



ICAR-CIAE NEWSLETTER

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From the Director's Desk



This year marks the celebration of the International Year of Millets (IYM - 2023) which has been spearheaded by the sustained efforts of India. Recognizing the enormous potential of millets, which also aligns with several UN Sustainable Development Goals in terms of being climate-resilient, nutritious, and water-efficient crops, the Government of India has been prioritizing millets. Millets are important by virtue of their great potential to generate livelihood, increase farmers' income and ensure food and nutritional security all over the world.

For removing the bottlenecks related to the production of millets, timeliness of operations has assumed greater significance in obtaining optimal yields from different crops, which is possible by way of mechanization. One of the key constraints to achieve food and

nutritional security is the poor post-harvest management that leads to the loss of grains and has an impact on the nutritional value of grains, adversely affecting the health of populations consuming unsafe food. For reducing post-harvest losses and increasing food availability, the processing of millets is a very important aspect in increasing its popularity. In addition to the traditional recipes of millets and healthy ready-to-eat food products will also go a long way in increasing consumption and would result better health of public and remuneration to farmers.

ICAR-CIAE has been working to modernize the millet production and post-production area to cater to a diverse population. In many parts of India, millets are still produced without scientific intervention, where there is potential to increase production through suitable mechanised efforts. Since millets vary in size and shape, different machinery is required for different operations. CIAE has developed a range of power, animal and manual operated machinery to reduce drudgery and improve the production of millets, right from seedbed preparation to threshing, to cater to a wide group of farmers. Interventions like proper seedbed preparation, sowing, intercultural operations, mechanised harvesting and threshing of grains at the right stage can improve the production and the quality of the millets.

The millets' size, shape morphology and composition are a few of the deterrents in their wide acceptability, which can be addressed through suitable technological interventions. Processing is a vital step to popularise millet consumption. Our institute has developed millet mill, which can dehusk a wide variety of millets, a millet flakes processing line and a popping machine. Several millet-based products have been developed through different technological interventions, with better nutrition, taste and shelf life.

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There is ample opportunity to start entrepreneurship with these technologies from the grassroots level, which can be a means of sustainable development. Recently the institute has published a technical bulletin on "CIAE Technologies for Production and Processing of Millets" which focuses on the mechanization of complete millet value chain. It includes machinery and equipment specially designed for mechanization of millet production on the farm, post-harvest processing equipment and machinery to improve efficiency, nutritive value and storability of millets and an array of process technologies using millets to promote their consumption suiting every age group, focusing on health-related issues.

This issue of the newsletter focuses on research and development of farm equipment and machinery like spray droplet deposition characteristics of unmanned aerial vehicle, automatic spraying system for polyhouse, image-based disease identification in soybean, plasma based torrefaction of crop residues etc. Institute scientists received various awards. Two new colleagues joined the institute, fifteen staff members in scientific, technical and administrative categories were promoted, and seven employees retired on attaining the age of superannuation.

As Director, ICAR-CIAE, I am happy to share this issue of Newsletter.

RESEARCH & DEVELOPMENT

Spray droplet deposition characteristics of unmanned aerial vehicle

Drone spraying technology has great potential for precise application of agricultural chemicals. The operational parameters of drone have an effect on droplet distribution, which significantly affect chemical utilization rate and treatment effectiveness. A drone spraying system of 10 litre tank capacity has been evaluated in experimental cotton field at different operational parameters like levels of speeds (2, 4, 6 m/s), discharge rate (1.2, 1.6, 2.0 L/min) and height of operation (1, 2, 3 m). Water sensitive papers have been placed on adaxial and abaxial surfaces of cotton canopy for determination of droplet deposition characteristics. The white paper sheet has been used to study the swath of drone spraying. The water sensitivity papers have been scanned in 600 dpi scanner and analysed in ImageJ software for droplet characteristics. The weather parameters i.e. temperature, humidity and wind speed have been recorded as 26.5°C, 40% and 1.8 m/s, respectively during spraying operation. The swath width ranges from 1.6 to 3.0 m. The application rate of liquid is 25 L/ha. The average actual field capacity of drone is 1.96 ha/h. The VMD and NMD of spray droplets are 110-150 μm and 63-72 μm , respectively. The droplet density, percent coverage and deposition are 55-225 droplets/cm², 1.6-7.7% and 0.01 -0.22 $\mu\text{L}/\text{cm}^2$, respectively.

**Automatic spraying system for polyhouse**

The polyhouse has high temperature and humidity that could be very severe and hazardous for workers who spray pesticides due to poor air circulation. To combat it, an automatic spraying system has been developed for chemical application inside the polyhouse. The



developed system has two units i.e. automatic spraying unit (ASU) which is battery-powered and DC motor-operated row changing unit (RCU). The ASU comprises of DC motor, flange wheels, vertical boom, nozzles, pipe, pipe roller, control valve, arduino mega, motor driver, ultrasonic sensor, XBee, limit switch, and 12 V battery. The main function of the ASU is to spray the chemical while the unit moves on the pipe railing laid in between the raised beds. The automatic spraying system has been evaluated in polyhouse for tomato crop. The forward speed, spray distance and working pressure of automatic spraying system had a significant effect on the droplet density, coverage, VMD and application rate. The optimum operating parameters viz forward speed, spray distance and working pressure are 0.79 km/h, 250 mm and 0.4 MPa, respectively. The cost of spraying with the automatic spraying system is at par with knapsack sprayer and it saves 86% time and 88% labour as compared to spraying by knapsack sprayer.

Pesticide exposure and PPE kit for spraying with power sprayer

Pesticides deposition on the body has an adverse effect on health during pesticides spraying. AICRP on ESA (Dr. BSKKV- Dapoli centre) has evaluated six different types of fabrics for their suitability of adoption for preparation of Dosimeters to reduce pesticide exposure to operators. The set-up consists of 80 × 80 mm test fabric (middle layer) and two 80 × 80 mm one sided absorbent papers of known weight. An emulsifiable concentrate 0.2 ml of the Prowl® 3.3 EC is applied at the centre of the fabric layer from a height of 25 mm. The experiment shows that the materials for protective clothing classified as Level C₁ (relatively low potential risk) with the upper limit for percent penetration as 40% is fulfilled by

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fabric-2 (GSM-215) having penetration of 37%. Similarly, fabric classified as Level C₂ (highly repellent fabric) with the upper limit for percent penetration less than 5% is fulfilled by fabric-6 (GSM-200) with penetration of 0.72%. A study of physiological parameters of workers during working with power sprayer in mango plantation wearing six different types of personal protective equipment (PPE) kits with eye protectors and masks show that Δ HRR is less than limit of continuous performance (LCP) for all six types of PPE kits and it is 21.2 beats/min for safety kit having C₂ level fabric apron. Similarly, VO₂ max is less than 35% i.e. acceptable work load (AWL) for all six types of PPE kits and for safety kit having C₂ level fabric apron is 22.3%. Study of wearing comfort on basis of modified Corlett and Bishop (1976) rating scale, shows that for 6 PPE kits the rating varies from 3.6 to 7.6. The wearing comfort for safety kit with C₂ level fabric is 7.6 indicating very comfortable rating. The increase in temperature inside PPE kits ranges from 3.9 to 11°C and it is 4.6 °C for safety kit with C₂ level fabric. The cost of final PPE kit manufactured with C₂ level fabric is Rs. 610/-.

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Ergonomical evaluation and modification of grass cutter-cum-harvester

The long-term use of the hand-held paddy harvester, a popular machine in the Konkan region, may lead to musculoskeletal disorders in the operator due to induced vibrations in the machine. To combat this situation, AICRP on ESA (Dr. BSKKV- Dapoli centre) has developed a grass cutter-cum-paddy harvester based on various anthropometric dimensions of male workers from Konkan. The hand held type grass cutter-cum-paddy harvester has been modified by mounting it on a two wheel drive trolley with a support wheel on front. It consists of an engine (1.95 hp), handle, two-wheel drive



trolley, rotary cutting blade and drive shaft. The operator can easily operate the modified grass cutter-cum-paddy harvester in the field. The ergonomic evaluation of machine has been done for paddy harvesting and compared with the hand-held paddy harvester. The working heart rate, working oxygen consumption rate and Δ HRR of the subjects for paddy harvesting with existing machine are 144 bpm, 1.4 l/min and 41.2 bpm, respectively and that for developed modified machine are 122.3 bpm, 1.1 l/min and 43.5 bpm, respectively. The average energy expenditure rate and work output for paddy harvesting with the existing machine are 31 kJ/min and 0.13 ha/h, respectively and that for the modified machine are 22 kJ/min and 0.12 ha/h, respectively. The modified grass cutter-cum-paddy harvester reduces the physiological work load of operator over the existing shoulder mounted grass cutter cum paddy harvester.

Development and evaluation of Flue Cured Virginia tobacco leaves stringing machine

In India, flue-cured Virginia (FCV) tobacco is cultivated mainly in the states of Andhra Pradesh, Karnataka, Odisha and Maharashtra. A minimum of 4000 kg of fresh leaves (900–1000 leaf sticks) need to be loaded into the curing barn or chamber for high-quality lemon yellow dried tobacco leaves. The curing takes place at linearly increasing temperature of 30–70°C for about 120 hours (5 days). The dropping of dried leaves needs to be avoided. The stringing of tobacco leaves is a critical process to obtain a quality product. The total number of labourers required for the stringing operation is 21 per curing barn. In the manual method of leaves stringing, the number of labourers, stringing time, and labour costs are high. Due to a labour shortage, the farmers are

RESEARCH & DEVELOPMENT



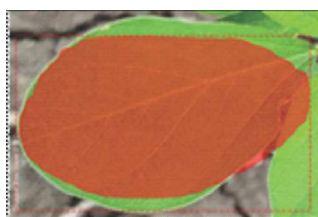
looking to mechanise this operation. Therefore, a flue-cured Virginia tobacco leaf stringing machine has been developed. It is a power-operated unit consisting of a sewing and conveyor assembly with a 0.5 hp electric motor, chain, drive, and ratchet mechanism. This unit can produce 1 stick per 20 s (@ 4 kg of fresh tobacco leaves/stick) with a stringing capacity of 730 ± 100 kg/h (i.e. 180 ± 10 number of sticks/h) using an oval-shaped (3 mm) needle and yarn (34 counts) made of viscose material. The chain stitches hold the leaves properly and prevent the dropping of even dried leaves. To make the operation faster and continuous, it has been provided with three sets of loading trays. Further, during/after the curing process, it was observed that the strung sticks were intact and yielded high-quality lemon-yellow dried tobacco leaves.

Image-based disease identification in soybean

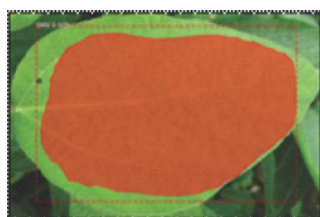
Anthracnose, frog-eye leaf spot (FLS), rhizoctonia aerial blight (RAB), soybean mosaic virus (SMV) and yellow

mosaic virus (YMV) are major common soybean diseases that seriously affect soybean yield in India. The symptoms of these diseases are also visible on soybean leaves which are detected with the help of experts or support systems i.e. leaflets etc. However, for mobile application development or for precision application, automatic detection of disease is required to take appropriate action for disease cure within minimum time and loss. Due to advancements in computer vision and the application of deep learning algorithms, the detection of a particular object in an image is now possible.

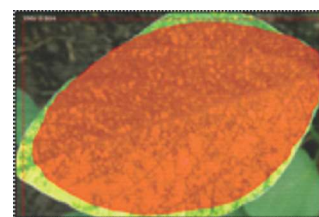
A deep learning algorithm for identification of the soybean foliar diseases has been studied. About, 3127 RGB images dataset of anthracnose, FLS, RAB, SMV and YMV-affected and disease-free leaves of soybean are collected from the agriculture fields. The Mask R-CNN detection algorithm is used for the detection of soybean leaf diseases by introducing the Resnet-50 module. The pre-processed images (512×512 pixels) are used as input in Mask R-CNN. The number of epochs, training step per epoch, training & validation and learning rate are 80, 500, 8 and 0.001, respectively. The detection accuracy is more than 85% at 0.90 level of minimum detection confidence. The accuracy can be further improved by increasing the size of the image dataset.



Disease free leaf



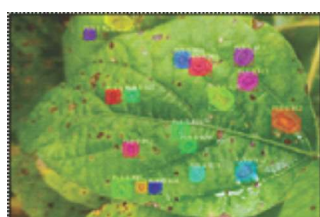
SMV



YMV



Anthracnose (multiple spots)



FLS (multiple spots)



RAB (multiple spots)

RESEARCH & DEVELOPMENT

Plasma based torrefaction of crop residues

The plasma-based torrefaction of mustard stalks has been conducted in a non-thermal plasma reactor. The reactor consists of rotary pump, diffusion pump, penning and pirani gauge for measuring the vacuum pressure inside the reactor. The system generates free and charged radicals in plasma under different levels of vacuum and can generate the vacuum as high as 1000 kPa. Crop residue of mustard stalks has been converted into small pieces by using mortar and pestle. Mustard stalks biomass has been kept between the electrodes in a plasma reactor and treated for 2 h and 4 h to study the inherent changes in bio-molecules. Water is supplied through water jacket to keep the chamber cool. Thermal degradation behaviour of plasma treated mustard stalks and raw mustard stalks biomass has been analysed at four heating rates (10, 20, 30 and 40°C/ min) with the help of TGA analyser. The rate of degradation of hemicellulose and cellulose in 4 h treated material has been observed higher as compared to 2 h treated and raw mustard biomass. It is mainly because of weakening of bonds due to thermal degradation. Hemicellulose, cellulose and lignin bonds are weakened by plasma treatment which results in early degradation of bio-polymer.



Solar PV-operated ice cream thela for street vendor

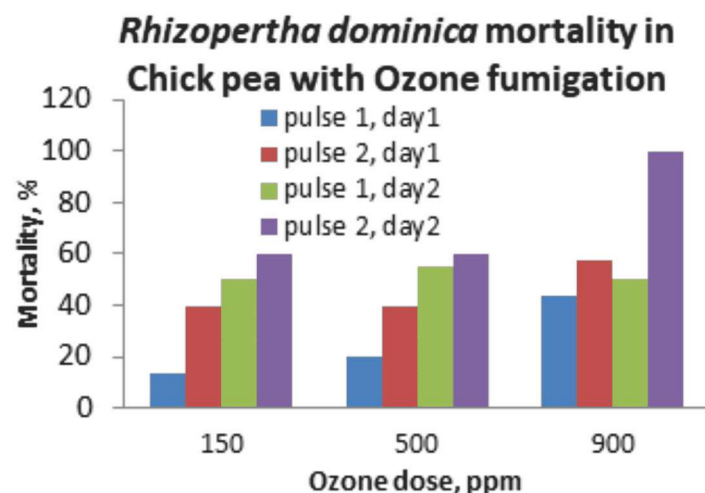
AICRP on EAAI (MPUAT, Udaipur centre) has designed and developed photovoltaic operated 100 litre solar ice cream cart with mobile refrigeration system for ice cream vendors. The developed four-wheel cart consists of three panels with a rated power of 165 W each connected in parallel, a charge controller of capacity 675 VA and two batteries of 12 V, 100 Ah rated capacity. An



eco-friendly R600a refrigerant has been used as a cooling agent. During preliminary testing under on-load condition, a fully charged battery provides the backup period for about 16 h, and is able to maintain average temperature of -18° C. The technology will help in economic upliftment of vendors by reducing their dependence on the utility grid.

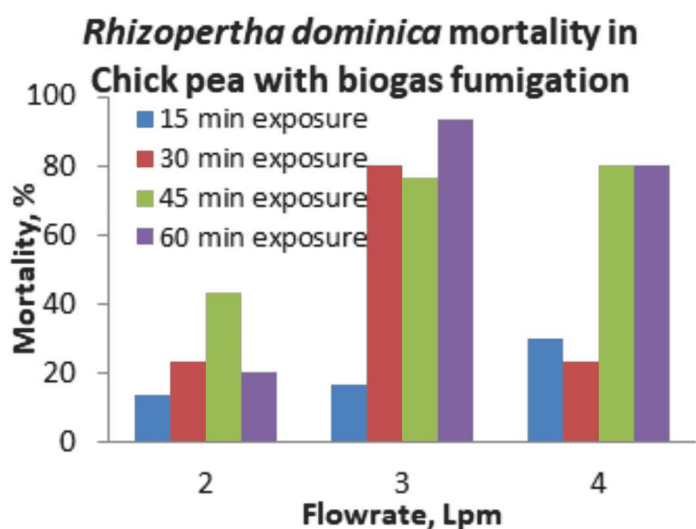
Ozone and biogas fumigation protocol for chickpea

Chickpeas are most susceptible to insect damage by a number of primary and secondary insects. *Rhizopertha dominica* is a primary pest in most cereals and a secondary pest of legume, attacking the broken or already invaded legume grains, causes irreparable damages in stored crops. At present, most insects are getting resistant to widely used chemical fumigants, and call for alternative fumigation protocols. A process protocol has been developed for disinfestation of chickpea grains with biogas and gaseous ozone treatment. Complete elimination of *Rhizopertha dominica*, a secondary pest in



RESEARCH & DEVELOPMENT/ IP&TM/ TECHNOLOGY TRANSFER

chickpea could be achieved with an ozone dose of 500 ppm per 100 g sample for two consecutive days. Biogas, whose major composition is CO₂ and methane, has also been found to be effective against *Rhizopertha dominica* for 60 min exposure at a flow rate of 3 L/min.



Patent Applications Filed

Patent application has been filed for the following technologies:

- Punch planting mechanism for seeds (Inventors: Dr. CP Sawant, Dr. BB Gaikwad, Er. AP Magar and Dr. Abhijit Khadatkar)
- Colorimetric food spoilage indicator: Method of preparation and application thereof (Inventors: Er. Priyanka Sakare, Dr. SK Giri and Dr. Debabandya Mohapatra)

License Agreements Signed

Licenses for commercial manufacturing of following technologies have been signed:

MoU Signed

On 7 March, 2023, institute has signed an MoU with NIT, Rourkela for Development of process technology for soy based multi-functional probiotic chocolate milk powder.

