



CIAE

NEWSLETTER

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Modernizing agriculture through engineering interventions



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From the Director's Desk



Weeds significantly reduce crop yield and account for 45% of the total annual loss in agriculture produce, which is significantly higher than losses caused due to insects (30%), disease (20%) and other pests (5%). Apart from this loss, weeding is extremely labour intensive and time consuming. Effective mechanical weeding can, not only reduce drudgery and time but also cost of production and herbicide use, making it environmental friendly. CIAE has developed a breakthrough technology for mechanical weeding in closely spaced crops like garlic, for which no weeders were previously available. The problem of weeding becomes four fold in tall crops (upto one meter) like okra, brinjal, cotton, pigeon pea, sugarcane etc. To aid this difficult operation a High Clearance Vehicle developed

at ICAR-CIAE is now equipped with a power weeder whose weeding efficiency is around 92% significantly reducing the drudgery and time involved in the operation.

Farmers with less than two hectares of farm land comprise more than 80 percent of India's farmers. Farm mechanization is the key to better yields and reduced drudgery in the face of spiraling costs of inputs. However, mechanization of small farms is a major challenge with large machinery and equipment that are currently available. A simple cost effective solution is designing equipment and implements specifically for a small sized farm which would help get work done faster with more convenience. Experts from tractor and implement manufacturing industries have also predicted that the future of the mechanization market will be the small tractor segment. Catering to this demand, institute has initiated studies on mini tractors (20 hp) and matching implements with research on important performance parameters viz. slip, draft requirements, depth of operation and fuel consumption during their field testing. The mini tractor records data during the operation itself helping us to identify best suited implements.

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This issue of the newsletter focusses on equipment for small farms and hills like the Animal drawn interculture cum fertilizer applicator, light weight multi-crop thresher for paddy, wheat, millets and amaranth etc. Apart from these the Tractor operated irrigation channel former, Ginger harvester, Finger millet thresher, Char-Ni based catalyst system for purification of producer gas, Automatic irrigation system for rice, Modular storage structure for onions are being presented in this issue.

In this quarter, an International Training of African-Asian Rural Development Organization (AARDO) on "Agricultural Engineering Technologies for Enhancing Productivity and Profitability in Agriculture Sector" was organized. Events like World Food Day, Mahila Kishan Divas, World Soil Day were celebrated with great enthusiasm, apart from organization of the 72nd Annual Conference of Indian Society of Agricultural Statistics. I also take this opportunity to wish best of luck to our superannuated staff, and welcome our new colleagues who joined in this quarter. It is my proud privilege and pleasure to present this volume of the CIAE Newsletter.

RESEARCH & DEVELOPMENT

Tractor drawn weeder for garlic under raised bed cultivation

Weed control with the hand tools is one of the most laborious and time consuming operation. Also it involves one-fourth of the total cost of cultivation in garlic production. Hand weeding generally requires about 50 - 60 man-days/ha. Until development of this weeder, no mechanical weeder was available for effective weeding in garlic field. The newly developed weeder is suitable for weeding in garlic crop sown on broad beds. It consists of spring tynes which strike the weeds to uproot them from soil. It has provision for changing the row to row spacing of 100 and 150 mm. Also, the number of tynes can be changed from one to four for weeding in a single row. Preliminary trials of the weeder in garlic crop (Amletha, G41) sown on broad beds (150mm height and 1200 mm top width) have shown promising results with an effective field capacity of 0.13 ha/h at forward speed of 1.14 km/h. The weeding efficiency when evaluated in garlic fields with soil moisture in the range of 20-25% (db) was observed as 63%. The weeder has potential for saving labour requirement and large scale adoption by farmers in garlic growing areas.



Weeding attachment for high clearance vehicle

The high clearance multi purpose vehicle developed recently has been equipped with a power weeder to carry out weeding operation in vegetable crops such as okra, tomato, brinjal, chilli and field crops such as cotton, pigeon pea, sugarcane, etc. Horizontal cutting concept is adopted in designing the weeder. The weeder can be mounted in the front of the vehicle with the help of a four bar lift mechanism. It has been

evaluated in maize crop planted at 600 mm and 450 mm row spacing at field soil moisture content of 15-17 % (d.b). Weeding efficiency, plant damage, field capacity of the weeder have been observed as 92.6%, 1.5%, and 0.16 ha/h, respectively.



Tractor operated irrigation channel former

Irrigation channels in orchards are usually formed manually by using local hand tools. It involves a lot of labour and the operation is drudgerous. The tractor operated irrigation channel former, developed by PAU Ludhiana centre of AICRP on FIM, can form channel of 1760-1875 m length per hour at forward speed ranging from 2.1 - 2.8 km/h. Irrigation channels with top width, base width, depth and slant height of 610 mm, 390 mm, 244 mm and 291 mm, respectively are formed. The average fuel consumption for making irrigation channels is 6.1 l/h. Labour requirement for making channels with the implement is calculated as 0.05 man-h/m in comparison to 0.16 man-h/m in case of manual method. Savings in labour and cost of operation are 68.7% and 61.3%, respectively in comparison to traditional method.



RESEARCH & DEVELOPMENT

Animal drawn inter-culture cum fertilizer applicator

The newly developed animal drawn interculture-cum-fertilizer applicator is suitable for topdressing of granular urea in widely spaced crops, such as cotton crop planted at spacing of 90×60 cm. There is provision to vary application rate of urea by changing exposure length of fluted roller as per requirement. It applies fertilizer at a distance of 7.8±0.9 cm from plant, whereas average length of fertilizer band has been observed as 9.5±1.3 mm. Field capacity, field efficiency and draft of implement are 0.12 ha/h, 74.9 % and 450-600 N, respectively at forward speed of 1.77 km/h. Fertilizer application and weeding efficiencies are 91 and 84.5%, respectively.



