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ICAR-CIAE NEWSLETTER
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From the Director's Desk

India's agricultural sector is on the cusp of a transformation. While traditionally reliant on manual labor, a wave of mechanization is sweeping across farms, and advancements in food processing are reducing waste and adding value to farm produce. Adoption of cutting age technologies like farm robots, drones, application of AI and other computing tools are taking Indian agriculture to new heights. This confluence of technology holds immense potential for the nation's food security and economic growth.

On the mechanization front, the government's push for "farm power" is yielding results. Recent reports indicate a national average of 47% mechanization level, with states like Punjab and Haryana leading the charge. Tractors and other equipment are mechanizing farm operations, leading to increased productivity and efficiency of land and labour. This is particularly crucial as the agricultural workforce shrinks due to urbanization. CIAE's effort to design and develop sensor based technologies are feather to the cap of Indian farm mechanization. However, challenges remain. The dominance of small and marginal landholdings makes large-scale mechanization difficult. The north-eastern states, for example, lag far behind in adopting these technologies. Government initiatives promoting smaller, more affordable equipment and custom hiring services are steps in the right direction.

The story is similar in food processing. India experiences significant post-harvest losses due to inadequate storage and processing facilities. However, there's a positive shift. Investments in modern processing units are on the rise, focusing on fruits, vegetables, and dairy products. This not only reduces spoilage but also extends shelf life, creates new markets, and increases farmer incomes. The road ahead necessitates a multi-pronged approach. Encouraging research and development of smart farm machinery suitable for smallholdings is key. Additionally, strengthening rural infrastructure, including cold storage facilities and transportation networks, will bolster the food processing sector. In conclusion, the winds of change are blowing through Indian agriculture. By embracing farm mechanization and investing in food processing, India can not only ensure food security for its growing population but also empower farmers and create a more robust and sustainable agricultural ecosystem. This is a transformation with the potential to uplift millions and solidify India's position as a global agricultural leader.

This issue of the newsletter focuses on research and development of various aspects of farm mechanization, food processing, energy and irrigation in agriculture. Some of the notable technologies developed in this period are image based variable-rate nitrogen applicator, unmanned multi-purpose track-type vehicle, tractor operated sugarcane leaf detrasher cum shredder, head feed type linseed thresher, energy-rich syngas generation, peeling machine for tender jackfruit and nutri-sorghum milk. CIAE feels proud to inform granting of 6 patents and three copyrights. As the Director of ICAR-CIAE, it is my immense pleasure to share this issue of Newsletter.

DIGEST

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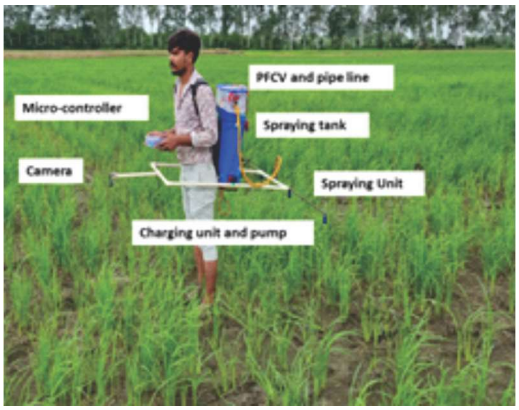
RESEARCH & DEVELOPMENT

Image based Variable-rate Nitrogen Applicator

An image-based variable-rate applicator has been developed to spray liquid nano nitrogen fertilizer on rice and wheat crops. It applies liquid nano nitrogen fertilizer in variable quantities based on the requirements of the crops. The developed hardware system comprises of a camera, Raspberry Pi micro-controller, power bank, HDMI display, proportional flow control valve (ASCO, USA), driver, knapsack sprayer pump, and boom fitted with nozzles (4 Nos.). An embedded system was developed to operate the proportional control valve based on the nitrogen stress level within a field. The micro-controller activates the proportional control value using a Sabertooth DC-powered driver. The proportional flow control valve regulates the fertilizer rate based on the crop stress measured from real-time images collected with a camera. Python 3 code was developed in Thonny software on a Raspberry Pi 4 for operating the proportional flow control valve. The sprayer adjusts the liquid fertilizer rate based on the N stress level, and four hollow cone nozzles uniformly spray the fertilizer in a 1.2 m width in the paddy field at a speed of 1.8 km/h. The developed system was tested in paddy and wheat crops for foliar application of liquid fertilizer with more than 70% stress identification accuracy.



Unmanned multi-purpose track-type vehicle

An unmanned multi-purpose track-type vehicle has been developed for small farms and hilly areas. The developed machine is equipped with 8.9 kW petrol engine, hydraulic transmission system, tracks and remote-control system. The track system consists of rubber track, load wheels, tensioners, drive wheels, rubber track tyres and chassis frame. Hydraulic

transmission system is actuated by remotely-controlled electronic solenoid valves. The remote-control system controls direction, speed, brake and equipment function during agriculture operation. The multi-row planter and rotary weeder have been developed as an attachment to the track-type vehicle. The field capacity and field efficiency of the system were reported as 0.16 ha/h and 78% for carrot planting. The developed weeder as an attachment to unmanned track-type vehicle was also tested at sugarcane field. The field efficiency, weeding efficiency and plant damage by developed machine were 76%, 91% and 1.2% respectively.

Tractor operated sugarcane leaf detrasher cum shredder

Sugarcane leaf removal is very labour intensive and time consuming operation. About 300 man-hours per hectare are required for leaf removal and harvesting of sugarcane crop. Standing sugarcane crop without leaves is also pre-requisite for operating sugarcane harvesters. Conventional detrashing by hands leads to serious health hazards for the labours. In manual leaf detrashing, leaves are not removed properly. In order to mechanize sugarcane leaf detrashing cum shredding operation, tractor operated sugarcane leaf detrasher

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cum shredder has been developed at MPKV, Rahuri centre of AICRP on FIM. The developed equipment was evaluated at Karveer, dist. Kolhapur in 13.09 ha area for 42 h. The effective field capacity of the machine was 0.31 ha h^{-1} and field efficiency was 82%. The net saving by using this machine was Rs.9,300/ha i.e. 83.70% over conventional method.