Consultancy Project

A consultancy project of USD 8000 was undertaken with ESCAP-CSAM on the topic "To conduct study to understand the status of straw management in pilot countries, identify gaps and opportunities, to collect the good practices/ technologies of straw management in member countries (with particular emphasis on mechanization-based solutions) and to design an action plan for pilot interventions of integrated straw management in selected member countries (Bangladesh, India, Pakistan, Nepal)".

Participation in Exhibitions

Technologies of the institute were put on display in the following exhibitions:

- Agri Exhibition, organized by IES University, Bhopal (20 January, 2023)
- Kisan Mela 2023, organized by Rani Lakshmi Bai Central Agricultural University (RLBCAU) Jhansi (26 - 27 February, 2023)
- One District One Product Agri Exposition, organized by Directorate of Horticulture and Food Processing, Government of Madhya Pradesh, Bhopal (24 - 27 March, 2023)



Sl. No.	Technology	Licensee
1.	SPAD Meter 2.0	<ul style="list-style-type: none"> • M/s W S Telematics Private Limited, New Delhi • M/s SKR Agrotech, Wardha
2.	Manually operated push type single row vertical plate planter with fertilizer drill for millet multi- crops	<ul style="list-style-type: none"> • M/s Vishwakarma Industries, Hyderabad • M/s Nabhitha Engineering Private Limited, Hyderabad
3.	Manually operated pull type three row planter for millets multi-crops (Vertical Plate Type)	M/s Nabhitha Engineering Private Limited, Hyderabad
4.	Lightweight multi-crop thresher for hills	M/s Himalayan Hi-Tech Nurseries, Distt. Nainital
5.	Portable rotating charring drum	M/s Srinivasa Agro Industrial Corporation, Hyderabad

TRAINING

Trainings Organized

CAFT Training

ICAR sponsored CAFT training on 'Artificial intelligence and advances in ICT for smart agriculture and food processing' was organized during 23 February - 4 March, 2023 and attended by 14 participants from different ICAR institutes/state universities. Dr. NC Patel, Former Vice Chancellor, Anand Agricultural University, Gujarat graced the inaugural function as a Chief Guest and Director, ICAR-CIAE, Dr. CR Mehta chaired the function. The major topics covered in the training include machine learning, Python/R and MatLab programming, deep learning; image processing, sensors and automation, data storage and management. Some food processing technologies developed at ICAR-CIAE Bhopal were demonstrated to the participants. An industrial exposure visit to M/s Bio-nutrient India Pvt., Ltd., Bhopal was also arranged during the training course. The valedictory function of the training was held on 3 March, 2023. Dr. RT Patil, Former Director, ICAR-CIPHET, Ludhiana was the Chief Guest and Director, ICAR-CIAE Dr. CR Mehta, chaired the session. The training was coordinated by Dr. Karan Singh, Dr. Dilip Pawar and Er. Subeesh.



Training programme for Technical personnel of ICAR institutes

A training on 'Selection, adjustment, operation and maintenance of agricultural implements for field and horticultural crops' was organized during 29 December, 2022-7 January, 2023 for 18 participants from different ICAR institutes. The broad objective of this training was to enhance the skill of participants in proper selection and calibration of farm equipment, and adjustment, operation and maintenance of various farm implements.



Shri Rajeev Chaudhary, Director, Directorate of Agriculture Engineering, Bhopal was the Chief Guest of the inaugural session held on 29 December, 2022. During the training, participants were briefed about new technologies on farm mechanization, precision agriculture and micro-irrigation. Participants were given practical training on operation, maintenance and adjustment of agricultural machinery. Visits to CFMTTI Budni, Eicher Tractor manufacturing plant, Skill Development Centre, Badwai were arranged to get exposure to various agricultural engineering technologies. The implements required for seed bed preparation, sowing/planting and transplanting, spraying, intercultural as well as harvesting and threshing were demonstrated on field. Moreover, women friendly tools/ implements, conservation agriculture machinery, covered cultivation techniques; drone simulation facility and precision farming technologies were also demonstrated. Dr. Dushyant Singh, Dr. Dilip Jat, and Er. Rajeshwar Sanodiya, were the training coordinators of this programme.

Skill Development Programme

Skill development programme on Micro-irrigation Technician (sponsored by NCAAPH, New Delhi under PDMC-RKVY scheme) was organized during 1-27 March 2023. A total of 26 candidates from different parts of Madhya Pradesh state (22 Male and 4 female) attended the training. Participants were provided practical training on different micro-irrigation systems, planning and layout, design, operation and maintenance along with automation in micro-irrigation



TRAINING

systems. Dr. KVR Rao, PS and Dr. Yogesh A Rajwade, PI PFDC were the training coordinators.

Soy-food training programme for upcoming entrepreneurs

A training programme on soy-food was organized during 20-24 February, 2023 and attended by 5 upcoming entrepreneurs from different parts of the country. The participants were provided information on different soy-based food products, preparation of soy milk and tofu, introduction to soy processing equipment, project planning, storage and packaging, marketing aspects of soy products and health benefits of soybean.



Hands-on training on food textural analysis

One-day hands-on training on food textural analysis was conducted at RC-CIAE, Coimbatore on 6 January 2023. Twelve participants from educational institutions and food industries attended the programme. Basic concepts on food texture, terminologies used in textural analysis, etc. were taught and followed by the practical session explaining about the Texture Analyser instrument, different probes with their usage and



desired textural properties from the graphs drawn, etc. Dr. Balasubramanian, PS and Head (I/c), and Dr. S K Aleksha Kudos, PS were the training coordinators for conducting this programme.

Awareness programme in entrepreneurship development in soybean processing

To create awareness in entrepreneurship development in soybean processing and problems encountered during manufacturing of soy products, online meets on "Problems, difficulties and remedial steps associated with Soy milk and Tofu production" were conducted on 18 January and 8 February, 2023, attended by a total of 94 participants. People associated with the soy industries, banking and marketing also attended and expressed their views. Another online meet was organized on 19 January, 2023 to encourage entrepreneurs to set up unit for production of soya chaap and attended by 25 participants. Participants were provided information on nutritional value of soya chaap.

A meeting with bank officials was organized on 3 March, 2023 to create awareness on food uses of soybean and to sort out problems related to sanctioning loan by the bank to entrepreneurs to set up enterprise, after getting training from the institute. Total nine bank officials participated in the meeting.

An online meet with officials of Food Processing Department, Government of Meghalaya was organized on 7 March, 2023 to create awareness on food uses of soybean and its health benefits and attended by 25 officials.



TECHNOLOGY TRANSFER/ TRAINING

Activities organized under SCSP programme

Under SCSP programme, training programmes on 'Women-friendly agricultural engineering technology, agro-processing and soybean processing for drudgery reduction and entrepreneurship development' of seven days duration each were organized. A total of 313 women SC-BPL beneficiaries from Bhaishkheda, Bandikhedi and Karondiya and Purchhandawada villages participated in the trainings. Various CIAE technologies on farm machinery, women friendly equipment, soya processing equipment and products, processing technologies such as fruit and vegetable processing, onion storage, energy and irrigation aspects were demonstrated to the participants. Possible business/enterprise for the livelihood support and income generations was also presented to the trainees. On the occasion of International women's day, sickles were distributed to 41 women farmers of Bheru Pura under direct benefit transfer (DBT). Under DBT, a distribution programme was organised on 23 March 2023. In this programme, black gram and green gram seeds were distributed to identified 312 farmers of Bandikhedi, Bhenskheda, Karondia, Pura Chhindwara, Nipaniya Jat, Tarawali Kalan and Sagoni Jora villages of Bhopal district.

A field day under SCSP component of CRP on CA was organized on 11 January, 2023 for distribution and demonstration of CIAE multi-fuel cooking stove to 51 farmers of Manakhedi village, Sehore District under Direct Benefit Transfer to the SC (BPL). Field days were also organized at Jaitpura and Muriakheda villages on 27 and 28 February 2023. During the interaction with the farmers, information about renewable energy like biomass energy, solar energy applications, solar energy based vehicle for spraying and weeding operations,



biomass fired cook stove etc. was provided. A demonstration of biomass fired cook stove was also done.

Field demonstration of drone technology under SMAM scheme

Drone technology demonstration programme was organized for the farmers of Bagaroda and Parwaliya sadak villages of Bhopal district during 10-12 January, 2023. The drone spraying system with liquid nano-fertilizers was demonstrated to 60 farmers in 10 ha area of wheat field. Another demonstration programme was organized on 6 March, 2023 at Bhairapura village for 50 women participants from Bhairupura, Kalyanpura and Agariya villages in association with Reliance Foundation.



हिन्दी प्रशिक्षण-मय-कार्यशाला

संस्थान के मंत्रालयिक, प्रशासनिक एवं आशुलिपिक श्रेणी के अधिकारियों तथा कर्मचारियों के लिए दिनांक 19.01.2023 को "हिन्दी में नोटिंग और ड्राफ्टिंग कैसे करें" विषय पर प्रशिक्षण-मय-कार्यशाला का आयोजन किया गया। इसमें १२ अधिकारियों एवं १६ कर्मचारियों सहित कुल २८ प्रतिभागी उपस्थित थे, जिनमें १ वैज्ञानिक, ५ तकनीकी श्रेणी के अधिकारी/कर्मचारी भी शामिल हुए। मुख्य प्रशासनिक अधिकारी श्री अभिषेक यादव की अगुवाई में आयोजित इस कार्यशाला में उप निदेशक (राजभाषा) राकेश कुमार ने प्रतिभागियों को राजभाषा नीति, नियमों एवं व्यवस्थाओं



EXTENSION ACTIVITIES/ AWARDS/ PUBLICATIONS

की प्रारंभिक जानकारी देते हुए सरकारी कामकाज के दौरान हिन्दी नोटिंग एवं ड्राफ्टिंग के दौरान आने वाले समस्याओं एवं आमतौर पर प्रयोग में लाई जाने वाली नोटिंग के बारे में प्रशिक्षण प्रदान किया। प्रशिक्षण के दौरान प्रतिभागियों की शंकाओं का मार्गदर्शी समाधान भी किया गया।

Media Activities

Name and Designation	Topic	Date	Media
Dr. CR Mehta Director	महिलाओं के लिए उपयोगी कृषि यंत्र	12 January, 2023	Akashvani, Bhopal
Dr. Dilip Jat Scientist	कटाई-गहाई के उन्नत कृषि यंत्र	6 March, 2023	DDK, Bhopal
Dr. SK Chakraborty Principal Scientist	मोटे अनाजों के प्रसंस्करण से उद्यमिता	12 March, 2023	AIR, Bhopal
Dr. UR Badegaonkar Principal Scientist	रबी फसलों की कटाई एवं खरीफ फसलों की बुआई हेतु कृषि यंत्र	18 March, 2023	AIR, Bhopal

KVK Activities

Following trainings programmes were organized by the KVK, ICAR-CIAE Bhopal during the quarter. Total 174 participants attended these training. In addition, six exposure visits were organized for about 300 officials of line departments and NGOs .

- Seed production technology of crops and vegetables
- Seed production technology of cereal crops
- Soya processing and industrial training programme
- Farmers and FPOs training programme organized in association with NSC, Bhopal.

Awards and Recognitions

Dr. Satya Prakash, Scientist was conferred with Shree A. Rama Rao Best Ph.D. Thesis Award - 2022 by Indian Society of Weed Science.



Dr R Senthilkumar, Senior Scientist received 'Dr APJ Abdul Kalam Best Scientist Award' by BSS Society sponsored by Tamil Nadu Scientific Research Organisation.



Dr. MK Tripathi, Principal Scientist was selected as NABL assessor in National Accreditation Board for Testing and Calibration Laboratories (NABL).

Ph.D. Awarded



Er. Abhishek Waghaye, Scientist (SS) was awarded Ph.D. for thesis entitled "Hydro-meteorological mapping and modelling of hydrological processes for managing surface and groundwater resources" by ICAR-IARI, New Delhi on 15 February, 2023. He completed his Ph.D. under the guidance of Dr. DK Singh, Professor & Principal Scientist, Division of Agricultural Engineering, ICAR-IARI, New Delhi.