Tractor operated ginger harvester cum elevator

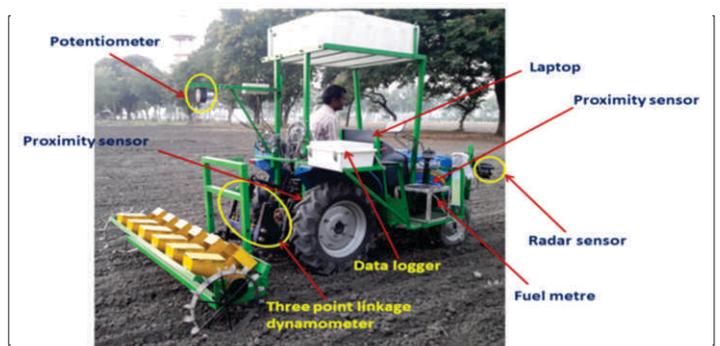
The conventional method of harvesting ginger is labour intensive (240 man-h/ha). In order to overcome the higher labour cost, a tractor operated ginger harvester cum elevator has been developed (AICRP on FIM- Raichur centre). The harvester consists of a digging blade, ground wheel and elevator, and the overall dimensions of the machine are 1.88 x 1.55 x 1.15 m. The conveying system is provided with arrangement for removal of soil clods in between mild steel rods. The effective field capacity and field efficiency of the harvester are 0.18 ha/h and 82%, respectively. The unit cost of equipment is approximately Rs. 80,000. The cost of operation of the harvester is Rs. 910/ha as compared to Rs. 2205/ha in traditional manual digging. Thus, the saving in cost is 59% as compared to traditional practice of manual digging excluding collection

and transportation. It also saves 86% of time as compared to manual digging.



Instrumented mini tractor for performance testing of matching implements

Mini tractors are essential in Indian conditions for mechanization of small farms and hill agriculture. To find matching implements for mini tractors, field testing is very much required. For this purpose, a small tractor (GT-20, Sonalika) has been instrumented for measurement of various performance parameters for the implements. Different sensors have been attached with the tractor and interfaced with data logger to record the real time data of tractor and implement performance such as slip, draft, throttle position of tractor, depth of operation of implements and fuel consumption at varying loads. A few implements such as 2- bottom MB plough, 7 tynes cultivator, planter have been tested and the performance parameters have been recorded in data logger for implement matching. The draft of MB plough, cultivator and planter are found as 4-5kN, 4-5 kN and 1-2 kN respectively at different throttle positions. The instrumented tractor will be useful in basic studies related to implement-tractor matching.



RESEARCH & DEVELOPMENT

Finger millet thresher

Threshing of finger millet is one of the critical operations. Traditionally, finger millet are threshed by three different methods viz. manually beating with sticks, bullock drawn stone roller and tractor drawn stone roller. These methods are labour intensive and give low output. The thresher designed and developed by AICRP on ESA-Dapoli centre fulfils the requirement of threshing and pearling of finger millets. It has been tested with Dapoli 1 variety of finger millet crop having 11 % (db) moisture content and grain to straw ratio of 3:1. The threshing efficiency, pearling efficiency, grain damage, cleaning efficiency, total grain loss and energy consumption are found as 99.5%, 99%, 0.7 %, 97.5%, 1.6 % and 0.7 kWh, respectively. The optimum values of the feed rate, concave clearance and cylinder peripheral speed for the thresher are 36 kg/h, 5 mm and 7.12 m/s, respectively.

**Energetics of maize-chickpea cropping system of Madhya Pradesh**

Analysis of energy requirement for different farm operation is important for minimization of energy input for growing crop and enhances the input use efficiency without hampering crop productivity. Energy input and output analysis for maize-chickpea cropping system has been carried out. The total energy required in maize crop for seed bed preparation, sowing, fertilizer application, interculture, plant protection, harvesting and threshing operation has been 1476.1, 650.5, 7987.9, 136.5 and 259.3 MJ/ha, respectively. In seed sowing, manual intervention is mostly followed to place the seed in channel. Fertilizer application requires the maximum 75.9% of total energy input. Diesel is the second highest contributor in the input energy matrix with 16.8% of total energy input. The average energy consumption for maize cultivation in Madhya Pradesh is found as

10510.3 MJ/ha. The analysis shows energy use efficiency and energy productivity of 5.01 and 0.34 kg/MJ, respectively. Input energy requirement for seedbed preparation, sowing, fertilizer application, irrigation, plant protection and harvesting & threshing of chickpea cultivation has been 936.5, 2236.1, 1943.1, 1915.7, 93.4 and 258.3 MJ/ha, respectively. Source wise energy contribution indicates that fertilizer share is more than other inputs. Diesel contributes 17.9% in total input energy matrix due to involvement of tractors and reaper. Similarly, the average total energy input, energy use efficiency and energy productivity for chickpea cultivation is 7381 MJ/ha, 3.41 and 0.19 kg/MJ, respectively.

