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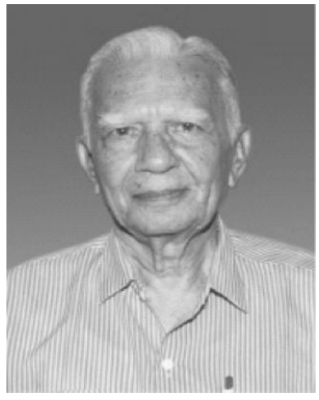
Pioneering Director of the Institute Passes Away



Prof. AC Pandya, the Pioneering Director of CIAE (May 1977 to April 1981), left for his heavenly abode on July 22, 2017.

Born on January 15, 1921 in Surat (Gujrat), Prof Pandya completed his graduation in Electrical and Mechanical Engineering from Bombay University in 1946. Thereafter he was awarded his Post-graduation degree in Agricultural Engineering from Iowa State University, Ames, Iowa, USA. He served the Agricultural Engineering community in various capacities as Head of Agricultural Engineering Department IIT, Kharagpur; Technical Director NDDB; Director Gujarat Energy Development Agency; Director CIAE and Director SPRERI, V.V Nagar.

During his illustrious career spanning 38 years he contributed not only in professional research but also in Institution building, administration and management. He guided 110 post-graduate and 22 Ph.D. students. He also served as the President and member of many professional societies related to Agricultural Engineering.

He laid the foundation and was one of the pioneering fathers of Agricultural Engineering in general and CIAE in particular.

His love for CIAE was reflected throughout the years, even when he was not serving as its Director. He was the chairman of QRT (2002-07) and participated actively in the growth and development of CIAE.

Prof Pandya shall always be remembered fondly for his devotion, discipline, vision and valuable contribution to Agricultural Engineering.

Sir, we will always miss you.

FROM THE DIRECTOR'S DESK

Dear Readers,

Humans have long recognized that weeds compete with desirable plants for water, sunlight, nutrients, and space, thereby reducing their productive capacity. Management of weed is an essential component of any cropping system especially during rainy (kharif) season. Considerable amounts of chemical fertilizer applied in the soil may be taken away by the weeds. Unless weeds are controlled at the appropriate stages of crop growth, the crop growth is adversely affected resulting in poor yields. Weeds grow very fast in large number in the agricultural land and their timely control is difficult. Weed control is done through the mechanical, cultural and chemical means. Mechanical control of weeds is the oldest method of weed control and involves use of tools (weeders) operated by man, animal or tractor. Cultural control of weeds involves crop competition, crop rotation, and cropping practices etc. Chemical control of weeds involves use of herbicides, which has its negative effect on the environment. Large amounts of herbicide use, leads to deterioration of soil and ground water.

Mechanical control of weeds causes soil aeration and thus increases crop yields. The *khurpi* is the most versatile and traditional hand hoe for removal of weeds but it takes 300-700 man-h/ha. Use of long handle weeders like wheel hoe and peg type weeders reduce this weeding time to 25-110 man-h/ha. Different types of self-propelled/tractor operated rotary weeders and sweep cultivators are commercially available in the market. However, these machines are suitable only for control of inter-row weeds. For intra-row weed control the only mechanical weed control option is manual weeding using hand hoe or spade. Keeping these points into consideration a mechanical intra and inter-row weeder has been developed by the Institute to perform inter and intra-row weeding operation simultaneously in wide-spaced row crops.

Moreover, hand held vegetable transplanters for transplanting of vegetable seedlings on ridge/raised bed and plastic mulch are also developed to provide solution to the manual operation at small farms. Presently, the vegetable transplanting for small scale gardening purpose (in developed countries) as well as field level (other than developed countries) is done by manually operated transplanters (hand-held planters). Manual vegetable transplanting is a labour intensive, tedious and time consuming operation, which consumes 260-320 man-h/ha. Semi-automatic vegetable transplanters are mostly being used in developing countries. Semi-automatic vegetable transplanters are also available in India for bare root, plug and pot type seedlings. Their transplanting rate is low (15-20 seedlings/min) which in turn gives low field capacity and field efficiency. It is due to the limitation of a labour to feed the seedlings to the transplanter at higher forward speeds (0.6-0.9 km/h). To overcome the above limitations, attempts are being made to develop automatic vegetable transplanters for plug (rubber with cells mechanism) and pot type (screw type and inclined rotor type) seedlings. Fully-automatic vegetable transplanters have been used in developed countries to handle large farm size. Attempts have been made in developing countries for modifying these machines to suit their locality in terms of farm size, farmer's capital status and serviceability. Robotic transplanting is being used in developed countries to handle large farm as well as atomise the operations. Since, some countries reached high-end techniques in planting, there is scope for developing countries to design or re-design or adopt the design of existing machines by considering the prevailing circumstances. Two-row and four-row semi-automatic transplanters for bare root seedlings were developed by this institute during nineties. These machines have been successfully adopted by farmers. Efforts are now being made to develop automatic transplanters for potted or plug type seedlings as chances of mortality in these seedlings are less in comparison to bare root seedlings. In this issue the details of one such transplanter with screw type metering mechanism has been presented while work on rotary magazine type metering mechanism for potted and plug type seedling is continuing.

DIGEST

Tractor operated system for controlled level puddling, mulch laying machine, hand cranking type paddy transplanter are other machines which has been presented in this issue of the CIAE Newsletter.

In this issue apart from the all-important research and development news CIAE is proud to have released 34 technologies which are ready for commercialization. These technologies are specially designed to help the farmer, manufacture and industry to be able to utilize modern technologies which will reduce drudgery and improve productivity and efficiency.

In this quarter apart from important trainings including an International training on *Farm Mechanization for Small Farmers* for our African and Asian counterparts was organised. A new QRT was constituted and they visited CIAE and gave their valuable feedback on the direction of research.

Many of our colleagues receive promotions and many superannuated. My congratulations to them.

It is my proud privilege to present this volume of CIAE Newsletter.