Mr. Muzaffar Hasan, Scientist (SS) was awarded Ph.D. for thesis entitled "Development and functional characterization of anthocyanin fortified fermented soymilk" by ICAR-IARI, New Delhi on 24 February, 2023. He completed his Ph.D. under the guidance of Dr Anil Dahuja, Principal Scientist, Division of Biochemistry, ICAR-IARI, New Delhi.

Publications

Research papers

Chakraborty SK, Subeesh A, Dubey K, Jat D, Chandel NS, Potdar R, Rao NRNVG and Kumar D. 2023. Development of an optimally designed real-time automatic citrus fruit grading-sorting machine leveraging computer vision-based adaptive deep learning model. Engineering Applications of Artificial Intelligence, 120, 105826.

PUBLICATIONS/ HRD

Human Resource Development

Name and Designation	Course Title	Duration	Venue/ Place
Dr. Shashi Rawat, Principal Scientist	Python for artificial intelligence in agriculture	2-12 February, 2023	ICAR-IASRI New Delhi
Dr. Manish Kumar Er. HS Pandey Scientists	Integrating precision agriculture tools with conservation agriculture for improving input use efficiency, resource conservation and farmers income	15-24 February, 2023	ICAR-IISS Bhopal
Er. Vijay Kumar Er. Deepak throat Er. HS Pandey Er. Sweeti Kumari Scientists	Big data analytics in agriculture	9-10 March, 2023	ICAR-NAARM, Hyderabad
Dr. RK Sahni, Scientist	RPAS remote pilot training	20-25 March, 2023	PBC's Aero Hub, Pune

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Sawant CP, Singh KP, Singh RS, Lakaria BL, Nandeha N, Patel A, Gupta A, Kumar M, Kumar M, Vishwakarma AK, Pandey HS, Singh D, Khadatkar A, Babu VB, Magar AP and Mandal S. 2023. Irrigation and conservation agricul-

PUBLICATIONS

tural practices can improve crop yield, water productivity and energetics of chickpea (*Cicer arietinum* L.) in vertisols of central India. *Irrigation and Drainage*, DOI:10.1002/ird.2817.

Saxena CK, Rao KV Ramana, Chauhan D. 2023. Carbon footprint pattern among submersible pumps at farmers' field in selected districts of Madhya Pradesh. *Agricultural Engineering Today*. 47(1): 63-65. DOI: 10.52151/aet2023471.1629.

Senthil Kumar R and Achuthan S. 2021. Perceived usefulness of banana pseudostem processing and value addition among farmers at Coimbatore District. *Journal of Extension Education*, 33(2): 6679-6682.

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Singh D, Nandede BM, Sawant CP, Kumar M, Patel A, Sharma A, Vishwakarma AK and Bishwas AK. *Sansadhan Sanrakshan Hetu Upayogi Krishi Yantra*. *Technical Bulletin No. CIAE/AMD/TB/2023/344*.

EVENTS

RAC Meeting

The 28th meeting of Research Advisory Committee (RAC) of institute was held during 23-24 February, 2023 (Hybrid Mode) under the Chairmanship of Dr. NC Patel, Former VC, AAU, Anand. Members of RAC namely Dr. Balashankari, CEO-Renewable Cogen Globe-EECC, Chennai, Dr. KN Tiwari, Emeritus Professor, IIT, Kharagpur, Dr. GP Sharma, Former Professor, CTAE, Udaipur, Dr. PL Singh I/c ADG (FE), Dr. CR Mehta, Director-CIAE, Dr. Sandip Gangil, Member Secretary along with scientists of the institute participated in the meeting. The detailed presentations about progress of work done during last one year of different Divisions, AICRPs, CRPs were done by respective HoDs/PCs/LCPCs. RAC also visited different laboratories. The RAC suggested to work in advanced areas of agriculture and post-harvest management and to conduct research activities in line with the national programs and priorities. The RAC also emphasized that research outputs of the institute should reach to the needy people in and outside the country. It was also suggested for capacity building of Ag. Engg. scientists in other areas like electronics, computer applications, material science etc. and an increase in linkages with the manufacturers through possibility of exclusive licensing of the technologies. The RAC also visited Govt. Horticulture Farm, Kuthar to witness on-going FLD of KVK, Bhopal on "Tractor operated potato planter" for sowing of Potato variety Kufri Chipsona-1.

**Workshop-cum-Exhibition on Empowering Women Through Production and Processing of Millets**

In a bid to commemorate the International Year of Millets-2023, ICAR-CIAE, Bhopal organized a workshop-cum-exhibition in association with ICAR-CIWA,



Bhubaneswar on 'Empowering women through production and processing of millets' during 8-9 February, 2023. Around 350 people participated, including women farmers from Betul, Sheopur, Chhatarpur, Raisen, Sehore and Berasia districts; representatives from Women and Child Development Department, Govt of MP; MP State Rural Livelihood Mission; NGO's (Welt Hunger HiLife, MP Vigyan Sabha, Solidaridad, Sunrise Rural Development Society) and industries (Bio-Nutrients, Vasundhara Krishi Yantra, Dharti Agro, Shiv Agro Solutions, Raman Greens).

In the inaugural session of the workshop, Dr. CR Mehta, Director, ICAR-CIAE, informed the gathering about machineries available at the institute for production and processing of millets as well as value-added products. The Chief Guest, Shri Rajeev Chaudhary, Director (Directorate of Agricultural Engineering), Government of Madhya Pradesh shared his experience on how consuming millets had improved his health and hoped that women would come in good numbers to produce and process millets leading to an improvement of the health of the society along with women empowerment.

Dr. Mridula Devi, Director, ICAR-CIWA informed that continuous research and dissemination of millets technology would increase the income of women farmers and also provide health benefits. Information on the genesis and benefits of the workshop for the empowerment of women working in the area of millets was given by the Organizing Secretary, Dr. Dipika Agrahar Murugkar, Principal Scientist, ICAR-CIAE.

