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ICAR

ISO 9001:2015

Annual Report 2018-19

ICAR - CENTRAL INSTITUTE FOR RESEARCH ON COTTON TECHNOLOGY (CIRCOT)

Adenwala Road, Matunga, Mumbai - 400 019
(An ISO 9001:2015 Certified Institute and NABL Accredited Lab)
www.circot.res.in

Towards doubling farmer's income through sustainable cotton processing technologies & value addition to by-produce

ISO 9001:2015

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ICAR-CIRCOT Annual Report 2018-19

Published by
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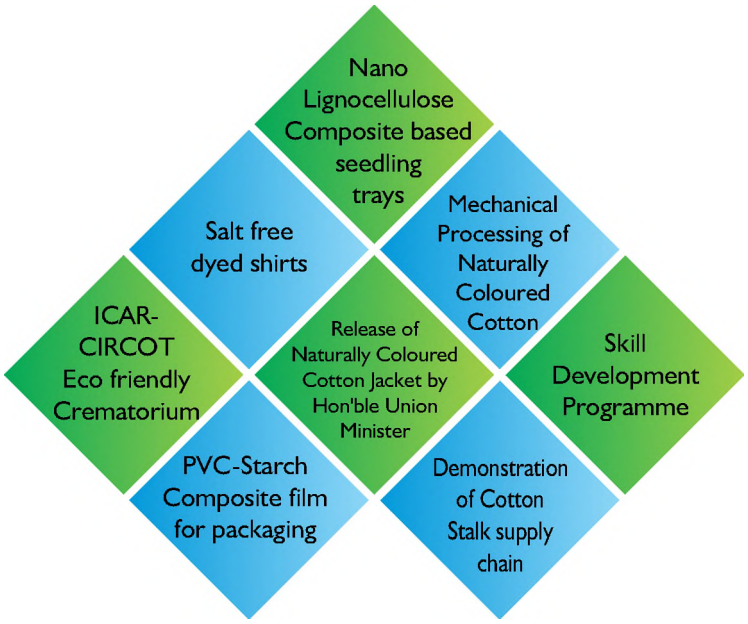

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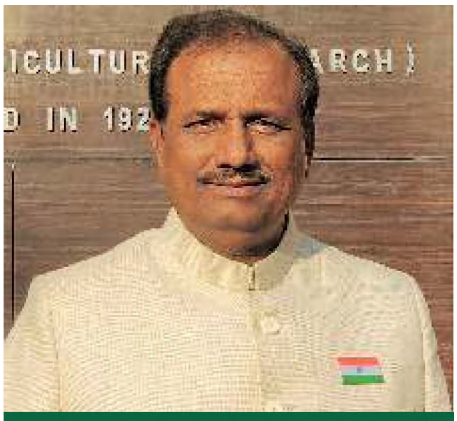
Contents

ABBREVIATIONS

ABI	Agri-Business Incubation
AFIS	Advanced Fibre Information System
AFM	Atomic Force Microscopy
AICRP	All India Coordinated Research Project
AKMU	Agricultural Knowledge Management Unit
ASRB	Agricultural Scientists Recruitment Board
ASTM	American Society for Testing and Materials International
BIS	Bureau of Indian Standards
BSKKV	Dr. Balasaheb Sawant Konkan Krishi Vidyapeeth
CBPD	Chemical & Biochemical Processing Division
CIRCOT	Central Institute for Research on Cotton Technology
CTRL	Cotton Technological Research Laboratory
DRGin	Double Roller Gin
FTIR	Fourier Transform Infrared Spectroscopy
GTC	Ginning Training Centre
HDPS	High Density Planting System
HVI	High Volume Instrument
ICAR	Indian Council of Agricultural Research
ICCC	Indian Central Cotton Committee
ICT	Institute of Chemical Technology
IFS	Indian Fibre Society
IJSC	Institute Joint Staff Council
IMC	Institute Management Committee
IP	Indian Pharmacopoeia
IRC	Institute Research Council
ISAE	Indian Society of Agricultural Engineers
ISCI	Indian Society for Cotton Improvement
ISO	International Organization for Standardization
ITMF	International Textile Manufacturers Federation
ITMU	Institute Technology Management Unit
MFC	Micro Fibrillated Cellulose
MGMG	Mera Gaon Mera Gaurav
MoU	Memorandum of Understanding
MPD	Mechanical Processing Division
NABL	National Accreditation Board for Testing and Calibration of Laboratories
NAIF	National Agriculture Innovation Fund
PMC	Project Monitoring and Evaluation Committee
QEID	Quality Evaluation and Improvement Division
QRT	Quinquennial Review Team
RAC	Research Advisory Committee
R&D	Research and Development
RPM	Revolutions per minute
SEM	Scanning Electron Microscopy
SBEE	Society of Benin Electrical Engineering
SNDT	Shreemati Nathibai Damodar Thackersey (Women's University)
TAP	Technical Assistance Programme
TTD	Technology Transfer Division
USDA	United States Department of Agriculture
UNCTAD	United Nations Conference on Trade and Development
VJTI	Veermata Jijabai Technological Institute

PREFACE



Dr. P. G. Patil, Director

Cotton, lifeline of over 5 million farmers in the country, was grown in an area of around 12.3 million hectares with a production of about 330 lakh bales during 2018-19. Cotton is the pre-dominant raw material for the textile sector in the country and the sector is the source of livelihood for around 45 million people linked to the value chain.

ICAR-Central Institute for Research on Cotton Technology, serving the stakeholders of the cotton sector for over nine and half decades, is carrying out the basic and strategic research in processing of cotton and its agro-residues and development of value added products. The institute also provides quality based inputs to the country's cotton breeding programme for varietal development with desired qualities.

The institute is also giving considerable attention towards elimination of the pink boll worm at the processing stage especially in ginning. The institute has initiated new programmes with emphasis on newer areas of application for cotton such as technical textiles, health care and smart textiles. ICAR-CIRCOT has made an initiative to revive the naturally coloured cotton through development of appropriate technology for its processing to make value added products. We also focus on development of technology that saves water, chemical, energy in processing of textiles and reduces the effluent load. The institute is also working towards enabling the cottonseed meal as protein source in non-ruminant feed.

The institute is pursuing every possible effort to promote effective utilization of cotton stalks through value addition rendering it as an industrial raw material and also providing a channel for additional remuneration to the farmers. An eco-friendly crematorium has been developed by the institute that uses cotton stalk or other agro biomass based briquettes for cremation, preventing the felling of trees. The institute is making efforts to capitalize on availability of huge volume of biomass viz., cotton stalks and banana pseudostem, and promote commercially viable economic activities through its technology for value addition.

ICAR-CIRCOT has created a place for itself for capacity development in the area of Post-harvest processing of cotton and value addition to its biomass. The programme has catered to the skill development needs of the cotton stakeholders in the country and also for capacity building of the stakeholders in the African countries. On the international front, the institute has assisted the United Nations Conference on Trade and Development (UNCTAD), Geneva in creating capacity and promoting the Cotton by-products based developmental activity in the countries of Zambia, Zimbabwe, Tanzania and Uganda.

Institute is emerging as a destination for promoting and nurturing the budding entrepreneurs through its Agri-Business Incubation Centre. The scope of the incubation facility in the institute has widened beyond providing the technology mentorship, as it has been bestowed with the RKVY- RAFTAAR ABI that has provision for financial support viz., pre-seed and seed stage funding, to the innovation based start-ups in the field of Agriculture.

ICAR-CIRCOT has always been front runner in implementing the initiatives of the government such as Mera Gaon Mera Gaurav (MGMG), Renewable Source of Energy, Waste to Wealth, Make in India etc.

As a Referral laboratory for cotton textiles, the institute has been serving the needs of the stakeholders through consultancy and commercial testing service. The Internal resource generation of the institute through its technology commercialization, research consultancy, skill development programme, incubation and sale of the products based on institute technologies was to the tune of Rs 190 lakhs during the Year 2018-19. I acknowledge the contribution of all the staff member for the achievement.

Mumbai
June 2019

Dr. P.G. Patil
Director

EXECUTIVE SUMMARY

ICAR-CIRCOT is a unique research institute in India working in the field of post-harvest processing of cotton and value addition to cotton by-products. The institute is a premier constituent institute of Indian Council of Agricultural Research, Department of Agricultural Research and Education, Ministry of Agriculture and Farmers Welfare. The Institute has a mandate to carry out basic and strategic research on processing cotton and its agro-residues, development of value added products and quality assessment besides organising skill development programmes & providing business incubation services and functions as referral laboratory for cotton fibres. It provides technological solutions to farmers and cotton industry stakeholders in the field of post-harvest processing of cotton and value addition to cotton by-produce and acts as a bridge between farmers and Industry.

The Institute has been accorded permanent recognition by University of Mumbai for guiding students leading to M.Sc. (by research) in Physics, Bio-physics, Microbiology and Organic Chemistry and PhD in Physics and Microbiology.

CIRCOT's dedicated scientific and technical workforce is always striving hard towards achieving sustainability & inclusive growth in the cotton sector. The Institute undertakes research activities in 5 major core area viz.

i. Pre-ginning and Ginning;
ii. Mechanical processing: Technical textiles and Composites;
iii. Characterization - cotton and other natural fibres, yarns and textiles;
iv. Chemical and Biochemical processing and biomass & by-product utilization
v. Entrepreneurship and Human Resource Development.

Some of the salient achievements made by the institute during 2018-19 are:

Research

Four process technologies, Eight Machineries / value added products have been developed.

Process technologies

- Process of colour removal from reactive dye bath effluent using adsorption technique
- Elementary Chlorine Free bleaching protocol for banana fibres
- Enzymatic process for production of surgical cotton
- Process protocol for extraction of protein concentrates from cottonseed meal

Machineries / value added products

- Trash handling system for control of pink bollworm in cotton ginneries
- Eco-friendly, efficient and Rapid burning Crematorium Using Cotton stalk/biomass briquettes
- Banana fibre based value added products(Dishware)
- Nanocellulose polymer based PVA Composite Film
- Seedling tray from nano-lignocellulosic biomass based composites
- Nanocellulose as a rheology modifier in water based paints and coatings
- Banana Fibre based Kraft pulping for packaging
- Conductive yarn for smart textiles

Publications

- Published 24 research papers in peer reviewed journals; 9 conference paper presentation; 5 monthly e-newsletters, 6 training manuals, four Book chapters, 11 popular articles, Booklet "ICAR-CIRCOT Value Addittion Technologies on Cotton By-Products for Eastern and Southern Africa"; 2 Brochures, 20 leaflets; and Hindi Magazine Amber 2017.

Skill Development initiative

- 37 training programmes including, specialised (self-sponsored) & Farmers training programmes have been organized benefitting 701 participants at Mumbai, Nagpur and Coimbatore for capacity building in the cotton sector.

Technology Management & Popularisation

- One patent has been filed, Twenty eight consultancies were undertaken and Twelve MoUs were signed for Technology commercialization and incubation.

- In Collaboration with UNCTAD, ICAR-CIRCOT conducted a workshop under the United Nations Development Account Project 1617K on "Promoting Cotton by-products in Eastern and Southern Africa" for participants from Zambia, Zimbabwe, Tanzania and Uganda. Significant contribution made by the institute in the project has been duly acknowledged by the Letter of appreciation from UNCTAD.
- Organized / participated in 07 exhibitions, 04 industry-interface meets as well as participated in various meetings, seminars, workshops and conferences for popularizing institute technologies among stakeholders.
- Mera Gaon Mera Gaurav activities were conducted in 30 cotton growing villages in Wardha district of Maharashtra where scientists and technical officers demonstrated farmer friendly technologies for enhancing farm income. During the year scientists conducted 47 village visits, 12 interface meetings, 14 demonstrations and 12 awareness programmes in which about 2300 farmers from adopted villages participated.
- Two television talks on DD Sahyadri and One radio talks on All India Radio were delivered by Institute Scientists.

Accreditation, Awards and Recognition

- Accredited with ISO 9001:2015 for Quality Management System by Bureau of Indian Standards.
- NABL accreditation for Mechanical and Chemical testing of cotton fibre yarn and fabrics.

Extracurricular activities

- Institute has participated in the ICAR west zone sports tournament and bagged seven gold, seven silver and six bronze medals in various events.In the ICAR inter zonal sports tournament, the institute got one Gold, three silver and one bronze medals.
- Cleanliness programmes under Swachh Bharat Abhiyaan in the Institute premises and at the staff quarters regularly conducted throughout the year with active participation of the staff.

Commercial Services

- ICAR-CIRCOT became Approved Assayer with Indian Clearing Corporation Ltd. and Multi Commodity Exchange of India Ltd.
- A total of 16,878 samples were tested at Mumbai headquarters, GTC Nagpur and other regional units generating a total revenue of ₹ 80,62,926/- through commercial testing.
- ICAR-CIRCOT calibration cotton, is an import substitute for USDA standards for calibrating textile testing equipment. During the year 493 containers of calibration cotton sold to stakeholders generating revenue of ₹ 5,32,170/-
- Twenty Eight consultancy projects were carried out during the year.
- Six new incubatees are admitted for developing new enterprises in Preparation of Value Added Products using Naturally Coloured Cotton, Production of biodegradable kitchen utilities directly from the whole banana pseudostem, Mechanical Property Testing of Paddy Straw Particle Boards and use facilities of ICAR-CIRCOT-ABI Centre for conducting 1 tonne material/day trial at GTC, Nagpur, Preparation of bio-degradable products using agro biomass (banana, rice straw, bagasse) and Development of starch based film for packaging.
- ICAR-CIRCOT has been bestowed with RAFTAAR - Agri Business Incubation Centre (R-ABI) of RKVY by the Department of Agricultural Cooperation and Farmers welfare.

Financial Management

- Implemented 100% cashless transactions.
- The Institute ensured complete utilization (100%) of the sanctioned budget allocation and a revenue of ₹ 176 lakhs generated during the year.

1. Introduction

ICAR-CIRCOT, established in 1924, as the Technological Laboratory under the Indian Central Cotton Committee (ICCC). The administrative control of the Institute was transferred to ICAR in 1966 and the institute was renamed as Cotton Technological Research Laboratory (CTRL). In 1991, the institute was renamed as Central Institute for Research on Cotton Technology (CIRCOT). The institute has made significant contribution to the stakeholders of the Cotton sector for over 95 years.

ICAR-Central Institute for Research on Cotton Technology, a premier constituent institute of the Indian Council of Agricultural Research (ICAR), under the Agricultural Engineering Subject Matter Division is headquartered at Mumbai. With the Vision of achieving Global Excellence in Cotton Technology, the institute is functioning with the following mandate

- Basic and Strategic Research on Processing Cotton and its Agro-Residues, Development of Value Added Products and Quality Assessment
- Skill Development and Business Incubation Services and Function as Referral Laboratory for Cotton Fibres

There are four research divisions in the institute: Quality Evaluation and Improvement Division (QEID), Mechanical Processing Division (MPD), Chemical & Biochemical Processing Division (CBPD) and Technology Transfer Division (TTD) to facilitate and monitor the Research, Consultancy, Training, Testing and Technology Transfer activities. The Institute has six regional units viz., Ginning Training Centre at Nagpur and regional Quality Evaluation Units placed in different cotton growing regions of the country at Coimbatore, Sirsa, Surat, Guntur and Dharwad.

The Institute is headed by the Director, who is assisted by the heads of four research divisions, administration and finance & accounts sections. The Priority-setting, Monitoring and Evaluation (PME) Cell assists the Director in assessing the performance of various research projects, handling communications with the Council etc.

The Research Advisory Committee (RAC) guides the Director in streamlining the research programmes of the institute. The Institute's Research programmes are carried out under the following five broad core areas

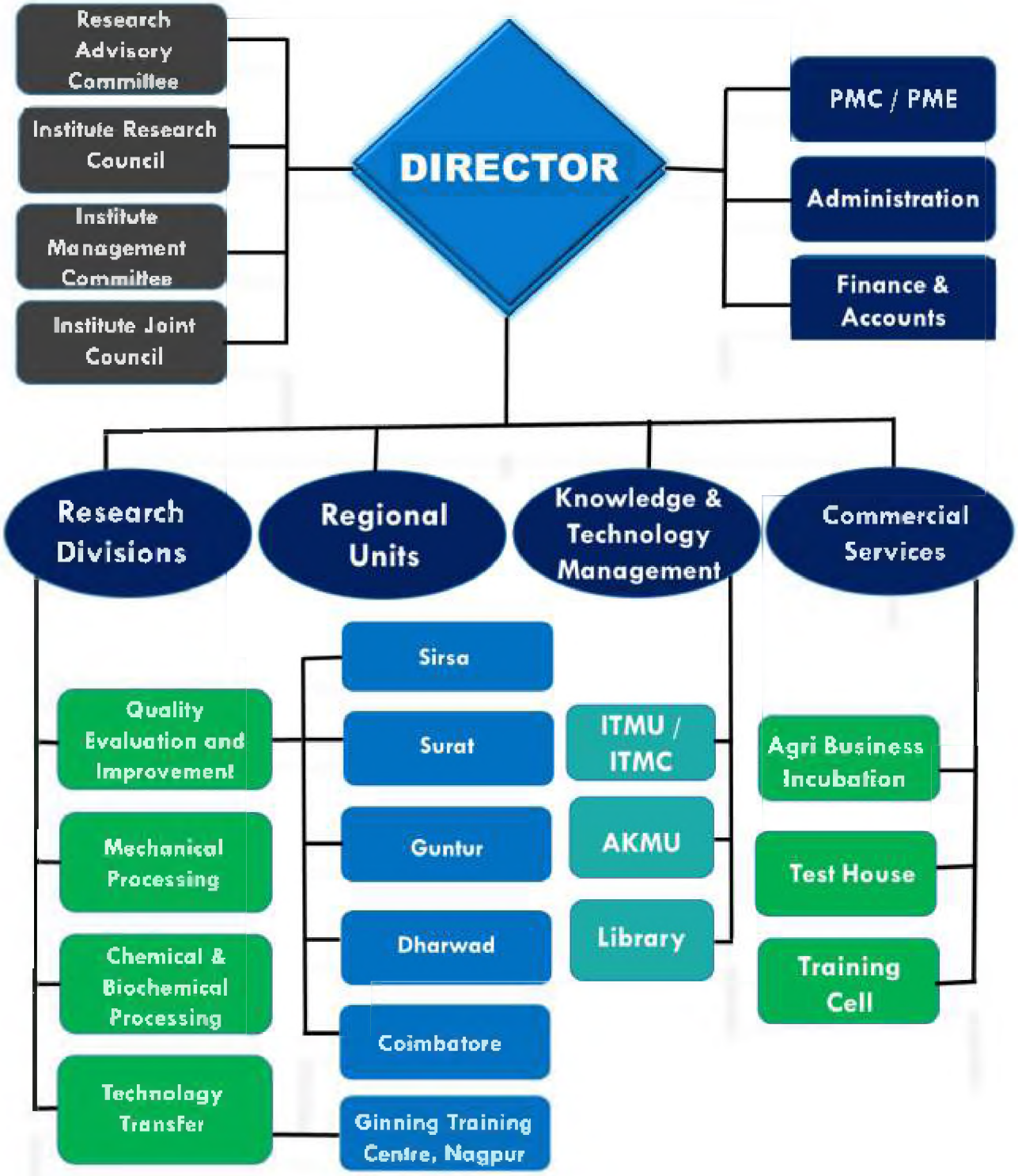
i. Pre-ginning and ginning
ii. Mechanical processing: Technical textiles and Composites
iii. Characterization - cotton and other natural fibres, yarns and textiles
iv. Chemical and biochemical processing and Biomass & by-product utilization
v. Entrepreneurship and Human Resource Development

The contribution of the Institute to the progress of post-harvest processing of cotton and value addition to cotton by-produce over the past nine and half decades of its existence is phenomenal. The institute is one of its kind in Asia in carrying out research in the Cotton Ginning Technology and provide technological support and skilled manpower to the ginning sector in the country. The institute has also played a pivotal role under the Technology Mission on Cotton (TMC) in Modernization of the Ginning Industry in the country. The significant contributions in the area of ginning machinery research have helped the country to be self-reliant and also become net exporter of ginning machinery. The Ginning machinery are now being exported to the Afro-Asian countries earning precious foreign exchange for the country.

The Institute has been playing an important role as the Technology partner under the All India Coordinated Research Project (AICRP) on Cotton for developing and screening quality cotton genotypes. Lauding its efforts, the Institute status has been designated as Principal Investigator for Quality Research in the project. ICAR-CIRCOT calibration cotton, an indigenously developed Standard Reference Material, is an import substitute for the USDA reference material used for calibrating fibre testing instruments like the HVI.

In its R&D efforts the institute is also collaborating with the Private sector for development of machinery in the post-harvest processing of cotton. The institute has developed new machines and products and successfully commercialised; some of them worth mentioning are on-board pre-cleaner for cotton stripper, saw band pre-cleaner for mechanically picked cotton, stick removal for mechanically picked cotton, double roller gin with self-grooving rubber roller, miniature spinning system and village level sliver making machine, cotton lint opener, rubber composites for flexi check dam etc., Many process technologies for the value addition of cotton fibres and cotton biomass are also developed by the Institute.

Organogram of ICAR-CIRCOT, Mumbai



Recently, the Institute has been carrying out research in diverse areas and developed products and processes like cotton rich blended fabrics for sportswear, application of cotton in technical textiles especially medical textiles, mosquito repellent finishing for textile materials, solvent extraction process for gossypol removal in cottonseed meal for use as non-ruminant feed, salt free dyeing technology value added products from Banana fibres and Naturally coloured cotton based products.

The institute has done a pioneering work in the area of nanotechnology and its application in textile materials. A Nanocellulose Pilot Plant facility, first of its kind in India, is established based on the chemo-mechanical process for its synthesis developed by the institute. The process for synthesis of nanomaterials for imparting functional finiishing to cotton textiles such as anti-microbial, UV protective, water repellent etc has been developed by the Institute. Applications of nano-cellulose in cement concrete, rubber composite, pulp and paper to enhance functional properties and in paint formulation as a rheology modifier has also been carried out. The development of security grade paper from natural fibre pulp is also being explored.

ICAR-CIRCOT is the Lead institute and the Nodal Centre for implementing the Consortia Research Platform (CRP) on Natural Fibres. The project is implemented in collaboration with ICAR-NINFET, Kolkata, Assam Agricultural University (AAU), Jorhat, Tamil Nadu Agricultural University (TNAU), Coimbatore

The Institute has been offering innovative tailor made skill development programmes at national and international level in a host of subjects which were not offered before. The institute also offers farmers training programme on "post-harvest processing and value addition to cotton by-produce" & "Increase in farm income through increase in production and processing at Village level". The institute also caters to the capacity building needs of the cotton sector in the African countries. Under the Cotton Technical Assistance Programme (Cotton TAP) for Africa, the institute has contributed towards capacity building of the stakeholders in seven African countries viz., Benin, Burkina Faso, Chad, Mali, Malawi, Nigeria and Uganda. CIRCOT was also instrumental in establishing a Regional Knowledge Cluster cum Training Centre for Post-harvest and Ginning Technologies at Bohicon, Benin. The institute also caters to skill building of the African Stakeholders under the Short Term Training Programme as per Indo-African Forum Summit. Recently ICAR-CIRCOT is assisting the United Nations Conference on Trade and Development (UNCTAD) in implementing a UN Development account Project 1617K on "Promoting Cotton by-products in Eastern and Southern Africa" in Zambia, Zimbabwe, Tanzania and Uganda.

The Agri-Business Incubation (ABI) Centre of the institute is promoting and nurturing the new enterprise based on the technologies of post-harvest processing and value addition to cotton and other natural fibre biomass in line with the Government programme of Start-Up India.

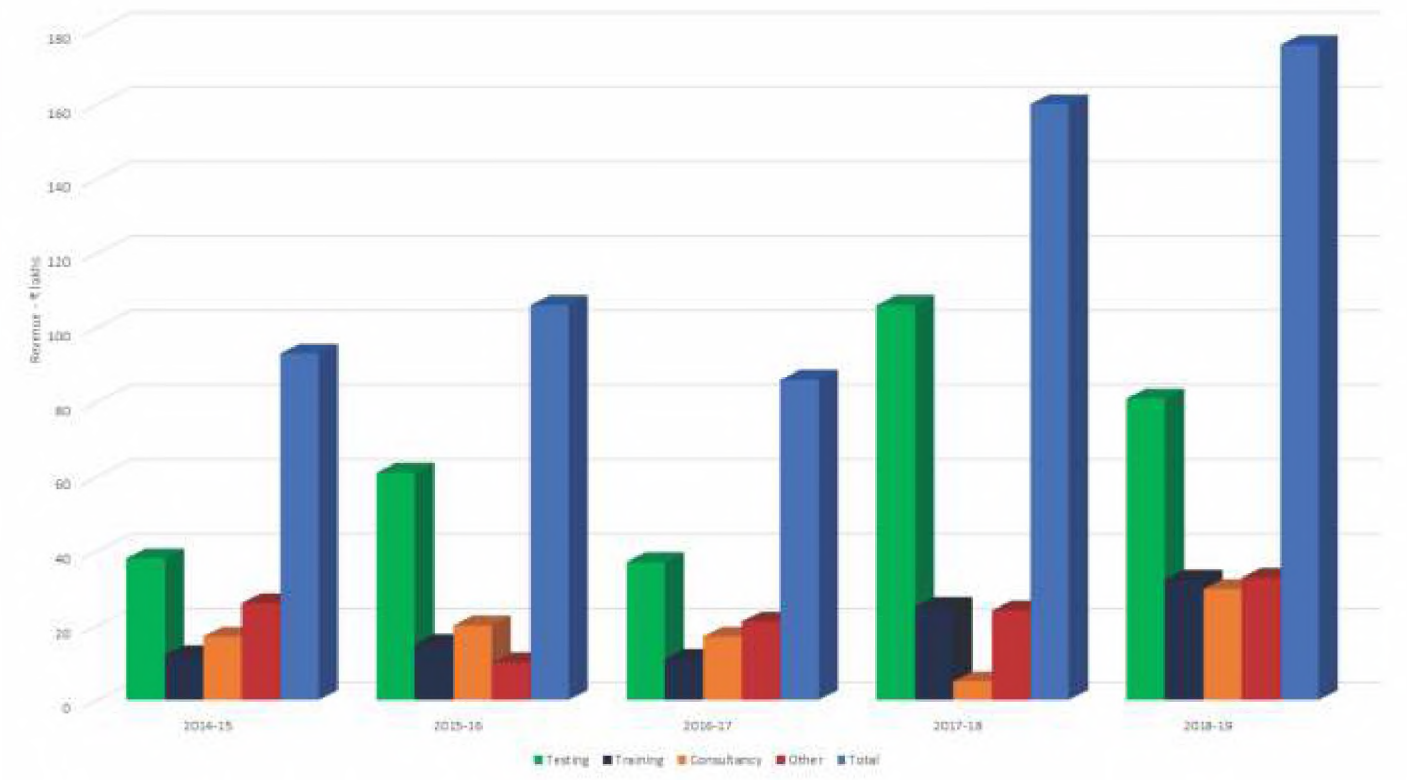
Coherent with the government initiative for doubling farmers' income, the Institute has taken up many innovative projects. Value addition to cotton biomass through preparation of compost from cotton biomass, popularisation of mushroom cultivation using cotton biomass and preparation of briquettes and pellets from cotton stalks as an energy source are some of the activities taken up for creating economic value for the cotton stalks and enhancing the farm income.

TABLE 1.1 : FUNDS UTILISATION DURING THE YEAR 2018-19 ₹ Lakhs

Head of Expenditure	CIRCOT*			CRP on Natural Fibres		
	Allocation	Expenditure	% utilization	Allocation	Expenditure	% utilization
Grant-in-Aid- Capital	166.64	166.62	99.99	7.59	7.59	100.00
Grant-in-Aid- Salaries	1869.76	1869.75	99.99	-	–	
Grant-in-Aid-General						
• Pension only	273.00	273.00	100.00	-	-	
• Other than Pension	631.69	631.63	99.99	61.00	42.93	70.38
Total	**2941.09**	**2941.00**	**99.99**	**68.59**	**50.52**	**73.66**

* Including SCSP

Revenue Generation (₹ Lakhs)



CIRCOT has good track record of meeting the Revenue Generation target provided by the Council through its Internal Resource Generation. The institute generated revenue through Technology Commercialization, Technology Incubation Service, Consultancy and Commercial testing services besides sale of the products developed based on Institute technologies. ICAR-CIRCOT makes every effort to ensure 100 % utilization of the allocated Funds.

The Institute is one of the most recognised laboratories for testing fibres, yarn and textiles made of cotton and blends with other fibres. It provides commercial services for the stakeholders in the cotton value chain. Some of the testing facilities in the institute are accredited with ISO 17025:2005 by the National Accreditation Board for Testing and Calibration of Laboratories (NABL) since 1999. The Institutes is also accredited with ISO 9001:2015 for Quality Management System by the Bureau of Indian Standards.

TABLE 1.2 : STAFF POSITION AS ON 31.03.2019

Category	Sanctioned	In-Position	Vacant	% Vacancy
Scientific	50	26	24	48
Technical	112	66	47	42
Administrative	47	34	13	28
Supporting	57	36	21	37
Total	**266**	**162**	**105**	**39**

2. Salient Research Achievements

2.1 CORE AREA-I: PRE-GINNING AND GINNING

2.1.1 Efficient System for Processing of Kawadi Cotton in Ginneries

Cotton, when harvested, contains lots of dust particles, leaves and bracts along with mature and immature bolls that need to be removed before processing of seed cotton. When seed cotton is taken to ginning industries, it is passed through many cleaning systems like pre-cleaner and hot-box dispenser where dust particles, leaves and unopened cotton bolls (kawadi) are removed. This material separated in different cleaning sections is generally ignored by ginners considering it as a waste material. However, kawadi cotton can be processed and good quality lint can be recovered from it.

In India, annually about 17-18 million tons of seed cotton is produced. If seed cotton is infested by insect attack or due to improper production technology, significant amount of kawadi cotton is present in it. About 5-25% kawadi cotton is expected in ginneries depending on the extent of damage. Difficulties in processing of kawadi cotton are causing ginners losses to the extent of up to Rs. 1.5 lakh/day. If this material is cleaned, opened and ginned, it can make about 1000 bales in a season of 5 months, thus earning an additional profit of around Rs. 2 crores. In India, cotton crop is severely affected by pink boll worm attack increasing the percent of kawadi in seed cotton received at ginneries. Industry people are asking for better and efficient solution to process this material.

Though, research on processing of kawadi cotton is scant with no reported past data, machines are available in the market for cleaning and opening of kawadi cotton, which need to be tested, evaluated and optimized to improve their efficiency.

Design refinement of the existing boll opener has been planned for development of a new system with improved efficiency, for which the test trial of Bajaj Boll Opener was conducted in the factory premises of BSIL, Nagpur

The capacity of the Bajaj Boll Opener for processing Kawadi cotton was found to be about 850 kg/h. Bulk density of raw kawadi cotton which was found to be 134 kg/m^3 reduced by almost half to 73 kg/m^3 on passing through Boll Opener, thus achieving opening and making it ginnable.

Fabrication of Boll Opener for processing of Kawadi Cotton in ginneries

Bajaj Boll Opener Test Trial

About 40% Kawadi cotton could be recovered for ginning, the rest going as losses through different mesh screens, dust and feeder splash-out. The opened kawadi cotton was ginned using DR as well as Saw gins. The Lint Recovery from the opened kawadi was marginally higher in saw gin (25%) as compared to DR gin (22%). The HVI test results of the lint thus obtained showed no significant differences in both methods

Unopened & Opened Kawadi Cotton

Opened Kawdi Cotton

25 mm 20 mm 12 mm

Output obtained from different screens

2.1.2 Trash handling system for control of pink bollworm in cotton ginneries

The pink bollworm (PBW) is a public nuisance and a menace to the cotton industry, and its eradication is a public necessity. Ginneries are equally responsible for dissemination of the PBW. During ginning process live PBW escapes through the gin trash and get disseminated in the neighborhood areas causing PBW incidence in cotton fields. It is necessary to break down the life cycle of PBW. Therefore a gin trash handling system is developed with an aim to crush gin trash in such a way that all the PBW are destroyed thus preventing the dissemination of the pest through the ginneries.

The gin trash handling system comprising of blower fan, ducting, cyclone and compactor is developed with a capacity of 2.5 tons of trash per hour. A 20 hp blower fan is fabricated to generate an air volume of 4800 m^3/h and pressure of 363 wgp. The fan impeller is made with six number of straight type of blades with fan wheel diameter of 490 mm and speed of 3000 rpm. The 1D-3D cyclone with diameter of 815 mm and height of 2445 mm is fabricated to separate out air and trash passed through the blower fan. Gin trash compactor with 1hp, 1500 rpm electric motor is fabricated to drive screw conveyor at a speed of 72 rpm. The ducting of 254 mm in diameter was provided at the inlet of blower and for conveying the trash from blower to cyclone. The steel support structure was provided to rest the cyclone. The developed system has been installed at Ginning Training Centre, of ICAR-CIRCOT, Nagpur. The preliminary trials are conducted to assess the functionality of the developed system. The system performance is found to be satisfactory as it carried out the intended design function of crushing the trash and killing the PBW successfully.

Trash handling system to control pink bollworm in cotton ginneries

2.1.3 Rotary Tubular Drum Dryer for Quarantine of Pink Bollworm Infested Cottonseeds in Ginneries

Unusual outbreak of Pink Bollworm (PBW) in most of the cotton growing districts of Maharashtra, in 2017-18 cotton season, caused severe cotton crop damage. Since, PBW is a monophagous pest, which can multiply only on cotton, there is possibility that the PBW larvae may feed and multiply on seed cotton, cottonseed, lint, trash, etc. The diapaused larvae present in these materials may become active during favourable conditions. Hence, there is concern that ginneries may cause built up or spread of pink bollworm to unaffected regions. Moreover, the transportation of cottonseed from infested area to the non-infested gin may lead to spread of PBW to un-infested regions. There are specific regulations in place, especially in US and Egypt to prevent the build-up and spread of the pink bollworm from ginneries. Hence, the impact of PBW is minimal in these countries. In US and Egypt, a Rotary Tubular Drum Dryer (RTDD) is employed for quarantine of PBW, wherein cottonseeds are heated indirectly to about 65-66 °C for about 5-6 minute using steam or thermic fluid at 160-170 °C at 5.5 bar pressure. The present work is aimed to develop a rotary tubular drum dryer for quarantine of PBW in Indian ginneries. During the reported period, a rotary tubular drum dryer of 1 tonne/h capacity has been designed for treatment of cottonseed against PBW. The dryer consists of 20 circular pipes of 50.8 mm internal diameter and 5 mm thickness. These pipes are fitted over a 127 mm diameter internal diameter and 7.6 mm thickness circular pipe. The pipe assembly is made to rotate in a drum of 600 mm diameter and 1042 mm height. In this equipment, thermic fluid at about 160 °C and 5.5-6 bar gauge pressure will circulate in bundle of tubes rotating at about 10-12 rpm. Cottonseed will be fed from top of the dryer through a bucket elevator, it is pushed and rotated in the drum through a specially designed lifter. In this system, cottonseeds are heated indirectly to about 65-66 °C for about 5-6 minute using thermic fluid at 160-170 °C at 5.5 bar pressure.

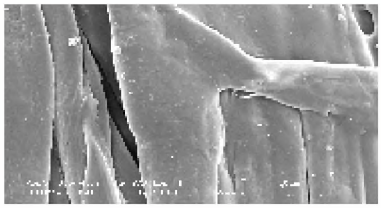
2.2 CORE AREA-II: MECHANICAL PROCESSING, TECHNICAL TEXTILES AND COMPOSITES

2.2.1 Development of activated carbon (AC) based protective mask

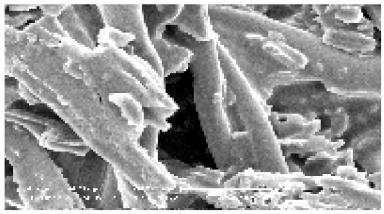
Air filters are designed to filter and remove a range of contaminants from the air, including moulds, gases, dirt and odours. Specific filters are required as per needs, as all filters are not designed to remove the same particles. Filters are made from various fibres, yarns and associated constructions and compositions. Filter should be designed based on pollutants available in air or atmosphere. To screen the pollutants viz. gases, particulate matter, metals and salts, the filter medium should incorporate adsorbent/catalyst as a one of the layer. The most common adsorbent is activated carbon (AC), it is predominantly an amorphous solid with large internal surface area and pore volume. Activated carbons are very effective adsorbents due to their highly developed porosity, large surface area, variable characteristics of surface chemistry, and high degree of surface reactivity. This surface reactivity is formed based on the activated carbon production methods. In order to develop activated carbon based mask, cotton based woven fabrics of various GSM was taken and coated with activated carbon using adhesives and binder.

The surface morphology of control and activated carbon coated fabric were analysed using scanning electron microscope (SEM) to study the activated carbon distribution over the fabric.

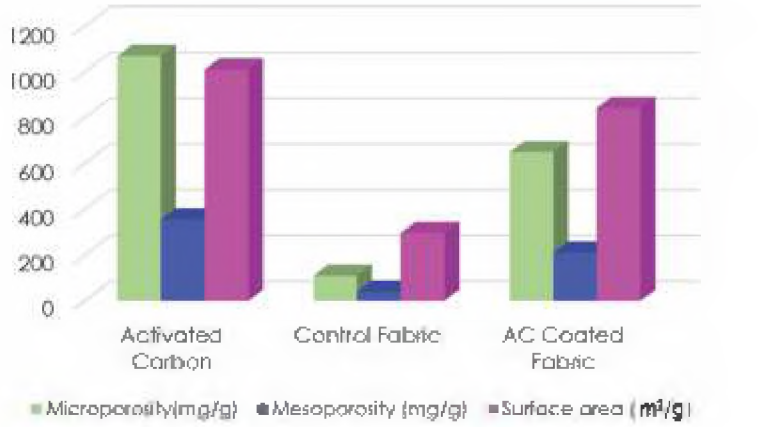
The porosity of activated carbon, uncoated cotton fabrics and activated carbon coated fabrics were analyzed. The Mesoporosity was analyzed by methylene blue adsorption test, Microporosity was analyzed by



Control Fabrics



AC Coated Fabrics



Porosity and surface area of activated carbon, control and coated fabric

iodine adsorption test and surface area analyzed by BET surface area analyzer. The results of all three samples presented in the figure shows that control cotton fabrics surface area is 296 m^2/g whereas activated carbon coated fabric was 842 m^2/g, almost three time increase in surface area after coating of the fabric.

2.2.2 Development of High Performance Cotton Pads for Wound Dressing

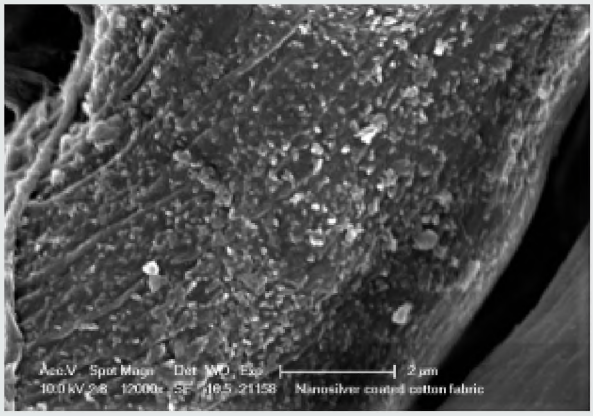
The wound is a disruption in the continuity of the epithelial lining of the skin or mucosa resulting from a blow, cut or other impacts. Properly selected dressings do, promote healing and prevent further harm to the wound. Using cotton fibre and its hybrid based nonwoven materials having antimicrobial properties, helps the wound remains moist with exudates (not macerated), free from infection, improve the duration of wound dressing and is cost-effective.

Primary wound dressing Test for Commercially Materials

The commercial available eight wound dressing material were collected and tested as per the standard BS EN 13726–1:2002 (Test methods for primary wound dressings to test the absorbency and its dehydration rate). The maximum absorbency was found in the cotton-based gauze pad about 19 grams of solution per 1 gram material. The minimum absorbency found for sliver based hybrid materials, which consist of Ag treated cotton woven fabric, middle layer with polyester/viscose nonwoven layer and top layer consist of an impermeable layer. From the result, it was observed that the cotton-based wound dressing shows good absorbency compared to foam based and synthetic based fibres. However, another important characteristic of wound dressing material is dehydration rate. The foam dressing shows higher dehydration rate, due to the high pore volume and porosity present in the foam. The cotton fibre has a lower dehydration rate compared to foam dressing. This is mainly due to the hydrophilic nature of cotton fibre and its high water holding capacity.

Cotton Gauze fabric & antimicrobial Finishing

Cotton gauze fabric was prepared from eight different yarn by changing Twist Multiplier™ and optimized the TM which shows good absorbency. The antimicrobial finishing is given to cotton gauze fabric through an in-situ technique using nano-silver and tested for an antimicrobial test as per the AATCC 100. It was observed that the fabric shows 100% antimicrobial efficacy against both *K. pneumoniae* and *S. aureus*.



SEM image of Nano-silver particle deposition on the Cotton fibre

2.2.3 Cotton Based Smart Fabrics for Warm Pads and Garments

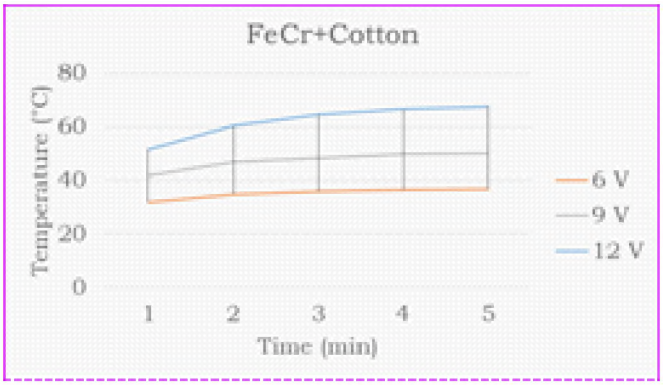
Different resistant metal wires were considered for heat

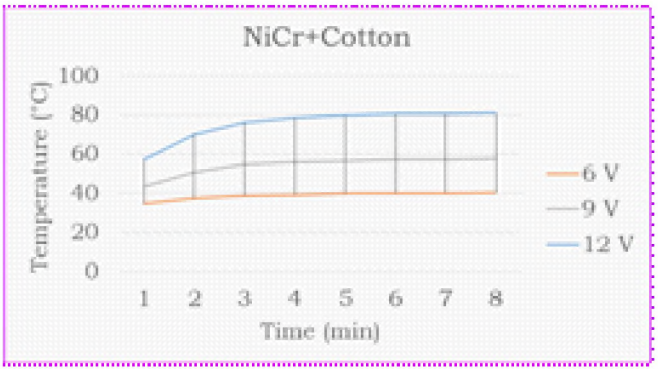
generation: Steel, FeCr, NiCr and CuNi. The Electrical and Thermal properties of the selected materials were analysed. Using Core yarn spinning, Cotton was wrapped on metal wires and their heat generating properties were studied at different voltages (6V, 9V and 12V) at time intervals of 1-5 minutes.

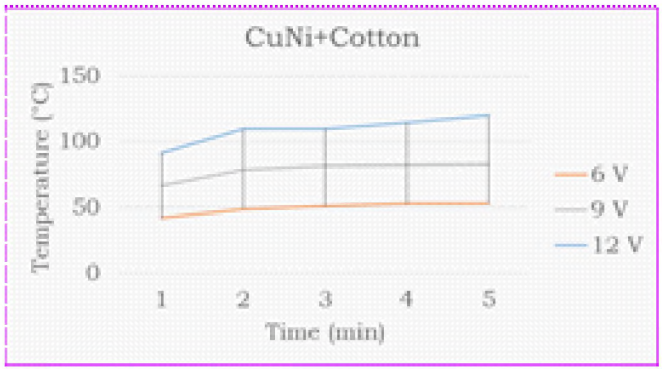
Metal wires were replaced by Carbon filaments, and the experiment was repeated to optimise their length, thickness and voltage required to provide optimum heat generation and heat holding capacity. Fabrics was constructed using the carbon filament as weft and their properties were studied for product development.

In the development of cotton based smart gloves, the conductive yarn was produced using carbon filament as core and the cotton fibres as sheath. The size and the thickness of the conductive yarn was optimized to produce required amount of heat to the wearer. The gloves were produce using the silicon finished knitted fabric to provide comfort. The conductive yarns were placed in appropriate place for generation of heat

These gloves provides not only comfort to the wearer but also retains the heat within the environment without more loss. The DC power supply was given using 9V battery also with 10K mAh power-bank. The temperature control button was also provided with 3 different modes for different voltage supply of 3.7V, 7.5V and 10V to the glove having battery life of 10hrs, 8hrs and 4hrs respectively as the voltage change. Further the product can be modified by sandwiching with leather material to avoid the heat transfer and same may help to increase the battery durability.







Cotton Based Smart Gloves

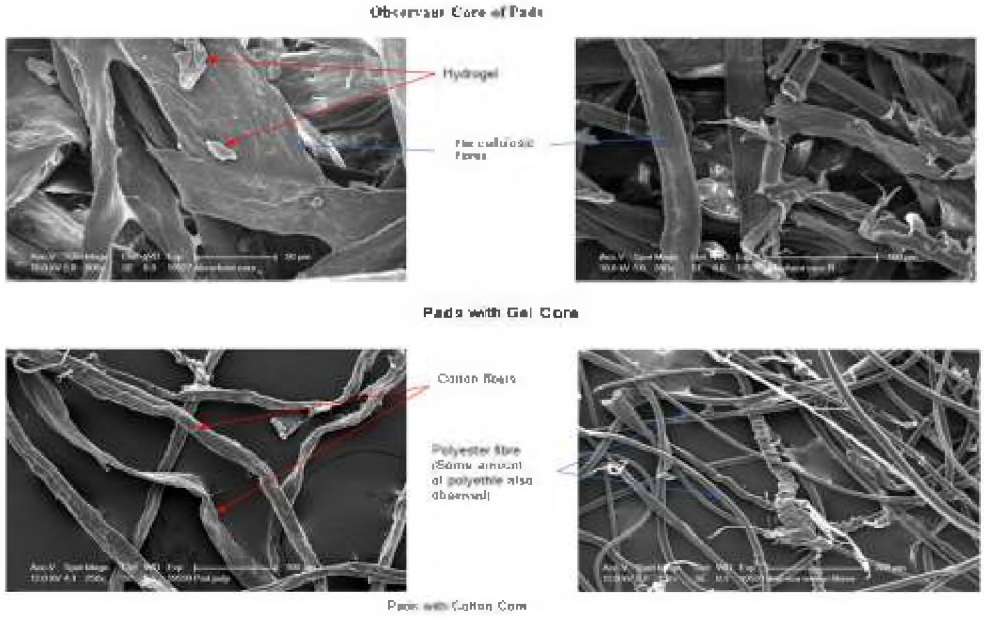
2.2.4 Composite Material Based Sanitary C Pad

Menstruation is a natural process in women's life but due to illiteracy, ignorance about religious teachings, poverty, socio-cultural trends, and negligence regarding psychological health and poor health facilities, the matter is not as properly dealt with as it ought to be. A sanitary napkin, sanitary towel, sanitary pad, menstrual pad, or pad is an absorbent item worn by a woman while menstruating. Menstrual pads are worn to absorb menstrual discharge (and thereby protect clothing and furnishings).

Popular brand Sanitary Pads available in Local Market (3 company brands and 3 models of pads of each was procured and studied for composition of material used. It was observed that Observant Core of Pads were manufactured with flat cellulosic fibres having hydrogel. Whereas pads with gel core had Cotton fibers and Polyester fibre (Some amount of polyethlene also) was found. SEM images of different cores presented in figure.

Absorbency Test of Sanitary Pads: It was observed that Gelling materials are used in many sanitary pads to absorb flow uniformly and hold. Cotton pads are good due to its ecofriendly nature and it also holds sufficient amount of flow. It was observed that more than 3 mm cotton fibre creats capillary action due to which flow distribution is non-uniform. Ground cotton fibre with less than 3 mm length has good absorbency of flow.

Sanitary C Pad Evaluation Test: Sanitary pads developed with absorbent cotton performs at par with commercially available pads. Many commercial samples failed to meet in microbial load test as they claimed. Experiments will be carried on large number of samples to confirm the results.



SEM images of some commercial samples

Test Name	Commercial Sample 1	Commercial Sample 2	CIRCOT C Pad	
pH	7.50	7.45	7.25	Permitted: 5-8.5
Absorbency of sheet, Sec.	6	8	8	Below 10w 10
Water holding capacity of sheet, g/g	16 (super absorbent pad)	9.5	12	-
IS:5405 (2oml coloured liquid)	Sample passes the test with uniform spreading	Sample passes the test with uniform spreading	Sample passes the test with non- uniform spreading. Powdered sample passes the test with uniform spreading.	-

2.3 CORE AREA-III: CHARACTERISATION – COTTON AND OTHER NATURAL FIBRES, YARNS AND TEXTILES

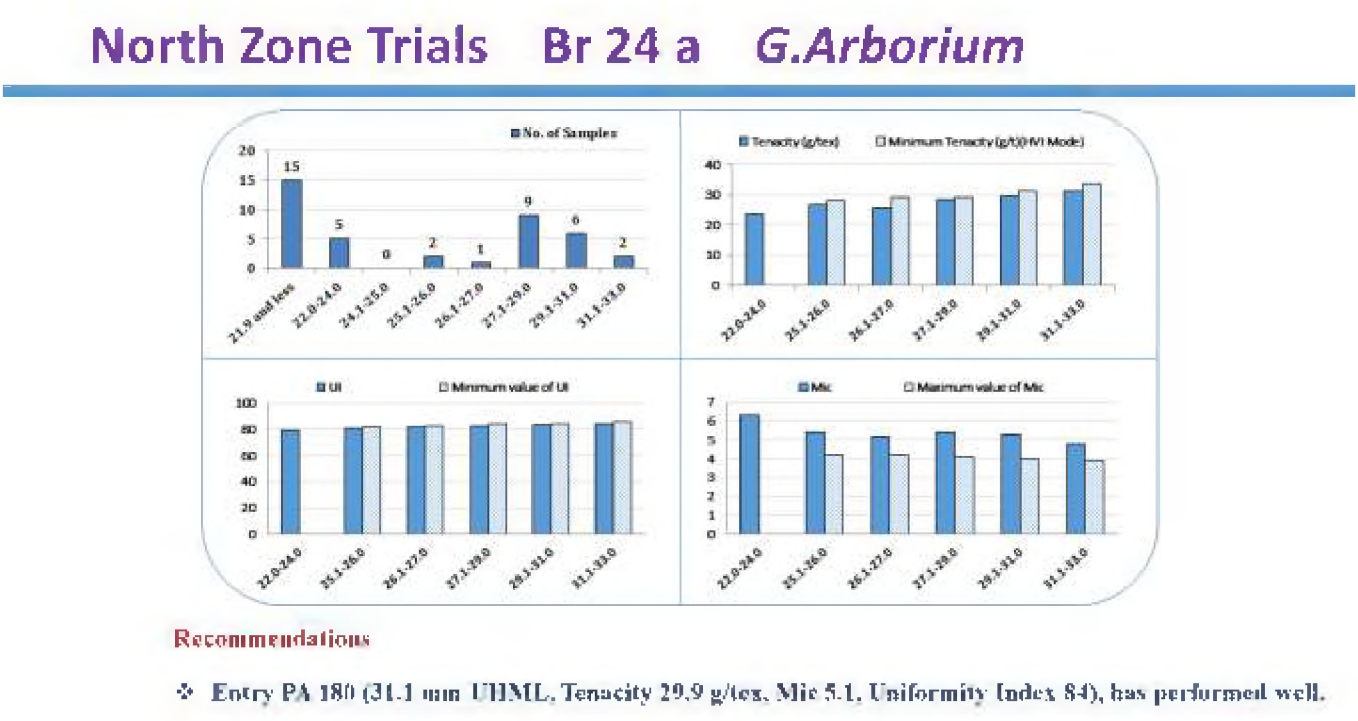
2.3.1 All India Coordinated Research project on Cotton (Quality Research)

ICAR-CIRCOT undertakes the fibre and yarn quality assessment of the varieties developed under AICRP on Cotton. Quality parameter data was generated on the cotton samples received from the cotton breeders throughout the country pertaining to the ICAR-AICRP on Cotton Trials (North Zone, Central Zone and South Zone) and National Trials. In all, the technological data on 5003 samples have been reported of which 2465 samples belong to National trials while 1257 cotton samples correspond to Zonal Trialsand 1272 samples from Bt trials. Out of the zonal trials, 166 cotton samples belong to North zone, 590 cotton samples belong to Central zone and 501 belong to South zone. Under Agronomy trial 24 samples were received for spinning performance along with fibre quality assessment. The quality parameters of all cotton fiber samples were measured using the High Volume Instrument operated in the HVI Mode. The data was analyzed and reported. The fibre quality data of all the analyzed samples were compiled and released as Annual Technological Report 2018-19.

2.3.2 Marker Fibres: A Tool for Traceability of Cotton Textiles

Cotton fibre contains majorly cellulose as its constituent with very little quantity of mineral content. These mineral content can be analysed using various techniques. XRF is one such method for the determination of metal content using non-destructive method. Metal contents were determined for 40 cotton samples from major cotton growing areas which covers different zones of the country. The basic procedure involved was keeping raw cotton samples in XRF sample holder and determination of the metals using X-ray fluorescence principle. The dominant metal in the cottons was potassium. All of the cottons tested had measurable quantities of potassium and Cadmium. The western grown, irrigated cottons, particularly those from Gujarat, generally had higher levels of potassium than did cottons grown in the northern areas. There were large variations in metal contents both zones and between locations particularly for potassium.

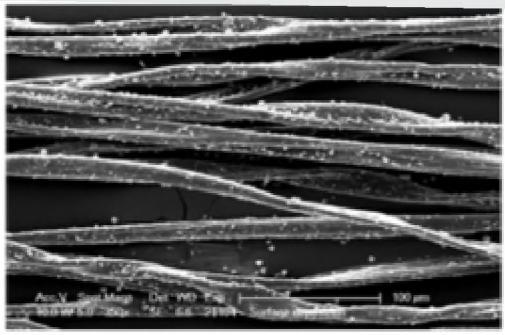
Another attempt was made with cotton fibre to synthesise the chemical which was used as the coding purpose. After the synthesis the fibre was characterized by SEM, XRFS, FTIR and Raman spectroscopy. SEM analysis confirmed the presence of in situ generated chemical. XRFS was used to confirm the metal content in the treated fibre. Raman spectra of pure substance was



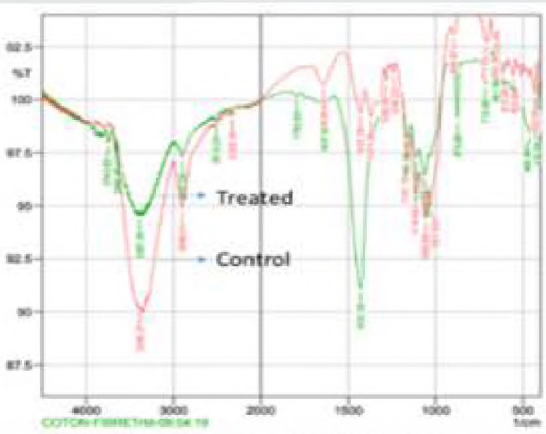
Entries in North Zone Trials Br - 24 (a)

compared with the spectra of treated fibres. From the analysis it was confirmed that the deposited chemical can be easily determined using the Raman spectroscopy.

The developed process will be further improved and used as marker fibres that can help in tracing the origin of cotton.



SEM image of the treated fibres



FTIR of treated fibres

2.4 CORE AREA-IV: CHEMICAL & BIOCHEMICAL PROCESSING AND BIOMASS & BY-PRODUCTS UTILISATION

2.4.1 Development of suitable solvent extraction process for obtaining low gossypol cottonseed meal for non- ruminant feed and food applications

Cottonseed meal is a rich source of high quality protein but its utilization is mostly limited to cattle feed due to the presence of the polyphenolic pigment gossypol which is toxic to monogastric animals and humans. Attempts were made to extract gossypol by using different solvents so that the amount of gossypol in extracted meal can be reduced to safe levels.

Aqueous extraction removed most of the protein, oil and also gossypol from the cottonseeds and freeze dried aqueous extract (45% yield) had 38% crude protein, 17% oil, 3.0 and 0.5% total and free gossypol contents respectively. In earlier experiments, it was observed that both acetone and its mixture with water were effective in extracting gossypol from powdered cottonseed kernels with acetone- water being more efficient but resulting in dark coloured meal. Acetone extraction produced light coloured meal and extracted oil also, hence was used on de-oiled material. Efficacy of three methods of extraction with acetone for cottonseed kernel flakes, the method used industrially was studied and Soxhlet extraction was found to be the best with 95 and 67% reduction in free and total gossypol contents respectively. Extracted flakes were light coloured and could meet the IS 4876 criteria for edible cottonseed flour. Overnight soaking with acetone could reduce free and total gossypol by 88 and 50% respectively and extraction in ultrasonicator could reduce 83 and 47% free and total gossypol within 45 min. and the extracted material from both the experiments was quite close to the IS specifications.

It was observed that exposure of kernel flakes to steam and high temperature (1200C) in an autoclave for 20 min resulted in binding of about 32% free gossypol with darkening of colour but the free gossypol content reduced only by 9% when flakes were heated in an oven at the same temperature and for similar duration of time in the absence of steam. A new, easily scalable, room temperature process for faster extraction of gossypol from cottonseed kernels using acetone and water without darkening of colour was developed with 92 and 49% reduction in free and total gossypol levels respectively. Resulting light yellow coloured meal was rich in protein (63% crude protein) and it could almost meet the specifications for edible cottonseed flour (IS 4876) in respect of total and free gossypol contents. Solvent recovery was good and if required, gossypol can be recovered from the solution and purified for pharmaceutical applications.

(1) Modified Acetone water extraction process-Meal and solution containing gossypol
(2) Meal obtained by Soxhlet extraction with acetone

2.4.2 Protocol for extraction of Quality Proteins from Cottonseed Meal

The de-oiled Cottonseed Meal (CSM) was supplied by Clean cotton Impex, Pitchampalayam Pudur, Tiruppur, Tamil Nadu contain 0.695% and 1.37 % amount of free and total gossypol respectively. Papain treatment reduced the gossypol to the significant levels. Enzyme assisted processing (EAP) using the papain resulted in significant decrease in the free and total gossypol content from 0.695% to 0.515% and 1.37% to 0.979% respectively.

Optimization of protein extraction parameters from CSM: For optimization of protein extraction parameters from CSM by using alkali (0.1 N KOH) with varying alkali to sample ratio, varying concentration of sodium sulfite and sodium chloride at pH=11. For this purpose Total 29 experiments for extraction of protein has been carried out according to response surface methodology (RSM). The recovery of protein ranged from 53.15 to 92.9% from CSM. The maximum recovery was obtained when protein was extracted with alkali at 1:30 sample to alkali ratio with 0.1 N NaCl and 0.2% sodium sulfite with incubation time of 2 hours for extraction and these values served as the central value for Box-Behnken design. Box-Behnken design was used as mathematical tool for carrying out optimization of extraction procedure of protein from CSM. It was found that all the proteins sample contains more than 85% of the protein by Kjeldahl method. The recovery of the each protein extract was calculated on the basis of the original protein content present in the CSM.

The original protein content in the cottonseed meal supplied by Clean Cotton Impex was found 48.23% as estimated by elemental analyser at IIT-SAIF. Most of the experiments yielded more than 60% of the protein on dry weight basis. The extracted protein was further analysed for the amino acid profile and it was found that all the essential amino acid were present in the extracted protein except methionine.

The optimization of the process of extraction of protein was done using design expert software. The predicted optimized value obtained from the design expert are as:

Alkali to Sample Ratio (A)	33.13
Time (B)	147.5
NaCl Conc. (C)	0.148
Na2SO3 (D)	0.272
Protein Recovery	93.6
Desirability	1.000

Based on the ANOVA fitted quadratic model for the protein recovery response as a function of alkali to sample (A), time (B), NaCl concentration (C), Na2SO3 (D) were obtained. The predicted optimum conditions for alkali assisted extraction for achieving maximum protein recovery was found to be

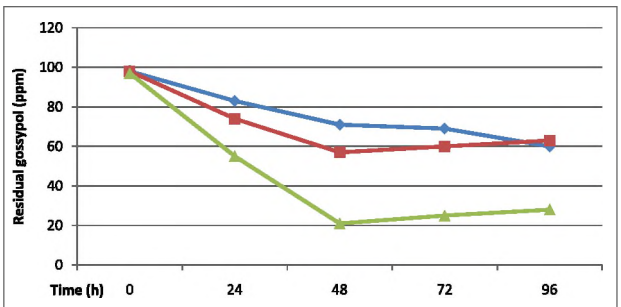
Under the optimized conditions, the experimental values of percent protein recovery was determined for checking the suitability of the developed model. It was found that experimental values are very close to the predicted value from design expert. Hence, model was found to be suitable for optimization.

Optimized protein sample was analysed for different functional properties viz. protein solubility (PS), foam capacity (FC), foaming stability (FS), emulsion activity index (EAI), emulsion stability index (ESI), water absorption capacity (WAC), oil absorption capacity (OAC) and compared with defatted CSM and Bovine Serum Albumin (BSA). Protein Quantification was done by Bradford Method using BSA as a standard. Results obtained from tests show good functional properties for extracted cottonseed meal protein sample. Extracted protein present different solubility profiles at pH 3-11. The PS increased with increasing pH. Extracted protein indicating that the higher protein solubility was correlated with the higher FC and FS. EAI and ESI of extracted protein was found be higher than cottonseed meal. The extracted protein showed lower WAC and OAC compared to the defatted CSM. Further, extracted protein sample was also compared to defatted CSM by doing FTIR analysis.

2.4.3 Scale-up of a microbial process for degossypolization and nutritive quality improvement of cottonseed cake

Cottonseed cake is rich in protein and well known ruminants feed. However, the presence of gossypol and low level of lysine, an essential amino-acid make cottonseed cake unsuitable for non-ruminants feed applications. At ICAR-CIRCOT, a microbial process was developed for gossypol detoxification and lysine enrichment in cottonseed cake. The microbial process involves solid state fermentation of cottonseed cake with degossypolizing yeast cultures viz., Candida tropicalis and Saccharomyces cerevisiae. The degossypolized cottonseed cake had 70-80% free gossypol reduction; 50-60% bound gossypol reduction, 20-25% increase in protein content and 10-15% increment in lysine content. At GTC of ICAR-CIRCOT, Nagpur, batch fermentation was taken up to 50 kg per day using the batch fermentation facility.

However, in the present project, attempts were made to develop a pilot plant for continuous production of degossypolized cottonseed cake at 100 kg per day. The degossypolizing yeast cultures viz., Candida tropicalis and Saccharomyces cerevisiae were grown in minimal media containing 1000 ppm of gossypol and cultured repeatedly in higher concentration of gossypol. The improved cultures were grown individually and in combination in minimal media containing 100 ppm of gossypol to evaluate its efficiency of biodegradation of gossypol. The results showed the combined culture, S. cerevisiae + C. tropicalis had higher degradation than individual culture. The residual gossypol present in the culture supernatant was 21 ppm which showed 79% of biodegradation of gossypol at 48 hours of incubation.



Residual gossypol in fungal cultures grown gossypol-containing minimal medium

The mechanical properties of De-oiled cottonseed cake (DOC) were evaluated for designing the prototype for degossypolization and nutritive quality improvement in cottonseed cake. The results showed that the bulk density was found to be 600 and 503 in raw DOC and fermented DOC respectively while the angle of repose was found to be 38 in both the materials. Considering this, a 3D prototype design of degossypolization (100 kg/day) was prepared for continuous production of nutritive enriched degossypolized cottonseed cake.

2.5 CORE AREA - V: ENTREPRENEURSHIP AND HUMAN RESOURCE DEVELOPMENT

2.5.1 Assessment of Factors Influencing Adoption of Scientific Cottonseed Processing in India

Field survey of conventional screw press oil mills: Surveyed 48 Screw expeller type oil mill units located in Maharashtra, Haryana, Punjab, and Karnataka. The technology of screw press is widelypractised across India for different commodities with different end products. It is preferred due to ease of operation and low investment (₹ 4 cr. for India make and ₹ 7 cr. for imported machinery for a typical 200 TPD plant). Viability of screw expeller depends on variation in prices of cottonseed vis-a-vis other agro-produce (Soybean meal and hull, Maize hulls, Rice bran, Hulls of all grams, Cakes of sunflower, groundnut, safflower, rapeseed and mustard, and commodities used for making of cattlefeed), UDC, washed oil and acid alkali soap (spent wash by-product). According to the owners of conventional screw press oil mills, factors responsible for non-adoption of scientific cottonseed processing plant are:

1. Capital intensive units (machinery cost ₹ 20 cr. – Made in India, ₹ 25 cr. - Imported, for a typically 200 TPD unit), making it questionable for viability.
2. No special incentives like subsidy & export incentives, electricity etc.(depending on states).
3. Concern of marketing of by-products - No customers for linters, hulls and DOC (gossypol) in domestic level. Linter use in domestic industry is very less and limited to certain industry. Hulls are used in making of formulated cattlefeed and in high demand when UDC or other cakes prices soared high in market due to the fact that it replaces costly inputs in making of cattlefeed.
4. Trading lobby (Seller, Broker and Commission Agent) always in favour of UDC in India. This is related to misconception of users rather than science facts. Farmers demand UDC (Haryana, Rajasthan, Punjab, UP)
5. In case of prohibitive cottonseed prices, the risk of unit shut-down and locking of investment is very high, resulting in the financial collapse.

Status Survey of Scientific Cottonseed Processing Units (SCP): Surveyed 18 units related to scientific cottonseed processing in Maharashtra, Haryana, Andhra Pradesh and Karnataka. Findings are:

1. Latest technologies developed in world are adopted and available in India
2. Primary technologies developed and adopted are satisfactory, except the energy intensive delinting operation
3. In Haryana, units operate to meet the rising demand of the linterless cottonseed for animal feeding
4. In Andhra Pradesh, delinting units operating to meet the rising demand of the linterless cottonseed for animal feeding in North India
5. Export market vanished for linters, due to nomenclature clarity for linter in import and export
6. Delinting machine in operation are imported (Carver & Cantrell) as well as indigenous (Bajaj, Ferro Oiltek, Kubros, Jai Bharat & Nav Bharat) with saws ranging from 150-185. Third cut Linter also obtained.
7. All SCP units have edible oil refineries, except stand-alone delinting units. It is necessity rather than luxury.

8. Units with assured linter purchase agreement for export are operating at full capacity Jalna (MPKUL), Dharwad (LN Oils) and Raichur (Laxmi Venkatadri).

Constraints faced by SCP units:

1. Main product DOC is used in manufacturing of animal cattlefeed with meager quantity. Broker and commission agent lobby in UDC favour in India, hence no market for DOC as cattlefeed.
2. Even though DOC contains high protein, gossypol factors in prohibiting use as feed for poultry and fisheries.
3. DOC majorly exported and hence dependence on importing country policy.
4. Formulated (compound) animal feed cake not well accepted among milch animal owners (due to non-adherence to IS standard)
5. No domestic customers for hull and linters. Also linter and hull prices are not remunerative in domestic market.
6. No parity for protein-rich DOC, compared to UDC
7. Skilled workforce in shortage for operation of unit (in Andhra Pradesh, workforce is from Odisha). Also number of work persons required quite high for a typical 200MTPD plant.
8. Capital investment is prohibitive (machinery cost ₹ 20 Cr – make in India, ₹ 25 Cr -Imported, for 200 MTPD plant)
9. No special incentives – subsidy & export incentives, electricity etc., even though SCP with small amount of production of edible oil reduces dependence on import of edible oil.

2.5.2 Application of Nanocellulose in Paint Formulation

Conventional solvent based paints are recently being replaced by environmentally friendly formulas due to ecological considerations, specifically reduction of volatile organic compound emission. The water soluble paints are characterized by low toxicity, low VOCs emission, non- inflammability. However, they possess lower viscosity and require more time and heat to dry resulting in poor quality of the resulted films. Nanocellulose affects the rheological property of a suspension due to its thixotropic property and thus may modify the viscosity of paints and coatings. Under the current study, nanocellulose was synthesized from cotton linter was applied as a thixotropic agent in paint formulation.

(a) Rheology of NC- Acrylic dispersion : In order to study the efficacy of nanocellulose as a rheology modifier in water based paints, the rheology of NC- acrylic dispersion was studied. NC at 0-6% concentration was mixed with acrylic resin and a homogeneous mixture was prepared. The rheology of the mixture in terms of complex viscosity, storage modulus and loss modulus were studied at varying shear rate. The results indicated that at low shear stress, the viscosity of acrylate increased with concentration of NC. With increasing shear stress, the viscosity also decreased. Also the lower value of loss modulus at low shear rate than storage modulus indicated gel like structure of NC-acrylic mixture, which became liquid like at higher shear rate, confirming shear thinning behavior of the mixture.

(b) Development of novel NC based paint formulation : Water based paint were formulated at varying concentration of acrylate, titanium dioxide, water, nanocellulose, dispersing & wetting agent and antifoaming agent. The properties of various formulations were evaluated as per IS: 15489-2004 at National Test House, Mumbai. The formulations showed properties as per the IS standard for class A paint. Washability and cleanability of the developed paints were found to be twice that of commercial paint indicating higher durability of the developed paint. The mass/ 10 ltr paint and pull off adhesion was found to be increasing with increasing pigment concentration. Based on the result, paint formulation was optimized using statistical analysis.

2.6 EXTERNALLY AIDED PROJECTS

2.6.1 Industrial Adoption of ICAR-CIRCOT Paper Pulp Technology

About 4 tonnes of banana fibres were sourced from M/s. Tapti Valley Banana Processing and Products Co-op Society Ltd., Jalgaon, Maharashtra. A pilot scale trial for pulping of banana fibres was carried out in a commercial factory located at Muzzafarnagar. As cutting of banana fibre is a bottleneck in the entire processing line, two different cutter / shredder were fabricated and being evaluated for their performance. Also, ICAR-CIRCOT's security feature was validated on lab-scale by M/s. Bank Note Paper Mill Ltd., Mysuru. Based on the successful validation, BNPM invited ICAR-CIRCOT's team to their Mysuru plant.

CIRCOT team, under the chairmanship of Dr. P. G. Patil, Director, visited BNPM on 17th Dec 2018 and discussed with the technical team of BNPM for further course of action. Then, on 2nd Jan 2019, Shri. K.G. Viswanathan, MD, BNPM visited CIRCOT to see the facilities and to interact with the scientific team. This project was reviewed by DG, ICAR on 19th January 2019 at ICAR-CIRCOT, Mumbai and appreciated the successful validation of ICAR-CIRCOT security feature by BNPM.

Industrial Pulping of Banana Fibres

Visit of Shri. K.G. Viswanathan, MD, M/s. BNPM to ICAR-CIRCOT, Mumbai on 2nd Jan 2019

Review of the project by DG, ICAR on 19th Jan 2019

2.6.2 ICAR-CIRCOT-Agri-Business Incubation (ABI) Centre

Agri-Business Incubation (ABI) Centre of ICAR-CIRCOT promotes incubation and business development in cotton and its by-products, conducts techno-entrepreneurial activities in cotton value chain for building prospective clientele and facilitates skill development in selected stakeholders related to cotton sector. During the current year, Six new entrepreneurs were admitted at ICAR-CIRCOT-ABI Centre for incubation on different technologies as preparation of value added products using naturally coloured cotton (jackets, stoles, shirts, handkerchiefs, infant wear); production of dishwares, molded products, kitchen utilities and biodegradable products using agro–residues as banana pseudostem, rice straw, bagasse etc. Seven of our incubatees, successful entrepreneurs and stakeholders got selected to exhibit their product innovations during 'Unleashing Potentials in Agriculture for Young Agripreneurs (UPAYA)': A Two-day Start-up and Entrepreneurship Conclave, organized at NASC Complex, New Delhi during 16th – 17th October 2018.

The Process Technology for Development of Value Added Products from Naturally Coloured Cotton was released during Agri Startup and Entrepreneurship Conclave on this occasion by the hands of Hon'ble Union Minister of Agriculture & Farmers' Welfare, Shri. Radha Mohan Singh Ji on 16th October 2018. A Technology Brochure titled "Naturally Coloured Cotton: An Opportunity for Innovative Textile Startups" was also released on this occasion.

List of Entrepreneurs admitted for incubation

Sl. No.	Technology	Incubatee	Date of MoU signing
1	Preparation of Value Added Products using Naturally Coloured Cotton	M/s. Kotak Commodities, Mumbai	17.04.2018
2		Mr. Deepak Sorap & Mrs. Nettra D. Sorap	27.04.2018
3	Production of biodegradable kitchen utilities directly from the whole banana pseudostem	M/s. Paras Gold Industries, Chota Udepur, Gujarat	11.07.2018
4	Mechanical Property Testing of Paddy Straw Particle Boards and use facilities of ICAR-CIRCOT-ABI Centre for conducting 1 tonne material/day trial at GTC, Nagpur	M/s. Fumalabs Private Limited, Gwalior (An incubatee of Venture Centre, NCL, Pune)	22.12.2018
5	Preparation of bio-degradable products using agro biomass (banana, rice straw, bagasse)	M/s. Kothari Distributors, Hyderabad	03.01.2019
6	Development of starch based film	M/s. Plantebase Ventures Pvt. Ltd., Mumbai	26.02.2019

MoU with M/s. Kotak Commodities, Mumbai for "Preparation of Value Added Products using Naturally Coloured Cotton" on 17th April 2018

MoU with M/s. Plantebase Ventures Pvt. Ltd., Mumbai for "Development of starch films" on 26th February 2019

New products / technologies developed / Innovations commercialized

Products made using Naturally Coloured Cotton


Gamcha


Jacket


Babywear


Handkerchief

Value Added Products from Banana Pseudostem





Biodegradable Dishware / Kitchen Utilities


Seedling Trays


Greaseproof Paper

Cotton rich Athleisure developed by incubatee

Cotton blended T-shirt developed by Incubatee M/s. Greyy

2.6.3 Valorization of Cottonseed Meal: Extraction of Quality Protein for improving the Livelihood of Cotton Farmers (DST)

The objectives of this project funded by DST are designing of process for extraction and purification of protiens from deoiled cottonseed meal with maximum recovery, development and optimization of process for production of cottonseed protein hydrolysate (CSPH) and Charecterising the isolated protein for food and feed apllications.

The extraction of the protein was done using aqua based solvent system. To achieve the objective of the project cottonseed meal protein was extracted by only water, aqua-salt, aqua-alkali and ultra-sonication method. All protein sample were analyzed for total nitrogen, protein content, free and total gossypol content. The recovery of the protein was very less (3%) by using only aqua based solvent system.

Protein extraction by ultra-sonication method from cottonseed meal then subjected for cold ethanol precipitation, centrifuged and lyophilized. The recovery of the protein was also calculated. The various experiments carried out are represented in Table 1.

Best condition found for extraction of protein was ultra-sonication at 30 min with mild alkali. The recovery at above condition was 60.8% with minimum free gossypol.

Protein sample	Recovery of protein (%)	Protein content (%)	Free Gossypol Content (%)	Total Gossypol Content (%)
Sample without ultrasonication (NaOH)	54	83.64	0.056	0.2
Sample with ultrasonication (NaOH)	56	86.56	0.03	0.2
Sample without ultrasonication (KOH)	56	89.49	0.043	0.41
Sample with ultrasonication (30 min) (KOH)	60.8	82.58	0.02	0.52
Sample with ultrasonication (45 min) (KOH)	56.8	84.44	0.038	0.31
Sample with ultrasonication (60 min) (KOH)	56.8	91.34	0.06	0.15

2.6.4 An Inclusive Agribusiness Model for Sustainable Cotton Marketing in the State of Maharashtra

This project is funded by National Agricultural Science Fund and implemented in collaboration with ICAR-CICR, Nagpur. The objectives of the project is to assess the existing market mechanism for its sustainability & profitability to cotton farmers, study the price quality relations, evaluate the harvesting and post-harvesting practices of cotton farmers in relation to price quality linkages, examine the utilization pattern of cotton by-product and come up with an inclusive agri-business model to improve the profitability of the cotton farmers and mechanism needed for its implementation.

Six major cotton growing districts and also representative of the different regions of Maharashtra viz., Jalgaon (Khandesh), Aurangabad & Parbhani (Marathwada), Yavatmal & Amaravati (Vidharba), and Ahmednagar (Western Maharashtra) have been identified. During the period survey was carried out in the district of Aurangabad for primary data collection covering over 100 farmers. The villages covered in the survey includes Lakhegaon and Tahirpur village in the Paithan tehsil, Mavshala village in Khuldabad tehsil and Mowli, Manjari Dahegaon Bahela, Turkabad and Malunga village in Gangapur tehsil. The primary data collected includes the information pertaining to cost of cultivation, marketing practices and utilization of cotton stalks by the farmers in the region. The cost of cultivation analysis reveals that the share of hired labour accounts for around 20 per cent of the cost, followed by fertilizer at 19 percent and family labour accounting for 18%. The share of plant protection, seed and Bullock & Animal power were 10, 8 and 11 per cent respectively. The marketing channel is dominated by the middlemen/traders. More than 95 per cent of the farmers sell their produce to the village traders in order to avoid additional expense towards the transportation charges. The farmers in this region does not make any commercial utilization of the cotton stalks. They are using a smaller quantities as fuel wood, some farmers shred the stalks in the field using the tractors and majority of them burn the stalks in the field.

2.6.5 CIRCOT-RKVY-RAFTAAR Agri Business Incubator (CIRCOT-R-ABI)

CIRCOT-RKVY-RAFTAAR Agri Business Incubator (CIRCOT-R-ABI) was sanctioned at ICAR-CIRCOT in 31st January 2019 under revamped Rashtriya Krishi Vikas Yojana - Remunerative Approaches for Agriculture and Allied Sector Rejuvenation" (RKVY-RAFTAAR) Scheme. The Rashtriya Krishi VikasYojna (RKVY) is an important scheme of the Government of India, Ministry of Agriculture and Farmers' Welfare (MoA&FW), aimed at strengthening infrastructure in agriculture and allied areas In order to promote agripreneurship and agribusiness by providing financial support and nurturing the incubation ecosystem, a new component under the revamped scheme RKVY- RAFTAAR has been launched in 2018-19 with 10% of annual outlay inclusive of 2% administrative cost.

Objectives:

1. To achieve "Lab to land" by dissemination of new technology/varieties to farmers through promoting a culture of Agri startups
2. To promote innovation, entrepreneurship and business creation in agriculture and allied sector by skill development, capacity building and technology scale up;
3. To create employment opportunities for youth in agriculture in the rural vicinity;
4. To promote an integrated approach for technology acquisition, R&D, commercial technology transfer and knowledge dissemination;

5. To facilitate evolution of an agri-startup ecosystem by support for cost effective, value added services including technical, legal, financial, intellectual property and regulatory compliance related services to agripreneurs;
6. To build a vibrant agri-startup ecosystem, by establishing a network between academia, financial institutions, industries and other related institutions;
7. Capacity building of existing agri-incubators as R-ABIs to achieve other related objectives;
8. To generate/provide innovative solution to meet local and global agriculture and business challenges, and competitiveness.

Brief Progress:

- Advertised for application for the following programmes:

  a. Agripreneurship Orientation Programme(AOP) - Uday

  b. Seed Stage Funding (SSF) as Grant-in-aid to Startups - Ankur

- Networking Programme initiated with ICAR organizations, Educational Institutes, KVKs etc.

2.7 CONSORTIA RESEARCH PLATFORM (CRP) ON NATURAL FIBRES

2.7.1 Lignocellulosic Fibre Based Biomass as Renewable Energy for Rural and Industrial Applications

A large-scale availability of cotton stalks in India is a potential source of increasing farm income and rural entrepreneurship development. This project is aimed to develop viable logistics for supply of cotton stalks for pelleting, briquetting and power generation, development of process parameters for preparation of premium grade pellets from cotton stalks, study of suitability of cotton stalk pellets for different industrial applications and development of Indian standards for biomass pellets and briquettes. Major work performed during 2018-19 are briefly explained as follows.

A. Development of a green crematorium

Cremation in the open air and on a pyre using fire wood is an ancient rite and practice. Cremation of a single person requires about 300 kg of fire wood, which is equivalent to two fully grown trees that takes at least 15 years to grow. Moreover, about 5 litres of kerosene/diesel and 2 kg ghee are also being used in wood based cremation for fire initiation. It leads to emission of a large amount of greenhouse gases causing global warming. The renewable ecofriendly solution to the conventional wood-based cremation that allows performing of all Hindu rituals has been sought by almost all municipal corporations in India as well as in abroad. With popularization of densified biomass fuels i.e. briquettes and pellets, attempts have been made by some researchers to develop briquette-based crematorium.

Development of briquette-based crematorium : Briquettes are used as alternative to coal for firing of boilers in many industries, where forced air draft is supplied for proper combustion of densely packed briquettes. Taking clue from burning of briquettes in boilers, we have designed and developed a briquette-based crematorium with provision of supply of forced draft of air using a centrifugal fan. The air draft generated by fan was directed towards pyre through the perforated set of innovative pipes provided underneath of the M.S. platform and 2 sides of cover plates.

Modification of the ICAR-CIRCOT Crematorium : The developed crematorium was modified based on field performance and feedbacks received from Municipal Corporations. The modified crematorium was able to accommodate about 300 kg cotton stalk briquettes after placing of a body. Length, width and height of the modified set up were 2250x975x1200 mm, respectively.

Modified ICAR-CIRCOT briquette-based crematorium installed at Ambazari Ghat, NMC, Nagpur

Field Trials of Modified Crematorium for Burning of dead bodies : The modified crematorium was installed at Ambazari crematorium, Nagpur Municipal Corporation (NMC), Nagpur. The set up was utilized for cremation by placing of 100 kg briquettes underneath 250 above the body. About ½ kg camphor and 1 kg ghee were sprinkled over the pyre for initiation of fire. The air supply system was started few minutes after the pyre was lit. During cremation, temperature roused to about 995 °C within 25 min of ignition of fire and briquettes burnt effectively without any persistent smoking. The lower body part burnt within 1 h of cremation. However, the hard muscles and torso remained unburnt even after 2 h of cremation. In 2 h duration, the quantity of briquettes depleted to produce sufficient heat required for burning of torso. The complete body was burnt in about 3 and ½ h duration by using 350 kg cotton stalk briquettes. Another trial was also conducted at the same crematorium for burning of a body using cotton stalk briquettes. In this case, the air supply system was stopped after 30 min of igniting of fire. In this case, the complete body was burnt in about 5 h duration with 250 kg briquette.

Refinement of ICAR-CIRCOT Crematorium : The dimension of the developed set up was further refined to reduce the cremation time, briquette requirement and controlling the pollution. The modified set up was converted into a trapezoidal shape of 2'4"x1'6" (700x450 mm) size so that the quantity of briquettes coming into contact of the body is rationalized according to heat requirement for burning of different body parts (the lower body parts require lesser heat for burning as compared to upper body part). The refined crematorium was found to require about 200 kg biomass briquettes, half kg camphor and 1 kg ghee for a cremation while traditional cremations require 300 kg of fire wood, 1 kg camphor, 2 kg ghee and 5 lit kerosene. The cost of cremation with ICAR-CIRCOT Crematorium comes to Rs. 2500/- as against Rs. 5500 for traditional cremation. Around 55% of cost saving per cremation can be attained making it economical and eco-friendly.

ICAR-CIRCOT Crematorium in operation at Ambazari Ghat, Nagpur Municipal Corporation, Nagpur

B. Performance evaluation of premium grade cotton stalk pellets prepared at GTC

The cotton stalk pellets prepared in this work using optimised conditions were evaluated for their suitability as fuels for firing of boilers in M/s. Haldiram Foods International Pvt. Ltd., Bhandara Road, Nagpur and cooking in M/s. Sairam Restaurants, Pratapnagar, Nagpur. The performance of cotton stalk pellets were found at par with that of other biomass pellets. The expenditure on fuel consumption using cotton stalk pellets was found as 1/3rd to the commercial LPG in commercial restaurants.

C. Finalisation of Indian Biomass Pellet Standard

In this work, biomass pellet samples were collected from about 50 end users and manufacturers across the India and analyzed for their quality attributes. Moreover, the data was also collected about requirement of pellet quality parameters for different end users. The quality parameters of pellets produced in India can be grouped in 5 major categories as given in the Table. The quality parameters prescribed in Table can be a beginning for standardization of Indian pellet standards.

Quality parameters of pellets being used in India					
	Premium	**Utility Grade**	**Industrial Grade I**	**Industrial Grade II**	**Industrial Grade III**
Bulk density (kg/m3)	625- 750	580-750	580-750	580-750	580-750
Diameter (mm)	6±0.5	6±0.5	6±0.5	8±1	10±1
Pellet Durability Index (PDI)	≥96.5	≥95.0	≥95.0	≥95.0	≥95.0
Fines % (at the mill gate)	≤0.5	≤ 1.0	≤ 1.0	≤ 1.0	≤ 1.0
Inorganic ash %	≤ 1.0	≤3.0	≤ 8.0	≤ 10.0	≤ 10.0
Length % greater than 35 mm	≤1.0	≤ 1.0	≤1.0	≤1.0	≤1.0
Moisture %	≤ 8.0	≤ 10.0	≤ 10.0	≤ 10.0	≤ 10.0
Chloride, ppm	≤ 300	≤ 300	≤ 300	≤ 300	≤ 300
Heating Value (kcal/kg)	4000	3900	3800	3800	3800

Transfer of Technology

- 'ICAR CIRCOT Green and Rapid Burning Crematorium Technology' was transferred to M/s. Vidarbha Sales, Nagpur for commercial production and marketing.
- Nagpur Municipal Corporation, Nagpur has installed an ICAR-CIRCOT Crematorium at its Ambazari Crematorium, Nagpur. They have cremated about 50 bodies in 4 months using this set up.

Delegates of international training programmes at cotton stalk chipping (left) and unloading stations being operational under guidance of CIRCOT Scientists (right)

Group photos of farmers of a skill development programme organised by CIRCOT, Nagpur to show case technologies developed under this work

- **UNCTAD, Geneva, Switzerland** has sponsored a week training programme for 16 African delegates of 4 countries for "Promoting Cotton By-products in Eastern and Southern African (ESA) Countries".
- Linkages have been created among the farmers, biomass suppliers and manufacturers of pellets and briquettes across various states of India.
- Technological support was provided to 6 group of farmers in two villages (Patansawangi and Mohopa) of district Nagpur for supply of cotton stalks using logistics developed in this project. These groups collected about 5000 tonnes cotton stalks from their villages and supplied the material to a nearby briquetting plant in 2018-19.
- Organisation of 20 Skill Development Programmes of 4 days each for about 500 farmers of Maharashtra for increasing farm income through value addition of cotton stalks and other crop residues.

2.7.2 Preparation of Micro/Nano Lignocellulose and its Incorporation in Molded Products for Improved Performance

Bio-Composite Plug trays using cotton stalk reinforced

with polyester matrix was developed for use in nursery. These trays were supplied to ICAR-DFR, Pune for field evaluation. The evaluation is carried out to study the plant growth (Dracaena- a foliage plant) in the prepared trays using different media having different water holding capacities, like soil based media (soil:sand:FYM 1:1:1), cocopeat based media (cocopeat:vermiculite:perlite 1:1:1) and only soil and only cocopeat. Figure 1 shows that the plant growth is very good and the trays are stable for more than 8 weeks.

Figure 1. Evaluation of Composite plug trays at ICAR-DFR, Pune

Bio-Based molded products were prepared using a combination of banana fibres and cotton stalks (Figure 2).

To impart hydrophobicity, a process of using emulsified bee wax / sugar cane wax is optimized since the commercially available bio-oil is not economical and they are imported as well. The developed technology of using bee / sugarcane wax to impart hydrophobicity is an eco-friendly way and it did not affect the bio-degradability of the molded products. The performance of bee wax coated products is shown in figure 3.

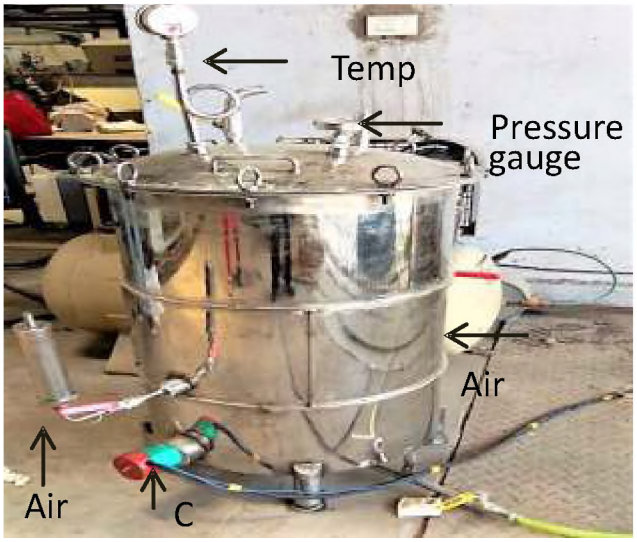
Fig. 2. Banana pseudostem fibre based kitchen utensils

Fig. 3. Bee wax (emulsion) coated biomass-based plates showing hydrophobicity

2.7.3 Eco-Friendly Method of Preparing Absorbent / Surgical Cotton from non-spinnable cotton

The solid state fermenter for producing the Enzyme has beendesigned and developed. The fermenter has the capacity for preparation of enzyme in large scale 150L/batch.

The solid state fermenter developed under the project has the capacity of 150 liters of enzyme production. The fermenter has the unique feature of autoclaving the substrate followed by fermentation in the same system.



Training : Organized Training cum Demonstration for rural women "Eco-processing of Absorbent Cotton using Enzyme" at GTC, Nagpur. Organized Training cum Demonstration for women's Self-help group, NGO at Amravati, about 35 women participated in it.

Entrepreneurship Development : Product Developed from Absorbent Cotton (Sanitary Napkin: by Women's Self-help Group). 5 g of cotton fibre was used in making each pad at M/s. Sanjeevini, Women's Self-help Group, Dharwad, Karnataka.

2.7.4 Sustainable Green Technology for Dyeing of Cotton

The project attempts to develop a eco-friendly reactive dyeing process for cotton using salt free dyeing technology. The salient features of the developed salt free dyeing technology are

- ICAR-CIRCOT has developed a process protocol by which the use of salt during dyeing of cotton can be completely eliminated.
- 80% reduction in the chemical use during dyeing
- Suitable for small scale dyeing industries – no need of installing RO

- Reduction in pollution load leads to adoption of ZLD with less cost
- 20% more water recovery, 20% saving in time and energy make dyeing sustainable
- Higher wash fastness on the dyed fabric.

Two industrial scale up trials have been completed with both knitted and woven fabric materials which showed that the process can be adopted at an industry level without modification of machine or process sequence.

The industrial level dyed fabrics were converted to garments for wear trial.

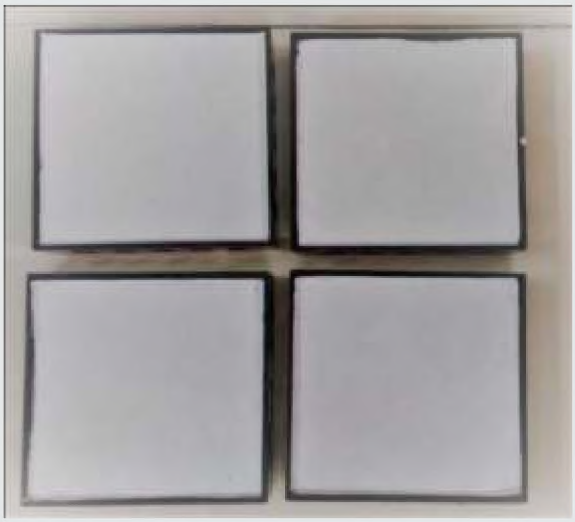
Two stakeholder's workshops have been conducted. First Stakeholder meeting conduced at Boisar in collaboration with Tarapur Industrial Manufacturers Association (TIMA) on 27.12.2018 with the participation of 40 Industries.

Second stakeholder meeting was organized at Tirupur on 01.03.2019 in collaboration with AIC-NIFT-TEA, Tirupur Exporters Association (TEA), Dyers Association of Tirupr (DAT) with the participation of 70 industries. MoU was signed between ICAR-Central Institute for Research on Cotton Technology (ICAR-CIRCOT), Mumbai and AIC-NIFT TEA Incubation Centre for Textiles and Apparels, Tiruppur for promotion of salt free dyeing technology, eco-friendly processing of textiles, new product development using cotton and other natural fibres on 15th March 2019.

2.7.5 Dense Paper from Banana Pseudostem Fibres for Packaging

Demand of dense paper (greaseproof paper, vegetable parchment paper, glassine paper) has increased in recent years due its augmented use in packaging of fatty food as well as fast food shops and home baking. This creates a necessity to explore alternative fibre sources that are sustainable and available in huge quantity. Plant biomass presently discarded as waste, like banana pseudostem could be utilized as a source of fibre instead of wood. Fibres extracted from banana pseudostem possesses good physical and mechanical strength, low cost, light weight and contains high amount of cellulose. This makes them suitable raw material for paper and pulp industry. Hence, use of banana pseudostem fibres for development of dense paper. In conventional paper mills, finely milled wood pulp is coated with synthetic polymers or chemicals to impart greaseproof properties to the dense paper was explored. Therefore, coating of paper with natural and biodegradable polymers was also tried.

Banana fibres were cut into small pieces and cut fibre were placed in laboratory rotary digester. Kraft pulping was carried out at specific digestion temperature, time, sulfidity, active alkali concentration and raw material to liquor ratio. After digestion, pulp was washed, bleached with hydrogen peroxide and refined to achieve predetermined degree of freeness. Hand sheets (40± 1 GSM) made using lab hand sheet maker were dried under natural environment and tested for various mechanical and barrier properties. The dried hand sheets were coated with natural coating materials such as caboxymethyl cellulose (CMC) and sodium alginate (SA) and tested for various mechanical and barrier properties.



Handsheets made from banana fibre pulp

The dense paper made from banana fibre showed good tensile index (22.4 ± 3.12 Nm/g), bursting strength (1.6 ± 0.07 kg/cm2) and air resistance (10.4 ± 0.24 s/100 mL). However, it does not pass 'turpentine oil test' for greaseproof paper. Both the CMC as well as SA coated paper showed significant increase in strength and air resistance. Application of either of the coating material does not help to enhance resistance to oil, at lower degree of refining. In addition to surface coating, paper made from a banana fibre pulp refined at higher degree of freeness showed grease resistance. Hence, further work is going on to impart desirable greaseproof properties to banana fibre paper made from pulp beaten/refined at lower degree.

2.7.6 Starch Based Biodegradable Composite Films For Packaging

Petroleum-derived synthetic polymers are most widely used materials for food packaging due to their simple processing and low manufacturing costs. However, these polymers are non-biodegradable, creating many problems concerning post-consumption disposal of wastes. A deep need is felt to look for eco-friendly biodegradable packaging materials with new functionalities as an alternative to petroleum-based synthetic polymers. Starch is a potential candidate to produce biodegradable polymers since it is renewable, biodegradable and abundantly available at low cost. However starch based biopolymers have certain drawbacks such as brittleness, poor mechanical, thermal and barrier properties; rendering them unsuitable for packaging films. Polymer blending of starch with compatible polymer like Poly vinyl Alcohol (PVA) is an effective strategy to obtain starch based composites with new functionality at relatively low cost.

ICAR-CIRCOT has developed Starch-PVA biodegradable composite films with improved properties using solvent casting method. The method involves gelatinization of corn starch in the presence of water and plasticizer (glycerol) at 95°C and 1000 rpm. To the pregelatinized starch, PVA in different concentration was added and the solution was mixed at 95°C for 1 h. The films were casted on a PET plates and peeled off after drying at 40°C for 48 h. The average film thickness of developed films was 100 μm. Blending of starch with PVA resulted in composite films with excellent barrier properties and optimum mechanical properties. FTIR spectra and SEM graphs of films showed excellent compatibility between starch and PVA.The strong bonding interactions between hydroxyl groups and branched amylopectin in starch with vinyl group of PVA, forming dimensional network structure leading to

enhanced strength and water vapor barrier. The films showed 93% increase in tensile strength, 270% increase in elongation at break and 53% improvement in water vapor barrier and 106 % increase in water solubility over starch film. The films are easily heat sealable. The water soluble composite films developed has excellent fat resistant properties, thus can find the applications in the packaging of oils, fats, dry foods, fried products etc. Being biodegradable, these films have promising potential to be used as an alternative to synthetic polymers currently being used for packaging.

Studies on biodegradability Starch-PVA composite films is under progress.

Starch films

Composite films

Products packed in composite film

3. Technology Management

ICAR-CIRCOT carries out basic & strategic research in processing of cotton and its agro residues, development of value added products and quality assessment. The research work results in development of machinery, products and process protocols. The Institute is also engaged in the refinement of the already developed technologies in the areas of post-harvest processing of cotton, eco-friendly finishing of textiles and value addition of cotton stalks. Technologies developed are protected through management of intellectual property rights. Assessment, popularization and commercial adoption of viable technologies are carried out regularly through demonstrations, industrial trials, awareness meets, exhibitions and seminars. Impact assessment of already commercialized technologies is also taken up for further improvement.

3.1 Intellectual Property Management

Institute Technology Management Unit (ITMU) takes care of the protection of intellectual property rights of the technologies developed in the Institute and is also involved in commercialization of these technologies.

PATENT FILED

- **Date of Filing :** 09-10-2018
- **Application Number :** 201821038218
- **Title :** CIRCOT Ecofriendly, Efficient and Rapid Burning Crematorium
- **Inventors :** Sujeet Kumar Shukla Prashantkumar Gulabrao Patil Vishnu Govind Arude Mageshwaran Vellaichamy Varsha Satankar Raja Anaippan Sivasubramanian Ashok Kumar Bharimalla Dhiraj Uddhaorao Patil

3.2 Technology Commercialized

Technology developed by ICAR-CIRCOT, "Eco-friendly, efficient and Rapid burning Crematorium Using Cotton stalk/biomass briquettes" has been commercialized to M/s. Vidarbha Sales, Nagpur.

3.3 Technology Incubation: Agri-Business Incubation (ABI) Centre

ICAR-CIRCOT has established an Agri-Business Incubation (ABI) Centre under 12th Plan Scheme of National Agriculture Innovation Fund (NAIF) (Component II) –Incubation Fund for the benefit of prospective entrepreneurs who wish to start their business using Institute technologies on post-harvest processing of cotton and value addition to its by-products. This centre promotes incubation and business development in cotton and its by-products, conducts techno-entrepreneurial activities in cotton value chain for building prospective clientele and facilitates skill development in selected stakeholders related to cotton sector. The Agri-Business Incubation (ABI) Centre was launched at ICAR-CIRCOT, Mumbai on 5th February 2016. Since inception, 13 incubates were admitted and 2 incubatees graduated. Six new entrepreneurs were admitted at ICAR-CIRCOT-ABI Centre for incubation on different technologies during the year 2018-19.

3.4 Technology Release

The Process Technology for Development of Value Added Products from Naturally Coloured Cotton was released during Agri Startup and Entrepreneurship Conclave at NASC Complex, New Delhi by Hon'ble

Sl. No.	Incubatee	Technology
1	Preparation of Value Added Products using Naturally Coloured Cotton	M/s. Kotak Commodities, Mumbai
2	Preparation of Value Added Products using Naturally Coloured Cotton	Mr. Deepak Sorap & Mrs. Nettra D. Sorap
3	Production of biodegradable kitchen utilities directly from the whole banana pseudostem	M/s. Paras Gold Industries, Chota Udepur, Gujarat
4	Mechanical Property Testing of Paddy Straw Particle Boards and use facilities of ICAR-CIRCOT-ABI Centre for conducting 1 tonne material/day trial at GTC, Nagpur	M/s. Fumalabs Private Limited, Gwalior
5	Preparation of bio-degradable products using agro biomass (banana, rice straw, bagasse)	M/s. Kothari Distributors, Hyderabad
6	Development of starch based film	M/s. Plantebase Ventures Pvt. Ltd.

Union Minister of Agriculture & Farmers' Welfare, Shri. Radha Mohan Singh Ji on October 16, 2018. The technology brochure was also released on this occasion.

Release of Jacket made from Naturally coloured cotton by Shri Radha Mohan Singh, Hon'ble Minister of Agriculture and Farmers' Welfare

3.5 Awareness Meets and Demonstrations

A day long Kisan Gosthi was organized by Ginning Training Centre (GTC), ICAR-CIRCOT, Nagpur in association with Confederation of Indian Textile Industry- Cotton Development & Research Association (CITI-CDRA), Mumbai at Village Rehaki, Tah.-Seloo, District-Wardha on April 28, 2018 to sensitize the farmers about cotton biomass management and field preparations for next cotton crop. 50 farmers participated in this programme.

An awareness-cum-demonstration programme was conducted by team of experts led by Dr. V. Mageshwaran, Scientist, Ginning Training Centre, ICAR-CIRCOT, Nagpur at Palasgaon village, Selu Taluk, Wardha district on May 31, 2018. 30 farmers participated (MGMG)

A Kisan Goshthi on "Utilization of Cotton Stalks for Preparation of Value Added Products" under MGMG was organized at village Dorli, Warha District, Maharashtra on June 26, 2018. 25 farmers participated.

An awareness programme on "Doubling the farm income through Quality Based Marketing and Effective Pink Bollworm Management" was organized by GTC Nagpur and CITI-CDRA on August 21, 2018 at Wardha, Maharashtra. 500 farmers participated.

An awareness-cum-demonstration programme was organized on September 18, 2018 at village Shegaon (Kund) and another on September 27, 2018 at village Sawali (Wagh) in which village level value added products (briquette, pellet, mushroom and compost) from cotton stalks and other crop residues were demonstrated to the farmers. Thirty progressive farmers attended in each of these programme.

Under the MGMG programme, an awareness cum demonstration meet on development of village level value added products from cotton stalks was organized on October 25, 2018 at village Ajni, Wardha District, which was attended by thirty progressive farmers.

A training cum demonstration on "Eco-Friendly method of preparing absorbent/surgical cotton from non-spinnable cotton" was organized for rural women at GTC of ICAR-CIRCOT, Nagpur on November 17, 2018.

An awareness programme under MGMG was organized on November 21, 2018 in collaboration with CITI-CDRA, Mumbai at village Yenora near to Hinganghat, Wardha District in which one hundred progressive farmers attended.

An awareness programme under MGMG was organized on December 07, 2018 at village Zadsi, Wardha District in which thirty two progressive farmers participated. The preparation of value added products (briquette, pellet, mushroom and compost) from cotton stalks and other crop residues were demonstrated to the farmers.

An Awareness-cum-Demonstration programme for the preparation of bio-enriched compost from cotton plant residues was organised at the field of Shri Rajaram, village Shahpur Begu in Sirsa District of Haryana State on January 17, 2019.

A Demonstration on "Preparation of Compost from Cotton Stalks" was held on January 30, 2019 at village Mehna-Kathira, Sirsa District of Haryana State.

An awareness programme on "Quality Cotton Production" was conducted at village Aamgaon (Khadki), Wardha District of Maharashtra on January 31, 2019.

An awareness programme under MGMG was conducted in Amgaon Village, Selu taluk, Wardha Dist., on February 04, 2019. Thirty six farmers from the village participated in the program.

Ginning Training Centre of ICAR-CIRCOT, Nagpur organized a Technology and Machinery Demonstration Mela- 2019 on February 15, 2019. In this programme, more than one hundred cotton growing farmers from Wardha & Nagpur along with stakeholders from industries and research organizations participated

3.6 Exhibitions and Agri-Fair

ICAR-CIRCOT participated and showcased exhibits and technologies in the 3rd International Symposium on Aquaculture and Fisheries Education (ISAFE-3), organized by the ICAR Central Institute of Fisheries Education (CIFE), Mumbai during May 16-18, 2018. The theme of ISAFE-3 was "Fisheries Education for Sustainable Blue Economy".

The entrepreneurs and stakeholders of ICAR-CIRCOT ABI Centre were invited to exhibit their product innovations duringAgri-Startup and Entrepreneurship Conclave 2018 "Unleashing Potentials in Agriculture for Young Agripreneurs (UPAYA)" organized at A. P. Shinde Auditorium Hall, NASC, ICAR, New Delhi during October 16-17, 2018. The products viz. naturally coloured cotton products, health & hygiene textiles and banana fibre based products etc. developed by the incubatees were displayed in the exhibition.

GTC of ICAR-CIRCOT, Nagpur participated in "Agri Exhibition" organized by ATMA, Maharashtra State Agriculture Department & Dr. PDKV, Akola, at Deekshaboomi, Bajaj Nagar, Nagpur on the occasion of Dharma Chakra Pravartan and Institute technologies were exhibited during October 17-18, October, 2018.

Participated in Exhibition during Kapus Mela/ Cotton fair 2018 organised by ICAR-CICR, Nagpur on October 30, 2018.

Ginning Training Center of ICAR-CIRCOT, Nagpur participated in 10th Agro-Vision, Central India's largest Agricultural Summit at Reshimbagh ground, Nagpur during November 23-26, 2018.

An exhibition was arranged to display the technology and machinery on cotton processing and by-products utilization for the farmers during the Technology and Machinery Demonstration Mela at GTC, Nagpur on February 15, 2019. Live demonstration on chipping of cotton stalks, preparation of bio-enriched compost, oyster mushroom cultivation and preparation of pellets were conducted for the benefit of farmers.

Inauguration of Exhibition at TDM 2019

ICAR-CIRCOT-Agri-Business Incubation Utsav held at ICAR-CIRCOT, Mumbai on 3rd December 2018. The

ICAR - CIRCOT stalls in "UPAYA"

event was held to recognize the efforts of incubatees and successful entrepreneurs associated with ICAR-CIRCOT-ABI Centre.

3.7 Television Talks

Dr. P.S. Deshmukh, Senior Scientist gave a TV talk in a show Krishi Darshan (Marathi) of DD Shyadri channel on "Kaapus Ek Upyog Anek" (One Cotton, Multiple Uses). The talk was broadcasted on September 18, 2018 at 6.10 pm.

A TV talk on "Quality of Cotton and its effect on Yarn Quality" by Dr. P. K. Mandhyan was telecasted on November 20, 2018 on DD Sahyadri.

3.8 Radio Talk

Dr. P.S. Deshmukh, Senior Scientist delivered a Radio Talk on the topic "Tools and implements for intercropping of khariff crops in Konkan" in Marathi on All India Radio (Akashvani), Asmita Vahini, Mumbai. The programme was broadcasted at 7:30 pm on June 25, 2018. This programme was re broadcasted on March 30, 2019 at 7.30 pm.

4. Training and Capacity Building

Training and capacity building is very important for every organisation for maintaining the quality of the work. It is very essential to upgrade the skill of the work force in their respective fields and to update them with lasest developments so as to enable them to provide maximum output.

Skill development in the area of post-harvest processing of cotton and value addition to its biomass is one of the mandate of the Institute. Training programmes are organised by the institute for the stakeholders including farmers, ginners, personnel from cotton trade and industry throughout the year. These trainings covers diveres areas of cotton processing.

Ginning Training Centre of the Institute at Nagpur regularly conducts training for the farmers covering production and post-harvest processing of cotton and utilisation of cotton biomass for value added products. Training courses for Gin fitters and other workers in the ginning industry on technologies for production of clean quality cotton, maintenance of various ginning and allied machines are also conducted regularly by the GTC.

The institute organises customised specialised training programmes on spinning, quality evaluation, chemical characterisation, nano cellulose, microscopy, electrospinning, absorbent cotton technology, value addition to cottonseeds etc. to personnel from the industry.

Training on LQMS as per ISO/IEC 17025: 2017

Staff presentation after attending training

4.1 Capacity builing of Staff

ICAR-CIRCOT, based on the training needs assessment plan for the period 2018-2019, trained its employees to improve their skill in addition to keep pace with the latest technological advancements in the relevant fields. The employees trained in premier institutions like IITs and IIMs and other national level training institutions to learn the cutting-edge technologies, skill development & project management methodologies. Routine training impact assessment is carried out after a period of one year to analyze the outcome of the training programmes. The percent realization of trainings planned during the financial year 2018-19 was 129%. Scientists underwent training in diversified fields like advances in microscopy, NABL training and value addition to cottonseed. Technical staff undergone training in skill & personality development, NABL, motivation, positive thinking, communication skill, and automobile maintenance. Administrative staff were trained in official language management, behavioural skills, pay fixation and NPS management. Supporting staff undergone a training on skill development.

Table 4.1 Skill development of Institute Staff

Programme Title	Duration	Venue	Name(s)
Scientific Staff			
One day training on MATLAB	May 18, 2018	ICAR-CIRCOT, Mumbai	Dr. D. M. Kadam Dr. N. Vigneshwaran Dr. T. Senthilkumar Dr. P. Jagajanantha Dr. A. Arputharaj Er. Jyoti Dhakane Dr. G. Krishnaprasad

Programme Title	Duration	Venue	Name(s)
Knitting and Knit garments	June 13-18, 2018	ICAR-CIRCOT, Mumbai	Dr. Manojkumar Dr. Sharmila Patil Miss Priyanka Sakre
Value Addition to Cottonseed	July 26-28, 2018	ICAR-CIRCOT, Mumbai	Er. Jyoti Dhakane
Laboratory Quality Management System as per ISO/IEC 17025: 2017 conducted by IAQM, Kolkata	August 22-25, 2018	Hotel Bawa International, Mumbai	Dr. Manoj Kumar
General Requirement for the Competence of Testing and Calibration Laboratories and Internal Audit as per ISO/IEC 17025:2017	October23 – 26, 2018	IDEMI, Chunnahbatti, Mumbai	Dr. P. Jagajanantha
Management Development Programme on Leadership Development	December 18-30, 2018	ICAR-NAARM, Hyderabad	Dr. Dattatreya M. Kadam
Advances in Microscopy	January 17-19, 2019	ICAR-CIRCOT, Mumbai	Er. Jyoti Dhakane- Lad
Extraction and Isolation of Phytoconstituent	February 09-10, 2019	ICT, Mumbai	Shri Santanu Basak
ISO/IEC 17025: 2017 training program,	Mar 05-08, 2019	ICAR-CIRCOT, Mumbai	Dr. Sujata Saxena Dr. P.S. Deshmukh Dr. G. Krishna Prasad
Technical Staff			
Hospitality Management	April 20-25, 2018	ICAR-NAARM, Hyderabad	Shri S.V. Kokane
Motivation, Positive Thinking and Communication Skills for Technical Staff (T-1 to T-4) of ICAR(Off-campus ICAR-NAARM)	August 01-07, 2018	ICAR-CIAE, Bhopal	Smt. Hemangi R Pednekar Smt. Medha P Kamble Shri D. M. Raje Shri Mahabir Singh Shri D. J. Dhodia
Training on Swachh Bharat Abhiyan	July 30, 2018	ISTM, New Delhi	Shri Nishant D. Kambli
Competency Enhancement on "Soft Skills and Personality Development for Technical Staff of ICAR	September 8-27, 2018	ICAR-NAARM, Hyderabad	Shri Anand R Jadhav Shri Yogesh Nagpure
General Requirement for the Competence of Testing and Calibration Laboratories and Internal Audit as per ISO/IEC 17025:2017	October 23 – 26, 2018	IDEMI, Mumbai	Shri R. S. Prabhu Desai
Automobile Maintenance, Road safety and Behavioral skills	February 19-25, 2019	ICAR-CIAE, Bhopal	Shri Santosh V Kokane
KOHA for Library Staff of ICAR	February 21-26, 2019	ICAR-NAARM, Hyderabad	Smt. Medha P Kamble

Programme Title	Duration	Venue	Name(s)
ISO/IEC 17025: 2017 training program,	Mar 05-08, 2019	ICAR-CIRCOT, Mumbai	Shri Nishant D. Kambli Shri R.R. Chhagani Dr. Sujata Kawlekar Shri R.S. Narkar Dr. N.M. Ashtaputre Shri Manoj Ambare Dr. C. D'souza Shri S. Banerjee Shri B.R. Pawar Shri C.M. More Shri H.S. Koli Shri V.D. Kalsekar Shri Prashant Gavhale Shri Paresh Thakur Shri R.K. Jadhav Shri Krishna Bara Smt. P. S. Nirhali
Motivation, Positive Thinking and Communication Skills for Technical Officers (T-5 and above) of ICAR Institutes (Off-campus ICAR-NAARM)	March 13-19, 2019	ICAR-IISWC, Dehradun	Shri B. R. Pawar Smt. Prachi R Mhatre Dr.Hamid Hassan
Administrative Staff			
Official Language Management in ICAR and new Directions (भाकृअनुप में राजभाषा प्रबंधन एवं नई दिशाएं)	April 24-25, 2018	ICAR-CRIDA, Hyderabad	Smt. Trupti P.Mokal
Enhancing Efficiency and Behavioural Skills	September 24-29, 2018	ICAR-CIFE, Mumbai	Smt. U. N. Bhandari
Training for specific programme (OSP) for newly recruited Assistant of ICAR Institute	May 14 – June 08, 2019	ISTM, New Delhi	Ms. Nikky Shokeen Ms. Himani Singh Ms.Pooja Tiwari
Capacity building under national pension systems (NPS)-PFRDA	October 23, 2018	AIR, Church Gate, Mumbai	Shri S.S.Angane Ms. Himani Singh
TA & LTC Rules	March 07-08, 2019	Institute of Govt. Accounts & Fiancne, Mumbai	Shri Avinash Aman
Pay Fixation & MACP	March 07-08, 2019	Institute of Govt. Accounts and Fiancne, Mumbai	Shri Avinash Aman Shri Sainath N Sahane
Skilled Support Staff			
Training on Skill Development for Supporting Staff	March 12, 2019	ICAR-CIRCOT, Mumbai	Shri V. B. Pujari Shri S. K. Bhobate Shri S. R. Tondse Shri D. K. Kasar Shri M. Z. Rathi Shri G. O. Thapa

4.2 Trainings Imparted

The Institute has been conducting regular training programmes for students, farmers, entrepreneurs and personnel employed in cotton and ginning sectors. Training programmes related to advances in cotton technology in the field of chemical processing, nano-technology, spinning, quality evaluation and use of advanced instrumentation are conducted at Mumbai headquarters. At Ginning Training Centre, Nagpur, training programmes on Ginning technology, Post-harvest processing & value addition to cotton by-products and Quality evaluation and grading of cotton are organised.

TABLE 4.2 : Training Programmes organised during 2018-19

Programme Title	Duration	No. of Participants	Participants' Profile
ICAR-CIRCOT, Mumbai			
Application of Physics in Textile Testing	April 25 -27, 2018	02	Academics
Quality Evaluation of Cotton	May 07-11, 2018	09	Industry personnel
Knitting and knit garments	June 11-13, 2018	13	Academics, ICAR, Industry
Quality Evaluation of Cotton	July 23-27, 2018	08	Industry
Value addition to Cottonseed	July 26-28, 2018	09	ICAR, Industry
Absorbent Cotton Technology	August 02-04, 2018	12	ICAR, Industry, Student, Farmer
Quality Evaluation of Cotton	August 06-10, 2018	09	Industry
Quality Evaluation of Cotton for Cotton Breeders / Scientists	September 24-26, 2018	05	Industry
Advances in Applications of Nanotechnology	September 24-28, 2018	13	Academics, Students
Electrospinning for Nanofibre Production & its Applications	October 29-31, 2018	10	ICAR, Academics, Students
Spectroscopic and Chromatographic Techniques for Material Characterisation	November 27-29, 2018	14	ICAR, Academics, Students
Advances in Microscopy	January 17-19, 2019	06	ICAR, Academics
Fibre Reinforced Composites	February 04-06, 2019	05	ICAR, Academics, Students
GTC of ICAR-CIRCOT, Nagpur			
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	April 23-26, 2018	19	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	May 02-05, 2018	26	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	May 14-17, 2018	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	May 21-24, 2018	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	May 28-31, 2018	30	Farmers

Programme Title	Duration	No. of Participants	Participants' Profile
Double Roller Ginning Technology & Basics of Cotton Quality Evaluation	June 11-16, 2018	06	Industry
Double Roller Ginning Technology & Basics of Cotton Quality Evaluation	June 27- July 02, 2018	02	Industry
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	July 02-05, 2018	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	July 09-12, 2018	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	July 16-19, 2018	30	Farmers
Double Roller Ginning Technology & Basics of Cotton Quality Evaluation	August 06-08, 2018	07	Industry
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	August 20-23, 2018	25	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	August 27-30, 2018	26	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	September 09-12, 2018	29	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	September 17-20, 2018	24	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	September 24-27, 2018	23	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	October 22-25, 2018	27	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	December 10-13, 2018	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	December 26-29, 2018	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	January 08-11, 2019	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	January 22-25, 2019	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	February 04-07, 2019	30	Farmers
Increasing Farm Income through Increase in Production and Processing of Cotton at Village Level	February 25-28, 2019	30	Farmers
Quality Evaluation Unit of ICAR-CIRCOT, Coimbatore			
Quality Evaluation of Cotton for e-NAM Platform of Govt. of India for Tamil Nadu Region	November 27-29, 2018	06	Department of Agricultural Marketing and Agri. Business, TN

Total number of training programmes	Number of beneficiaries	Revenue generated (Rs. Lakhs)
37	701	32.31

Training on Electrospinning

Training on Fibre Reinforced Composites

Training on Knitting

Farmers training at GTC, Nagpur

4.3 Education

The institute has been accorded permanent recognition by University of Mumbai for guiding students leading to M. Sc. (by research) in Physics, Bio-physics, Microbiology and Organic Chemistry and Ph.D. in Physics and Microbioogy.

Ph.D Students on Roll

Name of Student (Research Guide)	Year of Admission	Research Topic	Status
Mrs. Soniya Shetty (Dr. R.H. Balasubramanya)	2008	Anaerobic retting of coconut fibres to produce textile grade fibres.	Ph.D completed
Mrs. Sangeeta M. Chavan (Dr. N. Vigneshwaran)	2012	Effect of silver, zinc oxide and titania nanoparticles on nitrogen fixing, phosphate solubilizing and biofilm forming bacteria found in soil ecosystems.	On-going
Ms. Komal Saraf (Dr. N. Vigneshwaran)	2012	Preparation of nanofibre mats of alginate and pullulan by electro spinning and its application as nanosensor for detection of food spoilage	On-going
Ms. Siddhi Juikar (Dr. N. Vigneshwaran)	2012	Microbial production and Characterization of Nano-Lignin and its application ontocotton and linen fabrics for functional properties	Ph.D completed
Ms. Priyanka Bagde (Dr. N. Vigneshwaran)	2014	Immobilization of antimicrobial peptides on nanocellulose for potential use in active food packaging	On-going

4.4 HRD Achievements

Category	Total employees	Employees undergone training	No. of trainings planned as per ATP	% realization of trainings
Scientists	28	6	7	86
Technical	68	29	10	290
Administrative staff	33	8	9	89
SSS	40	6	12	50
Total	169	49	38	129

5. Linkages and Collaboration

ICAR-CIRCOT maintains linkages with various organizations at national and international level in the domain of research, education, skill development and extension. Linkages with stakeholders helps to foster research, enhance technology assessment and refinement, capacity building and fasten the transfer of technology from lab to the land.

ICAR-CIRCOT, a technology partner of the AICRP on Cotton and Principal investigator of Quality Research, is linked to ICAR institutions and State Agricultural University involved in the cotton breeding programme. The institute is also a part of the Central Variety Release Committee and the cotton varieties release should fulfil the CIRCOT quality norms.

The Institute has taken a new initiative to include the industrial stakeholders at the project initiation stage. The has led to development of linkage with industrial stakeholders through signing of Memorandum of Understanding (MoU) for carrying out collaborative research and machinery development in public private partnership mode. The association with the institutional stakeholders like Cotton Corporation of India (CCI) has also been strengthened to work in participatory mode for technology development.

The Institute is the nodal centre for implementation of the Consortia Research Platform (CRP) on Natural Fibres. Under this project the linkage has been established with institutes working in the field of natural fibres such as ICAR-NINFET, Kolkata, Assam Agricultural University, Jorhat, TNAU, Coimbatore.

Quality Evaluation (QE) units of the Institute are located within the premises of other institutes and agricultural universities in the country. Other than functioning as extension wings, these units also facilitate linkages and collaboration with host institutes.

Agri-Business Incubation (ABI) Centre at the headquarters that works towards promotion of the entrepreneurship based on institute technologies has created linkage with budding entrepreneurs, industries and other institutions working towards promotion of innovative ideas into new enterprises.

The institute has also created international collaboration with the stakeholders of the cotton sector in the African Countries. A partnership has been established with the United National Conference on Trade and Development (UNCTAD), Geneva for promoting cotton by-products in Eastern and Southern Africa especially in Zambia, Zimbabwe, Tanzania and Uganda. The different organizations and key stakeholders from the countries of Zambia, Zimbabwe and Uganda were invited for a study visit to learn from India's experience under the aegis of UNCTAD. In the process the linkage was also established with International Trade Centre (ITC) and COMESA.

Memoranda of understanding (MoUs) were signed with different industries and with individuals for development of and commercialization of Institute technologies for cotton processing and value addition to by-products.

5.1 MoU Signed

Research Collaboration

1. Memorandum of Understanding (MoU) was signed with Dr. M. K. Sharma, Whole Time Director & CEO, M/s Bajaj Steel Industries Limited, Nagpur for taking up collaborative research on "Development of trash handling system for control of pink bollworm in cotton ginneries" on April 12, 2018.
2. MoU was signed for Collaborative Research with M/s. Bajaj Steeel Industries Limited, Nagpur for 'Development of Rotary Tubular Drum Dryer for Quarantine of Pink Bollworm Infested Cottonseeds in Ginneries' on December 03, 2018.

Technology Incubation

3. Memorandum of Understanding (MoU) was signed with M/s. Kotak Commodities, Mumbai for Preparation of Value Added Products using Naturally Coloured Cotton on April 17, 2018.
4. Memorandum of Understanding (MoU) was signed with Mr. Deepak Sorap & Mrs. Nettra D. Sorap for Preparation of Value Added Products using Naturally Coloured Cotton on April 27, 2018.
5. Memorandum of Understanding (MoU) was signed with incubate M/s Paras Gold Industries Limited, Chota Udepur, Gujarat for preparation of Banana Fibre based value added products on July 11, 2018 (Mr. Mandar Tambe).
6. MoU was signed for co-incubation with M/s. Entrepreneurship Development Centre, Pune & M/s. Fumalabs Private Limited, Gwalior for "Mechanical Property Testing of Paddy straw particle boards and use facilities of ICAR-CIRCOT-ABI Centre for

Conducting 1 Tonne Material/Day Trial at GTC, Nagpur" on December 22, 2018.

7. MoU was signed with M/s. Kothari Distributors, Hyderabad (Incubatee) for "Incubation for preparation of bio-degradable products using agro biomass (banana, rice straw, bagasse)" on January 03, 2019.
8. MoU was signed with M/s Cotton Corporation of India Ltd., Mumbai for "Developing affordable machines for testing of cotton at farm level and to transfer technical knowledge with regard to best practices to Indian farmers" on January 25, 2019.
9. MoU was signed with Dept. of Agriculture Cooperation & Family Welfare for the "Establishment of RKVY-RAFTAAR Agri Business Incubator (R-ABI) at ICAR-CIRCOT" on February 19, 2019.
10. MoU was signed between ICAR-CIRCOT and M/s. Plantebase Ventures Pvt. Ltd., Mumbai for "Development of starch based film for packaging" on March 26, 2019 during the XXV RAC meeting.
11. MoU was signed with AIC-NIFT TEA Incubation Centre for Textiles and Apparels, Tiruppur for "Promotion of intensive innovation and startups in the textile salt free dyeing technology, eco-friendly processing of textiles, new product development and using cotton and other natural fibres" on March 15, 2019.

Technology Commercialization

12. MoU was signed with M/s. Vidarbha Sales, Nagpur for technology license to "Manufacture Ecofriendly, Efficient and Rapid Burning Crematorium using cotton stalk/biomass briquettes" on December 03, 2018.

MoU with M/s Paras Gold Industries

MoU with M/s. Kothari Distributors

MoU signed with Mr. Deepak Sorap & Mrs. Nettra D. Sorap

MoU with Cotton Corporation of India

MoU with M/s. Vidarbha Sales

MoU with M/s. Bajaj Steel Industries Limited

MoU signed with M/s. Fumalabs Private Limited, Gwalior and EDC, Pune

5.2 Commercial Testing and Consultancy Services

CIRCOT is one of the acclaimed NABL accredited cotton testing laboratories in India. The Institute has facilities for conducting more than 175 tests on different textile materials and cotton by-products. These facilities are extended to all the textiles mills, government departments and private sector parties.

During the year under report, a total of 16,878 samples were tested at different test centres including headquarters at Mumbai, GTC Nagpur and quality evaluation units at Coimbatore, Dharwad, Surat and Sirsa. Total revenue generated through commercial testing was ₹ 80,62,926/-.

Besides regular tests, special tests were also carried out as per demand on samples received from various government/ private organisations and universities. The Institute maintains liaison with different institutions including private organizations and entrepreneurs and strives to meet their technological needs by offering various other need based services generating additional revenue through the activities.

Table 5.1 : Number of Paid Samples Tested and Revenue Generated

Test Centre	No. of Samples Tested	Revenue Generated (Rs)
Mumbai	6198	43,29,235
Nagpur	5205	26,90,774
Coimbatore	4360	6,95,551
Dharwad	157	58,776
Guntur	196	67,904
Sirsa	726	2,15,730
Surat	36	4,956
Total	16,878	80,62,926

Table 5.2 : Tests Conducted and Clientele

Test	Party Name
Absorbent Cotton test	• Medicon, Kalburgi, Karnataka • N H Healthcare, Malkagiri, Telangana
Alpha cellulose	• SNDT Women's University Mumbai
ASH	• Kallam Agro Products & Oils Pvt Ltd., Guntur • SNDT Women's University, Juhu, Mumbai. • Umesh Board & Paper Mills Pvt Ltd., Aurangabad • Roshani Revolutionaries, Mumbai
BET	• M/S Devendra S. Pisal, ICT, Mumbai • Division of Natural Resource Management, Meghalaya • ICAR-Directorate of Medicinal and Aromatic Plants Research, Anand, Gujarat. • VJTI, Matunga, Mumbai.
BET surface area analysis	• PES Modern College of Engg. Pune
Biochar	• Sane Shell Carbon Pvt Ltd, Karnataka
Biodegradation	• Acharya Maratha College, Mumbai
Breaking Strength	• Textile Committee, Mumbai
Cellulose content	• Cotter Plants (i) Pvt Ltd., Andheri, Mumbai. • JDIET, Yavatmal
Cellulose yield	• Kallam Agro Products & Oils Pvt Ltd., Guntur
Contact angle	• Pulp & Fibre Innovation centre, Grasim industries, Mumbai.
Degree of Polymerisation	• L. N. Oils, Dharwad

Test	Party Name
FTIR	• Division of Natural Resource Management, Meghalaya • ICAR-CIFT, Vashi • ICAR-Directorate of Medicinal and Aromatic Plants Research, Anand, Gujarat. • VJTI, Matunga, Mumbai.
Gossypol	• Deep Frozen Semen Station, Harpur • Animal Husbandry and Veterinary Services, Dharwad • Central Semen Station, Anjora • Chhattisgarh State Co-op. Marketing Federation Ltd., Durg, Chhattisgarh • Livestock Breeding & Training Centre UAS Campus, Dharwad • Baramati Taluka Sahakari Doodh Utpadak Sanghma, Baramati • Komarla Feeds & Foods Pvt Ltd., Bengaluru
Paper GSM testing	• Patel Paper Company , Pune • Shivaji Vidyapeeth, Kolhapur
GSM, PH, Opacity	• Rites, Ltd., Mumbai
Instron	• Godavari Bio-refineries Ltd., Mumbai • Sourabh Patil, DKTE College, Ichalkarnji • JDIET , Yavatmal
KES / AATCC	• Central Silk Technological Research Institute, Bangalore
Lignin	• JDIET , Yavatmal • Raymond Luxury Cottons Ltd., Amravati • SNDT Women's University Mumbai
Linter	• Shree Ram Proteins Ltd., Rajkot • AICRP-HSC, ICAR CIWA ,Clothing & Textiles Rajendranagar • Shree Ram Proteins Ltd., Rajkot • Kotak Commodities Service Pvt Ltd,Mumbai. • Tirumala Cotton & Agro Products Pvt Ltd, Guntur
LOI	• Assam Agri.University, Assam • ICAR- NIRJAFT, Kolkata
Lyophilisation	• Khalsa College, Matunga, Mumbai. • Vaze College, Botany Dept., Mulund, Mumbai.
Moisture	• Tirumala Cotton & Agro Products Pvt Ltd, Guntur
Moisture & Protien	• Clean Cotton Impex, Tiruppur
Oil content	• CSIR-National Botanical Research Institute, Lucknow • PCK Cotton Pvt Ltd.,Cotton Green, Mumbai
Particle size	• NIFT, Bengaluru • ICAR-CIFT, Vashi • ICAR-IIPR,Kanpur, UP
PH, Water soluble matter	• Roshani Revolutionaries, Mumbai
Protein & Oil content	• Organica Biotech Pvt Ltd, Mumbai
Seed Test	• Gimatex Industries Ltd, Wardha.

Test	Party Name
SEM	• JDIET, Yavatmal • ICAR-CIFT, Vashi • Bombay College of Pharmacy, Kalina, Mumbai. • C. U .College Of Pharmacy, Santacruz,Mumbai. • C.K.T. College, New Panvel,Navi Mumbai. • C.U. Shah College of Pharmacy, SNDT Women's University, Mumbai • Camphor & Allied Product Ltd., Andheri(E), Mumbai • College of Home Science CAU,Tura, Meghalaya • Devansh Dua, Shobhaben Pratapbhai Patel School of Pharmacy Vileparle, Mumbai • Gangwal Chemicals Pvt. Ltd., Palghar,Thane • Hindustan Unilever Ltd.,Mumbai. • ICAR CIFT, Vashi, Navi Mumbai • ICAR-CIFE, Andheri • Indico Remedies Ltd., Rabale, Navi Mumbai • IQGEN-X Pharma Pvt. Ltd., Navi Mumbai • J D Birla Institute, Kolkata • JES College, Jalna • NMIMS University, Vile Parle, Mumbai • Oriental Aromatics Ltd, Mumbai • Reliance Industries Ltd., Navi Mumbai • Rubicon Research Pvt Ltd. Thane • Rutika Godse Bombay College of Pharmacy, Mumbai • Sarex Chemical, Tarapur • Sneha Govind, Bombay College of Pharmacy, kalina, Mumbai • VES College of Pharmacy, Chembur, Mumbai • Watson Pharma Pvt Ltd., Ambernath , Thane. • Zest N zeal, Mumbai • ICAR-IIPR ,Kanpur , UP • SNDT Women's University, Juhu, Mumbai. • ICAR-Directorate of Medicinal and Aromatic Plants Research,Anand, Gujarat. • VJTI, Matunga,Mumbai.
SEM / Cross section	• Vignan Lara Institute of Technology Vadlamudi
Surface Tension	• Janak Enterprise, Ahmedabad • Johnson & Johnson Pvt. Ltd, Mumbai • SP Ink, Ahmedabad
Tensile strength	• Umesh Board & Paper Mills Pvt. Ltd., Aurangabad
Total bacterial & Fungal count	• Eco Sense Labs (i) Pvt. Ltd.,Mumbai.
Total Nitrogen content	• Ruia College, Matunga,Mumbai.
Trash %	• India United Mill No.5 ,NTC Ltd (WR) Mumbai
UPF	• ICAR- NIRJAFT, Kolkata • Grasim Industries Ltd , Mumbai
UV Test	• Statex Electronics, Coimbatore
Water analysis	• Gini Silk Mills Ltd.,Mumbai
Zeta potential	• Rossari Biotech Ltd., Mumbai

Table 5.3 : Consultancy Projects Carried Out During 2018-19

Consultancy Project No.	Title of the Project	Name of the Organization to which consultancy offered
CP1/ 18-19	Preparation of Value Added Products using Banana Fibres	Mr. Sandeep Nikam, D-5, 2nd Floor, Agarwal Garden, Hadaspar, Pune- 411028
CP2/ 18-19	Studies of Non-Woven Fashion Apparel, PART I	Shri Vaibhav Dange, DKTE, Textile Engg. Instt. Ichalkaranji 416115, Dist- Kolhapur
CP3/ 18-19	Studies of Non-Woven Fashion Apparel, PART II	Shri Vaibhav Dange, DKTE, Textile Engg. Instt. Ichalkaranji 416115, Dist- Kolhapur
CP4/ 18-19	Preparation of Value added products from Banana fibres	Shri Mandar Tambe, Paras Gold Industries, Survey No. 3, Near Jagnath Temple, At- Piplej, Dist. Chote Udeipur- 391165, Gujarat
CP5/ 18-19	Conducting bleaching trials on two enzyme samples	M/s. S. A. Pharmachem Pvt. Ltd., 220, Udyog Bhavan, Sonawala road, Goregaon (East) Mumbai 400 063
CP6/ 18-19	Consultancy and auditing for NABL 17025 accreditation certification for Mumbai & Rajkot	M/s. Cotton Corporation of India, Cotton Exchange Bldg, 2nd Floor, Opp. Cotton Green railway station, Cotton Green, Mumbai 400033
CP7/ 18-19	Consultancy work for development of Activated Carbon from Jackfruit Seed	Ms. Shamila Chougule, PES Modern college, Pune
CP8/ 18-19	Study of Washing Treatments on Bending Properties of Cotton fabrics	M/s. Unilever Industries Pvt. Ltd., Research Centre Stores, B.D. Sawant Marg, Chakala, andheri (East), Mumbai 400 099
CP9/ 18-19	Effect of Drapeability of fabric after repeated washing with detergents	M/s. Unilever Industries Pvt. Ltd., Research Centre Stores, B.D. Sawant Marg, Chakala, andheri (East), Mumbai 400 099
CP10/ 18-19	Development of value added products from Naturally coloured cotton	M/s. Kotak Commodities, 1st Floor, Nirlon House, Near Old Passport office, Dr. A.B. Road, Worli, Mumbai 400 030
CP11/ 18-19	Preparation of Value added products from Banana fibres	Mr. Deepak V. Sorap, A-602, Horizon, Veer Nariman Road, Opp. Adarsh Nagar, Prabhadevi, Mumbai 400 025
CP12/ 18-19	Spinning of Viscose/Kenaf fibre blended Yarn	Ms. Rutvi Sheth, NIFT, Mumbai 410 210
CP13/ 18-19	Spinning of recycled cotton and its blend/Rotor Yarn development	Mr. Prabhakar Bhat, Jalgaon
CP 14/18-19	Comfort properties of Tasar samples	Dr. Kariappa, Central Silk Technological Research Institute, Central Silk board, Bengaluru - 560068 Karnataka
CP 15/18-19	Comfort properties of Silk saree samples	Dr. KMA Kadar, Central Silk Technological Research Institute, Central Silk board, Bengaluru - 560068 Karnataka
CP16/18-19	Evaluation of Sandwich of two different types of fabric for comfort properties	Central Silk Technological Research Institute, Central Silk board, Bengaluru - 560068 Karnataka
CP17/18-19	Optimization of Enzyme for Textile Application	Dr. Varsha Kelkar Mane, Dept. Of Biotechnology, University of Mumbai, Vidyanagri, Santacruz (East), Mumbai 98
CP18/18-19	Evaluation of loom finished soft silk fabric samples by using Kawabata Evaluation System	Dr. Shambhulingappa, Central Silk Technological Research Institute, Central Silk board, Bengaluru - 560068 Karnataka

Consultancy Project No.	Title of the Project	Name of the Organization to which consultancy offered
CP19/18-19	Colour parameter and colour fastness properties evaluation of colour cotton	Dr. Vinita Gotmare, PS, DCI, ICAR-CICR, Nagpur 440010
CP20/18-19	Evaluate potential of ice apple fruit fibre for making kraft paper	Muhsina M Lalani, A-203, Mount Mary Apts, Gora CHS Ltd. Dr. Peter Dias road, Bandra West, Mumbai - 400050
CP21/18-19	Preparation of biodegradable products using agrobiomass (Banana, rice straw, bagasse)	Siddharth Kothari Kothari Distributors, 15-8-131/2, Begum bazar, Hyderabad - 500012
CP22/18-19	Mechanical property testing of paddy straw particle board	Shubham Singh, Enterpreneurship Development Centre, 100, NCI Innovation Park, Dr. Homi Bhabha road, pune - 411008
CP23/18-19	Development of Starch based Film	Mr. Vishal Khandwala-CEO, Plantbase Ventures Pvt. Ltd, 7, Bhupendra Mansion, Phirozshah Mehta Road, Santacruz (W), Mumbai 400054
CP24/18-19	Calibration check of moisture meter	The Cotton Corporation of India Ltd. Kapas Bhavan CBD Belapur, Navi Mumbai
CP25/18-19	Assistance in utilization of indigenous bleached cotton linters for filter making	M/s. Bigtec Pvt. Limited, 2nd floor, Golden Heights, Rajaji Nagar, Bengaluru-560010
CP26/18-19	Study visit of participants from Africa on "Promoting Cotton by-products in Eastern and Southern Africa" under UN Development Account project 1617K	United Nations Conference on Trade and Development, Geneva
CP6/17-19	Design and development of natural product based formulation i.e. nano fibrous mats using electrospinning equipment	Namrata Bhattacharjee, Dr. L. H. Hiranandani College of Pharmacy, Ulhasnagar-
CP27/18-19	Design and Manufacturing of Pre-cleaner, Double Roller Gin, Baling Presses and Feeding Systems	M/s. Bajaj Steel Industries Limited, Imambada Road, Nagpur

6. Awards and Recognition

Jawaharlal Nehru Award

Dr. Prashant Sampatrao Deshmukh, Senior Scientist received prestigious Jawaharlal Nehru Award for P.G. Outstanding Doctoral Thesis Research in Agricultural and Allied Sciences (Agricultural Engineering), 2017 on the 90th ICAR Foundation Day and Award Ceremony held at NASC Complex, Pusa, New Delhi on 16th July 2018.

Lead / Invited Presentations

Topic	Event / Organizer / Venue	Delivered by
"Future Prospects of cottonseed/ cottonseed meal for Food and Feed purposes" (Invited paper)	Cottonseed, Oil & Meal Conclave 2019 organised by SEA & AICOSCA at Hyderabad on 23rd and 24th March 2019	Dr. Sujata Saxena
"Entrepreneurship development through drying and dehydration of fruit and vegetables" (Invited lecture)	ICAR sponsored 21 days summer school on "Emerging Post-Harvest Engineering and Technological Interventions for Enhancing Farmer's Income" during September 04-24, 2018 at ICAR-CIPHET, Ludhiana	Dr. D. M. Kadam
"Opportunities in Natural Fibre Waste Utilization – Cotton" (invited lecture)	National Seminar on "natural Fibre resource Management for Sustainable development" at ICAR-MINFET, Kolkata during February 02-03, 2019.	Dr. A. S. M. Raja Dr. P. G. Patil
"Arecanut Husk Fibre Extraction" (invited lecture)	Indian Fibre Society on September 29, 2018	Dr. P. S. Deshmukh

Research and Development

- A paper "Green initiatives of ICAR-CIRCOT Agribusiness Incubation Centre for Empowering Agripreneurs" authored by Bharimalla, A. K., Sundaramoorthy, C., Patil, P. G., Mukerjee, S., and More, M. and presented by Dr. C. Sundaramoorthy in First International Conference on Entrepreneurship in Agriculture and Renewable Energy Sector (EARES-2019) organized at Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola during 15-16 March 2019 received Best Paper award.
- Paper titled "Beater Mechanism for Arecanut (areca catechu L.) Husk Fibre Production" authored by P.S. Deshmukh, P.G. Patil, P. U. Shahare, J. S. Dhekale, G.B. Bhanage, V. G. Arude, A. K. Bharimalla and S.V. Ghadge, presented in National Seminar on Fibre Resource management for Sustainable Development held at ICAR-National Institute of Natural Fibre Engineering and Technology (NINFET) during February 2-3, 2019 received Best poster award.

- Certificate of Merit was awarded to Dr.P.G.Patil, Director and Dr.C. Sundaramoorthy, Senior Scientist for their valuable contribution to the UN Development Account Project 1617K on "Promoting Cotton by-products in Eastern and Southern Africa" implemented by United Nations Conference on Trade and Development (UNCTAD) in four African Countries: the United Republic of Tanzania, Uganda, Zambia and Zimbabwe.

Professional Society / Institution

- Indian Society of Agricultural Engineering (ISAE), New Delhi has approved new chapter of ISAE, Mumbai at ICAR-CIRCOT.
- Dr. P. S. Deshmukh elected as Fellow of the Institution of Engineers (India), Kolkata, on July 31, 2018

Work in Official Language

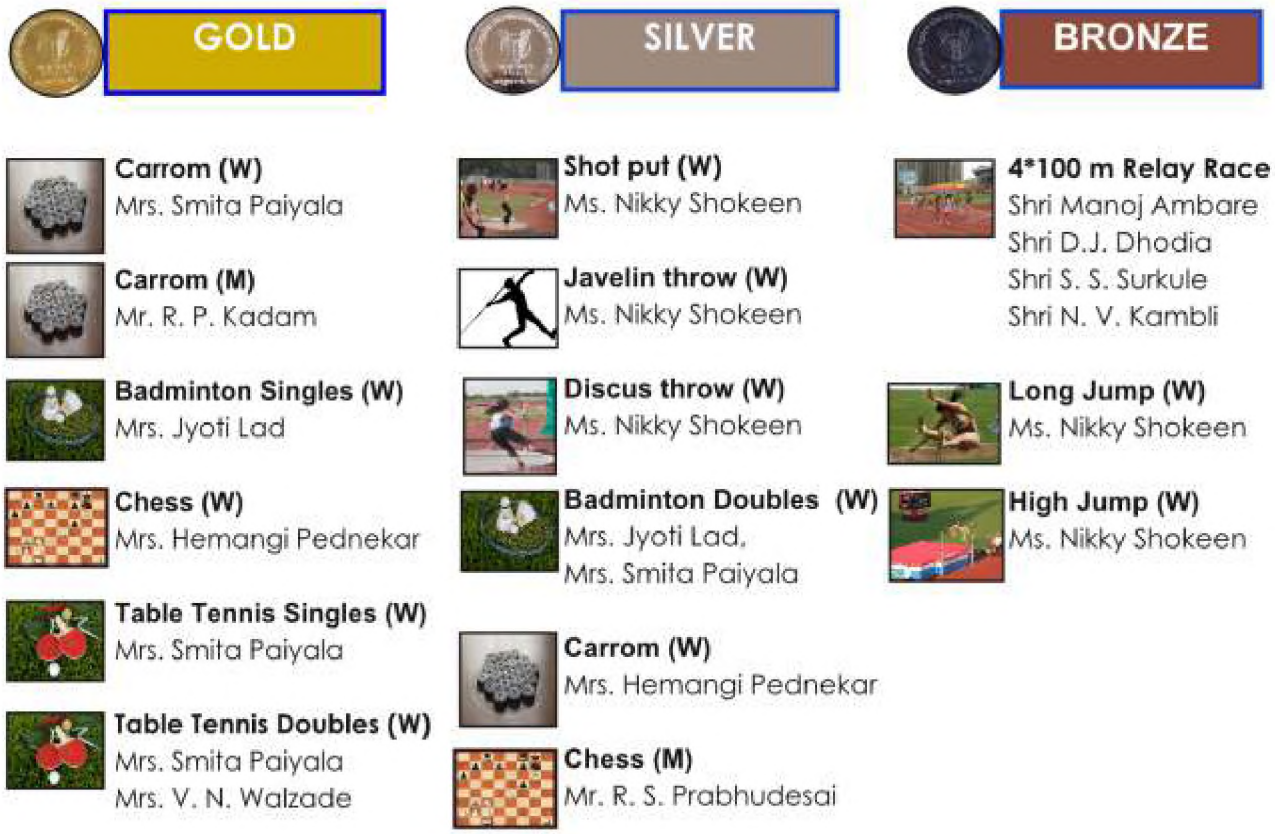
- Dr. Sujata Saxena, Principal Scientist & Head I/c, CBPD was felicitated for her contribution as a judge of Hindi competition on "Story writing in Hindi on shown picture" conducted on May 22, 2018 by Town Official Language Implementation Committee, Mumbai in collaboration with ICAR-CIRCOT, Mumbai.
- Mrs. Nandini Deshmukh, Assistant, ICAR-CIRCOT was awarded second prize in Hindi competition on "Story writing in Hindi on shown picture" conducted by Town Official Language Implementation Committee, Mumbai in collaboration with ICAR-CIRCOT, Mumbaion May 22, 2018.

Sports

CIRCOT sports contingent participated in the ICAR Sports Zonal Tournament (West Zone) – 2018 held at ICAR-CAZRI, Jodhpur during October 05-08, 2018. A team of 20 participants consisting of 14 men and 6 women players participated in various events - Volley Ball, Table Tennis, Badminton, Carrom, Chess, Kabaddi, Basket Ball and Athletics including track & field events. With 7 gold 7 silver and 6 bronze medals, the Institute performance was exemplaryamongst the 18 participating institutes.

A team of Five winners from the zonal tournament participated in the ICAR inter zonal sports tournament held at ICAR-Indian Veterinary Research Institute (ICAR-IVRI), Izatnagar, Bareli from 25-28 February 2018 and won 1 Gold, 3 silver and 1 bronze medals.

ICAR sports meet (West Zone)



Medal Winners of ICAR Sports Tournament (West Zone) – 2018 with Director, ADG and DDG

ICAR sports meet (Interzonal)

GOLD

Chess (M)
Mr. R. S. Prabhudesai

SILVER

Badminton Singles (W)
Mrs. Jyoti Lad,

Chess (W)
Mrs. Hemangi Pednekar

Javelin throw (W)
Ms. Nikky Shokeen

BRONZE

Shot put (W)
Ms. Nikky Shokeen

Medal Winners of ICAR inter zonal Sports Tournament with Director

7. Publications

7.1 Research papers

1. Arputharaj, A., Vigneshwaran, N., & Shukla, Sanjeev R. (2018) - Development of multi-functional cotton surface for sportswear using nano zinc oxide, Journal of Natural Fibers, 6 July 2018, 1-13, DOI:10.1080/ 15440478.2018.1492490, (NAAS Rating: 6.97).
2. Arude, V. G., Deshmukh, S. P., Patil, P. G. and Shukla, S. K. (2018) -Development of Spike Cylinder Type Single Locking Cotton Feeder cum Cleaner for Double Roller Gin. Agricultural Engineering Today, 2018, 42(1): 15-19 (NAAS rating: 5.3)
3. Arude, V. G., Deshmukh, S. P. Shukla, S. K. and Patil. P. G. (2018) -Development of Saw Band Cylinder-type Single Locking Cotton Feeder for Double Roller Gin, Journal of Agricultural Engineering (JAE) (ISSN 0256 6524), Vol. 55, No.2: 21-32. (NAAS Rating: 5.59)
4. Arude, V. G., Deshmukh, S. P., Patil, P. G. and Shukla, S. K. (2018). Application of response surface methodology to optimise single locking cotton feeder for enhancing ginning eficiency of double roller gin. Indian Journal of Fibre and Textile Research (IJFTR) (ISSN: 0971-0426), Vol. 44, March 2019, pp. 16-23. (NAAS rating 6.37).
5. Arude, V. G., Deshmukh, S. P., Patil, P. G. and Shukla, S. K. (August 2018), Optimization of single locking cotton feeder for maximizing ginning output and minimizing specific energy of double roller gin, Textile Research Journal,Doi.org/10.1177/0040517518792713, (NAAS Rating: 7.44)
6. Chavan, S., Vigneshwaran, N. - Effects of Nanoparticles on Plant Growth-Promoting Bacteria in Indian Agricultural Soil, Agronomy, 9 (140), 1-18. (NAAS rating 7.42).
7. Dahake, A.B., Patil, P.G. (2017) - Production of Particle Boards from Cotton Stalks-An Eco-Friendly Way of Biomass Utilization, Agricultural Engineering Today, 41 (3), 32-35. (NAAS rating: 5.3)
8. Guruprasad, R., Krishna Prasad, G., Prabu, G. T. V., Sheela Raj and Patil, P. G. (2018), Low-stress mechanical properties and fabric hand of cotton and polylactic acid fibre blended knitted fabrics, Indian Journal of Fibre and Textile Research, Vol.43(3), P 381-384, , (NAAS Rating: 6.43)
9. Jagajanantha, P., Mageshwaran, V., Varsha Satankar and Patil, P.G. (2018) - Eco-Friendly Process of Absorbent Cotton Preparation for Rural Entrepreneurship, International Journal of Current Microbiology and Applied Sciences, (2018) 7(6): 1097-1103, https://doi.org/10.20546/ijcmas.2018.706.130,(NAAS rating: 5.38)
10. Kambli, N.D., Samanta, K.K., Basak, S. et al. - Characterization of the corn husk fibre and improvement in its thermal stability by banana pseudostem sap, Cellulose, July (2018) PP 1-17,). https://doi.org/10.1007/s10570-018-1931-z, (NAAS Rating: 9.42)
11. Kumar, Manoj, Dahuja, Anil, Sachdev, Archana, Kaur, Charanjit, Varghese, Eldho, Saha, Supradip, Sairam, K. V. S. S (2018). Black Carrot (Daucus carota ssp.) and Black Soybean (Glycine max (L.) Merr.) Anthocyanin Extract: A Remedy to Enhance Stability and Functionality of Fruit Juices by Copigmentation. Waste and Biomass Valorization (https://doi.org/10.1007/s12649-018-0450-3)(NAAS Rating: 7.87)
12. Kumar, Manoj, Dahuja, Anil, Sachdev, Archana, Kaur, Charanjit, Varghese, Eldho, Saha, Supradip, Sairam, K. V. S. S (2018). Valorization of Black carrot marc: Antioxidant properties and enzyme assisted extraction of flavonoids. Research Journal of Biotechnology Vol. 13 (11) (NAAS rating 6.23)
13. Kumar,Manoj, Dahuja, Anil, Sachdev, Archana, Kaur, Charanjit, Varghese, Eldho, Saha, Supradip, Sairam, K. V. S. S. (2019). Valorisation of black carrot pomace: microwave assisted extraction of bioactive phytoceuticals and antioxidant activity using Box–Behnken design. Journal of Food Science and Technology. https://doi.org/10.1007/s13197-018-03566-9(NAAS rating 7.80).
14. Mageshwaran, V., Sharma, V., Chinnkar, M., Parvez, N. and Krishnan, V. (2018) Biodegradation of Gossypol by Mixed Fungal Cultures in Minimal Medium, Applied Biochemistry and Microbiology, 2018, 54 (3), 301–308. (NAAS rating: 6.66)
15. Mahapatra, Archana, Patil, Sharmila, Gotmare, V. D., Patil, P. G. and Arputhraj, A. "Effect of textile softeners on BTCA treated cotton fabric". Indian Journal of Fibre & Textile Research(NAAS Rating: 6.37)

16. Mahapatra A, Tripathy PP (2018) Modeling and simulation of moisture transfer during solar drying of carrot slices. Journal of Food Process Engineering 2018; e12909. https://doi.org/10.1111/jfpe.12909(Impact factor:1.955)(NAAS rating 7.37)

17. Mahapatra A, Tripathy P.P. (2018). Experimental investigation and numerical modeling of heat transfer during solar drying of carrot slices. Heat and Mass Transfer. https://doi.org/10.1007/s00231-018-2492-2(Impact factor 1.494)

18. Mandhyan P. K, Nachane, R. P., Patil P. G., Pawar B. R., Hasan Hamid and Venkatkrishnan. S. (2018) - Influence of segregation of cotton bales based on its fiber attributes in yarn properties, Journal of Natural Fibers, DOI: 10.1080/15440478.2018.1453429 Published online: 26 Mar 2018 (NAAS rating: 6.97)

19. Murugesan, M. and Senthilkumar, T., (2018) Properties of alkali modified jute reinforced virgin and recycled pet composite' Journal of Textile and Clothing Science, Volume: 01 Issue: 04 Oct.-Dec. 2018, ISSN: 2581-561X

20. Murugesan, M,, Senthilkumar, T., Devika, V., Kausicka, B., Seshadri, R. D. and Shreepat, G. M. K. (2018) Influence Of Various Process Parameters On Sewing Needle Temperature, Journal of Textile and Clothing Science, Volume: 01 Issue: 04 , Oct.-Dec. 2018 ISSN:2581-561

21. Patra, Aparajita, Raja, A. S. M. and Shah, Narendra (2019) Current developments in (Malaria) mosquito protective methods, International Journal of Mosquito Research; 6(1): 38-45(NAAS rating4.81)

22. Priyanka, B. and Vigneshwaran, N. (2019) Improving the stability of bacteriocin extracted from Enterococcus faecium by immobilization onto cellulose nanocrystals, Carbohydrate Polymers, 209, 172-180(NAAS rating 11.16)

23. Satyamurthy, P., Vigneshwaran, N. (2018) – Nanocellulose as functional filler in starch/ polyvinyl alcohol film for preparation of urea biosensor, Current Science, 114 (4) 897-901 DOI: 10.18520/cs/v114/i04/897-901 (NAAS rating: 6.88)

24. Vigneshwaran, N., Bharimalla, A. K., Arputharaj, A. (2018) Application of Functional Nanoparticle Finishes on Cotton Textiles, Trends Textile Eng. Fashion Technol. 3 (4), 1-5,

7.2 Book Chapters

1. Dattatreya M. Kadam and Amanpreet Kaur (2018). Novel Approaches of Nanotechnology in Agro and Food Processing (Chapter 16), In Handbook of Nanomaterials for Industrial Applications, Edited by Chaudhery Mustansar Hussain, Elsevier Publication USA, PP. 271-291

2. Mhatre A.M., Raja A.S.M., Saxena S. and Patil P.G. 2018. Environmentally Benign and Sustainable Green Composites: Current Developments and Challenges in the book Green Composites-Sustainable Raw Materials; Textile Science and Clothing Technology, Springer, Singapore PP. 53-90

3. Raja, A.S.M., Arputharaj, A., Saxena, S. and Patil, P.G. (2018) Water requirement and sustainability of textile processing industries in the book Water in Textiles and Fashion; Consumption, Footprint, and Life Cycle Assessment published by Elsiever-Woodhead Publishing. eBook ISBN: 9780081026540 Paperback ISBN: 9780081026335

4. Verma D. K., Dhakane J. P., Mahato D. K., Billora S., Bhattacharjee P. and Srivastav P. P. (2018). Supercritical fluid extraction (SCFE) for Rrice aroma chemicals: recent and advanced extraction method.In Verma D. K. and Srivastav P. P. (Eds.)Science and Technology of Aroma, Flavour, and Fragrance in Rice(pp.179-195). Waretown, USA: Apple Academic Press, Inc.

5. Vigneshwaran, N., Prasad, V., Arputharaj, A., Bharimalla, A. K., Patil, P. G. - Nano-Zinc Oxide: Prospects in the Textile Industry, Nanomaterials in the Wet Processing of Textiles (Edited by S. ul-Islam and B.S. Butola), pp. 113-134, Wiley publishers, 2018

7.3 Paper Presentations

1. Jagajanantha, P., Mandhyan, P. K., Arputharaj, A., Senthilkumar, T., Krishna Prasad, G. and Patil, P. G. "Cotton Based Smart Fabric for Warm Garments" (Oral Presentation) in international conference "Industrial Textiles – InduTech-2018" on 17th and 18thAugust 2018 at PSG College of Technology, Coimbatore, India.

2. Senthilkumar, T., Patil, P. G., Sujata, R. K, Sujata saxena, Arude, V. G, Krishna Prasad, G., and Jagajanantha, P. -"Production of activated carbon from agrowaste (Cotton Stalks)" presented in 1st Global Cleanup Congress 2018 jointly organized by CRC Care Australia and Tamil Nadu Agricultural University, Coimbatore, Tamil Nadu on 20-24th October 2018.

3. Bharimalla, A. K., Sundaramoorthy, C., Patil, P. G., Mukerjee, S., and More, M. "Green initiatives of ICAR-CIRCOT Agribusiness Incubation Centre for Empowering Agripreneurs" presented by Dr. C. Sundaramoorthy in First International Conference on Entrepreneurship in Agriculture and Renewable Energy Sector (EARES-2019) organized at Dr. Punjabrao Deshmukh Krishi Vidyapeeth, Akola during 15-16 March 2019 received Best Paper award.

4. Sujata Saxena, Patil, P.G. and Charlene P D'Souza "Future Prospects of cottonseed/cottonseed meal for Food and Feed purposes" presented in the Cottonseed, Oil & Meal Conclave 2019 organised by SEA & AICOSCA on 23rd and 24th March 2019 at Hyderabad

Research papers were presented(Oral) at 53rd Annual Convention of Indian Society of Agricultural Engineers (ISAE) - 2019 during January 28-30, 2019 at BHU, Varanasi.

5. "Performance evaluation of roller and saw ginning technologies for fibre attributes of long staple cotton cultivars" pesented by Dr. S. K. Shukla.

6. "Effect of single locking of cotton bolls on ginning performance of Double Roller gin" presented by Dr. V. G. Arude.

7. "Rheological characterization of nanocellulose for suitability as a food additive" presented by Dr. Archana Mahapatra.

8. "Rapid extraction of cottonseed oil using ultrasound assisted technique" presented by Er. Jyoti Dhakane- Lad.

9. "Development of starch – polyvinyl alcohol (S/P) biodegradable composite film" presented by Dr. Sharmila Patil.

7.4 Booklets

1. C. Sundaramoorthy, V G Arude, S K Shukla, A K Bharimalla, P S Deshmukh, V Mageshwaran, "ICAR-CIRCOT Value Addittion Technologies on Cotton By-Products for Eastern and Southern Africa", Booklet Published by ICAR-CIRCOT

7.5 Conference Proceedings/ Souvenirs

The following papers were published in the book of papers of the National seminar in Hindi on "Advanced Processing Technology of Natural Fibres and their Value Added Products (प्राकृतिक रेशों की उन्नत प्रसंस्करण प्रौद्योगिकी एवं उनके मूल्य वर्धित उत्पाद)" organized at ICAR-CIRCOT, Mumbai on 02-06-2018

1. इलेक्ट्रो स्पिनिंग द्वारा सेल्युलोज और उसके यौगिक पदार्थों से नैनोतंतु की निर्मिति और उनके अभिनव अनुप्रयोग – कोमल सराफ एवं एन. विघ्नेश्वरन
2. ईको–फ्रेंडली जीवन के लिए प्राकृतिक रेशे – सुधा तिवारी एवं मनोज कुमार
3. कपास के डंठलों से मूल्य संवर्धन– व्ही.जी. आरूडे, एस.के. शुक्ला, पी.जी. पाटील, एवं पी.एस. देशमुख
4. कपास रेशागुणवत्ता मूल्यांकन में उपयोगी लिंट ओपनर मशीन – शशिकांत घाडगे
5. केले के तने से रेशे और अन्य मूल्यवर्धक उत्पाद – पी.के. मध्यान, पी.जी. पाटील, आर.पी. नाचणे, बी.आर. पवार एवं सी.एम. मोरे
6. कॉटन लिंटर्स से माइक्रोक्रिस्ट लाइन सेल्यूलोज और नैनो क्रिस्टलाइन – प्रियांका बागड़े एवं एन. विघ्नेश्वरन
7. कॉयर तंतु प्रबलित कम्पोजिट्स – एक समीक्षा – टी. सेंथिलकुमार, सी. सुंदरमुर्ति, ए. के. भारीमल्ला, पी.जी. पाटील, एन.विघ्नेश्वरन एवं प्राची म्हात्रे
8. कोटिंग के लिए एक नवीन योज्य के रूप में नैनो सेल्युलोज – अर्चना महापात्र, शर्मिला पाटील, ज्योति ढाकणे, एस् बेनर्जी, ए. के. भारिमल्ला एवं पी.जी. पाटील
9. गुलाबी सूँडी के संक्रमण से कपास के गुणवत्ता एवं बाजार मूल्य पर प्रभाव – एक अध्ययन – डी.यु.पाटील, एस.के. शुक्ला, वर्षा सातनकर एवं व्ही. मागेश्वरन
10. गैर–लकड़ी रेशे के स्त्रोतों से ग्रीस प्रूफ कागज का निर्माण – प्रियंका साकरे, पुनीत कुमार, ए. के. भरिमल्ला एवं हिमाजॉन
11. गोसिपोलः कपास का एक महत्वपूर्ण बहुआयामी यौगिक – मनोज कुमार, सुजाता सक्सेना, वी. मागेश्वरन, पी.जी. पाटील, जगजानंथा एवं यामिनी टाक
12. ग्रामीण उद्यमिता विकास के लिए अवशोषक कपास बनाने का एक पर्यावरण अनुकूल तरीका – वर्षा सातनकर, वी. मागेशवरन, पी. जगजानंथा एवं एस. के. शुक्ला
13. घर्षण कताई से तैयार कोरशीथ धागे के संरचना–गुणधर्म संबंध – माणिक भौमिक, अरुप कुमार रक्षित, सजल कुमार चट्टोपाध्याय, औरसंतनु बॅनर्जी
14. जैविक कपास और इसका प्रसंस्करण – सुजाता सक्सेना, ए. एस.एम.राजा, सुजाता आर. कवलेकर एवं आर.आर. छगानी
15. बिनौला तेल निष्कर्षण के लिए आधुनिक तकनीकों का प्रयोग – ज्योती ढाकणे, जतिन्द्र कुमार साहु, अर्चना महापात्र एवं शर्मिला पाटील
16. भारत में कपास के विपणन का परिदृश्य – पंकज मेपानी, पी. के. मध्यान एवं पी.जी. पाटील
17. विभिन्न देशों में गुलाबी सूंडी को संगरोधित करने के लिए अपनाये जाने वाले तरीके एवं उनका विश्लेषण – एस.के. शुक्ला, व्ही.जी. आरूडे, वर्षा सातनकर, व्ही. मागेश्वरन एवं डी.यु. पाटील

18. सिल्वर नैनोकणों का सूक्ष्म जैविक उत्पादन तथा वस्त्रों में उपयोग – नंदिता अष्टपुत्रे, एन. विग्नेश्वरन एवं तथा आर. एच. बालसुब्रमण्या

19. सेल्यूलोसिक कपड़ों की बायो–पॉलिशिंग – मनोज कुमार, संजीव आर. शुक्ला, अरपुथराज, सुजाता सक्सेना एवं पी. जी. पाटील

7.6 Popular Articles

1. Yamini Tak & Manoj Kumar (2018) Proline: Biosynthesis and functions. Biomolecule Reports (ISSN: 2450-8759)

2. Yamini Tak & Manoj Kumar (2018) Antinutritional Factors in Foods. Biomolecule Reports (ISSN: 2450-8759)

3. "Effect of moisture, particle size and lignin content on quality of pellets prepared from cotton stalks in "Rasthtriya Krishi".

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8. Sharmila Patil, D. M. Kadam, Jyoti Dhakane, Archana Mahapatra, A. K. Bharimalla and P. G. Patil "Gossypol free protein from cottonseed". (2018). Processed Food Industry. Vol. 21 (12), ISSN 09721649

9. Jyoti Dhakane- Lad, Abhijit Kar, Manjit Lad, Archana Mahapatra, Sharmila Patil and D. M. Kadam. "न्यूनतम प्रसंस्कृत फल एवं सब्जियों के लिए खाद्य आवरण का उपयोग" प्रसंस्करण प्रगति, half yearly Rajbhasha Magazine, Vol 2. July- December, 2017, ICAR-CIPHET, Ludhiana

10. Jyoti Dhakane, Manjit Lad, Sharmila Patil and Sandeep Dawange (2018) "Applications of biosensors in food analysis", Beverage and Food World, 45 (9): 27-28

11. Archana Mahapatra, Sharmila Patil, Jyoti Dhakane, A. K. Bharimalla and P. G. Patil (2018) "Nanocellulose: A novel additive for coating films" Paint India 18 (3): 53-54.

7.7 Other Publications

1. Annual Report 2017-18 (English)
2. Annual Report 2017-18 (Hindi)
3. E-Newsletters (5 issues March 2018 – July 2018)
4. Amber 2017 (Hindi)
5. Technological Report for the season 2017-18 of AICRP on cotton
6. QRT Report of ICAR-CIRCOT for the period April 2012- Mach 2017
7. ICAR-CIRCOT: An insight (Brochure)
8. Schedule of fees for Tests
9. ICAR-CIRCOT Leaflet No. 181/2018: Rejuvenating Athleisure with Cotton
10. ICAR-CIRCOT Leaflet No. 182/2018: Health & Hygiene Textiles Empowering Women Entrepreneur
11. ICAR-CIRCOT Leaflet No. 183/2018: Naturally Coloured Cotton: An Opportunity for innovative Textile Start-ups
12. ICAR-CIRCOT Leaflet No. 184/2018: Valorizing Banana Pseudostem: From "Waste to Wealth"
13. Leaflet "ICAR-CIRCOT Green Crematorium"
14. ICR-CIRCOT leaflet no: 186/2019 "Workshop on promoting Cotton by-Products in Eastern and Southern Africa under the aegis of United Nations Conference on Trade and Development"
15. Brochure in Hindi "ICAR-CIRCOT - Ruprekha"
16. Training Leaflets

i. Knitting and Knit Garments
ii. Absorbent Cotton Technology
iii. Advances in Microscopy
iv. Applications of Nanotechnology
v. Basic and Advanced Statistical Techniques for Research
vi. Basic and Advanced Techniques for Evaluation of Textile Materials
vii. Characterization of Materials Using X-Ray Diffractometer -XRD

viii. Electrospinning for Nanofibre Production and Its Applications
ix. Fibre Reinforced Composites
x. Instrumental Evaluation of Clothing Comfort
xi. Spectroscopic and Chromatographic Techniques for Material Characterization
xii. Value Addition to Cottonseed
xiii. Quality Evaluation and Spinning Performance of Indian Cottons using Advanced Techniques
xiv. Double Roller Ginning Technology & Basics of Cotton Grading
xv. Quality Evaluation of Cotton

17. Training Manuals

i. Knitting & Knit Garments, Training organized during June 11-13, 2018.
ii. Advances in Applications of Nanotechnology, training organised during 24-28 September, 2018.
iii. Training Manual on "Quality Evaluation of Cotton" for the training programme conducted during 24-26 September, 2018.
iv. Electrospinning for Nanofiber Production and its Applications, Training organized during October 29-31, 2018.
v. Advances in Microscopy, Training organized during January 17-19, 2019.
vi. Fibre Reinforced Composites, Training organized during February 04-06, 2019.

8. QRT, IMC, RAC and IRC Meetings

8.1 Quinquennial Review Team (QRT)

Ninth meeting of the Quinquennial Review Team (QRT) of ICAR-CIRCOT for finalization of report was held during April 11-13, 2018 at V. Sundaram Committee room of ICAR- CIRCOT, Mumbai.

The team interacted with Dr. P. G. Patil, Director, ICAR-CIRCOT and finalized its draft recommendations. Chairman and members of QRT interacted with Institute Management Committee (IMC) members. Joint meeting of QRT and IMC was held on April 12, 2018.The salient recommendations and observations of QRT team was appraised in the meeting.

8.2 Institute Management Committee (IMC)

The Seventy Seventh meeting of the Institute Management Committee (IMC) was held on April 12, 2018 under the chairmanship of Dr. P. G. Patil at ICAR-CIRCOT, Mumbai. During the meeting, confirmation of the minutes of the previous meeting and action taken on the recommendation of the previous meeting were discussed. The demand for additional fund for the year 2018-19, condemnation of old vehicles, approval of IMC for nomination of the Grievance Committee, approval of the IMC for Hospitals and report on the official language implementation were discussed in themeeting.

8.3 XXV Research Advisory Committee (RAC)

The 25th Research Advisory committee meeting was held during 26-27 February, 2019 in the Conference room to review the progress of research. Dr. Nawab Ali, Chairman, RAC presided over the meeting. Members of RAC Dr. G. S. Nadiger, Former Director of Laboratories, Textile Committee, Mumbai, Dr. Narendra G Shah, Professor, Centre for Technology Alternatives for Rural Areas, IIT, Mumbai, Dr. B. K. Behera, Head, Department of Textile Technology, IIT, New Delhi, Dr. Debasis Nag, Former Director, NIRJAFT and Dr. S. N. Jha, ADG (PE), ICAR were present. Members of the Institute Management committee Shri D. B. Sawale Patil, and Smt. K. S. Somvanshi also attended the meeting.

Dr. P. G. Patil, Director presented the overall achievements of the institute in his welcome speech. Action Taken Report on 24th RAC proceedings and the progress of research projects during the current year were presented. The committee deliberated on the work being done and provided inputs and directions for future course of research.

A publication in Hindi "ICAR-CIRCOT - Rooprekha" was released by the RAC chairman and members.

A MoU was signed between ICAR-CIRCOT and M/s. Plantebase Ventures Pvt. Ltd., Mumbai for "Development of starch based film for packaging" during the XXV RAC meeting.

8.4 Institute Research Council (IRC)

Interim meeting of the Institute Research Council was held during July 03-04, 2018 to review the progress of research from April – June 2018.

ICAR-CIRCOT conducted Half Yearly Institute Research Council Meeting during 4-5 December 2018 to review the progress of research work carried out during April – September 2018. Dr. P. G. Patil, Director. Chaired the sessions. Dr. G. S. Nadiger, (Research Advisor (BTRA) and Former Director of Laboratories, Textile Committee) and DR. S Sreenivasan, (Former Director, ICAR-CIRCOT) also participated in the discussions as external experts.

9. Participation in Seminars/ Conferences/ Meetings / Workshops

Scientists and technical staff of the institute attend the seminars / symposia / workshops / conferences at national as well as international level to present their research work and keep them abreast of the latest developments in their specific areas. Their participation in such events and publication of proceedings / abstracts results in wider dissemination of the institute activities. The staff members presents their work and shares experience and knowledge gained during the visit with fellow colleagues through a formal presentation.

Table 9.1 : Participation in Conferences attended during 2018-19

Name of the Conference	Organizer / Venue	Date	Participants
Texellence 2018 Conclave on "Business Excellence in Textile & Apparel Industry Competitive Strategy for Growth in Uncertain Times"	Confederation of Indian Industry, Mumbai	May 25, 2018	Dr. Sujata Saxena
Indian Cotton Scenario in the Current Context 2018-19	Indian Cotton Fedration (ICF)	August 17-18, 2018	Dr. S. Venkatkrishanan
International Conference on "Industrial Textiles- Products, Applications and Prospects"	PSG College of Technology, Coimbatore	August 17-18, 2018	Dr. P. Jagajanantha
1st Global Cleanup Congress India 2018	Cooperative Research Centre for Contamination Assessment & Remediation of the Environment, Australia, Global Care, TNAU, Coimbatore	October 21-25, 2018	Dr. T. Senthilkumar
International Conference on Advances in Textile Materials and Process (ATMP 2018)	TEQUIP and IIT, Kanpur	November 19-20, 2018	Dr. Sujata Saxena
International Textile Conference on "Textile 4.0" Second Edition	The Textile Association (India), Mumbai Unit	February 07, 2019	Dr. Sujata Saxena Dr. D. M. Kadam Dr. A.S.M. Raja Dr. N. Vigneshwaran Dr. A.K. Bharimalla Dr. P. K. Mandhyan Dr. C. Sundaramoorthy Dr. V.G. Arude
First International Conference on Entrepreneurship in Agriculture and Renewable Energy Sector	Dr. PDKV, Akola	March 15-16, 2019	Dr. C. Sundaramoorthy

Table 9.2 Participation in Seminars / Symposia

Title	Organizer / Venue	Date	Participants
National Seminar on "Recent Trends in Fabric Forming"	The Textile Association (India), Mumbai Unit	September 8, 2018	Dr. A.S.M. Raja Dr. P.K. Mandhyan Dr. C. Sundaramoorthy Dr. T. Senthilkumar Dr. A. Arputhraj Dr. P. Jagajanantha

Title	Organizer / Venue	Date	Participants
3rd International Symposium on Aquaculture and Fisheries Education (ISAFE)	ICAR-Central Institute of Fisheries Education, Mumbai	May 16-18, 2018	Dr. Sujata Saxena
53rd Annual Convention of ISAE& International Symposium on Engineering Technologies for Precision & Climate Smart Agriculture	Institute of Agricultural Sciences, Banarus Hindu University, Varanasi	January 28-30, 2019	Dr. V.G. Arude Dr. S.K. Shukla Smt. Jyoti Dhakane Lad Dr. Sharmila Patil Dr. Archana Mahapatra
National Seminar on Natural Fibre Resource Management for Sustainable Development	The Indian Natural Fibre Society in Collaboration with ICAR-NINFET, Kolkata	February 02-03, 2019	Dr. A.S.M. Raja Dr. P.S. Deshmukh

Table 9.3 Workshops / Meetings attended

Title	Organizer / Venue	Date	Participants
Annual Group Meeting of AICRP on Cotton for 2017-18 and "Central Cotton Variety Identification Committee" meeting	CCS Haryana Agricultural University, Hisar	April 09-10, 2018	Dr. P. G. Patil Dr. P K Mandhyan Dr. A. Arputhraj Dr. Hamid Hasan Shri B.R. Pawar
5th Meeting of Indian Grain Storage Working Group with the theme "Bulk Storage, Fumigation and Drying of Grains at Farmers Level"	NASC Complex, New Delhi	May 21, 2018	Dr. Sujata Saxena
The 46th Joint AGRESCO – Agricultural Research and Development Committee Meeting 2018	DBSKKV, Dapoli	May 24-26, 2018	Dr. S.V. Ghadage Shri G.B. Hadge Shri Nishant Kambli
Brainstorming Meeting on "Banana fiber: Research needs for commercial exploitation"	ICAR- NRC Banana, Trichy	May 10, 2018	Dr. P K Mandhyan
National Consultation on "Making Agriculture Sustainable and Profitable" under the Swarajya to Surajya Series convened by Hon'ble Vice President of India.	Indian Institute of Public Administration VAMNICOM, Pune	June 20-21, 2018	Dr. P.G. Patil Dr. S.V. Ghadge Dr. Sundaramoorthy, C
Stakeholders meet on Natural Fibres chaired by Hon'ble Union Minister of Textiles	Udyog Bhavan, New Delhi	June 23, 2018	Dr. P. K. Mandhyan
Sub-committee Meeting to discuss and finalize terms of reference for the survey of delivery of loose cotton at the production stage, consumption of cotton in Non–Mill / Non–SSI units and in Non–Textile usage followed by CAB meeting	Textile Commissioner's office, Mumbai	June 16, 2018	Dr. P. K. Mandhyan
Meeting of TXD 07 committee of BIS	Manak Bhawan, New Delhi	July 30, 2018	Dr. Sujata Saxena
Regional Workshop organised by CCI	CCI, Chandigarh	September 20, 2018	Dr. Hamid Hasan
Road Show on Vibrant Gujarat Start-up and Technology Summit 2018	FICCI VMCC, IIT, Bombay	September 7, 2018	Dr. Archana Mahapatra Er. Jyoti Dhakane
ICAR Regional Committee-V Meeting	ICAR-CSSRI, Karnal	November 02-03, 2018	Dr. Hamid Hasan

Title	Organizer / Venue	Date	Participants
Workshop on "Krishi Portal Data Repository"	ICAR, New Delhi	December 04-05, 2018	Dr. A. Arputharaj
Training Workshop on "Extraction and Isolation of Phytoconstituent"	ICT, Mumbai	February 09-10, 2019	Shri Santanu Basak
Brain Storming Workshop on Cotton Technology	NASC, New Delhi	April 03, 2019	Dr. P. G. Patil
21st meeting of Textiles Division Council, TXDC	Bureau of Indian Standards, Manak Bhavan, New Delhi	April 10, 2019	Dr. P. G. Patil

Director's participation in Major meetings / events

- Meeting on "Developmental issues in the Konkan Region of Maharashtra" under the Chairmanship of Shri. Suresh Prabhu, Hon'ble Union Minister of Commerce & Industry and Civil Aviation held on April 1, 2018 at Ratnagiri Collectorate, Ratnagiri, Maharashtra. The Directors of ICAR Institutes in Maharashtra were present in the meeting.
- Meeting convened by DDG (Engg.), ICAR with officials of Central Silk Board (CSB) and ICAR on April 19, 2018 at Regional Office, Central Silk Board, August Kranthi Bhavan, New Delhi, to discuss on taking over of CSB Institutes by ICAR.
- Meeting convened by ICAR-Directorate of Floricultural Research, Shivajinagar, Pune, M.S. to assess anti-microbial fabrics in preservation and transportation of flowers during June 05 – 6, 2018.
- Interface Meeting between ICAR Institutes and Department of Agriculture (Maharashtra) on institute technologies for doubling farmers income organized at ICAR-National Research Centre for Grapes, Pune on 20th June 2018,.
- Meeting chaired by the Secretary, DARE & Director General, ICAR for discussion on the implementation of the ERP System in ICAR held on 25th June, 2018 at Krishi Bhavan, New Delhi.
- 90th ICAR Foundation Day and Award Ceremony held at NASC Complex, Pusa, New Delhi on 16.7.2018
- Meeting of the Directors of ICAR Institutes to decide the cadre strength of Institutes on July 18, 2018.
- Executive Council meeting of Dr.PDKV, Akola as D.G.'s Nominee and took part in the deliberations on October 11, 2018.
- World Food Day - Agri-Startup and Entrepreneurship Conclave - UPAYA Programme held at A.P. Shinde Symposium Hall, NASC, New Delhi during October16-17, 2018 to showcase CIRCOT technologies licensed to various entrepreneurs.
- Meeting with M/s. BNPM, Mysuru to discuss on utilization of natural fibre based pulp paper in security paper preparation during 16th -18th, December 2018.
- Convocation Ceremony of Vithalrao Patil Mahavidyalaya (Shivaji University, Kolhapur), as Chief Guest on 16th March 2019 at Kale, Kolhapur (M.S.) and delivered Graduation Day (Convocation) Speech.
- Meeting with the officials of Bank Note Paper Mill (BNPM) regarding ICAR-CIRCOT paper pulp technology and security feature technology for currency paper production at Mysore on April 05, 2019 along with DDG (Engg.), ICAR & Dr. N. Vigneshwaran, Principal Scientist, CIRCOT.

Visits of Dr. P. G. Patil, Director

- Visited Satara Cooperative Spinning Mill, Satara and DKTE Society's Textile & Engineering Institute, Ichalkaranji, Maharashtra during May 9-11, 2018.
- Visited "Mushroom Cultivation Unit" at College of Agriculture, Pune, the constituent College of the Mahatma Phule Krishi Vidyapeeth, Rahuri.
- Visited M/s. Nagarika Pulp Industry, Kolhapur on 16th June, 2018, to see and discuss the process of pulp making facility for Banana Fibres with their officials.
- Visited Banana Fibre Pulp making manufacturing Units located at Muzaffarnagar, UP along with Dr. P.K. Mandhyan, Sr. Scientist and Dr. A. Arputhraj, Scientist in connection with the project of Security Grade Pulp developed by ICAR-CIRCOT, Mumbai on July 26, 2018.
- Visited Spinning and Ginning Mills in Kolhapur during October 04-08, 2018 to process colour cotton for making products for UPAYA Programme to be

inaugurated by Hon'ble Prime Minister, Govt. of India at New Delhi on 16th & 17th October, 2018.

- Visited the Ginning Training Centre of CIRCOT, Nagpur on November 16, 2018, for monitoring the research, training and other activities of GTC.
- Visited Coir processing Unit of DBSKKV, Dapoli on November 30, 2018 and discussed about making value added products.
- Visited Ramie Crop Experiments Centres in Assam Agricultural University (Station: Biswanath Chariali) under CRP on Natural Fibres on December 25, 2018.
- Visited ICAR Research Complex for NEH Region, Umiam, Shillongon December 28, 2018 to review the banana fibre extractors supplied by CIRCOT.
- Visited Quality Evaluation Unit, Coimbatore on February 28, 2019, for discussion with officials about progress of research activities and also inspected the work of Technical Staff working in the station and guided them for future work

10. Events Organized

INDUSTRY-INTERFACE MEET

Stakeholders Meet on "Development of Indian Standards for Cotton Classing" was organized by Ginning Training Centre of CIRCOT on August 01, 2018.

Meeting was attended by Dr. V. N. Waghmare, Director, ICAR-CICR, Nagpur and Dr. M. K. Sharma, CEO and Whole time Director, M/s. Bajaj Steel Industries Ltd., Nagpur and other representatives from Trade and Industry. A presentation on "Cotton classing standards practised in US and Australia and Proposed Indian Standards for Cotton Classing" by Dr. S. K. Shukla, Officer In-charge, GTC, Nagpur. The objective of this meet is to have discussions among scientists, ginners, spinners and other stakeholders to fine tune and finalise the Indian standards for classing of cotton which are not presently in place.

ABI advisory meeting

The second advisory meeting of Agri-Business Incubation Centre of ICAR-CIRCOT was held on April 12, 2018 at Conference Hall of ICARCIRCOT, Mumbai. The meeting was chaired by Dr. P. G. Patil, Director, ICAR-CIRCOT, Mumbai. The members of the advisory committee Dr. S. N. Jha, ADG (PE), ICAR, New Delhi; Dr. R. P. Kachru, Former ADG (PE), ICAR, New Delhi; