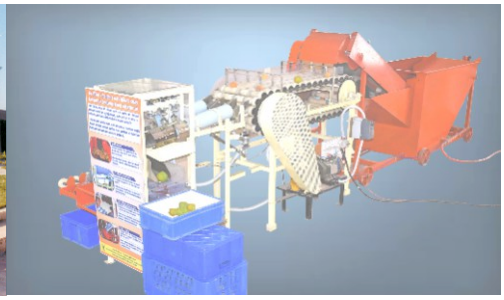




ICAR-CIAE NEWSLETTER

Vol. 30, No. 2
April-June, 2020

Modernizing agriculture through engineering interventions

www.ciae.nic.in

From the Director's Desk

The Coronavirus crisis has affected people across the globe including India. India has faced 5 phases of Lockdown during March to May, 2020 to check the spread of the pandemic. During these challenging times, while everything else was shut down across the country, agricultural activities continued despite facing lot of problems, in order to ensure a safe and reliable food supply for its people. An unprecedented movement of the migrant labourers was also witnessed resulting in an imbalance in on-farm and off-farm labour availability. While labour shortage has created problem for the industries in urban areas and agricultural activities in states like Punjab and Haryana, labour surplus is being faced in rural areas of some of the states. The changing demography of labour availability is expected to affect the agricultural machinery demand pattern in different parts of the country. Scarcity of labour for agricultural activities in some states provides an opportunity for greater engineering interventions by introduction of high capacity, precision, reliable and energy efficient farm equipment and machinery.

In the present fast changing scenario, Government of India has launched the ***Atma Nirbhar Bharat Abhiyan*** (Self-Reliant India Initiative) giving due importance to "Make in India". Recently, the Govt. of India has announced an economic stimulus package of Rs. 20 lakh crore along with new reforms under this initiative to boost growth in certain sectors having potential to become globally competitive and remunerative. Agriculture is one such sector and crop production and processing mechanization in particular is slated to promote income and employment generation.

Globally, the agriculture of the future is likely to be dominated by precision farming techniques like smart tractors, unmanned aerial vehicles, robots for harvesting, agri-bot for covered cultivation, wireless technology etc. From the Self-Reliant-India point of view and to promote Make-in-India as envisaged by our Hon'ble Prime Minister, more efforts are needed to introduce next generation machinery using technologies such as machine vision, sensors, AI, IoT, robotics etc. besides the innovations for small and marginal farmers of the country to help them sustain during and post COVID-19 periods.

This issue of the newsletter focuses on research and development of farm equipment and machinery like tractor drawn three-row garlic dibbler, tractor operated planter for tissue culture banana, dust separation system for wheat straw combine, solar assisted micro-algae harvesting system, non-thermal plasma pyrolysis reactor, animal drawn multi-crop planter cum herbicide applicator etc.

Technologies like touch free hand wash system and touch free sanitizer dispenser units were commercialized through licensing to M/s Ishaan Enterprises, New Delhi in this quarter.

ICAR-CIAE organized a webshop on 'Challenges posed by COVID-19 pandemic on production mechanization and way forward during and post COVID-19 era'. An online training programme on 'Ergonomical Design Guidelines for Agricultural Tool, Equipment and Workplaces' was also organized. International Yoga Day (IYD)-2020 was celebrated by the institute online@home on 21 June, 2020.

The 104th Institute Research Council was held in 24 sessions during May-June, 2020, attended by 76 members of IRC. Eighty six projects (63 RPF II and 23 RPF III) were discussed and reviewed.

During this quarter, two scientists joined this institute and six colleagues superannuated.

As Director, ICAR-CIAE, I am happy to share this Newsletter for this quarter.

DIGEST

RESEARCH & DEVELOPMENT

Liquid urea spraying system retrofitted on straw baler

One of the possible ways to increase the digestibility of poor quality roughages like rice and wheat straw is urea treatment. The urea treated straw is liked by cattle and helps to increase the milk production and body weight of animals. Conventionally, the straw is mixed manually with urea solution. The handling task can be minimized substantially by treating straw with retrofitted urea solution spraying system on straw baler.

An urea solution spraying system for straw baler (rectangular type) has been developed by ICAR-CIAE, Bhopal in collaboration with ICAR-NIANP, Bengaluru to pre-treat paddy straw during baling operation. The system consists of a plastic tank, spray boom with flat fan nozzles, HTTP pump, hose pipe, strainer, pressure relief valve and pressure gauge. The urea solution having concentration of 8% has been used with the system for on the go spraying of urea solution on loose straw during conveying to compression chamber of baler. The capacity of straw baler with urea spraying system is 109 bales/h for paddy at straw load of 8.3 t/ha. The cost of retrofitted urea solution spraying system is ₹30000/- and cost of urea treatment is ₹0.50/- per kg of straw. The weight and moisture content of bales increased in the range of 50-70% after application of urea solution. The urea treated bales have been wrapped with polyethylene sheet and stored for three weeks at room temperature. The baled wheat and paddy straw samples have been analyzed for crude protein (CP) content of the feed. Due to treatment of urea solution, the CP content increased in all the treatments and ranging from 9.14 to 13.41% for wheat and 8.93 to 12.28%, for paddy straw. On the basis of overall nutritional analysis, treating the straw with urea solution (8 kg/100 l) for paddy straw (50% moisture content) and wheat straw (70% moisture content) is recommended for straw baler with the system.

Tractor operated planter for tissue culture banana

Conventional planting of tissue culture banana is done manually by digging pits and planting the banana seedlings making the process labour intensive and tedious. Therefore, a tractor operated planter for tissue culture banana has been developed by AICRP on FIM (TNAU, Coimbatore centre). The planter can plant tissue culture banana at a spacing of 1.82 x 1.52 m. It consists of chisel type furrow opener, furrow enlarger, plants dispensing unit, earthing up assembly, operator seat and press wheel. Chisel type furrow opener opens the furrow to a depth of 300 mm. The furrow enlarger made up of sheet metal wings enlarges the furrow to 120 mm width and 200 mm depth behind the chisel. The seedlings grown in the bags of 60 mm diameter and 150 mm height are placed in the split spoon type valve arrangement by the operator after removing the grow bag. The valve is designed to open automatically at fixed plant to plant spacing of 1.52 m through ground wheel measuring system with the help of cam and lever. Seedlings are earthed up by a suitable shovel and the soil around the plant is compacted by the set of press rollers. The effective field capacity of the machine

RESEARCH & DEVELOPMENT

is 0.19 ha/h. Cost of the planter is Rs. 50,000 and cost of operation is Rs. 3500/ha. The operation can be done timely and accurate plant spacing may be maintained, thus leading to higher productivity. It helps in saving 50% in time, 81% in cost of operation and 90% in labour requirement as compared to traditional practice of manual planting.

Dust separation system for wheat straw combine

Wheat straw harvested by commercial straw combines contain undesirable materials like soil and other foreign materials which may lower feed intake, disrupt digestion and may have adverse health effect on animals. The AICRP on FIM (PAU Ludhiana centre) has developed dust separation system for wheat straw combine to reduce the soil entrainment into the bruising unit and eventually in the bruised straw. A perforated sheet of 2050 × 425 mm size having 7 mm diameter hole has been provided at a distance of 130 mm behind the cutter bar and under the straw conveying unit to remove soil. To remove soil clods, which come along the cut straw while straw is being pushed towards the bruising unit, a clod trapper has been hinged vertically, inclined at one side and kept open or closed at bottom side of the machine with helical spring. The bruising drum (740 mm diameter) consists of serrated tooth M type blades (204 blades) for bruising the wheat straw. The width of concave is 1435 mm with peripheral length of 920 mm. For effective size reduction of straw, a counter cutter has been provided adjacent to the concave and under the bruising drum. A cleaning sieve of 5 mm diameter hole has been placed below it. A centrifugal blower of 762 mm diameter has been used for blowing the bruised wheat straw. The bruised straw is blown into the wire meshed trailer, hooked behind the machine, by means of an adjustable duct. For wheat crop variety HD 2967, the average effective field capacity of the machine was 0.30 ha/h at forward speed of 2.02 km/h. The fuel consumption of the machine was 6.28 l/h. The average size of the bruised straw was 18 mm, which was 16% higher than the average straw size obtained from *Harambha* thresher (16 mm) and 19% lower compared to straw obtained from existing commercial straw combine (22.5 mm). The average dust concentration in developed machine, *Harambha* thresher and commercial straw combine, were 6.70, 5.40 and 11.25%, respectively.

Non-thermal plasma pyrolysis reactor

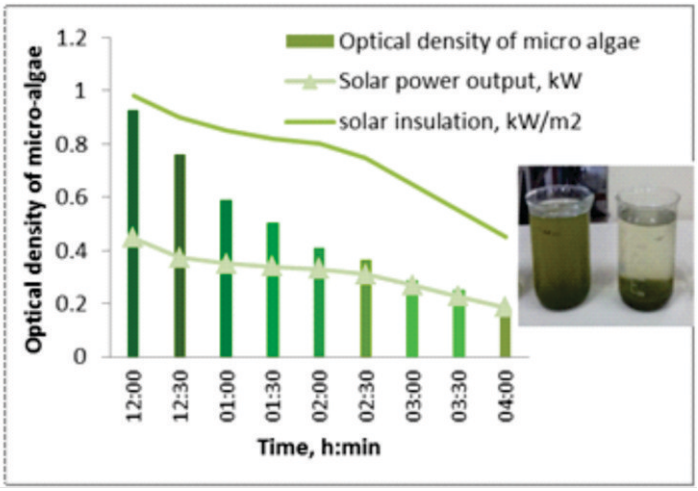
A sophisticated research facility to generate and use the non-thermal plasma (fourth stage of matter comprising the free and charged radicals) has been developed. A reactor has been designed and developed to study the pyrolysis/ thermal degradation of crop residues. The system consists of stain-less steel (SS) main reactor 200 mm diameter equipped with viewing glass, needle valve for allowing carrier gas in the reactor, passage for high vacuum system and plasma gun. The plasma gun has been designed for generation of plasma arc inside the reactor using molybdenum plate as the cathode and SS sample holder as anode. High vacuum system has been attached with the reactor to generate different levels of vacuum. It consists of the rotary pump, diffusion pump, penning and pirani gauge for vacuum pressure measurement, integrated three ways valve to control the vacuum inside the reactor. It can generate the vacuum as high as 10^{-8} bars. The thermal

RESEARCH & DEVELOPMENT

degradation behaviours of crop residues can be studied under different levels of vacuum and plasma intensity in different environment. The generation of free and charged radicals in plasma under different levels of vacuum is one of the important functionalities of the system.

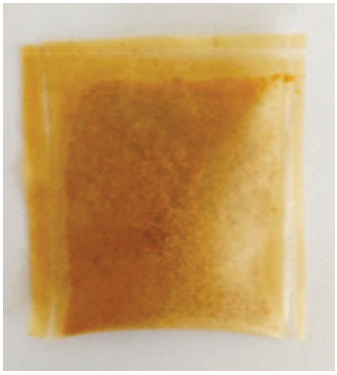
Solar assisted micro-algae harvesting system

Micro-algae generaly grows as a very dilute solution and it needs to be separated from water for recovery. Electro-flocculation is one of the efficient and easy methods for harvesting of micro-algae. An electro-flocculation harvesting system has been developed considering the optimized harvesting time and voltage for better efficiency. It consists of two solar panels connected in series that produce 60 V and 6.9 A current at an average solar insolation of 5.35 kW/m^2/day on tilted surface. Four aluminium flats of 4 mm were used in the form of electrodes. Total time required for harvesting is 4 h to bring down optical density of micro-algae from 0.97 to 0.18. Harvesting efficiency of the system was 81%. Average power output was 0.315 kW and energy requirement for electro-flocculation was 2.96 kWh/kg of dry micro-algae biomass.