Development of linseed threshers

a) Electric motor powered head feed type

The conventional method of threshing linseed involves significant manual labour, making it a time-consuming and arduous task for farmers. The traditional approach to linseed threshing relies on manual beating with sticks, trampling by bullocks, or repeatedly passing a tractor over the plants. This process aims to separate the capsules from the plants, extract the seeds from the capsules, and clean them. All the available methods thresh the crop but not able to separate the stem and capsules for further value addition to the stem fiber. Therefore, there is a need for a specialized thresher that can simultaneously perform both threshing and stem separation operations. By considering above facts, a head feed type linseed thresher has been developed at AICRP on FIM, IGKV Raipur centre. The developed prototype consists of threshing drum, concave unit and reciprocating sieve unit. The principle of working of thresher is to remove the capsule from the plant, separate the seeds from the capsule, and clean the seeds from the remaining capsule. This prototype operating as a "hold on" type was designed to not only separate linseeds but also preserve the stalks for potential fibre extraction. This thresher is operated by 0.375 kW electric motor and useful for small farmers. The threshing capacity of the prototype was observed as 178 kg/h with 99% efficiency. The cost of machine is Rs. 50,000/- and the operating cost is Rs. 90 per hour. The developed machine has an output of 17.8 times more than the traditional method.

b) Bullock powered linseed thresher

In another development, bullock operated linseed thresher has been developed by OUAT Centre of AICRP on UAE. The average output capacity of the thresher was 23 kg/h. The average threshing efficiency of the thresher was 96%. It was observed that the threshing efficiency increased with increase in moisture content of ear head and concave clearance. The average cleaning efficiency was 95% which was decreased with increase in concave clearance. The average percentage of grain breakage was 0.7%.

Battery powered two row manual paddy transplanter for root wash seedlings

Dr. BSKKV, Dapoli center of AICRP on ESA modified a cranking type transplanter to be operated by a DC motor. The required cranking force was 75 N and missing hills were 12.5% for optimized cam profile. The field capacity of the modified unit was also higher than hand

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cranking type transplanter. Ergonomic evaluation of the developed transplanter was also carried out. Biomechanical models showed that maximum shear force at L4/L5 was reduced from 122 N to 48 N, while maximum compressive force was reduced from 660 N to 615 N during operation with battery powered and manual cranking of the transplanter, respectively. Comparative ergonomic evaluation indicated that the overall discomfort rating for cranking type transplanter was 'more than moderate discomfort' and for battery powered transplanter it was 'moderate discomfort'. Body parts discomfort score for cranking type and battery powered transplanter were 16.6 and 10, respectively.

Energy-rich syngas generation through low-cost catalytic gasification

TNAU, Coimbatore centre of the AICRP on EAAI studied selected agricultural wastes such as coconut shells as feedstock for energy-rich syngas production. The biomass gasification system used in the study consisted of a fixed bed downdraft biomass gasifier (capacity: 10 kg h^{-1}; thermal capacity: 12 kW), a cleaning system, a blower, and a burner. Waste eggshells were used to synthesise the calcium oxide (CaO) via calcinations to be used as catalyst in the gasification process. Response Surface Methodology (RSM) - Central composite design (CCD) has been employed to optimize process parameters. The experimental results showed that the maximum syngas yield (2.4 m^3 kg^{-1}) and cold gas efficiency (70.14%) were achieved under optimum conditions (equivalence ratio of 0.25 and catalyst loading of 29%). From the results, it can be concluded that syngas yield and cold gas efficiency are increased with increase in equivalence ratio and catalyst loading.

The average temperature at oxidation and pyrolysis zones in the gasifier was 433 and 815°C, respectively. The tar removal efficiency and particulate matter content were 83% and 7 mg Nm^{-3}, respectively. From the composition analysis of syngas, it was observed that hydrogen and carbon monoxide contents increased by 8.4 and 7.1%, respectively. The calorific value of syngas enhanced from 4.8 to 5.5 MJ/Nm^3.

Peeling machine for tender jackfruit

Tender jackfruit is quite popular as vegetable in human diet and now a days tender jackfruit in powder form has been emerged as a novel product and it has many food uses. However, peeling is one of the most important but tedious operation in processing of tender jackfruit. Manual peeling is cumbersome and risky as well. A peeling machine has been developed for removal of spikey peel of tender jackfruit. Jackfruit holding assembly and peeling arm with blade are the key components of the machine. Jackfruit is held vertically between the pair of pinned jaws. Provision has been made for tight gripping of the jackfruit in the holding assembly. A spring-loaded peeling arm having a peeling blade is to be fixed on the surface of the rotating jackfruit. During the rotational motion of jackfruit, the peeling arm moves linearly from top to bottom and peels the outer spikey peel of the jackfruit. Rotational speed of jackfruit, linear speed of peeling arm and location of peeling blade are the key operating parameters of the machine. The peeling efficiency of the machine has been found to be 90-95 % with a peel loss of about 3-4% only at a rotational speed of 80 rpm and linear peeling speed of 0.005 m/s. The machine takes about 40-50 s to peel a tender jackfruit weighing about 2.5-3 kg. The machine is operated by an electric motor (1.47 kW) and its output capacity is about 120-130 kg/h.

RESEARCH & DEVELOPMENT

Nutri-Sorghum Milk

The development of sorghum-based ready-to-drink milk and beverages is an innovative and nutritious option for consumers, especially those seeking lactose-free and gluten-free alternatives. Fermented sorghum was used as the base material for the development of the sorghum-based ready-to-drink milk and beverages. This formulation results in a high-fat content due to use of coconut milk. The sorghum milk is prepared through a series of processing steps including fermentation, cooking, grinding, homogenizing, and pasteurization. The whole sorghum grain was fermented using 2% LAB culture at 37°C for 10 h. Pasteurization was also conducted at 72° C for 15 min to ensure safety, quality, and nutritional integrity. The beverages combine fermented sorghum with coconut milk, imparting a rich creaminess to the final product. The sorghum milk has a fat content of 4.4 g/100 ml, protein content of 1.75 g/100 ml, and total carbohydrate content of 10 g/100 ml. The protein content is comparable to other non-dairy beverages. Optimized beverage was found to be acceptable to consumers, with an overall acceptability score above 7 on a 9-point hedonic scale. The developed sorghum milk exhibits antioxidant activity, with a free radical scavenging activity (RSA %) of 73. Sorghum-based milk can serve as a calorie-rich snack or supplement, providing essential nutrients and potentially improving nutritional status. Additionally, it is suitable for individuals with dairy allergies or intolerances and is naturally gluten-free, catering to individuals with gluten sensitivities.

