANSFER/ HRD

Media Activities

Speaker	Topic	Media	Date
MK Tripathi	Post-harvest management of fruits and vegetables for value addition	All India Radio, Bhopal	05.04.2024
RK Singh	टपक सिंचाई का खेती में महत्व	Karmveer Radio, ML Chaturvedi University, Bhopal	30.04.2024
Dipika Agrahar Murugkar	कृषि में सामयिक कार्य एवं प्रसंस्करण	Doordarshan Kendra, Bhopal	24.05.2024
Dipika Agrahar Murugkar	चौपाल- सामयिक कार्य चर्चा	Doordarshan Kendra, Bhopal	02.06.2024
MP Singh	मोटे अनाजों का उत्पादन और उपयोगिता	Karmveer Radio, ML Chaturvedi University,	01.03.2024
	अंतर्फसल खेती का महत्व	Bhopal	27.04.2024
	खेती में जल संरक्षण एवं सहजीवन		30.04.2024
	समसामयिक कृषि कार्य पर चर्चा कृषि चौपाल		21.05.2024

Human Resource Development

Name and Designation	Course Title	Duration	Venue/ Place
Gopal Carpenter, Scientist	IP Awareness/Training	24 April, 2024	Online
Mukesh Kumar , Scientist	program under National		
Ravindra Randhe , Scientist	Intellectual Property		
	Awareness Mission		
	organized by Intellectual		
	Property Office, India		
Sandip Mandal, Sr Scientist	6 th Pedagogy Training	1-5 April, 2024	National
Prabhat K Guru, Scientist	on Enhancing		Academy of
	Pedagogical		Agricultural
	Competencies for		Sciences, NASC
	Agricultural Education		Complex, New
			Delhi

Foreign Deputation

Dr VK Bhargav, Project Coor-dinator, AICRP on EAAI participated in the "Regional Workshop on Integrated Straw Management in Asia and the Pacific - Mechanization Solutions for Sustainable and Climate-Smart Agriculture" held in at Qingdao, China from 19 to 20 June 2024. The workshop was organized by the Centre for Sustainable Agricultural Mechanization of the United Nations Economic and Social Commission for Asia and the Pacific (ESCAP-CSAM) in collaboration with the

College of Engineering of the China Agricultural University with the support of local agencies in Qingdao. In this workshop, over 100 stakeholders, policy-



makers and representatives from 16 countries and

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international organizations participated and shared their experiences, good practices to address crop residue burning. He presented a country report on Crop Residue Management-Mechanization Solution which includes insitu as well as ex-situ management on paddy straw. The success story of paddy straw management machinery in the north central region of India was highlighted.

Publications

Book

Kumar Anil, Tripathi MK, Mohapatra D., Kumar Ashwani. 2024. अदुभुत पोषक श्री अन्न:एक गाथा उत्पादन एवं मूल्य संवर्धन की Satish Serial Publishing House,. ISBN: 978-93-95700-32-0, E-ISBN; 978-93-95700-34-4. No pages; 347.

Shiv Vendra Singh, Sandip Mandal, Ram Swaroop Meena, Sumit Chaturvedi, K. Govindaraju, Biochar Production for Green Economy, Academic Press, 2024, ISBN 9780443155062, https://doi.org/10.1016/C2022-0-01743-8.

Book Chapters

Barman A, Roy S, Saha P, Dey S, Patel S, Meena DK, Bera A, Singh SV, Mandal S, Nath, S. and Bagrecha, S., 2024. Sustainable management and diversification of problematic wastes: prospects and challenges. Biochar Production for Green Economy, pp.57-79.

Datta D, Ghosh S, Das K, Singh SV, Mazumdar SP, Mandal S and Singh Y. 2024. Biochar imparting abiotic stress resilience. In Biochar Production for Green Economy (pp. 227-248). Academic Press.

Dawn CP Ambrose 2024. Primary processing of fruits & vegetables. In the book: Food Production, Diversity, and Safety Under Climate Change (pp.121-127) edited by Chakraborty, Rakhi & Mathur, Piyush & Roy, Swarnendu. Springer Nature Switzerland. ISBN: 303151646X, 9783031516467

Dixit PS, Sahni RK, Kumar P. 2024. Application of unmanned aerial vehicle (UAV) in smart agriculture. Advances in Agriculture Sciences Volume I (ISBN: 978-

93-95847-16-2). Bhumi Publishing, India. Pp-68-76. https://www.bhumipublishing.com/wp-content/uploads/2024/03/Advances-in-Agriculture-Science-Volume-I.pdf

Dixit PS, Sahni RK, Shukl KS, Mishra DB and Singh R, 2024. Precision agriculture technologies for a sustainable future. Farming the Future: Advanced Techniques in Modern Agriculture Volume I (ISBN: 978-93-95847-45-2), Bhumi publishing, Kolhapur, Maharashtra, India, pp. 70-81.