Mechanical intra and inter row weeder for wide spaced field crops

Mechanical control is among the most important classical weed management methods. Mechanical weeding has distinct advantages over chemical weeding i.e. slow growth of weeds and no adverse effect on plant growth. Presently no mechanical weeders are available for intra row weeding of field crop. So combinations of active and passive tools were used to develop an intra and inter row weeder for field crops. Spring tyne (length 260 mm) and sweep (width 250 mm) were used for intra and inter row weeding operation, respectively. The intra row weeding tool rotates around a horizontal axis parallel to the direction of travel, which is positioned directly above the crop row and moves along it. Maximum torque required for operating the intra row weeding mechanism was found to be 21.6 Nm at a compaction level of 600 kPa. Hydraulic motor of 50 cc displacement and 100 Nm capacities was used to operate intra rows. Final u/v ratio of 3.7, arm length of 260 mm, 6 arms at a weeding depth 30 mm were found to be the best for maintaining a higher weeding index. The final designed machine was developed and tested in maize crop. The results of sweep in inter rows showed that all weeds were affected by the tillage action of sweep, resulting in zero percentage of intact weeds. For intra row, nearly 71% of the weeds were destroyed by uprooting or cutting. The field capacity of the developed machine was found to be 0.26 ha/h.

Automatic vegetable transplanter for pot seedlings with screw type metering mechanism

Labour costs, solicitude in transplanting and difference in depth of planting seedlings are factors that make mechanical transplanting of vegetable seedlings necessary. A three row tractor drawn automatic vegetable pot seedlings with screw type metering mechanism has been developed consisting of a screw type metering mechanism, power transmission system with chain and sprocket as well as ground wheel, stack for storage the seedlings and three point attachment system. The replaceable screw metering mechanism and stack have been fabricated so as to reduce number of seedlings fillings and save the time. The metering mechanism has been preliminarily evaluated in the field. The speed of operation of the machine was found to be 1.5 km/h.

Tractor operated system for controlled level puddling

A system of controlled puddling using conventionally available 2WD tractor (MF1035) was developed and tested at AICRP FIM (TNAU, Coimbatore centre). The system uses a commercially available laser transmitter, receiver and control box (Black stallion –ES1313007). The receiver has been mounted on top of a mast fitted to a rotary tiller. The output of the tractor's hydraulic pump has been tapped through a flow diversion valve mounted on the hydraulic system housing. The lifting and lowering of the implement has been done by a pair of externally mounted hydraulic cylinders at the rear of the tractor and powered by the hydraulic output from the tractor. The total dynamic force required to be exerted by the lift cylinders has been calculated as 24.3 kN to ensure a static lift force of 11 kN. Based on this, a pair of 62.5 mm diameter lift cylinders with a stroke of 200 mm based on the linkage geometry were used.

A special hydraulic circuit was developed for use with the external hydraulic system consisting of a solenoid operated 4/3 direction control valve that may be operated by the control box. The pressure to both sides of the cylinder was regulated independently. A pressure compensated flow control valve has been provided in the pump line to regulate the rate of raise and drop of the implement and hence control the response, independent of the mass of the implement. Three field trials have been conducted, one with conventional rotary tiller of 1500 mm width and two trials with the rice special rotary tiller of 2600 mm width. Measurements were taken in fields to confirm the surface levels achieved using the laser controlled rotary tiller. The cost of the modification excluding the laser system and rotary tiller is estimated to be about Rs. 40,000/-. The cost of the entire system is Rs. 5.5 lakh. The effective field capacity of the system has been found to be 0.26 ha/h. The cost of controlled puddling with this system is Rs.2300/ha.

Tractor operated mulch laying machine

Tractor operated mulch cum drip-laying cum seedling planter has been developed at AICRP of FIM (MPUAT, Udaipur center). It consists of bund forming unit, fertilizer unit, mulch

laying unit, drip laying arrangement, press wheel, punch planter unit and covering device. The bund former comprises of two MS plates attached to the main frame and the size of the bunds varies according to the requirement by changing the distance between the bund formers. The fertilizer unit provided on the mulch laying machine to applies fertilizer at the time of mulch laying. A fertilizer box of size 620 × 460 mm is employed and a star wheel type metering mechanism made of plastic has been provided for metering of the fertilizer. A punch planter arrangement has been provided to make holes in the plastic mulch film and to plant seedling into the soil on the bund.

The field trials of the machine have been conducted at a moisture content of 12-14% in sandy loam soil. The effective field capacity is in the range of 0.08-0.12 ha/, the draft is 3610 to 3983 N and the fuel consumption is in the range of 3.6-4.2 l/h.

Two row rice transplanter (Hand Cranking Type)

A hand cranking type two-row transplanter developed by AICRP on ESA (Dr BSKKV, Dapoli center) for root washed seedlings consists of a seedling tray, seedling picking mechanism, nursery holding and pushing mechanism, nursery shifter cum erector, power transmission system, float and handle. The size of transplanter is 550 x 450 x 930 mm with weight of 14.6 kg and costing Rs. 6500/-. The field capacity and cost of operation (transplanting) has been found as 0.03 ha/h and Rs. 2600/ha, which is 71% less as compared to traditional method of manual transplanting. The working heart rate for male and female workers has been found to be 108 beats/min and 118 beats/min, respectively. The Overall discomfort rating (ODR) has been found to be 38 % lesser than the traditional method due to reduced bending posture.

Bullock power, rotary mode driven feed-in type sunflower thresher

AICRP on UAE (OUAT, Bhubaneswar centre) has developed a bullock power, rotary mode driven feed type sunflower. The average output of the thresher has been found to be 65 kg/h with threshing and cleaning efficiency of 99% and 85% respectively. The speed of rotation of the thresher shaft (430 rpm), oscillating screen shaft (360 rpm) and blower shaft (270 rpm) is maintained with the bullocks moving at 1.9 km/h. The overall fatigue score of the bullocks has been found to be 13.5 after 1 hour continuous operation, indicating that the equipment could be operated comfortably by them. The average power requirement for threshing has been calculated as 0.29 kW. The cost of sunflower threshing by the newly developed feed in type thresher has been found to be Rs1.70/kg. The cost of operation of sunflower threshing with the developed thresher is Rs 5.30/kg and threshing cost with conventional method is Rs 10.40/kg.