Process Protocol for edible coating of tomato using dipping method

Fruits and vegetables are considered as perishable commodity because they continue to respire even after their harvest. In recent years, application of edible coating has shown positive results on the shelf life extension of fresh produce. In this study, the carboxyl methyl cellulose (CMC) as a polysaccharide base is used for the development of coating for fresh tomatoes. The concentrations (1, 2, 3, 4%) of CMC based edible coating with 40% glycerol (dry weight of the starch) were applied on the surface of tomato and optimized based on the

Days	Control	Coated
0		
3		
6		
9		
12		
15		
18		

RESEARCH & DEVELOPMENT/ SUCCESS STORY

maximum reduction in physiological weight loss (PLW). Thereafter, the concentration (0.25%, 0.5% and 1%) of lemon grass essential oil (LEO) was optimized with 1% of mango kernel starch (MKS) based edible coating for tomato. The results showed that the edible coating for 1% MKS with 0.5% lemongrass essential oil with 40% (w/v) glycerol have shown the maximum reduction of PLW and total yeast and mold count. The effect of selected and optimized CMC based edible coating with essential oils was investigated on the post-harvest shelf life of tomato at room (23±2°C) temperature. The CMC based edible coating composite with lemon grass essential oils caused retarded loss in water, higher firmness, better color attributes, visual appearance, anti-microbial and antioxidant activity of the fruits. The self-life of edible coating treated tomato was 15 days at room temperature.

New External Funded Projects

Title of the Project	Budget (Rs in lakhs)	Funded by
Development of robotic harvester for grapes bunches	80.32	ICAR-NASF
Empowerment of Tribal Farmers' Societies through Smart Agri mechanization Packages in Tribal Areas of Tamil Nadu	311.91	Directorate of Tribal Welfare, Govt. of Tamil Nadu
Rural Technology Action project (RuTAG 2.0) (Lead Institute: ICAR-NAARM, Hyderabad), Total Fund: Rs.151.45 lakhs	50.00 (for CIAE)	Office of Principal Scientific Advisor, GoI, New Delhi

SUCCESS STORY

Technology Dissemination and Agricultural Engineering Interventions to Provide Livelihood Support and Economic Development to Rural Community under SCSP programme

Under this programme, total 53 number of villages (21 in Bhopal, 10 in Ujjain, 10 in Datia districts) of Madhya Pradesh and 12 villages (6 in Coimbatore; 4 in Erode; 2 in Permabalur districts) of Tamil Nadu were identified in which total 6347 SC-BPL beneficiaries family indicating total of 31,735 number of rural populations were benefitted by means of awareness/ training/ field days/ nutritional fairs/demonstration/ skill development programmes (total 124). These training programmes created awareness among the beneficiaries for agricultural engineering machineries and enterprise development in agriculture and allied aspects. The key areas of these trainings were in food processing (EDP), soybean processing, farm mechanization, renewable energy and irrigation.

Distribution of agricultural and allied tools and agricultural input material under direct benefit transfer is also one of the key activities of SCSP project for the livelihood support of beneficiaries. Total 8014 number of agricultural tools/equipment, 24 tonne of seeds (wheat, gram and maize) and 20 tonnes of fertilizers were distributed to total 6347 SC-BPL beneficiaries family indicating total of 31,735 number of rural populations. About 20-30% increase in yield of wheat crop has been obtained by the farmers of selected villages of Bhopal districts though adoption of quality seeds. Distributed farm equipment like cono weeder, hand ridger, inclined plate planter, Naveen dibbler, twin wheel hoe, vegetable transplanter, stalk up rooter, dry land weeder are useful to the farmers for carry out different operations in crop production and reduction in drudgery of workers. About 40-50% of beneficiaries have adopted the distributed equipment for their farm operations and it has recorded about 20% increase in productivity of crops like wheat, soybean, rice and vegetables. The adoption rate of some of the small manual tools and equipment is around 50% while the adoption rate of some promising tools and equipment's like spiral grader, maize sheller, groundnut decorticator, irrigation pipes, pumps, water storage tanks, wet grinder, storage tanks etc. are about 90-100%. A set of soya processing equipment (wet grinder, storage tank, pressure cooker) distributed to 151 beneficiaries are being used for the soya and other food processing (fruit, vegetables) at domestic scale to prepare soya milk, tofu, tomato puree. Cleaning and grading of food-grains is providing about 20% more returns to the farmers. A set of drip-tape for irrigation was distributed to 100 farmers of Coimbatore and it helped in enhancing profitability for coriander crop in Coimbatore district. The distribution of sprayer, irrigation pipe and motor etc. enhanced the water use efficiency in the farmer's fields and resulted in higher productivity of 3000 farmers. The impact of skill development training to rural women and distribution of women friendly technology reduced the drudgery during farm operations and developed rural agro enterprises and provided livelihood support to total 2500 women.

TECHNOLOGY TRANSFER

Drone Demonstration

Drone demonstration was conducted under Sub-Mission on Agricultural Mechanization (SMAM) scheme during 15 January to 19 February, 2024 at Khamkheda, Shahpur, Devpur, Barodi, Sagonia, Jaitpura, Lamba Kheda, Nipania and other villages of Bhopal district. The demonstration was conducted for farmers of the villages in an area of 200 ha. The drone spraying was conducted with nano urea/DAP in wheat crop. The crop parameters, weather parameters, chemical details etc. were recorded.

Demonstration of Agricultural Mechanization and Food Processing Equipment

Field day cum demonstration programme on 'Agricultural Mechanization and Food Processing" was organized at Indargardh village of Datia district. About 150 farmers attended the programme. Information was provided to the farmers about the institute and activities of SCSP programme. Some equipment like groundnut decorticator, cook stove, maize sheller, soya milk and tofu production process were demonstrated to the benefecairies.

Technology and Machinery Demonstration Mela

The Technology and Machinery Demonstration Mela is a large event held at the Central Institute of Agricultural Engineering in Bhopal, and the centres of AICRP schemes operated from the institute every year in the month of February. The event showcases the latest agricultural machinery and technologies from all over India. Farmers visit the mela to learn about new agricultural engineering products and technologies and see them in action. They can also talk to experts about how to use these new technologies to improve their farms. The mela is a great opportunity for farmers to network with other farmers and learn from each other.