Soy based composite edible film

Soybean aqueous extract was used as the main ingredient for the development of an edible film with different additives which increased the water barrier, mechanical and anti-bacterial properties. The water barrier property of the film ranged from 5.3 to 9.2 x 10^{-10} g/ms Pa. The tensile strength of the film varied from 5.1 to 8.2 MPa, which is higher than similar composite edible films. The elongation of the film ranged from 70 to 88%. The edible film was used as a packaging material for the instant *masalas* of ready to cook noodles. Sensory evaluation of the film showed very good consumer acceptability of the product with an overall acceptability score of 7.80 out of 10. The film was also tested as a cheese slice separator in cheese packaging. The application of edible film to the cheese slice reflects its suitability for separating ingredients in sandwiches and burgers or to wrap the food product.



Animal drawn multi-crop planter cum herbicide applicator

Three row multi-crop planter cum herbicide applicator has been developed by AICRP on UAE (IGKVV, Raipur centre) for planting of seeds and application of herbicide simultaneously. It consists of a frame, seed hoppers, seed metering devices, seed delivery tubes, inverted T type furrow openers, sprayer tanks, boom and

RESEARCH & DEVELOPMENT/ SUCCESS STORY

nozzles. Sprayer nozzles, seed metering mechanism, hoppers and seed delivery tubes have been mounted on inverted T type furrow openers and can be adjusted for row spacing of 230–240 mm.

The performance of the implement has been evaluated for sowing of soybean, green gram and fodder maize crops. The average draft and speed of operation are 440 N and 1.8 km/h, respectively. The average power requirement was 0.22 kW. The effective field capacity of the equipment for soybean, green gram and fodder maize was 0.183, 0.121 and 0.124 ha/h, respectively. Field efficiency for soybean, green gram and fodder maize was 78.2, 70.7 and 72.5%, respectively. Cost of the implement is Rs. 15000.

The cost of sowing operation per ha was Rs. 440, Rs. 666 and Rs. 650 for soybean, green gram and fodder, respectively. The operational energy was calculated as 78, 115 and 118 MJ/ha for soybean, green gram and fodder maize, respectively.

SUCCESS STORY

Modified Atmospheric (MA) Storage system for bulk handling of fresh produce

Among the major fruits grown in India, mango is one of the most common fruits which has delicious taste, strong aroma and rich in many vitamins. Amrapali is one of the leading hybrid varieties of 'Dasheri' and 'Neelum' cultivated in many parts of the country, having higher yield but short shelf life.

Some post-harvest constraints of mango are faster fruit ripening, loss of firmness, off flavor development, unfavourable to low temperature storage and occurrence of post-harvest diseases like *Anthracnose* and *Gelly seed* at ambient temperature. Modified Atmospheric (MA) packaging is a successful technology for increasing shelf life of fruits. The technology is available for small size packages of 1-2 kg. However, storage structures are not available for long distance transportation of fruits and vegetables under MA condition. The MA storage structure of 100 kg capacity having size of 1000 x 750 x 750 mm has been developed at ICAR-CIAE, Bhopal for handling and transportation of fresh fruits and vegetables. The structure has been fabricated using fiber reinforced plastic (FRP), which is light in weight and can sustain the load during handling and transportation. The cost of the MA storage system is Rs. 35000/-.

Mr. Pyare Khan, who has taken the auction of ICAR-CIAE mango orchard in the year 2019, has stored the matured *Amrapali* mango in MAS structure in three batches of 100 kg each. It has been observed that the mango stored in MAS structure has shelf life of 12 days, which was two times more than the mango stored at ambient condition. Quality analysis of stored mango indicated physiological loss in weight (PLW), firmness, puncture strength, colour (L*, a*, b*) and TSS of 6.14%, 42.7 N, 15.2 N, 52.63, 5.91, 29.80 and 13.20° Brix, respectively after 10 days of storage in MAS system at 25º C which was comparable with the quality parameters at harvesting maturity. It has been observed that the MAS stored mango has better overall quality than mango stored at normal condition. Thus, developed structure is highly beneficial in retailing and transportation of fresh produce. According to Mr. Pyare Khan, the MA storage system extended the shelf life to two fold and provided a buffer period of one week for marketing. The B:C ratio, Net Present Worth and Return on Investment of the developed MAS structure were 5.87, Rs. 42460 and 33.90%, respectively.

COVID-19 CARE

Initiatives to tackle the COVID-19 Pandemic

The portable touch-free hand wash system, hand sanitizer unit and pedal operated sanitizer dispensing unit have been developed by CIAE which can be adopted by hospitals, offices, malls, crowded market, railway station, industries etc to follow the guidelines of regular hand washing and sanitization to prevent spread of COVID-19.

Touch-free hand wash system

The portable touch-free hand wash system consists of water tank, infrared sensor, 12V DC water pump, DC speed regulator, 12V DC battery, relay board, touch-free sanitizer dispensing unit and water disposing plastic hose.

When the hand reaches near the sensor, it produces output pulse relay which triggers (act as a switch) the pump to turn it on. Pump in turn ensures the flow of liquid soap/water from tank to liquid soap/water outlet. A single relay triggers up to 5 ml of liquid soap from touch-free dispenser unit and 100 ml of water from water tank. The discharge rates of liquid soap and water can be regulated based on necessity by using DC regulator switch. The capacity of the automatic refillable system is 120 hand wash/hour. The system can either be powered by AC current or by DC battery for portable use. The provision is also made for charging the battery and operation by a solar panel.

Touch-free hand sanitizer unit

The touch-free hand sanitizer is a standalone, wall mounted or placed on the table to dispense the sanitizer without touching the unit. The device is easy to fabricate and light in weight (1 kg without sanitizer). In this unit, infrared sensor is located near the outlet in order to detect the user hands. As soon as the hand is detected, relay (act as switch) triggers the AC/DC pump to operate and up to 5 ml of sanitizer is dispensed at delivery end. The capacity of the unit is 180 hands sanitization/hour. The provision is given to use 12 V DC water pump with 12 V DC battery.

The touch free hand wash system and touch free sanitizer dispenser unit have been licensed to M/s Ishaan Enterprises, New Delhi and the company has started commercial production of the units.

Touch-free pedal operated sanitizer dispensing unit

The touch-free pedal operated sanitizer dispensing unit has been developed for hand sanitization without touching any surface with hand. The unit is very simple in construction and operation, and is designed in such a way that required quantity of sanitizer or liquid soap can be dispensed by pressing the foot pedal. Total height of the unit is 1100 mm. It is portable and can be placed at entrance of lobbies, corridors, farms, meeting rooms, outside the shops etc. The cost of this unit is about Rs. 1000/-. This unit has been placed at different locations of ICAR-CIAE for use.

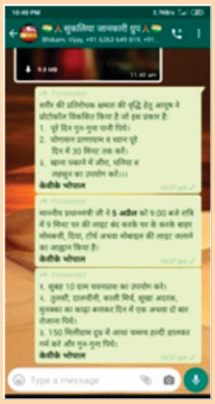
COVID-19 CARE/ MEETINGS

Advisories during Lockdown Period

Mohapatra D. 2020. Advisory for safe grain handling and storage under the threat of COVID-19. Agri News Network (Agriculture Today Group), http://www.agrinewsnetwork.in/ articles.php#art_77.

Pawar D, Giri SK, Kotwaliwale N and Pawar V. 2020. Post-harvest management practices for grape farmers during adverse conditions in India**.** Agri News Network (Agriculture Today Group), http:// www.agrinewsnetwork.in/ articles.php#art_62.

Pravitha M, Tripathi MK, Giri SK, Pawar Dilip and Kotwaliwale Nachiket, 2020. COVID-19 Era: Guidelines for fruit and vegetable handling practices. Agri News Network (Agriculture Today Group), May 22, 2020. http://www.agrinewsnetwork.in/articles.php#art_115.



During the COVID-19 lock down periods and afterwards, KVK, CIAE, Bhopal has issued many advisories through Social Media (WhatsApp Groups) on the use of technologies, machinery, health & nutrition, agricultural practices and engineering/marketing information to mitigate the effect of COVID-19 pandemic. Such advisories were sent to six groups consisting of 193 farmers/officials of Bhopal district. Apart from these, the Subject Matter Specialists of KVK have sent WhatsApp messages to 11 groups consisting of 860 farmers/officials of Madhya Pradesh state during the lockdown period.

Meetings

104th Institute Research Council (IRC) Meeting

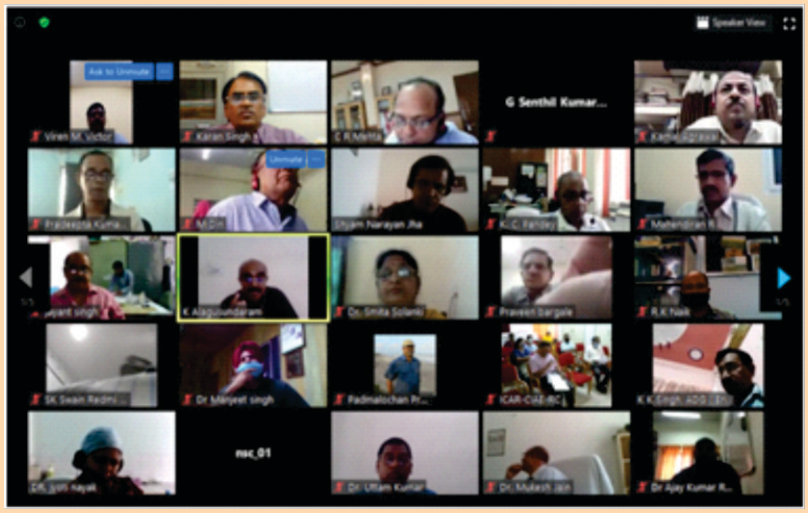
The 104th IRC was held in 24 sessions during May – June, 2020 and attended by 76 members of IRC. Total 86 projects (63 RPF II and 23 RPF III) were discussed and reviewed.

Dr. C.R. Mehta, Director, CIAE & Chairman, IRC welcomed all the members of IRC and mentioned that the country is facing difficult time due to the COVID-19 pandemic and CIAE is striving hard towards achieving its goal struggling through this tough time. He told that scientists should formulate research projects based on national need, government policies and initiatives and recommendations of major committees.

Dr. S. Mandal, Member-Secretary, IRC presented the follow-up action on adopted RPF III and action taken report of 102nd and 103rd IRC meetings. He thanked all the members for providing the information required for compilation of agenda items of 104th IRC.

COVID-19 CARE

Webshop on Challenges Posed by COVID-19 Pandemic on Production Mechanization and Way Forward during and post COVID-19 Periods



ICAR-CIAE, Bhopal organized a Web based Workshop (Webshop) on 'Challenges Posed by COVID-19 Pandemic on Production Mechanization and Way Forward during and post COVID-19 Periods' on 8 June, 2020. Dr. K. Alagusundaram, Dy. Director General (Agricultural Engineering), ICAR was Chairman and Dr. Kanchan K. Singh, Asst. Director General (FE) and Dr. S. N. Jha, Asst. Director General (PE) co-chaired the programme. The Webshop was attended by 135 participants from different SAU's, ICAR Institutes,IIT, NERIST etc.

At the start, Dr. C.R. Mehta, Director, ICAR-CIAE welcomed the participants and dignitaries. He highlighted the change experienced in last 2-3 months due to COVID-19 outbreak and subsequent development taking place in different aspect of life especially the effect of labour migration on agriculture in different parts of the country.

Dr. K. Alagusundaram, DDG (Agril. Engineering) in his address emphasized the need of mechanization and proper planning of activities for sustainable agricultural production in view of the COVID-19 situations. He emphasized that in the changed scenario, region specific problems need to be addressed jointly by AICRPs centres and state governments. Manufacturing sector has also been affected, therefore, mechanization planning has to be done in close coordination among R&D agencies, development departments and manufacturers to keep the pace of mechanization in different parts of the country.

Dr. S.N. Jha, ADG (PE) in his remark stressed that to mitigate the challenges due to COVID-19, the future research works need to be reoriented towards automations in agricultural operations using robotics, IoT, sensor networks etc. For this purpose, expertise needs to be developed in these frontier areas of research. He suggested to bring mechanization related activities under MNREGA scheme to ensure employment of skilled labourers migrated at their native place.

Dr. Kanchan K. Singh, ADG (FE) stressed on the need to convert the challenges into opportunities. He suggested that skill development programmes should be taken up at faster pace to generate employment for migratory labour. He also emphasized to prepare a detailed region specific plan for all round mechanization of the country.

Seven presentations were made during the Webshop. Dr. C.R. Mehta, Director, CIAE presented the national perspective on the subject, while region wise presentations were made by Dr. Manjeet Singh, Head, Department of Farm Machinery and Power, PAU, Ludhiana (Northern region), Dr. B. Sridhar, Dean, AEC&RI, TNAU, Coimbatore (Southern region), Dr. Debraj Behera, Head, Farm Machinery Department, OUAT, Bhubaneswar (Eastern region), Dr. T.B. Bastewad, Principal Investigator, AICRP on FIM, MPKV, Rahuri (Western region), Dr. Atul Srivastava, Head, Department of Farm Machinery and Power, JNKVV, Jabalpur (Central region) and Dr. D.K. Vatsa, Director Research, CSK HPKVV, Palampur (Hilly regions).

The region specific issues and strategies were discussed during these presentations and guidelines were formulated for national and region specific interventions. The Webshop ended with vote of thanks proposed by Dr. K.N. Agrawal, Project Coordinator, AICRP on Ergonomics and Safety in Agriculture, ICAR-CIAE, Bhopal.

TRAINING & CAPACITY BUILDING

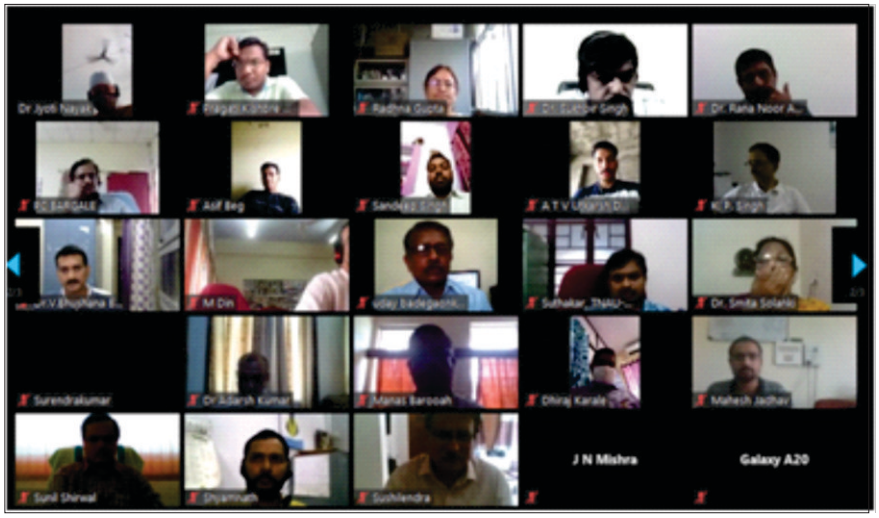
Ergonomical Design Guidelines

An online training programme on Ergonomical Design Guidelines for agricultural tool, equipment and work places was organized during 29 June-3 July, 2020. Total 40 participants including 22 from SAUs, 8 from ICAR institutes, 8 from national institutes and 2 from industry participated in the training programme.

The training programme was inaugurated by Dr. K. Alagusundaram, Dy. Director General (Agril. Engg), ICAR, New Delhi. In his inaugural address, he highlighted the importance of ergonomic aspects not only in agriculture but also in every walk of life. He also emphasized the need of application of ergonomic principles in design of agricultural machinery and agro-based processing machinery to reduce drudgery and improve worker's efficiency. Dr. Kanchan K. Singh, Asst. Director General (Farm Engg), ICAR in his address emphasized on improving the life style of agricultural workers by developing agricultural technologies through ergonomic interventions. While welcoming delegates, Dr. C.R. Mehta, Director, ICAR-CIAE, Bhopal informed about the role of ergonomics in farm equipment design especially for development of gender friendly agricultural tools and equipment to empower women workers.

The training comprised exposure to holistic approach of designing agricultural implements and workplaces of tractors and self-propelled implements. The special emphasis was given on applications of ergonomical considerations during the design process with due incorporation of limits with respect to anthropometric and strength data of Indian workers, and environmental aspects such as vibration, noise, dust, chemical and ambient conditions. The participants were provided first-hand experience through examples of design of machinery or workplace using ergonomic principles through participatory learning. Participants felt that such training was the need of hour and the same should also be offered to students during their summer training programme to inculcate the use of ergonomical principles by young engineers.

The training programme concluded on 3 July, 2020 with remarks by Dr. L.P. Gite, former Scientist Emeritus, CIAE, Bhopal. He emphasized the need of using ergonomic parameters in design at initial stage rather than incorporating it at later stage after prototype is ready. He stressed on the need of wide spread use of the ergonomic principles for benefit of large section of farmers and workers.



The training was coordinated by Dr. K.N. Agrawal, Project Coordinator, Ergonomics and Safety in Agriculture.

Participatory promotion of climate smart agriculture machinery in selected village cluster of MP

It is necessary to promote climate smart agricultural practices to overcome the adverse effects of prevalent cultivation practices that exploit the limited natural resources like fertile soil, water and minerals. Modern farm practices like tillage, interculture, irrigation, harvesting and threshing operations consume lot of energy and amongst them tillage consumes maximum quantum of energy. The efforts have been made to promote climate resilient agriculture using no-tillage or minimum tillage through demonstrations of machinery and technology like roto-

TRAINING & CAPACITY BUILDING

till-drill, broad-bed-furrow planter, laser land leveller, ridge and furrow seeder and mole drainage technology on farmer's fields. Roto-till-drill was demonstrated in *rabi* season, 2019 and BBF planter in kharif season, 2020 for soybean crop. In addition, under SCSP component of NICRA-TDC, fertilizer has been distributed to 28 SC-BPL farmers of Kachhibarkheda and Sagoniya villages on June 15, 2020.

Activities organized under Schedule Caste Sub Plan Programme (SCSP)

Field day cum distribution of fertilizer & chemicals was organized under SCSP programme for the benefit of 92 SC farmers of Kurana, Barodi, Nipaniya Jat, Sukaliya and Balampur villages of Bhopal district.

Human Resource Development

The following scientists attended the online trainings organized by different institutes:

Name and Designation	Training Title	Duration	Organizer
A Khadatkar	Protected cultivation technologies for climate smart agriculture	21-26 April, 2020	MPKV, Rahuri
Manoj Kumar	Basic practices of ANSYS 2020 R1 for agricultural researchers	12-29 May, 2020	VNMKV, Parbhani
AP Pandirwar	Basic practices of ANSYS 2020 R1 for agricultural researchers	12-29 May, 2020	VNMKV, Parbhani
Adinath Kate	Smart handling and processing systems of horticultural produce	9-14 May, 2020	MPKV, Rahuri
Ajita Gupta	Carbon sequestration in climate smart agriculture	11-13 May, 2020	MPKV, Rahuri
MK Tripathi	Impact of COVID-19 pandemic on food safety & future product development	15 May, 2020	HBTU, Kanpur
	Practical rheology for the food technologist	19 May, 2020	HBTU Kanpur
Sweeti Kumari	Post COVID-19 agribusiness: Challenges and opportunities	13-14 June, 2020	JAU, Junagadh
	National e-workshop on Prospects of blended learning beyond COVID-19	25-26 June, 2020	Govt. VYT PG Autonomous College, Durg

TRAINING & CAPACITY BUILDING

ICAR-CIAE Regional Centre, Coimbatore distributed essential agricultural inputs to 62 SC farmers of Irumporai Panchyat, Karmadai block of Coimbatore on 23 May, 2020 with the help of Asst. Director (Ag) office, Karamadai block. In this meet, maize (Co-6 Hybrid seed variety), vegetables (Brinjal & *Bhindi*) and banana booster (Micro Nutrient Mixture) were distributed to 60 beneficiaries.

KVK News

On farm testing & front line demonstration

Thirty three On-farm testings (OFT) & front line demonstrations (FLD) for wheat (OFT var. HD-2967 & FLD var. HI-1544) and chickpea (OFT var. RVG-202) crops were conducted by KVK, ICAR-CIAE, Bhopal in an area of 13.2 ha during *Rabi* (2019-20) season (April 2020) at villages Sukaliya and Sagoniya in Bhopal district. OFT for *Kharif* (2020-21) season has started and sowing of soybean JS 2029 has been completed at Sagonia village. Total 19 OFTs have been planned in an area of 5.2 ha at Sagonia village.

Demonstrations at Farmers' fields

Eight demonstrations of standing type groundnut decorticator, bund former and inclined plate planter with pre-herbicide applicator were conducted at 5 farmer's fields at Devpur Kuthar, Kalyanpur Balrampur and Kotra Chopra villages.

Frontline demonstration at farmers' fields

Programme	Collaboration	Date	Village	No. of Farmers
Demonstration (FLD) of inclined plate planter (8 rows) for inter-cropping soybean with maize	PD-ATMA	26 June, 2020	Balampur	1
		30 June, 2020	Sukhi Sewania & Barkhedi Abdulla	4
Demonstration of ridge and furrow seed drill	---	28 June, 2020	Sukaliya	2

Kisan mobile advisory/through farmers' portal, advisory and diagnostic

Discipline	Scientist visited at farmers' field	KMA*	Advisory to farmers
Agronomy/Horticulture	01	02	21
Engineering	12	01	19
Home science	00	01	15
Govt. scheme info.	00	00	06
Total	13	04	61

* Each KMA reaches to 65228 farmers of the district through SMS.

IP&TM/ PUBLICATIONS

Patent Applications

Date of Application	Application No.	Title	Inventors
13 March, 2020	202021010795	High speed planting mechanism for soybean and like	Manoj Kumar and RK Sahni
4 June, 2020	202021023413	Chemical free pre-treatment process and equipment for the production of raisins	Dilip Pawar, SK Giri, N Kotwaliwale and AK Sharma

Publications

Research Papers

Balasubramanian S, Kumar R, Roselin P, Saxena SN and Singh KK. 2020. Determination of thermal properties of ambient and cryoground black pepper. *International Journal of Seed Spices,* 10 (1): 1-11.

Banga KMS, Kumar S, Kotwaliwale N and Mohapatra D. 2020. Major insects of stored food grains. *International Journal of Chemical Studies*, 8(1): 2380-2384.

Chakraborty SK, Mahanti NK, Mansoori SM, Tripathi MK, Kotwaliwale N and Jayas DS. 2020. Non-destructive classification and prediction of aflatoxin-B1 concentration in maize kernels using Vis-NIR (400-1000 nm) hyperspectral imaging. *Journal of Food Science and Technology*, DOI: 10.1007/s13197-020-04552-w.

Das H, Majumder A, Kumar M and Nishad D. 2020. New series of optimal covariate designs in CRD and RBD set-ups. *Journal of the Indian Society of Agricultural Statistics*, 74(1):41-50.

Jadhav SK, Wakudkar H, Bhardwaj M and Soni R. 2020. Effect of torrefaction on physio-chemical properties of paddy straw and its size reduction. *International Journal of Current Microbiology and Applied Sciences,* 9 (1):7-18.

Khadatkar A, Mathur SM, Gaikwad BB, Pandirwar A and Shrinivas DJ. 2020. Biometric properties of vegetable plug seedlings used in design of vegetable transplanter. *Journal of Agricultural Engineering,* 57(1): 16-24.

Khwairakpam B and Agrahar-Murugkar D. 2020. Development of millet based ready to drink beverage for geriatric population. *Journal of Food Science and Technology*, Doi.org/10.1007/s13197-020-04359-9.

Kumar M, Din M, Magar AP and Singh D. 2020. Conservation agriculture mechanization practices for small holders under soybean-wheat cropping pattern. *Current Journal of Applied Science and Technology*, 38(6):1-11.

Kumar M, Gaikwad BB and Sahni R. 2020. Mechanization of garlic (Allium sativum) cultivation in India: An overview. *Pantnagar Journal of Research*, 18(1):1-13.

Kumar M, Sarangi A, Singh DK, Sudhishri S and Rao A.R. 2020. Development of production function of wheat cultivars under irrigated saline environment and foliar potassium fertigation. *Current Science*, 118 (12): 1939-1945.

Kute AB, Mohapatra D, Kotwaliwale N, Giri SK and Sawant BP. 2020. Characterization of pectin extracted from orange peel using microwave assisted and acid extraction methods. *Agricultural Research*, 9 (2):241–248.

Mahanti NK, Konga U, Chakraborty SK, Babu VB. 2020. Non-destructive estimation of spinach leaf area: Image processing and artificial neural network based approach. *Current Journal of Applied Science and Technology*, 39(16): 146-153

Mahanti NK and Chakraborty SK. 2020. Application of chemometrics to identify artificial ripening in sapota (*Manilkara zapota*) using

PUBLICATIONS

visible near infrared absorbance spectra. *Computer and Electronics in Agriculture*, DOI: 10.1016/j.compag.2020.10553 9.

Sahni RK, Kumari S, Kumar Manish, Kumar Manoj and Kumar A. 2020. Status of litchi cultivation in India. *International Journal of Current Microbiology and Applied Sciences*, 9 (4): 1827-1840.

Saxena CK, Ambast SK and Gupta, SK. 2020. Laser land levelling for higher water productivity in rice-wheat system. *International Journal of Innovative Technology and Exploring Engineering*. 9(8):374-379.

Tripathi MK and Kotwaliwale N. 2020 Functional foods that boost the immune system and fight infections. *Octa Journal of Biosciences*, 8 (1):14-16.

Popular Articles

Badegaonkar UR, Tamhankar MB, Saha KP and Bargale PC. 2020. A business model of custom hiring of agricultural machinery for enhanced farm mechanization in Madhya Pradesh. *Indian Farming*, 70 (1): 18–22.

Hasan Muzaffar, Maheshwari Chirag, Yadav Ajay and Kate Adinath Kate. 2020. Curcumin: From extraction to bioavailability. *Biotech Express*, 7 (80): 22-26.

Jadhav SK. 2020. Indoor air quality: A safety measure of airborne diseases in rural area. *Scientific India*, May-June 2020, Published online on 6th May 2020

Jagdale M, Jadhav M, Potdar RR, Gaikwad BB and Agrawal KN. 2020. *COVID-19 pasun bachawasathi krushi kamgar margadarshak suchana. Agrotouch*, 11:36-39.

Khadatkar A, Sawant CP and Imran S. 2020. Customized tools for farm women for rice cultivation. *Indian Farming,* 70 (4): 24–26.

Mehta, CR. 2020. Harbinger of agricultural mechanization in India – ICAR-CIAE, Bhopal. *Agriculture Today*, June, 56-57.

Sawant CP, Mehta CR, Tiwari PS and Khadatkar A. 2020. Improved rice sowing and transplanting machinery to address labour shortage due to COVID-19 pandemic. *Indian Farming*, 70 (4): 39-45.

Tripathi MK, Giri SK and Srivastva RM. 2020. Role of prebiotic food ingredients in microbiome maintenance: healthy gut microbiome and COVID-19. *Scientific India*, 8 (3): 11-15.

Tripathi MK, Giri SK, Jadam R and Singh V. 2020. Potential of agro-food by products for natural food additives. *Scientific India*, 8 (2): 20-21.

Tripathi MK. 2020. Diet, gut microbiota and human health. *Scientific India*, 8(1): 36-38.

जेना पी.सी., कुशवाह एन एवं कुमार एस. 2020. फसलों की सिंचाई में सौर ऊर्जा चलित पम्पों का महत्व, मध्य भारत कृषक भारती, जून 3:37-38.

जेना पी.सी., कुशवाह एन एवं कुमार एस. 2020. कृषि उत्पाद को सुखाने में एस्पिरेटर प्रकार के सौर ऊर्जा आधारित संयंत्र का विवरण. मध्य भारत कृषक भारती, अप्रैल 1 : 20

सिंह आर.के. 2020. वर्षा जल संरक्षण एवं प्रबंधन. इक्षु, 2:32-33.