Purification of producer gas by tar cracking with Char-Ni based catalyst

Removal of tar and particulate matters from producer gas below 50 mg/m^3 is required for efficient engine operation. But it requires a cumbersome downstream process such as water filtration followed by dry filtration which increases capital expenditure as well as operating cost. Char-Ni based catalyst is a solution to crack the tar present in producer gas inside the gasifier itself, and reduce the heavy downstream process. Char has been prepared from jute stalk at 600C under nitrogen environment and are cut into small pieces with diameter 0.5 to 2 cm and length of 0.5 to 2 cm. The pallets of char are then impregnated with nickel nitrate by incipient wetness method using nickel solution of 0.035 g/cm^3 concentration to obtain 2 % nickel loading. Impregnated char pellets are dried in oven at 105 C for 6 hours and then calcined in N_2 atmosphere at 800 C for 2 hours to complete the conversion of nickel nitrate into nickel oxide. The prepared catalysts (200 g) has been loaded in a tubular



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reactor for testing with producer gas from an updraft gasifier at a bed temperature of 700C. The average tar content in raw producer gas from the updraft gasifier is 8.58g/Nm³ which reduced to 0.406 g/Nm³ by the developed catalyst giving an efficiency of 95.3%. The findings of the study indicate that nickel infused char can be used as a low-cost catalyst for tar cracking during biomass gasification.

Automatic Irrigation System for Rice

Rice is the water intensive crop commonly cultivated under submerged condition and remains under ponding water for almost 80% of its cropping duration. The existing automated irrigation systems are based on soil moisture measurement, which fails to recognize the moisture level beyond the 100% saturation level. The automatic irrigation system, designed for alternate wetting and drying (AWD) method of irrigation, detects ponding water in rice fields. It consists of sensors and microcontroller, which detects water levels and transmits the signal to the controller wirelessly. The controller unit is accordingly programmed to operate the pump based on the water level at the field during different crop growth stages. Another manual colour based system for water level indication at rice field has also been developed apart from automatic irrigation system. It shows the level of water at the rice field above and below the soil surface. Farmers can operate their pump after seeing the status of water at the rice field.

Both the systems have been evaluated in a paddy field at CIAE farm, and the results are compared with the farmer's practice of rice cultivation. The irrigation water productivity is found as 6.15, 5.71 and 3.06 kg/ha/mm, and the total water productivity is 4.80, 4.49 and 2.63 kg/ha/mm for automated, manual and controlled system, respectively. Crop yields of 4.8, 4.6 and 4.1 t/ha are obtained for automated, manual and control system, respectively. The automatic irrigation system saves water approximately 35% as compared to conventional irrigation practices for rice.

Modular system for bulk storage of onion

Storage of onions especially during rainy seasons leads to great amount of losses on account of fungal rot, sprouting and physiological weight loss. Losses to the tune of 30 to 40% during a period of 4 months have been reported. A modular storage system having capacity of 1 tonne and consisting of a storage structure, sensor controlled aeration unit and fumigation unit has been developed. The structure has been evaluated for storage of *Rabi* onion harvested in the month of April. The storage study has been conducted for 180 days, up to harvesting of *Kharif* season onion i.e. till second week of October. The storage protocol of onions included intermittent air flow @ 0.045 m³/s and sulphur fumigation @ 50 g/m³ for 6 h. The results indicate 9.97 % of weight loss, 1.73 % rotting and 0.16 % sprouting in the stored lot of onion at 120 days storage. This is much less than 18.75% weight loss, 13.22 % rotting and 1.92 % sprouting as reported by other studies for same storage period. Further, over a period of 180 days the losses have been recorded as 20.30 % weight loss, 5.07 % rotting and 0.67 % sprouting. The storage structure is rust proof and hence expected to have long life and durability. Since the aeration and fumigation



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units are required intermittently for one storage unit, the same can be used to serve multiple storage units of similar capacity. Approximate cost of the structure with sensor network (excluding blower) is about Rs. 16,000/-. Moreover, time required for filling up and emptying the storage bin is about 0.83 man-h/t and 0.4 man-h/t, respectively as compared to 1 man-h/t and 3 man-h/t in case of conventional *Chawl* structures.

New External Funded Projects

The Institute received approval for executing the following external funded projects:

Title of the Project	Budget (Rs in lakhs)	Funded by
Development of sensing system for potato, onion and tomato in storage	193.67	ICAR-National Agricultural Science Fund (NASF)
Technology forecasting and projecting market trends for agricultural machinery manufacturing sector	30.00	DSIR, New Delhi

TRAINING ORGANIZED

International Training

An International Training of African-Asian Rural Development Organization (AARDO) on "Agricultural Engineering Technologies for Enhancing Productivity and Profitability in Agriculture Sector" was organized during 27 Nov 2018 to 10 Dec 2018. The training sponsored by AARDO and Ministry of Rural Development, GOI was attended by nine participants; two each from Egypt, Oman and Taiwan and one each from Sri Lanka, Sudan, Syria. During this training programme, knowledge about technologies and equipment for agricultural production, irrigation and drainage, processing and value addition and renewable energy was imparted through lectures, presentations, practical sessions, hands-on experience and field visits. Valedictory function of the training was held on 10 Dec 2018. Secretary General of African-Asian Rural Development Organization (AARDO) His Excellency Eng. Wassfi Hassan El Sreihin was the

chief guest of the valedictory programme. Dr. KK Singh, Director, ICAR-CIAE presided over the function.