Melas were also jointly organized by AICRPs on Farm Implements and Machinery, Ergonomics and Safety in Agriculture, and Post-Harvest Technology, and Agricultural Machinery Manufacturers. More than 1.75 lakh farmers participated at different centers during the month of Feb., 2024. Over 1.75 lakh farmers witnessed display and demonstration of more than 40 different types of farm and processing machinery. This year institute celebrated this event on 14th Feb., 2024 with much enthusiasm and showcased the latest machines and equipment developed at the institute. About 900 farmers from different parts of the Madhya Pradesh participated in the event. CIAE Regional Station at Coimbatore also organized the Mela in association with TNAU and centres of AICRP schemes on 13 February, 2024 and participated by about 600 farmers from different districts of Tamil Nadu.

TRAINING

Winter School

ICAR-Sponsored Winter School on "Artificial Intelligence, Electronic Devices, and IoT for Transforming Agriculture with Cutting-Edge Technologies" was organized during 3-23 January, 2024, attended by 22 participants. The program was designed to update the skills and knowledge of the researchers/ teachers/ extension specialists involved in the field of design, development, and extension activities related to the Internet of Things, electronic devices, artificial intelligence, machine learning, deep learning, and algorithm development. Dr Seema Jaggi, ADG (HRD), ICAR was the chief guest of the valedictory function. The course director of the winter school was Dr NS Chandel, Senior Scientist and Dr Dilip Jat, Scientist was the Course Co-Director.

CAFT programmes

ICAR sponsored advanced faculty training on "Power Rich" Bio-functional Foods: Sustainable Technologies for Utilization, Processing, and Marketing was organized during 31 January to 9 February, 2024. The objective of this training programme was to create awareness among the participants regarding emerging prospects of power-rich food processing techniques, strength and pitfalls, their applications for entrepreneurship development and possible role in new business opportunities for economic security. The lectures, demonstrations, hands-on practicals on various topics were: overview of recent trends in power-rich food processing, opportunities for entrepreneurship development, nutritional profiling and chemical analysis; hyperspectral imaging approaches for food safety, various processing and value addition of soybean and millet, food safety and regulations under FSSAI: Role of GMP, GHP and HACCP in food processing industry, IPR and technology valuation in food products development and commercialization.

Another CAFT programme on Entrepreneurship Development through Mechanized Production, Processing, and Value Addition of Millets and their By-Products was organized during 22 February to 2 March 2024. This CAFT programme aimed to create awareness among the participants regarding the on-farm processing of millets, improved mechanized practices for millet production, processing technologies for value addition in millets, and millet by-product utilization for food and nutraceutical applications. Dr. Indra Mani, Vice-Chancellor, VNMKV, Parbhani was the Chief Guest of the inaugural session and Dr. NK Tyagi, former member of the ASRB, New Delhi, was the special guest. Seventeen participants from different institutions across various states of the country attended the training. Dr. C Tara Satyavathi, Director, ICAR-IIMR, Hyderabad graced the concluding session as the chief guest, while Dr. Nawab Ali, former DDG (Engg.), was the guest of honor. More than 20 experts from different organizations, including ICAR-CIAE delivered lectures and shared their views.

TRAINING

Hands-on Training on Women-Friendly Technologies

Hands-on training and demonstration of women-friendly improved agricultural tools and implements was organized under CRP on Farm Mechanization and Precision Farming (FMPF) during 17-19 January 2024. Total 40 farmers from two districts (Bhopal and Rajgarh) of Madhya Pradesh participated in this training programme. The various farm implements for seedbed preparation, sowing/planting and transplanting, spraying, intercultural operations as well as harvesting and threshing were demonstrated. Moreover, women-friendly improved tools/implements, conservation agriculture machinery, renewable energy technologies, protected cultivation techniques and soybean processing plant and their developed products were also demonstrated.

Training on Entrepreneurship Development in Agro-processing

Training on "Entrepreneurship Development in Agro-processing" was organized during 17-23 January 2024 for the SC-BPL beneficiaries under SCSP scheme. A total of 25 participants from Pura Chindwara and Bhainskhedi villages of Bhopal district participated in the training program. Training was provided on various post-harvest technologies developed by the institute such as primary processing machinery for fruits, vegetables and food grains, minimal processing, ripening chamber, onion storage, product development, packaging of food, agro-processing center and other facilities of the institute. Participants were made aware about the importance of the technologies and possible enterprise development in food processing sector.

Training-cum-exposure visit

Training on "Production, processing and value addition of millets in perspective of climate change" was organized during 29-31 January 2024, which was attended by 24 farmers. Exposure visit to millet growers of Tamia at Chhindwara district was organized.

Startup-Master Class Series and Bootcamp

A Startup-Master Class Series on "UNNATI - To Promote Innovation, Technology and Entrepreneurship in Agricultural Machinery / Manufacturing" was organized during 19 February to 13 March, 2024. Total 110 students, farmers, technology seekers etc. attended online live lectures on various topics related to agricultural machinery/ manufacturing, crop residue management, agritech startups, intellectual property rights, etc. The shortlisted participants were then invited to the Institute to participate in two days bootcamp to see various facilities under Agri-Business Incubation center and get hands-on experience on machinery manufacturing and operating process.

TRAINING

EDP on Soy Food

An entrepreneurship development programme on 'Soy-Food for Upcoming Entrepreneurs' was organized during 11-15 March 2024. The programme was attended by 6 trainees from Madhya Pradesh and Maharashtra. The training module primarily consisted of practical demonstrations and hands-on training supported by theoretical aspects. 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 were covered during the training programme. The health benefits of soybean and their nutraceutical properties were discussed and a guest lecture on financial support was also organized. A visit to a nearby soybean-processing unit was arranged for the trainees to provide practical insights.

Custom Hiring Training

Custom hiring trainings for giving farm machineries on rental was organized at the Institute during 29 January, 24 to 2 February, 2024, which was attended by 18 participants.

Training under DBT Kisan Hub Phase-II project

Under the DBT Kisan Hub Phase-II project, training on farm machinery with a major focus on conservation agriculture and resource conservation machinery was organized on 6 February 2024 at ICAR-CIAE Bhopal. A total of 20 farmers from the Khandwa district attended the training programme. The objective of training was to demonstrate the various machinery developed by the institute including conservation agriculture and resource conservation machinery. The training was provided on the use of drone technology in agriculture, cotton mechanization, machinery for conservation agriculture and protected cultivation technology. The information on soy processing equipment and different soy-based food products was also provided to the farmers.