सावंत सी.पी. एवं गायकवाड़ बी.बी. 2020. यंत्रो द्वारा धान की रोपाई . एग्रो प्लस, सकल, एग्रोवोन, 18 जून 2020. पृ10.

सावंत सी.पी. एवं मेहता सी.आर. 2020. धान रोपाई के लिए उन्नत कृषियंत्र. टेक्नोवोन, सकल एग्रोवोन, 17 जून 2020. पृ10.

सावंत सी.पी., खड्तकर ए., गायकवाड़ बी.बी. एवं मगर ए.पी. 2020 मजदूरों की कमी होते हुए कैसे करोगे धान की बुवाई? जान लो धान की रोपाई के लिए उन्नत यंत्र. कृषिपिडिया, कृषि जागरण, 26 जून 2020.

Technical Bulletins/Manuals

Jadhav SK and Pandey KC. 2020. Operators manual of biomass briquette based rapid combustion system. Technical Bulletin No. CIAE/AEP/2020/57.

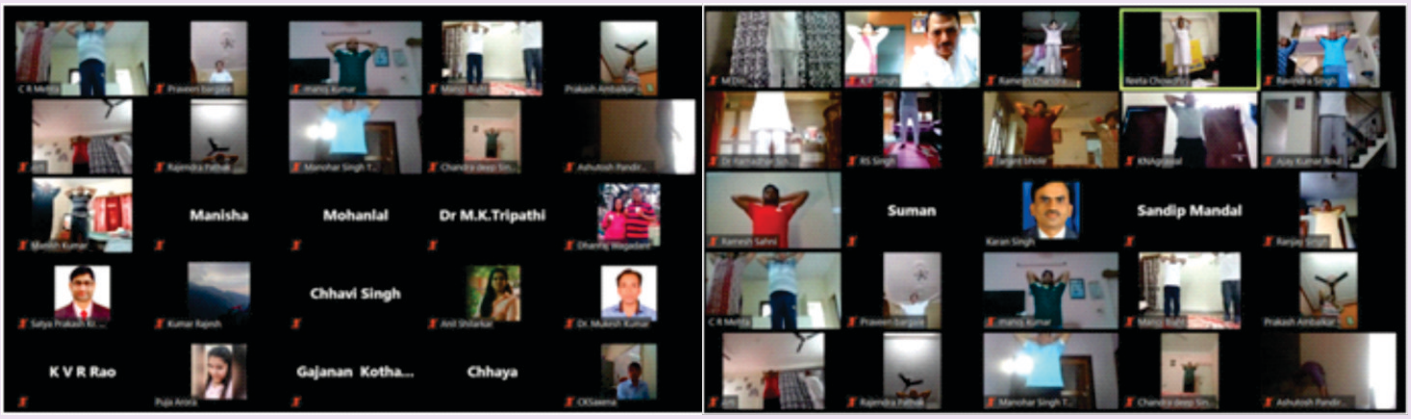
Tiwari PS, Singh KP, Jat D and Saha KP. 2020. Good agricultural practices through agricultural engineering interventions. Technical Bulletin No. CIAE/AMD/2020/297.

EVENT/ NEWS FROM PERSONNEL

International Yoga Day - 2020

Fifteen days online Yoga training sessions were organized for officers and staff members of the institute during June 7-21, 2020. The regular yoga practice sessions for enhancing the health and immune system were conducted under the guidance of Mrs. Rita Chaudhary, Area Head, *Bhartiya Yog Sansthan*, Bhopal. Number of officers and staff members of institute practiced different *yogasanas, pranayams* and *dhyan* based on common yoga protocol for an hour everyday with their family members.

The training programme concluded with celebration of International Yoga Day (IYD) in online mode on the theme of **Yoga at Home and Yoga with Family** on 21 June, 2020. Dr. K.P. Singh, Nodal Officer, IYD - 2020 briefed about the yoga activities conducted in 15 sessions during the training programme. In his concluding remarks, Dr. C.R. Mehta, Director-CIAE, Bhopal emphasized the importance of regular practice of yoga and its effect on health and mind of an individual. He also informed that regular yoga practice will help to improve immune system of an individual to fight COVID-19 pandemic. Smt. Rita Chaudhary replied to the queries of the participants in an interactive session held on the day. The session ended with vote of thanks proposed by Dr. K.N. Agrawal, Project Coordinator, AICRP on Ergonomics and Safety in Agriculture.



Our New Colleagues

Shri Subeesh A
Scientist
(Computer Application and IT)
joined on 4 April, 2020

Er. Pravitha M.
Scientist
(Agricultural Structures and Process Engineering)
joined on 4 April, 2020

NEWS FROM PERSONNEL

Staff Superannuated

Following staff superannuated from the Council's service during this quarter.

Shri Ravi ji Raina
Senior Technician
30 April, 2020

Dr Sumedha S Deshpande
Principal Scientist
31 May, 2020

Shri K Tulsidharan
Technical Officer
31 May, 2020

Shri ZV John
Assistant
31 May, 2020

Smt Asha Kudopa
Assistant
30 June, 2020

Shri Jaswant Singh
Technical Assistant
30 June, 2020

Chief Editor: Dr. RK Singh, Principal Scientist
Editors: Dr. CK Saxena, Senior Scientist and Dr. CP Sawant, Scientist
Word Processing: K. Shankar **Photography:** M/s SS Bagde and Kalyan Singh
Publisher: Director, ICAR-Central Institute of Agricultural Engineering, Nabi Bagh, Berasia Road, Bhopal - 462 038 Phone: 91-755-2737191, Fax: 2734016
Email: directorciae@gmail.com, director.ciae@icar.gov.in; Web: www.ciae.nic.in