Lavanya R, Sahu P, Mandal S, Singh SV and Meena RS. 2024. Crop waste conversion into biochar: an overview. Biochar Production for Green Economy, 1-23.

Sharma RK, Mandal S, Nazari MA, Haydary J and Verma A. 2024. Advanced pyrolysis reactors for energy efficient production of biochar. In Biochar Production for Green Economy (pp. 27-41). Academic Press.

Tripathi MK, Shrivastava RM, Hasan M, Maheshwari C and Jadam RS. 2024. Essential oil Biochemistry. In PK Shukla, AK Shrivastav, S Agnihotry, D Chopra, P Misra, J Singh (Eds.), Aromatherapy: The Science of Essential Oils (pp. 65-95). Bentham Publisher. ISBN: 978-981-5136-21-0.

Upadhyay A, Chandel NS and Chakraborty SK. 2024. Disease Control Measures Using Vision-Enabled Agricultural Robotics. In Applications of Computer Vision and Drone Technology in Agriculture 4.0 (pp. 165-186). Singapore: Springer Nature Singapore.

Research Papers

Giri, S.K., Mohapatra, D., Tripathi, M. K., Kate, A., & Wahid, A. (2024). Optimization of process parameters of refractance window drying for aonla slices and comparison with other drying techniques. Journal of the Science of Food and Agriculture. https://doi.org/10.1002/jsfa.13615.

Gupta A, CP Sawant, Mukesh Kumar, RK Singh and KVR Rao. 2024. Assessment of rainfall erosivity for Bundelkhand region of central India using long-term rainfall data. Mausam, 75 (2): 415-432. doi.org/10.54302/mausam.y75i2.3893.



PUBLICATIONS

Hasan M, Tripathi K, Harun M, Krishnan V, Kaushik R, Chawla G and Kumar M. 2024. Unravelling the effect of extraction on anthocyanin functionality and prebiotic potential. Heliyon, 1-15.

Jyoti B, Roul AK, Potdar R, Kumar M, Nandede BM, Singh Parmar B and Divaker CD. 2024. Influence of Operational Parameters of Cutting Blade on Torque Requirement and Cutting Index of Cassava Stem. Journal of Agricultural Engineering (India), 61(2), 147-156.

Kumar V, Mangaraj S, Prasad S. 2024. Implement and Machinery Fabricated and Disseminated during 2020-21 to 2023-24. Agricultural Engineering Today, 48 (1), 35-38.

Kumar, SP, Jat D, Sahni RK, Jyoti B, Kumar M, Subeesh A, Parmar BS and Mehta CR. 2024. Measurement of droplets characteristics of UAV based spraying system using imaging techniques and prediction by GWO-ANN model. Measurement, p.114759.

Mahapatra J, Tiwari PS, Singh KP, Nandede BM, Sahni RK, Pagare V, Singh J, Shrinivasa DJ, Mandal S. 2024. An Adjustable Pneumatic Planter with Reduced Source Vibration for Better Precision in Field Level Seeding. Sensors, 24(11), 3399.

Mandal S and Sahu K. 2024. Performance of Micro-scale Gasifier based Power Generation Unit using Pigeonpea Stalk Pellets with Mass and Energy Flow Analyses. Journal of Agricultural Engineering (India), 61(2), 286-298.

Mohapatra D, Nickhil C, Kar A, Sharma Y, Deshpande SS, Tripathi MK and Haromuchadi SR. 2024. Impact of LAB Fermentation on the Nutrient Content, Amino Acid Profile, and Estimated Glycemic Index of Sorghum, Pearl Millet, and Kodo Millet. Frontiers in Bioscience-Elite, 16(2), 18.

Pawar DA, Giri SK and Sharma AK. 2024. Kinetics and modelling of grape drying with abrasive and chemical pre-treatments. Journal of Scientific and Industrial Research. 83: 350-361.

Rajwade YA, Chandel NS, Chandel AK, Singh SK, Dubey K, Subeesh A and Manjhi M. 2024. Thermal–RGB Imagery and Computer Vision for Water Stress Identification of Okra (Abelmoschus esculentus L.). Applied Sciences, 14(13), 5623.

Siddiqui SA, Elsheikh W, Ucak , Hasan M, Perlita ZC and Yudhistira B. Replacement of soy by mealworms for livestock feed-A comparative review between soy and mealworms considering environmental aspects. Environment, Development and Sustainability. May 2024. 1-44.

Subeesh A, Kumar SP, Chakbraborty SK, Upendar K, Chandel NS, Jat D, Dubey K, Modi RU and Khan MM. 2024. UAV imagery coupled deep learning approach for the development of an adaptive in-house web-based application for yield estimation in citrus orchard. Measurement, p.114786.