During two days workshop, technical sessions on millets were organized wherein experts working in the area

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shared their insight with women farmers. The technical sessions included insights on mechanization and processing machinery for millets, process technologies for millet products, entrepreneurship development and incubation. On 9 February, a farmers-stakeholders-Industry interface meeting was organized where leaders among the women farmers in FPO's were invited to share their experiences with the participants. A discussion on the use of women friendly tools and funding opportunities for women farmers was held. Many women led FPO's, entrepreneurs, NGO's working in the area of millets shared their experiences in the workshop. An exhibition was organized to demonstrate various millet processing equipment/ products developed by ICAR-CIAE as well as the products developed and marketed by women farmers.

Institute Foundation Day

Institute celebrated its 48th Foundation Day on 15 February, 2023. On this occasion, Dr. CR Mehta, Director of the institute welcomed the dignitaries and participants to the inaugural function and explained about the impact of agricultural engineering and its role in nation building. He presented details of the machinery and technologies developed by the institute over the year. The Chief Guest of the programme Dr. SN



Jha, DDG (Agril. Engineering), ICAR in his address underlined the role of ICAR-CIAE in agriculture and nation building. He also congratulated the institute for new innovations and emphasized on paying special attention to update and modernize the developed technologies at the institute to make it accessible to the stakeholders.

The renovated main gate and visitor room of the institute was also inaugurated by Dr. SN Jha. Dr. Praveen Sharma, Managing Director, Global Florex delivered the Professor AC Pandya Memorial lecture. The Directors of Bhopal based ICAR institutes (ICAR-IISS and ICAR-NIHSAD) and Director, Directorate of Agricultural Engineering, Madhya Pradesh also graced the occasion and applauded the importance and contribution of ICAR-CIAE in the field of Agricultural Engineering in their address.



Three progressive farmers were honoured for their significant contribution to agriculture. The employees of the institute who have completed 25 years of service were also honoured. The scientists and the students of the institute were honoured for their excellent scientific research papers. Several nutritional products developed by the institute were launched by the Chief Guest in the series of inaugurating the exhibition. About 100 farmers participated in the programme who also witnessed the innovations and contribution of the institute displayed in the exhibition. About 10 agricultural machinery manufacturers from Madhya Pradesh also participated in the exhibition and exhibited their developed machinery. Cricket and many other sports events were organized to celebrate the occasion.

EVENTS

Workshop on FPOs in Agriculture and Allied Sectors: Problems and Prospects

ICAR-CIAE, Bhopal and Kerala Agricultural University, Thrissur jointly organized a one-day workshop on 'FPOs in Agriculture and Allied Sectors: Problems and Prospects' under the KAU-ICAR-NAHEP-Sub-project on Profile Analysis of Farmer Producer Companies in India at ICAR-CIAE on 28 March, 2023. The workshop was intended to provide a platform for representatives from different farmer-producer companies in Bhopal district to discuss the challenges and opportunities FPOs face in India. Dr. CR Mehta, Director, ICAR-CIAE inaugurated the programme. PI and CCPI of the sub-project on Profile Analysis of Farmer Producer Companies in India Dr.

Sudheer KP, Dr. Ajesh Kumar V, Dr. Uday R. Badegaonkar, Head, TTD, and Mr. Dinanath Dhote, SHDM, Dept. of Horticulture, Govt. of Madhya Pradesh, handled different sessions of the workshop. Representatives from more than 15 FPOs attended the programme.

**Annual Workshops of AICRPs****Workshop of AICRP on ESA**

XIV Workshop of All India Coordinated Research Project on Ergonomics and Safety in Agriculture was inaugurated on 10 January, 2023. The session was chaired by Dr. SN Jha, DDG (Agril. Engg.), ICAR and Co-Chaired by Dr. PL Singh, Incharge-ADG (Farm Engg), ICAR and Dr. CR Mehta, Director, ICAR-CIAE. Dr. PK Nag, Former Director, NIOH, Ahmadabad and Dr. LP Gite, Former Scientist Emeritus, ICAR-CIAE, Bhopal were the distinguished experts. Dr. K Narsaiah, ADG (Process Engg), Dr. Mridula Devi, Director, ICAR-CIWA, Dr. M Din, Project Coordinator of AICRP on UAE, Research Engineers and Investigators of different cooperating centers were present during the session. Dr. SN Jha, DDG (Engg.), ICAR, New Delhi and chairman in his inaugural address emphasized the need of developing a comfort index. He stressed to have more projects on core mandate of the scheme of ergonomical studies.

**Workshop of AICRP on FIM**

XXXVII Annual Workshop of All India coordinated Research Project on Farm Implements and Machinery (AICRP on FIM) was organized at OUAT, Bhubaneswar (Odisha) during 19-21 January, 2023. The workshop was chaired by Dr. SN Jha, DDG (Agril. Engg.) and Co-Chaired by Dr. PL Singh, Incharge-ADG (Farm Engg). Prof. PK Roul, Vice Chancellor, OUAT, Bhubaneswar was the chief guest for the inaugural session. Dr. Kanchan Kumar Singh, Former ADG (FE) was the distinguished expert to review the progress of the centres. About 110 participants' that include scientists from ICAR-CIAE, Bhopal and OUAT, Bhubaneswar (Host organization), senior officials and Research Engineers/Pis and associated scientists from 25 centres of AICRP on FIM participated in this workshop. Around 341 projects and activities (i.e. 152 completed projects, 79 ongoing projects and 110 new proposals) were presented and discussed during the workshop.

EVENTS

Workshop on Millet Start-ups Opportunities

Workshop on Millet Start-ups Business Opportunities was organized at RC, ICAR-CIAE, Coimbatore on 24 January, 2023. Total 13 participants from various institutes, entrepreneurs and start-up attended the workshop. Participants learned operation of millet processing equipment, packaging techniques of millet and millet products. They also had group discussion for millet start-ups business opportunities.

**Lecture on Precision Agriculture organized**

ISAE Bhopal Chapter organized a lecture session on the topics 'Precision agriculture: The next gen Ag' and 'Scientific Writing' on 6 March, 2023. The speaker was Dr. Abhilash Chandel, Assistant Professor, Virginia Agriculture and Research Centre, USA. The scientists and Ph.D. students of the institute attended the lecture. Dr. Chandel had a detailed discussion and shared his work on precision agriculture, sensor technologies and application of machine learning and drone technologies in agriculture in Indian as well as American contexts. In his talk on "Scientific writing", the speaker presented some useful insights in scientific reporting.