Rapid combustion system for thermal application

A force draft rapid combustion system for thermal applications using briquettes as a fuel source comprising of a combustion chamber insulated with ceramic fibre blanket, continuous biomass feeding unit with provision for feed control, raiser at the top of the combustion chamber, axial fan for air supply, cladding for thermal safety, and sliding ash bin for easy ash has been developed. The biomass feeding unit and axial fan is operated using a 12V, 7Ah battery. The unit has been tested using 6-8 mm biomass palettes of crop residue (pigeon pea and soybean stalk mixture). The thermal efficiency of combustion system has been found to be 35%, as compared

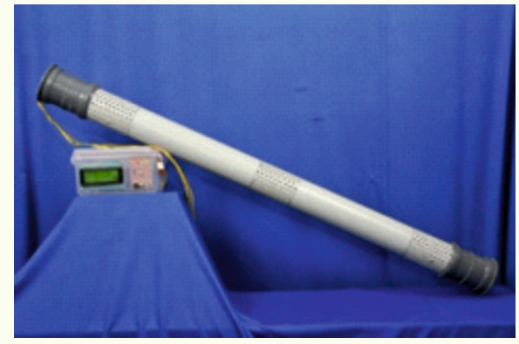
to conventional (13%) and CIAE improved (22%) cook stoves of the same capacity. The output of the system has been controlled between 5 to 8 kW to suit for various thermal applications such as cooking and steam generation.

Starch/ PLA based biodegradable films for packaging of fresh produce

Starch (cassava, corn, maize, rice and potato, (10-20%) blends) and PLA based biodegradable films using commercial blown film extrusion have been developed for packaging of fresh vegetables. The oxygen transmission rate (OTR) of the developed films ranged from 106 to 318 cm3/m2.day, Water vapour transmission rate- WVTR from 83 to 413 g/m^2 day and tensile strength from 22 to 56 MPa, which are similar to the conventional polymeric films. The Tg, Tm and Tc of biofilm varied from 58-65°, 141-147° and 106-114°, respectively. Modified Atmosphere (MA) storage using bio-degradable packaging with capsicum having package size of 28 x 16 cm (packaging surface area of 0.09 m^2) with a fill weight of 0.35 kg has been carried out at ambient and 8°C. MA packages maintained the quality of capsicum up to 12 days and 24 days , respectively as compared to unpackaged capsicum having shelf life of 4 days and 9 days at 25°C and 8°C, respectively. The bio-degradability study of the developed films using soil burial test indicates that after 150 days, the weight loss varies from 47-52%.

Automatic alert generation system for grain health monitoring

Monitoring of micro-environment inside a storage system is imperative to control insect activity and restrict spoilage of stored grains. Temperature, relative humidity and carbon-dioxide concentration are good indicators of environmental conditions inside storage structures. To this end, a sensor rod is mounted with 3 DHT-22 sensors for monitoring temperature, relative humidity and carbon-dioxide levels inside a storage system. Sensors, LED indicators and LCD with a data logger are mounted on the microcontroller. A program to generate and send automatic alert message to a mobile, in the case any of these parameters are more than the threshold value is also created. The sensor rods are installed in a flexible PVC coated fabric bag to monitor wheat grain health for a period of 8 months. The temperature, relative humidity and CO_2 levels in the bag are in the range of 12-37°C, 34-37%, 406-5764 ppm, respectively whereas the ambient conditions outside the bag ranges between 11-38°C, 8-91% relative humidity. Heightened insect activity increases the CO_2 level which indicates that CO_2 sensors are more suitable in detecting the grain health as compared to conventional temperature and relative humidity level of the interstitial environment of a bagged grain storage system.



Sensor rod mounted with alert generation system

Flexible grain storage system

Flaxseed fortified products

Flaxseed is a treasure trove of nutrients and nutraceuticals with established health benefits in human beings. Flaxseed has been incorporated into three products namely crackers, cookies and extruded snacks and quality parameters of the developed products in terms of nutritional and functional parameters have been studied. The products has no artificial preservatives and additives. Omega-3 fatty acid contents are about 3 g/100 g across all the products and the anti-nutritional content in terms of hydrocyanogenic acid is less than 22 mg per kilo gram across all the developed products.

CIAE-Hand held vegetable transplanter

Model 1- Single row: The manually operated single row hand held vegetable transplanter is a light weight (2 kg), low cost (Rs 500) machine which reduces the drudgery and increases the productivity of rural labor. It is used for transplanting of vegetable seedlings on ridge/raised bed/plastic mulch and consists of delivery pipes, frame with clutch and handle and jaw type mechanism. The developed transplanter has been tested in the field for transplanting of plug seedlings of tomato and chilli. The average transplanting rate is 15-17 seedlings/min with single labor. The overall dimension of the transplanter is 210 x 60x 1000 mm.

Model 2- Two row: The two row unit consists of portray fixing arrangement, two delivery pipes, frame with clutch and handle and jaw type mechanism. The transplanter has an overall dimension of 530 x 610 x 1000 mm, weighs 5 kgs and costs Rs 1000

CIAE- manual portray type nursery seeder

The manual portray type nursery seeder is useful for uniform watering, homogenous firming of the media reducing the use of excess amount of water and washout of the media It consists of set a of plates such as base plate, media firming-cum-watering plate, hole forming plate and set of seeding plates. The set-up is developed for sowing of 104 cells portrays (13 x 8 rectangular arrays).