Thorat D, Mehta CR, Agrawal KN, Jyoti B, Kumar M and Chandel NS. 2024. Performance Evaluation of Variable Rate Spraying System under Simulated Conditions. Journal of Agricultural Engineering (India), 61(2), 133-146.

V. Vignesh, Dibyakanta Seth, Chingakham Ngotomba Singh, Madhuresh Dwivedi, Shyam Kumar Singh, Samlesh Kumari 2024. Electrohydrodynamic encapsulation: A novel technique to enhance the stability of bioactive compounds in food. Trends in Food Science & Technology, 151, 4, 1-14.

Popular Articles

Hemu Shanishre, Praveen Nayak, DS Thorat, Dushyant Singh and Manish Kumar. Direct Seeded Rice (DSR) Sustainable Rice Cultivation Practice for the Madhya Pradesh State. Agritech Today, Volume 2, Issue 2 (May, 2024).

Technical Bulletins/ Technical Reports/ Technical Manuals

Yadav Y, Tripathi MK, Potdar R, Mangaraj S. 2024. Entrepreneurship development through mechanized production, processing and value addition of millets and their by-products. Technical Report No. CIAE/APPD/TM/2024/68.

Wakudkar H and Gangil S. 2024. Solar powered bird scarer. Extension Bulletin no. CIAE/AEP/EB/2024/19.

Wakudkar H, Gangil S and Bhargav VK. 2024. Crop residues briquetting. Extension Bulletin no. CIAE/AEP/EB/2024/20.

AWARDS/ EVENTS

Awards and Recognitions

Dr. Adinath Kate received "Young Scientist Award" of National Academy of Agricultural Sciences (NAAS) for outstanding contribution in the field of "Agricultural Engineering and Technology" during Annual General Body meeting and "Foundation Day" Programme of National Academy of Agricultural Sciences (NAAS) held at NASC, New Delhi on June 4-5, 2024.



Dr R Senthil Kumar, Senior Scientist received Reviewer Excellence Award by Agricultural Research Communication Centre (ARCC) for Asian Journal of Dairy and Food Research on 25.06.2024

Dr. Harsha Wakudkar received best poster award at National Conference on Innovative Technologies and Entrepreneurship Development in Agriculture held during March 07-08, 2024 at CAET, Dr. PDKV, Akola (Maharashtra).

RAC Constituted

New Research Advisory Committee has been constituted for a term of three years wef 21 March, 2024. The new RAC is chaired by Dr. DC Joshi, Former Vice Chancellor, Agriculture University, Kota and the members are Dr. D. Manohar Jesudas, Retired Professor (Farm Machinery), TNAU, Coimbatore, Prof. Madan Kumar Jha, Professor (HAG), Groundwater Hydrology & IWRM and Head, Agricultural and Food Engineering Department, Indian Institute of Technology Kharagpur, Dr. V. Siva Reddy, Director (Tech), National Institute of Solar Energy, Ministry of New and Renewable Energy (MNRE), Gurugram and Dr Tanweer Alam, Additional Director, Indian Institute of Packaging, Lucknow.

World Intellectual Property Day

A Seminar on 24/04/2024 was organized by NAIF-ZTMC & ABI, ICAR-CIAE, Bhopal to mark the Celebration of World Intellectual Property Day - 2024 with the theme: Intellectual Property Management: Transition from Agriculture to Agribusiness. A presentation on topic "Online-E Filing of IP applications" was delivered by Ms. Aparna Pandharkar, Indian Patent Agent.

Review Meeting of NePPA

A review meeting of Network Programme on Precision Agriculture (NePPA) under the broad area, "Development of sensor based technologies for precise farm input application and quality control in post-harvest processing", was held at ICAR-CIAE, Bhopal on 18-04-2024. The meeting was attended by Dr Amitabha Bandopadhyay, Chairman, TAC, NePPA; Dr Anil Rai, ADG (ICT), ICAR; Dr C.R. Mehta, Director, ICAR-CIAE, Bhopal; Dr Rabi Narayan Sahoo, Programme Leader, NePPA; Dr Subhash N Pillai, Head, Agril Physics, ICAR-IARI, New Delhi; and the NePPA team of ICAR-CIAE, Bhopal. The meeting started with on-site field visits followed by a detailed review presentation of ATR's till date and documented progress of the research projects.



IRC Meeting

The 110th IRC meeting was held on 28 - 29 May, 2024 and 62 members of IRC participated. There were 103 projects (25 RPF-I, 21 RPF III, 34 RPF II and 23 Extension Proposals) discussed and critically reviewed during the IRC meeting. Chairman IRC emphasized the importance of proper planning for projects, aligning them with the ICAR and national priorities and RAC recommendations. He urged scientists to adhere to the timelines set by the IRC for



EVENTS/ PERSONNEL NEWS



project completion, while emphasizing the need for divisional project reviews by HODs at regular intervals.

Visit of ADG (FE)

Dr. K.P. Singh, ADG, Farm Engineering, ICAR, New Delhi visited CIAE on 29 April 2024 to review progress of CIAE scientists for the year 2023-24, with a focus on the contributions and advancements made by each scientist according to the directive of 'One Scientist, One Technology in a Year'.



Visit of Dr VC, SVBPUA&T

Dr. K.K Singh, Vice Chancellor, Sardar Vallabh Bhai Patel University of Agriculture & Technology, Meerut (Former Director, ICAR-CIAE) visited CIAE on 12th June, 2024 to interact with scientists of the institute and to have a discussion on advanced scientific works being conducted in the institute.



World Yoga Day

International Yoga Day was celebrated at the institute on 21st June 2024. The theme of the event was "Yoga for Self and Society," was marked by great enthusiasm and active participation from the institute's staff and guests. Experts from the Sahaj Yoga Foundation, Bhopal, including Dr. Purnima Nayak, Mr. Pratik Shrivastava, Smt. Neerja Pare, Smt. Sushma Choure, Smt. Hemlata Sharma and Smt. Suparna Kumar conducted the yoga session. The session included general yoga practices, meditation, various asanas (postures), pranayama (breathing exercises), and relaxation techniques. Dr. CR Mehta, Director, addressed the participants and urged all staff members to practice yoga regularly to maintain physical and mental health.



Staff Promoted



Dr Manoj KumarSr Scientist
(Agriculture Statistics)
wef 4 November, 2022



Shri Saryu PrasadSr Technical Assistant
(T-4)
wef 18 August, 2023



Shri Abhishek Meena Sr Technical Assistant (T-4) wef 27 August, 2023

OUR NEW COLLEAGUES



Faiz Ahmad Administrative Officer 22.04.2024



Abhishek Katare Technician (T-1) 19.04.2024



Rishi Prakash Shukla Technician (T-1) 22.04.2024



Akshay Mahendra Gajbhiye Technician (T-1) 22.04.2024



Technician (T-1) 19.04.2024



Mayank Jysawal Subhash Singh Rathour Technician (T-1) 23.04.2024



Ravi Ranjan Technician (T-1) 25.04.2024



Manoharsh Meena Technician (T-1) 25.04.2024



Technician (T-1) 26.04.2024



Pushpendra Kumar Raman Kumar Maurya Technician (T-1) 26.04.2024



Ashutosh Kumar Technician (T-1) 29.04.2024



Bablu Kumar Technician (T-1) 29.04.2024



Pravesh Sonkar Technician (T-1) 30.04.2024



Mahendra Pratap Singh Technician (T-1) 01.05.2024



Shubham Modi Technician (T-1) 01.05.2024



Rangesh Kumar Technician (T-1) 02.05.2024



OUR NEW COLLEAGUES



Shivam Maurya Technician (T-1) 02.05.2024



Sanjay Kumar Choudhary Technician (T-1) 06.05.2024



Uma Kumari Gupta Technician (T-1) 06.05.2024



Kunal Yadav Technician (T-1) 08.05.2024



Nitin Kumar Technician (T-1) 08.05.2024



Abhishek Kumar Technician (T-1) 08.05.2024



Amrendra Kumar Technician (T-1) 09.05.2024



Dr Aman Mahore Sr Technical Officer (T-6) 30.05.2024



Dr Shubham SinghSubject Matter Specialist (T-6)
(Soil Science)
03.06.2024



Narendra Kumar Meena Subject Matter Specialist (T-6) (Vegetable Science) 03.06.2024



Sita ChoudharySubject Matter Specialist (T-6)
(Agronomy)
03.06.2024



Dr Nidhi JoshiSubject Matter Specialist (T-6)
(Home Science)
03.06.2024



Akhilesh Patel Technician (T-1) 20.06.2024



Manojit Chowdhury
Subject Matter Specialist (T-6)
(Farm Power & Equipment)
20.06.2024

PERSONNEL NEWS

Staff Transferred



Dr Ajay Yadav, Scientist (Food Technology) was relieved on 1 April, 2024 to join at ICAR-NDRI, Karnal on his own request.



Shri Saryu Prasad, Sr Technical Assistant (T-4) was relieved on 27 April, 2024 to join at ICAR-IISR, Lucknow on his own request.

Staff Superannuated



Ms Purnima Mahto Assistant 31.05.2024



Shri RC Malviya
Technical Officer (T-5)
31.05.2024

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