TRAINING

Training organized by Regional Station, Coimbatore

Sl. No.	Tittle of Training	Date	No of participants
1	Students internship training	4 December, 2023 to 29 February, 2024	7 students from Sri Shakthi Institue of Technology, Coimbatore
2	Fruits and vegetable processing at RCT, Vadavalli, Coimbatore	4 January, 2024	40 entrepreneurs/students
3	Agril. machinery usage and field demonstration, training of sub surface irrigation and their benefits at Karamadai block, Coimbatore	30 January, 2024	40 farmers from Thookanaicken Palayam, Erode Distt. (TN)
4	Women friendly technologies for Groundnut, Onion and Maize crops	2 February, 2024	20 SC BPL Farmers
5	Operation and maintenance of farm equipment at KVK, Perambalur	9 February, 2024	26 SC BPL farmers

Training organized by KVK

Sl. No.	Training	Date	No of participants
1.	Training programme under Rural Agricultural Work Experience (RAWE) for B.Sc. Agriculture final year students from LNCT, university, Bhopal and SSSTMU, Sehore	20 September, 2023 to 6 February, 2024	54
2.	Training-cum-Exposure visit from National Institute of Women, Child and Youth Development, Bhopal	23-24 January, 2024	89
3.	Training-cum-Exposure visit from Indian Farm Forestry Development Co-operative (IFFDC) LTD. Bhopal	5 March, 2024	22

INTELLECTUAL PROPERTY RIGHTS

Patents Granted

Type of patent	Title of the patent	Scientist Name	Patent/ Design No.
Design Patent	Singulation and pickup mechanism for bare root seedlings of onion, cuttings and the like	Dr. Ajit Magar, Dr. BB Gaikwad	514390
Design Patent	A tractor- operated grass seed harvesting apparatus	Dr. CS Sahay, Dr. Deepak Thorat, Dr. PK Pathak	524257
Design Patent	Multi-millet thresher cum dehuller	Dr. KP Singh, Dr. Rahul R Potdar	525306
Design Patent	A sensor based intra-row weeding system (AICRP on FIM-IIT)	Dr. VK Tewari, Dr. Satya Prakash Kumar, Dr. Brajesh Nare, Dr. Abhilash Kumar Chandel, Dr. Chethan CR	508805
Design Patent	Pant-ICAR rotating drum batch type biochar production unit and method for production of biochar from loose biomass	Dr. Sandip Mandal, Dr TK Bhattacharya	519075
Design registration	Tractor operated single row maize cob picker (AICRP on FIM-PAU)	Dr. Balveer singh Meena, Dr. Atul Kumar Shrivastava, Dr. Kunal Bhalave, Dr. Prabhat Kumar Guru	397649-001

Copyrights Granted

Technology	Inventor	Copyright Number
Gravity-driven drip irrigation solutions for terraced and flat landscapes	Ghanshyam T. Patle & KVR Rao	L-140566/2024
Programming of fertigation controller for fertigation preparation and scheduling in soilless grow bag cultivation	Ravindra Dhondibhau Randhe, Murtaza Hasan, D. K. Singh, S. Naresh Kumar, Pramod Kumar, Wasi Alam and Indra Mani	SW-17733/2023
Printed circuit board (PCB) design for fertigation controller for fertigation preparation and scheduling in weight changes basi s in soilless grow bag cultivation	Ravindra Dhondibhau Randhe, Murtaza Hasan, D. K. Singh, S. Naresh Kumar, Pramod Kumar, Wasi Alam and Indra Mani	24650/2023-CO/SW

NEWS

MoUs signed

Memorandum of Understanding (MoU) was signed with Directorate of Tribal Welfare, Government of Tamil Nadu on 6 March, 2024 for facilitating and implementing the Tribal Livelihood Project on 'Empowerment of Tribal Farmers Societies through Smart Agri Mechanization Packages in Tribal Areas of Tamil Nadu' at Namakkal, Tamil Nadu. Sm. N Kayalvili, Minister of Adhi Dravida Welfare, Govt. of Tamil Nadu presided over the function and Dr Ravindra Naik, Head, CIAE-RS participated on behalf of CIAE. ICAR-CIAE shall take up baseline data collection and beneficiary selection, preparation of user friendly pictorial training manuals for all interventions. The major objectives of this project are (a) to identify the critical gaps and needs in agricultural mechanization adoption in selected tribal belts; (b) to establish 10 agri machinery banks (amb) for custom hiring operations by tribal farmers societies across state; (c) to undertake farm technological package interventions and AMB as business ecosystem for sustainable income generation; (d) to develop digital enabled smart apps for complete agri machinery solutions for pro-poor inclusive development in the project areas to cover approximately 3400 tribal farmers in three years.

A memorandum of Understanding (MoU) with **M/s Watershed Support Services and Activities Network (WASSAN),** an **NGO** based at **Hyderabad** was signed on 20 March, 2024 to jointly carry out extensive demonstrations of identified agricultural engineering technologies using the network of WASSAN. The dissemination and adoptions of the modern and promising technologies would benefit the pace of mechanization of animal husbandry and allied sectors in the selected areas for small holding farmers of rainfed areas.

Foreign Deputation

Dr. CR Mehta, Director, ICAR-CIAE attended Sixth Session of The Technical Programme Committee of African-Asian Rural Development Organization (AARDO) at Egypt during 4-8 February, 2024. During the Session, the TPC-6 reviewed the Technical Work Programme for the triennium 2021-23 as well as evaluated some of the training programmes organised at centres of excellence of AARDO. It also examined the draft work programme of AARDO for the triennium 2025-27 along with the suggestions and comments received from member countries on the work programme.

Ph. D Awarded

Dr. Gopal Carpenter was awarded Ph.D. for his thesis titled 'Design and development of a canopy volume based variable rate sprayer for mango orchards' on 09-02-2023. He did his Ph.D. from ICAR-IARI, New Delhi under the guidance of Dr Indra Mani,Vice Chancellor, VNMK, Parbhani.

Professional Attachment Training

Ms. Nisha Sulakhe, Scientist, ICAR-CISH, Lucknow underwent Professional Attachment Training on 'Packaging of fresh produce' during 4 December, 2023 to 2 March, 2024.