**International Women's Day 2023 Celebrated**

International Women's Day was celebrated on 8 March, 2023 on the thematic area 'Accelerating equality & empowerment: How women's leadership & collective action can make a difference'. Since it is also the International Year of Millets, the "Importance of millets" in accelerating equality & empowerment was also highlighted. The staff, students, and family members of ICAR-CIAE attended the event. The occasion started with

a welcome address by Dr. Dipika Agrahar Murugkar, PS APPD and Chairperson of the Women's cell at ICAR-CIAE who spoke on the role of millets in not only improving the health of the women and their families but also as a source of income generation for equality and empowerment. Smt. Chanda Kumari, Manager, SBI-CIAE branch, Mrs Anita Mehta and Mrs Bedekar (retired employee, ICAR-CIAE) graced the function. A millet cookery contest was organized in which the participants were asked to use a majority of millets in savoury or sweet dishes. Emphasis was placed on the nutritional quality of the dishes presented. The dishes made by the participants were tried and savoured by all present. The best 3 dishes were awarded prizes. The contest was followed by a quiz contest and a cultural show put together by the women staff of the organisation.

**Republic Day celebration**

The 73rd Republic Day was celebrated in the institute premises with enthusiasm. Dr. CR Mehta, Director, ICAR-CIAE hoisted the National Flag and addressed scientists, officers and other employees. In his address, Dr. Mehta highlighted about the national agricultural scenario and significant role of the institute in agricultural engineering development in the country. He called upon everyone to understand their role and responsibility in the development and prosperity of the country.



QRT/ NEWS FROM PERSONNEL

QRT Constituted

The Council has constituted Quinquennial Review Team (QRT) to review the work done by the institute including its AICRPs on FIM, EAAI, UAE and ESA and CRP on FMPF and EA for the period 2017-22. The composition of the QRT is:



Dr. MM Pandey

Former DDG (Engg), ICAR
Chairman



Dr. Shridar B

Former Dean, AECRI, TNAU
Member



Dr. YC Bhatt

Former Prof & Head, MPUAT
Member



Dr. TK Bhattacharya

Emeritus Scientist, GBPUAT
Member



Dr. TK Satyanarayana

Former Registrar, ANGRAU
Member



Dr. SK Das

Dean, OUAT
Member



Dr. AK Dixit

Principal Scientist, ICAR-NDRI
Member



Dr. KVR Rao

Principal Scientist, ICAR-CIAE
Member Secretary

Dr. KP Singh joined as ADG (FE), ICAR



Dr. KP Singh, Principal Scientist, ICAR-CIAE has joined the ICAR Headquarters as Assistant Director General (Farm Engineering) after relieving from ICAR-CIAE, Bhopal on 14 March, 2023. Dr Singh did his graduation and post-graduation from GBPUA&T, Pantnagar in 1996 and 1999, respectively. He did his doctoral degree from IIT, Kharagpur in 2010. In twenty three years of his research career, Dr Singh was associated with development of 20 machines/hand tools, out of which, 12 were commercialized. Some of the machines/tools developed by him include potato combine, multi crop thresher for hills, bed planter-cum-mulcher for maize and wheat, economy seeder, multi crop dibbler, broad bed former-cum-seeder, multi millet thresher, seed drill with differential depth, two stage fertilizer application systems Vivek thresher-1, VL Paddy thresher, VL seed-cum-ferti drill, insect trapping device etc. Vivek Thresher-1 was adjudged as one of the five best inventions for the year 2006 under NRDC Award. He received ASPEE award from ISAE, New Delhi in 2010 for successful commercialization and adoption of VL paddy thresher and Vivek thresher-1. Besides, other awards, Dr. Singh received Fellowship of NAAS in 2019, He has published about 70 research papers in peer reviewed international journals and national journals.

NEWS FROM PERSONNEL

Our New colleagues



Dr. Nita Khandekar, joined as Principal Scientist on transfer from ICAR-IISR, Indore on 27 March, 2023.



Dr. Gopal Carpenter, joined as Scientist on transfer from ICAR-CISH, Lucknow on 23 March, 2023.

Staff Promoted



Dr. V Bhushana Babu
Senior Scientist
(Agricultural Statistics)
wef 21 June, 2016



Dr. Manoj Kumar
Senior Scientist
(Farm Machinery & Power)
wef 12 May, 2020



Dr. BM Nandede
Senior Scientist
(Farm Machinery & Power)
wef 1 January, 2022



Dr. Sandip Mandal
Senior Scientist
(Farm Machinery & Power)
wef 13 February, 2022



Dr. AK Roul
Senior Scientist
(Farm Machinery and Power)
wef 26 July, 2022



Dr. Muzaffar Hassan
Scientist (Pay level-11)
(Plant Biochemistry)
wef 5 July, 2022



Shri Ravindra Singh
Chief Technical Officer
wef 1 January, 2022



Shri AP Shilarkar
Chief Technical Officer
wef 27 April, 2022



Shri AK Sainy
Senior Technical Officer
wef 20 January, 2022



Shri Bhagwan Sahay
Technical Officer
wef 1 July, 2022



Shri S Padmanaban
Technical Officer
wef 17 February, 2022



Shri VK Darwai
Senior Technician
wef 7 February, 2022

NEWS FROM PERSONNEL

Staff Promoted



Shri Prakash Patil
Assistant Administrative Officer
wef 16 January, 2023



Shri BP Vishwakarma
Assistant Administrative Officer
wef 1 February, 2023



Shri Radheshyam Maskole
Lower Division Clerk
wef 17 January, 2023

Staff Superannuated



Dr Maharani Din
Project Coordinator, AICRP on ESA
31 January, 2023



Shri Banmali Bhaskar
Technical Officer
31 January, 2023



Shri OP Rajak
Assistant Administrative Officer
31 January, 2023



Shri CP Mishra
Assistant
31 January, 2023



Shri MB Topre
Technical Officer
31 March, 2023



Shri MS Thakur
Senior Technical Assistant
31 March, 2023



Shri R Chandran
Skilled Support Staff
31 March, 2023

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Phone: 91-755-2737191 **Email:** director.ciae@icar.gov.in, directorciae@gmail.com **Web:** <https://ciae.icar.gov.in>