Training on Ergonomical Design Guidelines

Training on "Ergonomical Design Guidelines for Agricultural Tool, Equipment and Work Places" was organized during 23-25 Oct 2018. Total 17 participants including 2 from industry, 7 from ICAR institutes, 6 from SAUs and two from National Institute attended the training programme. The training programme comprised of exposure to holistic approach of designing agricultural implements, and workplaces of tractors and self-propelled implements. The special emphasis was given on ergonomical considerations during the design process with due incorporation of limits with respect to anthropometric body dimensions and strength values of Indian workers, safe limits of environmental aspect such as vibration, noise, dust, chemical and ambient conditions. Participants felt that such training was the need of hour and the same should also be offered to students during Summer Training programme to inculcate the use of ergonomical principle in all young engineers and duration of the programme should be extended to the level of short course with more practical.



TRAINING

Hands-on Training for Farmers

Hands-on Training for Farmers on Improved Agricultural Implements and Machinery under Consortia Research Platform on Farm Mechanization and Precision Farming (CRP on FMPF) was organized in three batches during 8-10 Oct 2018; 18-20 Oct 2018; and 20-22 Dec 2018. Total 307 farmers from Chhattisgarh, Odisha, Madhya Pradesh, Maharashtra, Bihar participated. During the training programme, participants were briefed on updates of technologies on farm mechanization and agro-processing. They were given hands on training along with demonstrations of improved agricultural technologies, necessary adjustments, repair and maintenance. Participants visited different laboratories to get exposure of different available agricultural technologies. Demonstration of operation-wise implements required for seed bed preparation, sowing/planting and transplanting, spraying, interculture as well as harvesting and threshing were given. Women friendly tools/ implements, conservation agriculture machinery and bullock drawn machinery were also demonstrated. Moreover, covered cultivation technique, post-harvest technologies, value addition techniques and packaging techniques for fruits and vegetables were also explained.



Entrepreneurship Development Programmes

Entrepreneurship development programme on 'Preparation of soymilk and tofu' and 'Preparation of soy bakery foods and soyflour' was organized during 22-27 Oct 2018 and 10-15 Dec 2018, attended by 22 upcoming entrepreneurs.

Entrepreneurship development programme on 'Custom hiring of agricultural machinery' was organized in two batches during 22-27 Oct 2018 and 1-6 Nov 2018, attended by 41 participants.

Training for FMTTI Engineers

Four weeks trainings were organized for four extension functionaries/senior agricultural engineers of NRFMTTI, Hisar and one extension functionaries/senior agricultural engineers of CFMTTI, Budni during October to December, 2018.

Training on operation and maintenance of farm equipment

Regional Centre, Coimbatore organized training on "Operation and maintenance of farm equipment" under CRP on Farm Mechanization and Precision Farming. This one day training was organized on different dates during the quarter. Total 257 farmers from Udhagamandalam, Trichy, Erode, Coimbatore, Krishnagiri, Namakkal, Puducherry, Tirupur and Dindigul attended the training.



Skill Development Training Programmes

During the quarter, two skill development training programmes under Pradhan Mantri Kaushal Vikas Yojna (PMKVY) were organized.

The first training on "Green House Operator" was organized during 1-29 November, 2018, attended by 20 participants. The programme was targeted to impart skill of planning, organizing and directing the activities of greenhouse to propagate grow and market horticultural crops including vegetables, flowers and other plants and produce. The participants themselves carried

TRAINING/ TECHNOLOGY TRANSFER



out all the green house operations in the green house facility available at the Institute.

The second training on “Tractor Operator” was organized during 19Nov to 15 Dec 2018, attended by 20 participants. The programme was targeted to impart skill of operation and maintenance of tractor and field operation of primary tillage, secondary tillage, sowing and planting, interculture and plant protection, harvesting and threshing machinery and tractor trailer. For certification of participants, assessment of participants was conducted, through agency designated by Agricultural Skill Council of India(ASCI).



License Agreement

License Agreement was signed with M/s VasundhraKrishiYantra, Bhopal on 27 Nov 2018 for manufacturing of two technologies – i)

Bullock drawn three row planter with fertilizer drill for millets - multi-crop Model I - (Inclined plate type) and ii) Bullock drawn three row planter with fertilizer drill for millets-multi-crop Model II-(Vertical plate type).

Patent applications filed

During the quarter, patent application was filed for following two technologies:

Sl. No.	Technology	Inventor
1	Rotating finger with push-type mechanism for automatic vegetable transplanter for plug type seedlings	Dr Abhijit Khadatkar & Er SM Mathur
2	Automatic washer cum singulating system for spherical fruits	Dr SK Chakraborty

Participation in Exhibition

Regional Centre, Coimbatore participated in the **Krishimela-2018** during 15-18 Nov 2018 at University of Agricultural Sciences, GKVK, Bangalore.



Participation in Electronic Media Pro-grammes

S. No.	Media	Subject	Date	Person
1.	D.D. Kisan	KVK activities and inter cropping in orchards for doubling income	27 September, 2018	Dr. UR Badegaonkar
5.	ETV-18	Mechanization of potato planting	26 October, 2018	Shri RD Soni & Dr. UR Badegaonkar

TECHNOLOGY TRANSFER

NEWS FROM KVK

KVK organized on farm testing of following crops/ technology at farmers field, covering an area of 14 ha:

Sl. No.	Crop & Variety	Area
1.	Wheat HI-1544	2 ha
2.	Wheat HI- 8663	2 ha
3.	Gram RVG- 202	2 ha
4.	Gram RVG- 201	4 ha
5.	Differential depth seed -fertilizer applicator	2 ha
6.	Wheat HI-1605	2 ha



Frontline Demonstration

KVK conducted frontline demonstration of following technologies at farmers' field, covering an area of 16 ha:

S. No.	Technology	No. of farmers benefitted	Area (ha)/ Weight (g)	Village
1.	Groundnut digger	10	1.5	Basai (Berasia)
2.	Maize thresher	05	15q	Khamkheda (Berasia)
3.	Happy Seeder	05	1.5	Bhaironpura, Khamkheda (Berasia)
4.	Zero Tillage Sowing	25	08	Amoni (Phanda)
5.	Zero Tillage Sowing	15	05	Polah, Mandideep



Training for farmers

During the quarter, KVK organized following training, benefitting 614 farmers:

- Resource conservation techniques for doubling income
- Crop production techniques for rabi crops
- Integrated crop management for rabi crops
- Operation and maintenance of tractor and custom hiring of agricultural machinery, crop problems, identification and its management.
- Greenhouse operator under PMKVY
- Tractor operator under PMKVY
- Improved farm equipment for women
- Improved farm machinery techniques
- Establishment of kitchen garden at village Karariya and Prempura
- Utilization of soybean soya milk, paneer and soya product

TECHNOLOGY TRANSFER

Mahila Kisan Diwas

Mahila Kisan Diwas was organized on 15 October, 2018 in Village-Gol, Kolar Road, Phanda, Bhopal. More than 100 women farmers from Gol and adjacent villages participated in the event which also included activities like demonstration of women friendly agricultural equipment exhibition, speech, drawing competition on the themes: role of women in agriculture, women empowerment, and nutrition and income generation & swacchhata abhiyan.



Girls from Government School of Gol prepared and displayed drawings showing different roles played by women in agriculture. Speeches were delivered and poem recitation was also done by girl students during the event, highlighting the importance of women empowerment. Few women farmers from four different villages were also felicitated at this occasion for being the inspiration to other women with their contributions in the field of agriculture and allied sectors.

An exhibition on "Women Friendly Tools & Equipment" was also organized during the event and various agricultural implements adoptable by women farmers were displayed and demonstrated. Safety aspect was especially highlighted during the exhibition, by demonstrating the use of safety gadgets during spraying of pesticides in particular. Women farmers were felicitated and prizes were given to participants who took part in speech and drawing competition.

World Soil Day

World Soil Day was celebrated on 5 Dec 2018 at village Prempura, Bhopal. The program was attended by around 100 farmers. On this occasion, leaflets and folders about soil health and different programmes and schemes of Government of India were distributed. Zero-tillage technology for soil health improvement was also demonstrated.



Advisory and Diagnostic Services

Sl. No.	Discipline	Advisory services		
		Kisan Mobile	Advisory to farmers	Diagnostic services by visiting at farmers field
1.	Agronomy	15	210	18
2.	Engineering	02	130	04
3.	Horticultural	01	25	03
4.	Home science	06	55	05
Total		22	420	30

REPORT/ PUBLICATIONS

Study Leave Granted

Shri AP Magar, Scientist was granted study leave for three years wef 29 Oct 2018 to pursue Ph.D. in the discipline of Farm Machinery and Power at Mahatma PhuleKrishiVidyapeeth, Rahuri.

Human Resource Development

Name & Designation	Course	Duration	Venue
AK Malvia Personal Asstt.	Enhancing Efficiency and Behavioural Skills	24-29 Sep., 2018	ICAR-CIFE, Mumbai
RD Soni, STO & Smt SK Bharti, ACTO	Linking geospatial on technologies and agriculture system models to assess climate change on natural resource management	24 Oct., to 2 Nov., 2018	ICAR-IISS, Bhopal

Foreign Deputations

Dr CR Mehta, Project Coordinator, AICRP on FIM participated as a consultant in the 4th Training of Trainers of Asian and Pacific Network for Testing of Agricultural Machinery held in Beijing, China during 22-27 Oct 2018.

Trainers of Asian and Pacific Network for Testing of Agricultural Machinery held in Beijing, China during 22-27 Oct 2018.



Dr KK Singh, Director participated in the 40th Plenary Meeting of ISO/TC 23/SC 3 (Safety and Comfort Sub-Committee) held at Frankfurt, Germany on 23 Oct 2018.

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Papers Published

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Dr T Senthil Kumar, Principal Scientist and Dr AK Roul, Scientist attended the 4th Training of

PUBLICATIONS

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Sawant CP, Kumar A, Mani I, Singh JK, Yadav R, Sahoo RN. 2018. Performance evaluation of iari wheat seed-cum-fertilizer plot drill for pearl millet-wheat cropping system on permanent raised bed system. *Journal of Agricultural Engineering*, 55 (4):1-12.

Shiva KN, Adiyaman P, Naik R, Marimutu N. 2018. Development and standardization of Banana pseudostem based novel functional blended ready to drink beverages and studies on nutritional changes during storage. *LS: International journal of life Sciences*, 7(3):151-158.

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PUBLICATIONS

Books and Book Chapters

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REPORT

72nd Conference of Indian Society of Agricultural Statistics

Agricultural statistics is the brain in the embodiment of agricultural research, Dr. Trilochan Mohapatra, Secretary (DARE) and Director General ICAR said this while inaugurating 72nd Conference of Indian Society of Agricultural Statistics (ISAS) at ICAR-CIAE, Bhopal. The conference with the theme of "Statistics, Informatics, Engineering Interventions and Business Opportunities: A road-map to transform Indian agriculture towards prosperity", organized during 13-15 Dec 2018 at ICAR-CIAE, Bhopal. Dr. NS Rathore, DDG (Edu.), ICAR, Dr. Padam Singh, former member, National Statistical Commission and Executive President of Indian Society of Agricultural Statistics, Dr. KK Singh, Director, ICAR-CIAE, Bhopal, Dr. LM Bhar, Director, ICAR-Indian Agricultural Statistics Research Institute, New Delhi & Hon. Secretary, Indian Society of Agricultural Statistics also deliberated during the inaugural session. The inaugural programme was attended by around 300 delegates, scientists and guests. Dr. PC Bargale, organizing secretary presented vote of thanks.



REPORT

Annual Workshop of AICRPs**Workshop of AICRP on UAE**

The XVIII Annual Workshop of All India Coordinated Research Project on Utilization of Animal Energy with Enhanced System Efficiency (AICRP on UAE) was organized at Indira Gandhi KrishiVishwavidyalaya, Raipur during 4-5 December, 2018. The workshop was inaugurated on 4 December, 2018 under the Chairmanship of Dr Kanchan K. Singh, Assistant Director General (Farm Engineering), ICAR, New Delhi. Dr S. K. Patil, Hon'ble Vice-Chancellor, IGKV, Raipur was the Chief Guest. Dr. S. K. Rautaray, Ex-PC, AICRP on UAE and Ex Head of FMP, CAEPHT, Sikkim was the Guest of Honour. Dr S. K. Patil, as Chief Guest expressed his satisfaction on the performance of the AICRP on UAE project which has got huge relevance with the society and state. He emphasized on the role of small farm mechanization with integrated farming system approach. Dr. Kanchan K. Singh, ADG (FE), ICAR highlighted that India has got the largest livestock population and the AICRP on UAE group should work on the progress of mixed type Indian farming targeting to enhance the resource use efficiency. On the occasion, total six publications consisting of folders, technical bulletins, success Story and others were released.

**Workshop of AICRP on EAAI**

XXII workshop of the ICAR-All India Coordinated Research Project on Energy in Agriculture and Agro-based Industries (ICAR-AICRP on EAAI) was organized at University of Agricultural Sciences, Raichur during 10-12 Jan 2018 and progress of the approved projects under various components during 2018-19 was reviewed and proposal of the new projects were evaluated. Dr. K.N. Kattimani, Honorable Vice Chancellor, UAS, Raichur and Dr. S. Kamaraj, Ex-Prof. & Head, Bio-energy Department, Agricultural Engineering College & Research Institute (AEC&RI), TNAU, Coimbatore were the chief guest and special guest, respectively on the occasion. Dr. Anil Kumar Dubey, Consortium Project Coordinator – CRP on Energy from Agriculture & Head, Agricultural Energy & Power Division, CIAE, Bhopal and Dr. P.L. Singh, Principal Scientist, Subject Matter Division (Agricultural Engineering), ICAR, New Delhi, respectively chaired and co-chaired the inaugural session. The welcome address was delivered by Dr. B. K. Desai followed by the presentation of Project Coordinator's report by Dr. K. C. Pandey. On this occasion, four publications of the coordinating cell, two success stories and one publication of the ICAR-NRRI, Cuttack centre were released by the dignitaries on the occasion. The session ended with vote of thanks by Dr. veerangouda.



REPORT

Workshop of AICRP on ESA

The 10th Workshop of All India Coordinated Research Project on 'Ergonomics and Safety in Agriculture' was held at PAU, Ludhiana during 27-28 Nov 2018. The workshop was inaugurated by Dr. Baldev Singh Dhillon, Hon'ble Vice-chancellor, PAU, Ludhiana as Chief Guest. Dr. N. S. Bains, Director (Research), PAU, Ludhiana and Dr. L. P. Gite, Former Scientist Emeritus, ICAR-CIAE, Bhopal were Guest of Honour of the function. One Media CD developed in collaboration with VigyanPrasar on Women Friendly Technology and another media CD on Achievements of AICRP on ESA was released. A



special interactive session with industry was organized to ascertain initiative taken by industries to incorporate safety features and use of anthropometric data for equipment design and requirement of industry/manufacturers. Another brain storming session on agricultural accident survey was held to discuss the modalities of carrying out agricultural accident survey 2018-19.

BIS meeting

BIS meeting of sub group PCD7 on Mineral and solid Bio fuel was organized on 15 December, 2018. Director CIAE briefed the member on importance of biomass based pellets and briquettes. Scientists from the CIMFRI and CIAE Bhopal participated and finalized the standards on Specification and Terminology of Woody Pallets and Briquettes.



World Food Day

ICAR-CIAE along with NAIF-Agricultural Business Incubation (ABI) Unit, Bhopal and Association of Food Scientists and Technologists(I)-Bhopal Chapter jointly organized a product exhibition and business meet for promotion of Innovative Food Process Technologies on 16 October, 2018 "World Food Day". The one day product exhibition and business meet included fraternity from the scientific world, State Government, Faculty and students of colleges and Entrepreneurs. The exhibition included demonstration of innovative food technologies developed by ICAR-CIAE and local colleges. A poster competition for college students on the theme 'A Zero hunger World by 2030 is possible' was also organized. Mr. Satyanand, IFS, Commissioner Horticulture and Food Processing Industries, Govt. of MP inaugurated the function and emphasized the

opportunities and importance of food processing industries and the role of food scientist and technologist in eradicating poverty and hunger. Dr. KK Singh, Director, ICAR-CIAE laid emphasis on agri-business incubation, research collaboration, contract research for potential & upcoming entrepreneurs at pilot scale. He also stressed that every section of society should strive to curb food losses and food wastage. About 50 product technologies were displayed in the exhibition by different organizations. In poster presentation competition held for college students, total 62 posters were presented and 21 students took part in the Innovative Food Product contest. Around 500 people participated in the event. Prizes were distributed to the winners of the poster presentation and other competitions by Dr N. Kotwaliwale, Head APPD, ICAR-CIAE & President AFST(I)- Bhopal Chapter.