AWARDS/ HRD

Awards & Recognitions

Name & Designation	Details of award/ honour received for	Awarding Society/Institute
Dr. Manoj Kumar, Senior Scientist	Best scientist award in the field of Agricultural Statistics	Society of Krishi Vigyan at Fourth SKV National Conference held at Jabalpur during 1-3 March 2024.
Dr. Manish Kumar, Senior Scientist	Young scientist award in the field of Agricultural Engineering	Society of Krishi Vigyan at Fourth SKV National Conference held at Jabalpur during 1-3 March 2024.
Dr. Manoj Kumar, Senior Scientist	Best oral presentation award	National Conference on "Plant Health for Food Security: Threats and Promises" organized by Indian Phytopathological Society, held at ICAR-IISR, Lucknow during 1-3 February, 2024.

Human Resource Development

Name and Designation	Course Title	From	Organizer
Dr. Adinath Kate, Scientist	Pedagogy development Program	29 January to 2 February, 2024	IARI, New Delhi
Dr. Abhijit Khadatkar, Senior Scientist Dr. Deepak Thorat, Scientist	Refresher course on Robotics	19 February, 2024 to 2 March, 2024	UGC – MMTTC JNTU, Hyderabad
Dr. RK Singh, Principal Scientist	Introduction to Remote Sensing & Geographic Information System using QGIS	19-23 February, 2024	National Water Academy (Central Water Commission), Pune (online mode)
Dr Muzaffar Hasan, Scientist	Decoding Genomics & Proteomics Data using Machine Learning Approach	21-27 February, 2024	ICAR-IASRI, New Delhi (Virtual Mode)
Dr. Sweeti Kumari, Scientist	ICAR-sponsored CAFT training on "Entrepreneurship Development through Mechanized Production, Processing, and Value Addition of Millets and Their By-Products"	22 February, 2024 to 2 March, 2024	ICAR-CIAE, Bhopal
Dr. Abhijit Khadatkar, Senior Scientist Dr. Ajit Magar, Senior Scientist	Data Visualization using R	4-8 March, 2024	NAARM, Hyderabad
Dr. Dilip Pawar, Scientist Dr. Sandip Mandal, Senior Scientist	Pedagogy development Program	4-8 March, 2024	IARI, New Delhi
Dr Muzaffar Hasan, Scientist	Application of molecular and genomic tools for bio fortification in crops	5-7 March, 2024	ICAR- IARI, New Delhi.

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Final Meetings of the QRT

The Council constituted the Quinquennial Review Team (QRT) under the Chairmanship of Dr. MM Pandey, Former DDG (Engg.), ICAR to review ICAR-CIAE, AICRPs & CRPs for their achievements during 2017-2022. The team was entrusted with responsibility of reviewing the ICAR-CIAE along with four AICRPs and two CRPs for their achievements during the review period and recommending future programmes for next five years. The team reviewed the mandate, objectives and achievements of the Institute, its regional station at Coimbatore, 62 centres of four AICRPs along with 18 centres of CRPs. The QRT held its meetings at CIAE, Bhopal; ICAR-RCNEH, Barapani; MPKV, Rahuri; TNAU, Coimbatore; OUAT, Bhubaneswar and CCSHAU, Hisar to review and assess the achievements of institute and different centres of AICRPs and CRPs during 2017-2022. During the review process the team met various stakeholders including farmers, manufacturers, officials of state governments, custom hiring entrepreneurs to understand the liasioning of the Schemes with them. QRT also interacted with students and staff of ICAR-CIAE. After having several rounds of deliberations, the final meetings were held at the Institute during 12-14 February, 2024. During this meeting, the team formulated its report on achievements and recommendations.

Meeting of the IMC

The 54th meeting of the Institute Management Committee was held on 13 February, 2024. The meeting was also attended by the QRT chairman and members to present major recommendations to the Committee. Dr. CR. Mehta, Director chaired the meeting and was attended by Dr. KP Singh, ADG (Farm Engg.), ICAR; Er. Rajiv Choudhary, Director, Directorate of Agricultural Engineering, Govt. of Madhya Pradesh, Er. AK Upadhyay, Director, CFMTTI Budni, Dr. PK Sahoo, Principal Scientist, ICAR-IARI, New Delhi, Dr. CS Sahay, Principal Scientist, ICAR-CIAE, Shri Chanderkant Gour, Harda, MP and Shri Ravi Bhadra, SFAO, ICAR-IGFRI, Jhansi and Project Coordinators and Head of Divisions from the institute. Shri Abhishek Yadav, Chief Administrative Officer and Member Secretary briefed the members about the significant activities of the Institute and presented the agenda to the committee. The members appreciated the work and revenue generating activities being conducted in the Institute. The committee agreed to the agenda placed before the committee.

EVENTS

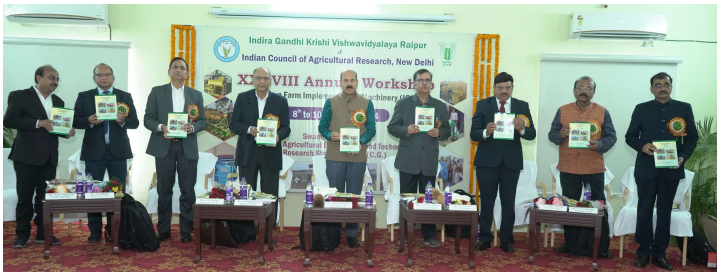
Foundation Day Celebration

Institute celebrated its 49th Foundation Day on 15 February, 2024. On this occasion, Dr SN Jha, DDG (Agricultural Engineering) was the Chief Guest. The chief guest Dr SN Jha, DDG (Agricultural Engineering), acknowledged the efforts of the institute and also motivated the staff to work hard for better prospects. He emphasized the importance of assessing the progress achieved by the institute and setting the future targets for the benefit of stakeholders. Dr CR Mehta, Director spoke about the contribution made by the Institute including the project achievements, publications, copyrights, awards, etc including upcoming challenges and opportunities. Dr Mehta extended his heartfelt congratulations to all the dedicated staff who have played a pivotal role in building the institute's legacy. Dr KP Singh, ADG (Farm Engineering) and Dr. K. Narasimha, ADG (Process Engineering) also joined online and extended their best wishes. Director, ICAR-IISS, Bhopal and Deputy Director, Directorate of Agricultural Engineering, Madhya Pradesh graced the occasion as guests of honour. Dr. Tarun Kumar Bhattacharya, Distinguished Scientist, Govind Ballabh Pant University delivered Prof. A.C. Pandya Memorial Lecture on 'Bioethanol and biogas policy and their possibilities in the Indian context'. Three progressive farmers were honoured for their significant contribution to agriculture. Institute's staff who have completed 25 years of service were felicitated for their contributions. The scientists and the students of the institute were honoured for their excellent scientific research papers. Winners of the ICAR Central Zone Sports meet were also honoured.

EVENTS

Workshop of AICRP on FIM

The 38th Annual Workshop of ICAR-All India coordinated Research Project on Farm Implements and Machinery (FIM) was organized at IGKV, Raipur during 8-10 January, 2024. The workshop was chaired by Dr. SN Jha, DDG (Agril. Engg.) and Co-Chaired by Dr. KP Singh, ADG (Farm Engg.) and Dr. CR Mehta, Director, ICAR-CIAE. Dr. Girish Chandel, Vice Chancellor, IGKV, Raipur was the chief guest of the inaugural session. Dr. VM Mayande, former Vice Chancellor, Dr. PDKV, Akola was the distinguished expert to review the progress of the centers. Senior officials and Research Engineers/ PIs and associated scientists from 25 centers of AICRP on FIM, project coordinators of the associated scheme(s) of agricultural engineering division, scientists from ICAR-CIAE and officials of IGKV, Raipur participated in this workshop. Dr. KN Agrawal, Project Coordinator, AICRP on FIM presented the progress of the scheme for last one year, which included 18 completed and 30 ongoing R&D projects, 55 PFT projects and 96 FLD projects. Dr. VM Mayande stressed upon the mechanization and said, "Changes in agriculture needs change in mechanization" and Dr. S N Jha spoke about the significant role of AICRP on FIM in the field of farm mechanization towards development of Indian agriculture. He also recommended that manufacturers seek assistance from diverse centers to address issues and demands specific to their regions. He emphasised the importance of manufacturers routinely visiting the websites of ICAR and the Ministry of Farmers' Welfare to stay informed about various government schemes. He enlightened the importance of robotics and drone technology in agricultural operations. During the event, a diverse range of agricultural machinery was presented in the exhibition, creating opportunities for engaging with various manufacturers of these machines. Dr. KP Singh emphasized that manufacturers should also consider the requirements of small landholding farmers, ensuring their safety during field operations. He also emphasized the advantages offered in the form of subsidies provided by the Government of India on agricultural machineries.



Workshop of AICRP on EAAI

The XXVII workshop of ICAR-All India Coordinated Research Project on Energy in Agriculture & Agro-based Industries (EAAI) was organized during 28-30 January, 2024 at Punjab Agricultural University, Ludhiana. The inaugural session of the workshop was held on January 29, 2024 under the Chairmanship of Dr. SN Jha, DDG (Agricultural Engineering), ICAR and Chief Guest was Dr. Satbir Singh Gosal, Vice Chancellor, PAU, Ludhiana. On 28th January, a technical session to discuss new research program for year 2024-25 was organized under the Chairmanship of Dr KP Singh ADG (FE), ICAR. An interaction session with the different stakeholders of renewable energy gadgets/equipment was also organized. DDG (Agril Engg.) suggested to all Research Engineers that national priority in the field of Bio Energy must be considered while preparing the new projects. There should be focus for commercialization of developed equipment. During the inaugural session, the publications of ICAR-CIAE Bhopal, CCSHAU Hisar, TNAU Coimbatore and SPRERI VV Nagar centres were released. Dr. VK Bhargav, Project Coordinator, AICRP on EAAI presented the Project Coordinator's report on the progress of work done by sixteen centres of the scheme and action taken report of last workshop, budget details significant quantified achievements, output, outcome and impact of the scheme.

EVENTS

Annual Workshop of AICRP on ESA

XV Annual Workshop of AICRP on 'Ergonomics and Safety in Agriculture (ESA) was organized during 20-21 March, 2024 in online mode. The workshop was chaired by Dr. S. N. Jha, DDG (Engg.) and Co-chaired by Dr. KP Singh, ADG (FE) and Dr. CR Mehta, Director, ICAR-CIAE. Dr. PK Nag, Former Director, NIOH, Ahmedabad and Dr. LP Gite, former Project Coordinator, AICRP on ESA, ICAR-CIAE, Bhopal were experts to review the progress of the centers. Dr. Sukhbir Singh, Project Coordinator (AICRP on ESA) presented the report of the scheme. PIs of respective centre presented their annual progress. About 42 participants participated in this workshop, which included the senior level scientists from ICAR-CIAE, senior officials and REs/PIs and associated scientists from 12 centers of AICRP on ESA. Chairman, Co-chairman and experts provided their keen observations, inputs and suggestions for improvement in research work of the cooperating centres.

Meeting of centres of AICRP on UAE

A virtual meeting for the approval of new research project proposals to be undertaken by centres of AICRP on Increased Utilization of Animal Energy with Enhanced System Efficiency was organized on 1 March, 2024. Dr. K. P. Singh, ADG (FE), ICAR presided over the meeting as chairman with Dr. CR Mehta, Director, ICAR-CIAE as co-chairman. Dr. KN Agrawal, Project Coordinator, AICRP on FIM, ICAR-CIAE participated in the meeting as a special invitee. Valuable comments were provided to improve the projects outcomes and deliverables. Chairman suggested the PIs to bring uniqueness to their projects. He appreciated the efforts in the new projects focussing on precision and AI-based initiatives related to Animal Husbandry mechanization. Twenty new research project proposals were presented by the respective Principal Investigators (PIs)/Co-Principal Investigators of cooperating centres.

International Women's day Celebration

The Institute Women's cell organized an educational trip to the CGIAR institute ICARDA located in Sehore district and to a women FPO in commensuration with the International Women's day celebration. The staffs of the institute were briefed about the activities of both the organization as an initiative to broaden the horizon of the women staff as well as students. On 5th March 2024 several programmes were organized. Dr Nita Khandekar, Chairperson, Women Cell, ICAR-CIAE, Bhopal, in her welcome address spoke about how the progress of women in our society can be accelerated. Mrs. Anita Mehta was the chief guest of the programme. Dr. C. R. Mehta in his presidential address focused on the importance of women in day to day life and also motivated everyone to achieve higher goals in our life. He acquainted the audience with the theme of the year "Invest in women: Accelerate progress". Dr Mehta further in his address told that this global occasion, dedicated to celebrating the social, economic, cultural, and political achievements of women, is symbolised by three distinct colours: Purple, Green, and White. These colours trace their origins back to the Women's Social and Political Union (WSPU) in the United Kingdom in 1908. The

EVENTS/ NEWS FROM PERSONNEL

Purple signifies justice and dignity, while Green embodies hope, and White represents purity. In line with the theme "Inspire-Inclusion" a talk was delivered by Ms Muskan Ahiwar, a young women, who inspires the slum girl children to read. She has been running the library "kitabimasti" at the Durganagar Colony, Bhopal since she was 9 years old. She has been a recipient to several awards from NITI Aayog as well as state government. The women staff, students, and family members of ICAR-CIAE attended the event. Earlier in the forenoon a rangoli competition was also organized for all the participants. A cultural programme was organized by the staff and their families in the afternoon session. The programme was co-ordinated by Dr. Harsha Wakudkar and Ms Dipika Shinde, Ms Sarita and Ms Priya Boarkar.

IJSC Meeting

Meeting of the Institute Joint Staff Council was held on 24 January, 2024.

BIS Manak Manthan programmme

Regional Station, Coimbatore organized a "Manak Manthan" programmme for Technical Discussion on "IS 19040:2023 Millet Dehusker - Specification and Test code" in collaboration with BIS, Coimbatore chapter on 22 February 2024.

Visit of Secretary, DoA&FW

Shri Manoj Ahuja, Secretary, Department of Agriculture and Farmers Welfare, Government of India visited Regional Station, Coimbatore on 9th March, 2024. He was accompanied by Mr. Samuel Praveen Kumar, Jt. Secretary, DAC & FW, GoI, New Delhi and Mr. T. R Kesavan, Group president, TAFE India. During the visit, equipment and technology developed by the Regional Station were demonstrated/displayed.

Republic Day celebration

The 75th Republic Day was celebrated with great passion on 26th January 2024. Dr. CR Mehta, Director, ICAR-CIAE unfurled the national flag with the singing of the National Anthem. At the outset, Director conveyed his warm wishes to all the members of CIAE family on the occasion of 75th Republic Day. He highlighted the key achievements of the Institute and complemented the staff members who brought laurels by winning awards and recognitions in various fora. He called upon all the members of the CIAE family to strive hard to take forward the momentum so as to realize the Vision of the Institute.

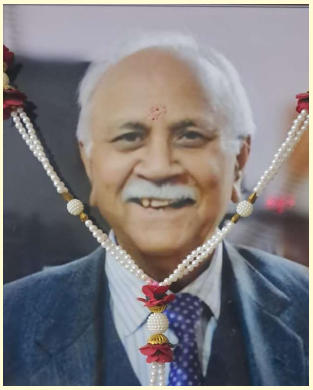
Our New Colleague

Dr. Sukhbir Singh, Principal Scientist (FMP) joined as Project Coordinator of All India Coordinated Research Project on Ergonomics and Safety in Agriculture on 15 February 2024. Dr. Singh has more than 23 years of working experience in different capacities starting as Asstt. Agril. Engineer (AICRP on FIM) at CSKHPKV, Palampur; Sr. Scientist (FMP) at ICAR-VPKAS, Almora; Sr. Scientist (FMP) and Principal Scientist (FMP) at ICAR-IISR, Lucknow. He and his team developed 17 farm tools, equipment and machinery suited to hills and sugarcane mechanization. He received NASI-ICAR Award on Innovation and Research on Farm Imple-ments-2017 and "Distinguished Service Certificate-2013 (ISAE), "Jain Irrigation Award-2013" and "Commendation Medal Award 2020" from ISAE, New Delhi.

OBITUARY

Homage to our Former Directors

Dr. NSL Shrivastava, former Acting Director, ICAR-CIAE and former ADG (Engg), ICAR passed away on 1 January, 2024. He made extraordinary contributions in design of several useful machinery and institution development. He was instrumental in guiding large number of scientists in R&D projects. His contributions have been well recognized through number of awards including Rafi Ahmed Kidwai Award at national level.



Dr Gyanendra Singh, former Director, ICAR-CIAE and former ADG/ DDG, ICAR, passed away on 6 January, 2024. He started his career at the Indian Institute of Technology Kharagpur (1966-69), and served Indian Agricultural Research Institute, New Delhi (1969-79), Central Institute of Agricultural Engineering, Bhopal (Head, 1979-89; Director 1996-2004); Indian Council of Agricultural Research, New Delhi (Asstt. Director General (Engg.), and as Dy. Director General (Engg) (1989-95). In a long career of 48 years (1966 to 2015), Dr Singh was associated with several National (ICAR, NIRD, UGC, AICTE, NAAC, CAPART, DST, UPSC) and International Organizations (FAO, ESCAP, UNIDO, British Council, USDA, SAREC, Sweden, CIRAD, France JICA, Japan, IRRI, Philippines etc.). Dr. Singh was also associated with a number of professional bodies/societies; a Member of Editorial Board of Bio-System Engineering, UK; Ex Chief Editor, Journal of Agricultural Engineering, ICAR; and Ex Chief Editor, Journal of Agricultural Engineering Research, Indian Society of Agricultural Engineers. He was associated with many technical committees of Ministry of Agriculture, Department of Science and Technology, National Commission for Women, and State Agro-Industrial Development Corporations for project appraisal, review and monitoring related to machinery development and popularization. Dr Singh provided leadership for the educational quality reform as the Chairman of Standing Committee of the Vice-Chancellors in MP; besides strengthening the only Rural University in India at Chitrakoot, MP as the Vice-Chancellor (2004 to 2010); acted Chairman/Member of Review Committees of AICTE (NBA) and NAAC for evaluation of quality education in Indian Universities/ College. Dr Singh was a recipient of more than 30 awards from many Institutions.

NEWS FROM PERSONNEL

Staff Promoted

Dr Sadvatha RH
Scientist (SS)
wef 1 January, 2020

Dr Ajita Gupta
Scientist (SS)
wef 4 January, 2023

Mrs Jolly John
Senior Technical Officer (T-6)
wef 1 January, 2023

Staff Superannuated

Shri B Mistry
Technical Officer
31 January, 2024

Shri AR Yadav
Technical Officer
31 January, 2024

Shri Kaluram Barela
Senior Technician
29 February, 2024

Shri HG Menon
Private Secretary
31 March, 2024

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