CIAE- Push vertical plate planter with fertilizer drill: This equipment is suitable for sowing small seeds of millet, jute etc. Use of the multi millet seed cum fertilizer planters can save seed, fertilizer and cost compared to drilling by traditional methods. The developed equipment can be used by small and women farmers. The equipment has been developed for 4 different power sources viz. manual, animal drawn, power tiller operated and tractor operated (inclined plate and vertical plate). The specifications are as follows:

Specifications	Manual-Single row	Manually operated pull type three row planter	
		Inclined plate type	Vertical plate type
Overall dimensions, m	1.17 x 0.45 x 1.1	1.17 x 1.1 x 0.4	
Weight, kg	20	21	22
Draft, N	100-200		
Field capacity, ha/h	0.04	0.09	
Field efficiency, %	62-70		
Cost of operation, Rs/ ha	600-700	500-600	
Cost of machine, Rs	4,100/-	9,400/-	8,650/-

Specification	Bullock drawn three row		Tractor operated	
	Inclined plate type	Vertical plate type	Inclined plate	Vertical plate
Overall dimensions, m	0.7 x 1 x 0.9		0.7 x 2.1 x 1.0	
Weight	35		75	
Draft, N	400-500		800-900	
Field capacity, ha/h	0.12		0.42	
Field efficiency, %	65-70		70-82	
Operation cost, Rs/ ha	800-900		1000-1200	
Cost of machine, Rs	16,500/-	13,050/-	27,850/-	21,700/-




Technologies released by the ITRC

In its first meeting of the Institute Technology Release Committee (ITRC) held on 8 June, 2017, following 34 technologies have been recommended for release:

Sl. No.	Name of Technology	Salient feature of technology
1.	CIAE manual stalk uprooter	It is light weight (4.5 kg), gender friendly, simple, handy and easy to fabricate manual stalk uprooter useful for crops such as cotton, red gram, lantana camara etc.
2.	CIAE hand held vegetable transplanter	It is hand held single row light weight and low cost equipment for transplanting plug/ pod/ seedlings on ridge/ raised bed/plastic mulch. 
3.	CIAE manually operated portray type nursery seeder	It is a low cost manually operated portrays type nursery seeder for sowing of vegetable. It saves time, cost of operation and labor to the tune of 68% when compared with manual seeding by traditional method. 

TECHNOLOGIES RELEASED BY ITRC

Sl. No.	Name of Technology	Salient feature of technology
4.	CIAE Manually operated push type single row vertical plate planter with fertilizer drill	It is manually operated single row light weight with low ground clearance machine suitable for planting of small seeds (such as millet, jute etc.) and drill fertilizer simultaneously which leads to cost saving compared to traditional method. 
5..	CIAE Manually operated pull type three row planter for millets -multi-crops Model I - Inclined plate type Model-II-Vertical plate type	It is manually operated three row light weight pull type planter suitable for planting of small seeds such as millet, jute and multi crops, sorghum, bajra and vegetable seeds etc. It is available in two versions such as inclined plate type and vertical plate type. Use of the multi millet seed cum fertilizer planters can save seed, fertilizer and cost compared to drilling by traditional methods.  
6.	CIAE Bullock drawn three row planter with fertilizer drill for millets-multi-crop Model I - Inclined plate Type Model II Vertical plate type	It is light weight bullock operated low ground clearance three row machine used for planting of multi-crops such as millets, jute, carrot, grams etc. It can save seed, fertilizer and cost compared to drilling by traditional methods to the tune of 60-70%. The developed equipment can be used in the bullock dominated areas of the country. 
7.	CIAE power tiller attachment to six row planter with fertilizer drill	It is an attachment used to integrate the six row planter with fertilizer drill (inclined plate and vertical plate type) to power tiller. 
8.	CIAE Tractor drawn six row planter with fertilizer drill for millets/multi crop Model I - Inclined plate Type Model II - Vertical plate type	It is light weight tractor operated low ground clearance six row planter with fertilizer drill machine for sowing of millets/ multi-crop such as sorghum, wheat, maize etc. and nd drill fertilizer simultaneously. The metering is done through inclined plate or vertical plate system. 
9.	CIAE Animal lifting device for bullock and equines	It is manually operated, low cost and low maintenance cost equipment which is suitable for lifting and shifting animal upto 900 Kg. It is suitable device for treatment of recumbent animals. 
10.	CIAE Tractor drawn rotary assisted broad bed former-cum-seeder	It is rolling type bed shaping system which has also been used as power wheel which is a special feature of this seeder. Dumbbell shape re-shaper is also used as power source for metering device. This can be used by attaching and detaching of rotavator. 

TECHNOLOGIES RELEASED BY ITRC

Sl. No.	Name of Technology	Salient feature of technology
11.	CIAE motorized multi millet thresher	It is a motorized machine which has unique feature to carry out cutting and threshing of millet crop through alternately fitted canvas strip and cutting knife in six row on threshing drum. 
12.	CIAE tractor drawn seed-cum-fertilizer drill with two stage fertilizer application system	It is tractor drawn five row machine to apply fertilizer at two different depth in single operation. This machine has potential to increase wheat yield up to 15% and soybean up to 22%. 
13.	CIAE hydraulically operated three point linkage mounted instrumented cone penetrometer	It is a three point linkage mounted hydraulically operated cone penetrometer with tractor and DC power pack system of 12V lead acid battery. It can be operated in soil having cone index upto 500 kPa and soil profile of 500 mm depth.
14.	CIAE low cost SPAD meter	It is compact, handheld, portable and low cost meter to measure SPAD equivalent value for fertilizer application. 
15.	CIAE tractor drawn pre-emergence herbicide strip applicator-cum-planter	It is a tractor drawn six row planter-cum-fertilizerdrill equipped with pre-emergence strip herbicide applicator. 
16.	CIAE power tiller operated tree felling machine	It is a machine been developed basically for cutting tree upto 30 cm diameter under agri-forestry.
17.	CIAE power operated expanding type fruit grader (5 t/h)	The principle involved is sizing through one-dimensional separation of fruits by carrying the fruits on an expanding pitch flap conveyor. The grader has the provision to separate fruits into five grades by adjusting flap spacing between 30 to 145 mm. It is very much suitable for orchard owner growing various fruits in the field at different seasons because of its high capacity (5t/h) and high efficiency (95%). 
18.	CIAE soy fortified Nutritious Healthy Noodles	The soy fortified noodles with 10% FFSF, 10% DFSF and 8% SPI contains 391 Kcal and is rich in protein.
19.	Extruded functional snacks food	The extruded functional snacks food are rich in protein i.e. 20-80%, low in fat, of good quality and shelf life and acts as good protein supplement for school children.

TECHNOLOGIES RELEASED BY ITRC

Sl. No.	Name of Technology	Salient feature of technology
20.	CIAE diverging belt fruit grader (1 t/h)	It is ergonomically designed light weight (can be carried by two labourers in hilly terrain as well) diverging belt type fruit grader that has power requirement of 0.5hp single phase. It has high capacity (1.2-1.5t/hour), is easy to fabricate, operate and maintain. It is suitable for all round fruits and vegetable. 
21.	CIAE process technology for pro-duction of pro-biotic soya cheese spread	It is soy-cheese spread which is nutritionally rich and having probiotic characteristics. The probiotic soy cheese spread contains about 17% protein, 25% fat, high antioxidant activity (53 %), probiotic culture viability. It can be utilized as a spread with bread/ chapatti/ paratha/ biscuits as a main meal or a meal supplement. 
22.	CIAE ripening chamber for horticultural crops	It is portable chamber suitable for fruit growers (farmers) and small to medium scale fruit merchants. The chamber is equipped with an air-conditioner, humidifier, and ethylene generator to maintain the desired conditions for ripening. Fruits take 4-6 days to ripen. The material of construction is low cost EPE foam sheets (as insulating material) and twin wall PC sheets to make panels. An ethylene generator is used to generate gas for ripening. 
23.	CIAE power operated millet flaking machine	It is very compact machine yet easy for cleaning and maintenance. The adjustable gap between rollers makes it more suitable for flaking of different size of millets/ cereals and other food/feed materials. 
24.	CIAE fermented wholegrain sorghum flour	Fermented whole grain sorghum flour has improved nutritive value, taste, digestibility and storability. It can be stored up to 1 month in comparison to jowar flour with a shelf life of one week.
25.	CIAE nutri-bar	Nutribar is a high energy, protein, minerals and vitamins bar which is also a good source of phenolics and anti-oxidants. It is free from saturated fats and cholesterol having pleasant flavour with good palatability. 
26.	CIAE gluten free eggless cake	The cake is eggless, gluten free, cholestrol and trans-fat-free. It uses banana and yoghurt as the egg replacer. It is rich in protein, minerals and antioxidants and is a tasty and healthy snack. 

TECHNOLOGIES RELEASED BY ITRC

Sl. No.	Name of Technology	Salient feature of technology
27.	CIAE multi nutrient *ladoo*	The high energy and protein multi nutrient ladoo has a high satiety value is a good source of minerals, phenolics and antioxidants and easy to store and consume. It is liked by children and has a shelf life of one month. 
28.	CIAE power weeder for mound cassava	The unit is very handy weighs only 15 kg and hence any women operator can easily work without fatigue. The weeder can be moved freely in between the narrow spaces of 30-40 cm of mounds. The prototype consists of petrol engine (0.5 hp; 4-stroke), 
29.	CIAE banana chipper shredder	The machine is a horizontal free-standing unit mounted on four legs. It is operated by 3-hp three phase motor. As the equipment gives the desired size of banana pseudostem chips of about 25 x 50 mm, it is best suitable for vermin composting. This machine is gender friendly, cost effective, portable and suitable for on-farm task. 
30.	CIAE two row tractor drawn mechanical transplanter for sugarcane bud settlings raised in portrays	It is the only equipment available for planting of sugarcane bud settlings raised in portrays. The mechanism is a new method for propagation of sugarcane through bud chip/single bud technology. Seed material required under this technique is only 1 to 1.5 t/ha and the remaining cane after taking bud chips can be sent for milling/ jaggery. It also facilitates easier handling and transportation. The field capacity of the equipment is 0.20 ha/h. 
31.	Motorised double headed sugarcane single bud cutting machine	In this technique of raising of settling in the protray, the single bud along with a portion of the nodal region is cut off and planted in raised bed nurseries/polybags/protrays filled with FYM or press mud, soil and sand at 1:1:1 proportion. Seed material required under this technique is only 2 to 3 tons per hectare and the cane after taking single buds can be sent for milling/ jaggery making.
32.	Post harvest mechanization package for banana central core (slicer, dicer, fibre removal, juice squeezer, juicer/ grinder and surface water removal)	Banana central core is an abundant natural resource in tropical and subtropical regions, which is a good source of nutrition. About 5-7 tons of central cores can be extracted from one hectare. The banana central core which is wasted mostly can be made into value added nutrition products for human consumption, thus generating additional revenue to farmers / entrepreneurs / processors.
33.	CIAE mechanization package for rope making from outer sheath of banana pseudo stem	Out of the 14-18 sheaths available in a pseudostem of banana, the outermost 4-6 sheaths yield coarse fibre, the outer 6-8 sheath give soft lustrous fibre and the rest of the middle sheaths yield very soft fibres. This waste from banana plantation can be turned into wealth by value addition to useful products. Ropes from outer sheath of banana pseudostem is in high demand for different applications but is made labour intensive with hand spinning or by ratt machines.

TECHNOLOGIES RELEASED BY ITRC/ TECHNOLOGY TRANSFER

Sl. No.	Name of Technology	Salient feature of technology
34.	CIAE aonla deseeding/ segmentation unit	The model developed which is being operated by a motor will obviate the drudgery, provide safety and helps in hygienic way of deseeding aonla. The equipment is unique in design and very useful in seed removing and segmentation of the aonla fruits with ease. 

Technology demonstration

The package of machinery and implements namely Cultivator, Rotavator, Inclined plate planter, Pneumatic planter, Power weeder and Boom sprayer were demonstrated and evaluated in 10 ha area at 25 farmers fields at Kurumpakadu, Kollapalayam, vellitiruppur villages comes under Ammapettai block of Andhiyur Taluk of Erode district, TN. Parameters for field efficiency and cost of operations were estimated for different machines used in the project. The yield and economics of mechanical HDPS were compared with conventional HDPS cultivation. A mean average of 15.6, 62.5, 50.2, 65.7, percent of cost (Rs/ha) saving with respect to land preparation, sowing cost, weeding cost and spraying cost, respectively were arrived with mechanical HDPS. The total treatment cost (includes land preparation, sowing cost, weeding cost and spraying cost) of Rs.14,475 /ha was incurred with mechanical HDPS as compared to Rs 28,525/ha by conventional HDPS cultivation which gave 32% saving in cost by mechanized cutivation. The mean seed cotton yield of 13 q/ha registered with mechanical HDPS was found to be at par with conventional method. The net return of Rs.33,525/ha was realized with mechanical HDPS which was 61% higher with the conventional HDPS cultivation (Rs.20,875/ha). The benefit cost ratio 2.3 was calculated with mechanical HDPS and 1.4 with conventional HDPS.

Enhancement of awareness of food uses of soybean for nutrition purpose

To enhance the nutritional status of pre-school children of Hoshangabad district, educated Atal Bal Palak and officials of WCD through presentation entitled 'Food uses of soybean to enrich food products for malnourished children of Hoshangabad district' in the 'Sneh Sarokar Sammelan' was organised at Itarsi. The interactions convinced the District Collector and WCD officials to provide soybased nutritious foods in nutrition feeding programmes. SHG members of study area were trained to prepare soybased food products for Aanganwadi children. To create awareness regarding processing of soybean for food uses, two programmes were organized for rural women and official of WCD in study area (Hoshangabad rural and Pipariya block).

Training programme on ergonomical design guidelines

Training programme on Ergonomical Design Guidelines for Agricultural Tool, Equipment and Work Places was organized during 16-18 May, 2017. Total 14 participants including 4 from industry, 5 from ICAR institutes, 4 from SAUs and one 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. The participants were provided first hand experience through examples of designing the 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 Summer Training programme to inculcate the use of ergonomical principle in all young engineers.

Success Story
About 200 soy process enterprises established

Realizing the nutritional benefit and importance of entrepreneurship on soybean processing for economic development, a need was felt for establishment of soy processing enterprise at cottage scale in various regions of the country. Entrepreneurship development programme (EDP) on soybean processing for production of soy based acceptable food products has provided 6 day tailor-made hands-on training to more than 2000 upcoming entrepreneurs so far from various parts of the country. The training also includes technical guidance for establishment of soy processing enterprise in their region. The EDP training has resulted in establishment of about 200 soy processing enterprises at cottage scale in various regions of the country.

TRAINING ORGANIZED

International Training Program

An International Training Program on "*Farm Mechanization for Small Farmers*" was organized during 11-25 April, 2017. The two week training program was part of the USAID sponsored "Feed the Future- Indian Triangular Training (FTF ITT) Program in which USAID, Government of India and 11 African and 6 Asian countries are members. Twenty-three participants from nine countries namely Botswana (3) Ghana (2), Kenya (3), Liberia (2) Malavi (3), Mozambique (2), Uganda (3), Afghanistan (2) and Mangolia (3) participated. The participants were Agricultural Engineers, Agricultural Technical Officers, Livestock and fisheries officers, Agricultural Extension officers, Agri-business managers, Soil and plant protection experts and Agricultural economists. The training emphasized sharing of knowledge related to appropriate mechanization of small farms in the developing countries using machines and technologies developed under ICAR umbrella.

During the training, participants were exposed to various manual, animal operated, power tiller operated, tractor drawn and self-propelled machines suitable for the small farmers of respective countries. They were also given knowledge on post-harvest processing machines and renewable energy gadgets.

Shri Vishwas Sarang, Hon'ble Minister of State (Independent Charge), Department of Co-operatives, Panchayat, Rural Development and Bhopal Gas Relief, Govt. of MP, Bhopal inaugurated the training. Mr. Oliveira Amimo, Economics and Commercial Counsellor, High Commission of the Republic of Mozambique graced the occasion as Special Guest and Mrs. V Usha Rani (IAS) Director General (MANAGE), Hyderabad were also present.

The training programme was concluded on 25 April, 2017 in the presence of Shri Gauri Shakar Bisen, Hon. Minister for Farmers welfare and Agriculture, Govt. of Madhya Pradesh.

Training programme for established agripreneurs

CIAE RC, Coimbatore in collaboration with National Institute of Agricultural Extension Management (MANAGE), Govt. of India, Hyderabad organised training on Farm Mechanization for Established Agripreneurs during 28 June to 1 July, 2017 for the established Agripreneurs under AgriClinics & Agri-Business Centres Scheme (AC&ABC). About 25 established Agripreneurs from various parts of the country actively participated in the four days training programme. The training programme included sixteen lecture modules viz Status of Agril. Mechanization, Machinery for rice, banana, sugarcane, horticulture, millets and other field crops, agro-processing, value addition, demonstration of CIAE RC marketable technologies, etc.

Training for tribal farmers

CIAE RC, Coimbatore organized training for Tribal Farmers on Value-addition of banana pseudostem in association with M/s Keystone foundation, Kotagiri, Nilgiri District at Pillur tribal village of Coimbatore on 6 April, 2017. The training comprised of two session's viz. Banana Rope-making & Handicrafts and Banana Central-core Process Machinery demonstration. Mr PM Murugesan, Proprietor of M/s Banana rope production centre, Madurai, TN & CIAE RC provided the hands on training for the tribal group for making value added products from outer sheath of banana pseudo stem. The package of equipment in banana central-core process machinery, viz.banana central core slicer, dicer and juicer was introduced to the tribal group. They were also briefed about the various value added products from Banana Central core. Twenty five tribal farm men and women attended the training.

New external funded project

A project entitled "Development of Automated soil nutrient sensing system" was sanctioned under NASF, ICAR with a total budget of Rs.145.8374 lakh.

TECHNOLOGY TRANSFER

Signing of MoU and MoA

- Memorandum of Understanding (MoU) was signed with Directorate of Health Services, Govt. of Madhya Pradesh for collaborative work on malnutrition of children on 6 April, 2017.

- Memorandum of Understanding (MoU) was signed on 16 May, 2017 for commercialization of tractor drawn two row sugarcane settling transplanter with M/s Rohit Krishi Industries Private limited, Pune for an amount of Rs 1 lakh. The technology was released jointly by Dr. K.K Singh, Director, ICAR-CIAE and Dr Bakshi Ram, Director, ICAR Sugarcane Breeding Institute, Coimbatore. The Scientists associated in the development of the equipment include Dr. SJK Annamalai, Dr. T Senthilkumar and Dr Ravindra Naik from ICAR -CIAE RC, Coimbatore and Dr N Vijayan Nair, Dr Rajendra Prasad, and Dr Bakshi Ram, from ICAR SBI, Coimbatore. The transplanter is used for transplanting sugarcane bud chip settling raised in portrays. It has the arrangement for adjusting row to row spacing (90, 120 and 150 cm), plant to plant spacing (30, 45 and 60 cm), and depth of planting (2 to 6 cm). It also has furrow openers to open the furrow, in which the settlings with soil are planted and furrow closure to close the furrow after transplanter and a ridge former to make irrigation channel.

- Memorandum of Agreement (MoA) was signed with M/s Vashundhara Agro industries, Bhopal for commercial manufacturing of five CIAE technologies (Three row seed cum fertilizer drill; Two row seed cum fertilizer drill; Power tiller drawn seed drill; Power tiller drawn auger digger; CIAE pedal cum power operated grain cleaner cum grader) on 29 June, 2017.

Patent application filed

Patent application for following technologies was filed in the month of May, 2017:

- Power cum manual operated fruit and vegetable grader
- Process technology for utilization of digested bio-gas slurry for cellulose production

Participation in exhibitions

CIAE technologies were exhibited in the following exhibitions:

- Krishi Mela at Motihari, Bihar (13-19 April, 2017)
- Krishi Vikas Mela at Bhopal (19-21 May, 2017)
- Kisan Vigyan Mela at Rajgarh (5-7 June, 2017)

Prototype production and supply

CIAE prototypes (704 Nos.) worth Rs.7.74 lakhs were supplied to various stakeholders.

News from KVK

KVK, CIAE Organized a “Soil Health Campaign” on 13 April, 2017, in Village-Dhamarra in which 40 farmers participated. Soil health cards were also provided to the farmers who earlier submitted the soil samples.

Organized a camp on “Summer Ploughing” and “Soil Health Campaign” on 14.04.2017, in Village-Acharpura in which 45 farmers participated. This programme was organized on Birth Anniversary of Dr BR Ambedkar in which the Sarpanch of village Acharpura and state govt. officials also participated. The farmers were made aware of the benefits of summer ploughing against burning of crop residue and also the benefits of soil testing in deciding about the nutrient application.

A Kisan Sangosthi was organized in association with Directorate of Agricultural Engineering divisional office Bhopal on Mechanized Crops Production Technology of kharif crops in Village-Tarawali, in which farmers from adjacent villages, namely Chandukhera and Hirankhedi also participated. Overall 72 farmers participated in the event, who were made aware of the raised bed technology for soybean cultivation, besides plant protection and integrated nutrient management practices.

KVK organized training in the following areas. Total 264 farmers attended.

- Farm machinery, post-harvest technology, high tech horticulture and crop cultivation
- Crops residue management and efficient utilization of agro chemicals in kharif crops
- Improved production technologies of onion crop
- Improved production technologies of soybean crop
- Redgram production technology and water management practices
- Soybean production technology and utilization of polluted water and crops residue in kharif crops
- Utilization of crop residue for nutrient management in kharif crops and drainage management in crops field

REPORT

TV Programmes

Sl. No.	Channel	Topic	Date	Presenter
1.	E T.V M.P. (Annadata)	Insect and pest management in cucurbitaceous crop	25 May, 2017	RS Yadav, CTO
2.	E T.V M.P. (Annadata)	Composting of biomass by NADEP PITS	26 May, 2017	RD Soni, STO
3.	E T.V M.P. (Annadata)	Improved production of technology of black gram	13 June, 2017	RD Soni, STO
4.	E T.V M.P. (Annsdata)	Improved production of technology of groundnut	13 June, 2017	RD Soni, STO

Radio Programme

Radio	Topic	Date	Presenter
AIR	Orchard management in summer season	12 April, 2017	RS Yadav, CTO

Human Resource Development

Shri PK Das, Senior Technical Officer attended training on *Electrical controls and relay logic applications* at CRISP, Bhopal during 15-19 May, 2017.

Ph.D. Awarded

Er Narendra Singh Chandel has been awarded Ph.D. by IIT Kharagpur for his thesis entitled "Electronic control unit and digital nutrient integrated variable rate fertilizer application technology". He did his Ph.D. work under the guidance of Prof. V K Tewari, Professor & Head Agricultural and Food Engineering Department, Indian Institute of Technology Kharagpur.

Foreign Deputations

Dr KK Singh, Director attended Regional Workshop for Research and Academic Institutions on Establishing a Cooperation Mechanism for Human Resource Development on Sustainable Agricultural Mechanization of Centre for sustainable Agricultural Mechanization (CSAM), held at Nanjiang, China during 13-15 April, 2017.

Dr CR Mehta, Project Coordinator, AICRP on FIM attended 3rd Meeting of the Technical working Group (TWG) of the Asian and Pacific Network for Testing of Agricultural Machinery (ANTAM), held at Dhaka, Bangladesh during 24-27 May, 2017.

Swachhta Pakhwada

The Swachhta Pakhwada was observed during 16-31 May, 2017 and following programmes were organized

- Swachhta Pledge (16 May)
- Cleanliness drive in the lawns and gardens of the Institute with the aim to create awareness among the staff for sanitation and beautification (17 May)
- The Hon'ble Member of Parliament (Lok Sabha-Bhopal) Shri Alok Sanjar visited and addressed to all the staff on the importance of Swachh Bharat Mission and appealed to work for complete sanitation (18 May)
- Sensitization and awareness programme was in village Nabi Bagh for sanitation at the rural level. Mr. Rafiq Khan Mansoori & Mr. Hafeez Khan Mansoori, both residents of village Nabi Bagh, developed a park on their own land for all the villagers by getting inspiration from the various activities undertaken at this Institute during previous year Swachhta Pakhwada programmes. Director, CIAE inaugurated the said park (19 May)
- Programme on sanitation and agricultural waste management (20 May)
- Awareness and sensitization programme on sanitation in the adopted village Barkhedi Abdullah (22 May)
- Programme on use of impure water for irrigation purposes for the agricultural crops (23 May)
- Debate competition on the topic "Effective Use of Modern Agriculture in Sanitation" (24 May)
- Programme on sanitation and effective use of impure water in agriculture for farmers of village Pipaliya Dhakad and Borkhedi
- Workshop on basic maintenance for Institute staff (25 May)
- Programme on digitization and e-office for Institute staff (27 May)
- Slogan, Poster and Banner competition for Institute staff (29 May)
- Shri Sharad Chandra Dubey, Retd. City Superintend of Police, Bhopal, addressed the staffs of the Institute on the complete sanitation programme of Government of India under Swachh Bharat Mission (30 May)
- Closing Ceremony of Swachhta Pakhwada (31 May)

Quinquennial Review Team Constituted

Quinquennial Review Team Constituted was constituted by the Council on 18 May, 2017 to review the work done by the Institute and its AICRPs (FIM, UAE, EAAI and ESA) and CRPs (FMPF and EA) during the period 2012-17. The following is the composition of the QRT:

Dr Gajendra Singh
Chairman
(Former VC, Doon University & DDG (Engg), ICAR)

Dr MK Garg
Member
(Former Dean & Prof. CAET, CCSHAU, Hisar)

Dr Surendra Singh
Member
(Former PC, AICRP on FIM & Technical Advisor, AIMMA)

Dr Diwakar Durairaj
Member
(Dean, AEC&RC, TNAU, Coimbatore)

Dr HS Sidhu
Member
(Senior Research Engineer, BISA, PAU, Ludhiana)

Dr KN Tiwari
Member
(Professor, A&FED, IIT, Kharagpur)

Dr Sukhpal Singh
Member
(Former Professor of Economics, IIM Ahmedabad & DG, CRRID, Chandigarh)

Dr KN Agrawal
Secretary
(PC, AICRP on ESA, ICAR-CIAE)

The first meeting of the QRT was held at the Institute under Charimanship of Dr. Gajendra Singh, Former Vice-chancellor, Doon University and former DDG (Engg), ICAR, during 14-16 June, 2017. Other members present during the meeting were Dr. Surendra Singh, former Project Coordinator AICRP on FIM and Technical Advisor, AIMMA; Dr. H.S. Sidhu, Senior Research Engineer, Borolog Institute of South Asia; Dr. K.N. Tiwari, Professor, IIT, Kharagpur; Dr. M.K. Garg, Ex-Dean and Professor, HAU, Hisar; Dr. Sukhpal Singh, Professor, IIM Ahmedabad and DG, CRRIDD, Chandigarh. The team reviewed the progress made by the institute, AICRPs and CRPs during XII Plan (2012-17). Achievements and impact of the Institute and different schemes were presented by Director, CIAE, Bhopal, Project Coordinators of AICRPs and Lead Centre Principal Investigators of CRPs. Project wise achievements were presented by Head of Divisions. The team also visited manufacturers of the CIAE technologies and adopted village Kachhi barkheda to ascertain the impact of institute technologies.

MEETINGS/ PUBLICATIONS

IRC Meeting

The 99th IRC meeting was held during 6-8 and 22-23 June, 2017. The following 15 new projects were approved in this IRC:

- Mechanization package for mini tractors (upto 20 hp)
- Development of Automated Soil Nutrient Sensing System (NASF Project)
- Design and development of tools and gadgets for floriculture (Inter-institutional collaborative project with ICAR-Directorate of Floricultural Research, Pune)
- Characterization and substitution of existing materials for selected machinery
- Market assessment and demand forecasting of farm machinery manufacturing in Madhya Pradesh
- Technology package for the production of quality grape raisins
- Development of Infrared pre-treatment system for pulse milling
- Development of process technology for production of soy chaap
- Development and characterization of edible films for food packaging application
- Solar powered prime mover for spraying and weeding operations
- Design of horizontal subsurface flow filter for agricultural runoff / waste water for irrigation
- Development of Banana sucker paring equipment, pseudo stem injector, bunch harvester and pseudostem outer sheath plate making equipment
- Development of power operated carrot harvester cum detopper for hilly region
- Development of farm machinery mobile app for major crops of Tamil Nadu
- Technology commercialization and Entrepreneurship development in Farm Mechanization in Southern Region

PUBLICATIONS

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News from the Personnels

Our New Colleagues

Shri Bikram Jyoti joined as Scientist (FMP) on 15 April, 2017

Smt Samlesh Kumari Meena, joined as Scientist (Dairy Microbiology) on 23 May, 2017. She was transferred to ICAR-CIAE from ICAR-NIHSAD, Bhopal

Transfer

Shri Prashant Kumar, SFAO was relieved on 1 April, 2017 to join as SFAO at ICAR Research Complex for NEH Region, Umiam, Meghalaya

Shri Kumar Vivek, SAO was relieved on 1 April, 2017 to join as SAO at IIPR, Kanpur.

Dr Bhaskar B Gaikwad, Scientist (FMP) was relieved on 29 June, 2017 to join as Scientist, ICAR-NIASM, Baramati

PERSONNEL NEWS

Promotions

Dr MK Tripathi
Principal Scientist
(Bio-Chemistry)
wef 15 April, 2015

Dr S Mangaraj
Principal Scientist
(AS&PE)
wef 24 July, 2015

Shri G. Muruganandam
Sr Technical Officer
wef 25 Feb, 2016

Shri AR Jesuraj
Technical Officer
wef 17 Feb, 2017

Shri S. Padmanabhan
T-4 Sr Technical Assistant
wef 17 Feb, 2017

Shri VK Gond
T-4 Sr Technical Assistant
wef 27 March, 2017

Shri Dharmendra Singh
T-3 Technical Assistant
wef 21 Nov, 2016

Shri Kalyan Singh
LDC
wef 19 May, 2017

CIAE bids adieu to superannuating staff

The following staff were superannuated from the Council's service. They were given a warm farewell. CIAE fraternity wishes them and their families a healthy and prosperous future.

- Shri Manphool, Skilled Support Staff (30 April, 2017)
- Dr S Ganesan, Principal Scientist (31 May, 2017)
- Shri RC Malviya, Assistant (31 May, 2017)
- Shri RB Amkare, Technical Officer (31 May, 2017)
- Shri Annilal, Skilled Support Staff (30 June, 2017)
- Shri Madanlal, Skilled Support Staff (30 June, 2017)

Shri Manphool

Dr S. Ganesan

Shri RC Malviya

Shri RB Amkare

Shri Annilal

Shri Madanlal

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