REPORT

Academia-Industry Interaction Meet for Central Region

ICAR-CIAE, Bhopal organized an Academia-Industry-Interaction Meet at ICAR-CIAE, Bhopal on 19 December, 2018. The main aim of the meet was to provide common platform for one-one interaction between the researchers and agricultural machinery manufactures. Shri J.J.R. Narware, Director, Central Farm Machinery Training & Testing Institute (CFMT&TI), Budni (M.P.), GOI was the Chief Guest. Dr. K.K. Singh, Director, ICAR-CIAE, Bhopal, Dr. C.R. Mehta, Project Coordinator, AICRP-FIM, Dr. M. Din, Project Coordinator, AICRP-UAE, Dr. K.N. Agrawal, Project Coordinator, AICRP-ESA, Dr PS Tiwari, Head of Agricultural Mechanization, ICAR-CIAE; Shri Gyarsi Prasad, Assistant Director, Testing facilities at MSME Testing Station Bhopal; Shri Mahesh Tilekar, Assistant Manager, NABARD; Shri O.P. Choksey, Ex-President, M.P. KrishiUpkaranNirmataSangh (MPKUNS); Shri Suresh Girdhani, Gen. Secretary, MPKUNS; Scientists, ICAR-CIAE, Bhopal and a large number of, micro, small, medium and large scale manufacturers of Agricultural machinery attended the meet. Shri J.J.R. Narware, in his inaugural address stated that manufactures must follow BIS standards while manufacturing agricultural equipment. He has stressed that the manufactures should look forward for the scope of improving mechanization in the area of hill agriculture, horticultural crops, post-harvest and intercultural practises in collaboration with ICAR-CIAE. ICAR-CIAE publication entitled as "Modern Agricultural Technologies" in Hindi was also released on this occasion by Director, CFMT&TI,



Budni, Shri J.J.R. Narware and Director, ICAR-CIAE, Bhopal, Dr. K. K. Singh. Dr. K. K. Singh, Director, CIAE, Bhopal briefed the distinguished participants about the objectives of the meet and emphasized that Farm Mechanization is need of an hour and it is one of the crucial factors for achieving the goal of doubling farmers' income by 2022. Dr. C.R. Mehta, PC, AICRP-FIM and Dr. P.S. Tiwari, Head, AMD presented technologies developed under AICRP-FIM and at ICAR-CIAE, respectively. About 100 delegates were participated in the interaction meet.

Industry Institute Interaction meet on Post-harvest Engineering and technologies

Government of India has been supporting Agricultural Mechanization in general at many forums. Equipment under post-harvest technology is gaining momentum and many government schemes are supporting the post-harvest equipment. The need of the hour is that the manufacturers under post-harvest sector also need to sensitize and to create awareness among manufacturers and other stakeholders on recent technologies on post-harvest engineering and technology. Regional Centre of the Institute at Coimbatore organized a one day Industry Institute Interaction meet on Post-harvest Engineering and technologies on 20 December, 2018 at Coimbatore. During this meet Dr. S. Balasubramanian, Principal Scientist welcomed the gathering and Th.K. Viswanathan, Honoray General Secretary, All India Agricultural Machinery Manufacturers Association briefed about the background of the interactive meeting. Dr. Ravindra Naik, Principal Scientist and Head, Central institute of Agricultural Engineering, Regional Centre, Coimbatore has explained about latest technologies in post-harvest engineering in agriculture during his keynote address. Er. N. Unnikrishnan, Superintending Engineer, Agricultural Engineering Department, Coimbatore briefed about government schemes and government initiatives on post-harvest engineering in Tamil Nadu. Er. A. Rajkumar, President, All India Agricultural Machinery Manufacturers Association, TN Chapter detailed

about their activities on promotion of agricultural mechanization. The chief guest Dr.Surendra Singh, Technical advisor, AMMA-INDIA insisted the post-harvest equipment manufacturers to utilize this opportunity for promotion of their products during his special address. Finally Dr.T.Senthilkumar, Principal Scientist thanked the participants. More than forty manufacturers, scientists and government official attended the interaction meet.



Vigilance Awareness Week was organized at the Institute during 29 October to 03 November, 2018. The Vigilance Awareness Week 2018 was commencing with the Integrity Pledges. The main topic of this week was "Eradicate Corruption-Build a New India". A quiz was organized on 1 November, 2018 whereas debate competition was held on 2 November, 2018. The main objective of the competition was to highlight the importance of vigilance awareness in the Institute. A guest lecture was organized on 1 November, 2018 related to vigilance awareness in which keynote address was delivered by Shri. K.N.Tewari (IPS), Special D.G. of Police, PHQ, Bhopal, M.P.Govt. Many other programmes in this context were also held in different schools of Bhopal.



Regional Centre, Coimbatore also organized Vigilance Awareness Week. A seminar on "Anti-corruption in the Society" by Dr. Mareena Hawkes, Chairman, All India Anti-crime and corruption control committee was organized on 2 November, 2018 at SFVGHS School Sreenaickenpalayam.

Swachhta Pakhwada

The Institute and its Regional Centre at Coimbatore organized the Swachhta Pakhwada programme during 16-31 December, 2018. The programmes/ activities include:

- Swachhta Pakhwada was launched by Swachhta Pledge by the Institute Staffs and address of the Director, ICAR-CIAE, Bhopal.
- Sanitation and Hygiene related speeches by the staff of the Institute.
- Rally and awareness programme on management of bio degradable and non-biodegradable waste by Institute Staffs in nearby village.
- Sensitization on complete sanitation and maintenance of hygienic atmosphere and vermicomposting/ composting of biodegradable waste management by involving farmers of "MeraGoanMeraGaurav" villages (Village Bhasouda, Berasia Block, and Village Nayapura, Tah: Huzur, Distt Bhopal)
- Comprehensive Campaign through drawing competition for Institute Staffs children. Shramdaan by officials and plantation of trees within the campus by the Institute staff.
- Addresses by distinguished guests (Shri Bablesh Singh, Parshad, Ward No. 79 and Shri Badri Towai, Paarshad, Ward No. 75 of Bhopal Municipal) on the importance of sanitation at home and public places for all Institute Staff.
- Programme/ Debate on sanitation measures by the Ph. D. Students and Institute staffs.
- Shramdan by the Institute staffs in dedicated cleaning of work places, workshops and beautification of the premises of the Institute.



REPORT

Central Zone Sports Meet

The Institute with contingent of about 80 sportspersons participated in the Central Zone Sports Meet organized by ICAR-IISS, Bhopal at BHEL Sports Ground during 12-15 Nov 2018. The following 21 players have been qualified for participation in ICAR Inter Zonal Sport Meet to be held at IVRI, Izatnagar (U.P.) during 25-28 February, 2019.technical supervision of ICAR-CIAE, Bhopal.

Sl. No.	Name	Event	Position
1	Dr. Dipika A. Murugkar	Badminton (Doubles)	Winner
2	Ms. Jolly John	Badminton (Single & Doubles)	Winner
3	Ms. PremlataVerma	Table Tennis (Single)	Winner
4	Ms. ManjuLohani	Table Tennis (Single) Table Tennis (Doubles)	Runner Winner
5	Ms. AshaKudopa	Table Tennis (Doubles) Carrom	Winner Runner
6	Ms. KaveriMondal	Carrom	Winner
7	Dr. AshtoshPandirwar	200 & 400 meter race	Winner
8	Dr. ChetanSawant	Javelin Throw Discus Throw	Winner Runner
9	Dr. Ajesh Kumar	Javelin Throw	Runner
10	Sh. R S Rajput	Cycle Race	Runner
11	Sh. RK Hedau	Carrom	Runner
12	Sh. Ravindra Singh	Volley ball (Shooting)	Winner
13	Sh. K. Shaji		
14	Sh. P.L. Jaison		
15	Sh. Rais Khan		
16	Sh. L KManipuri		
17	Sh. Ramesh Imne		
18	Sh. S K Bagde		
19	Sh. Umesh Sharma		
20	Sh. BasantVerma		
21	Sh. G R Potphode		

Distinguished Visitors

Dr. T Mohapatra, Secretary (DARE) & Director General, ICAR; Dr. NS Rathore, DDG (education) paid visit to different laboratories on 13 December, 2018 during 72nd Conference of Indian Society of Agricultural Statistics (ISAS). They witnessed demonstration of many newly developed technologies in the field of farm machinery, post-harvest processing, irrigation and protected cultivation. They showed keen interest in the innovative technologies especially those involving sensors and automation, viz. uniform rate spraying system, high clearance vehicle, SPAD meter, inter and intra row weeder, sensor based fruit packing line, sensor based storage monitoring systems, automated irrigation system for rice, real-time sprinkler irrigation etc. Both lauded efforts of the institute

in attempting novel and modern solutions which could very well be able to replace imported and expensive technologies. They also met one incubatee of the institute who is running business of minimally processed vegetables under technical supervision of ICAR-CIAE.



REPORT/ PERSONNEL NEWS

Ex-CM of UP and Member of ICAR Governing body, Shri.Jagdambika Prasad visited the Institute on 4 October, 2018 and appreciated the CIAE technologies.



Staff Promoted



Shri R Balamurugan
Technical Officer
wef 1 Sep., 2017



Shri RK Yadav
Sr Technical Assistant
wef 22 Oct., 2017



Smt Jolly John
Technical Officer
wef 1 Jan., 2018

Our New Colleagues



Shri Shubham Malviya
Technical Assistant (T-3)
3 November, 2018



Shri Prashant Patwa
LDC
26 October, 2018



Shri Sheelesh Parewa
LDC
29 October, 2018



Shri Gaurav Soni
LDC
26 October, 2018



Smt Deepika Shende
Assistant Chief Technical Officer
1 December, 2018

PERSONNEL NEWS

Staff Superannuated

Following staff superannuated from the Council's service and they were given a warm farewell:



Dr RC Singh

PS & Head, Agricultural Energy & Power Division
30 November, 2018



Shri Chhote Ram Pal

Skilled Support Staff
30 November, 2018

OBITUARY



Shri D.S. Uikey, Technical Officer left for heavenly abode on 1 November, 2018

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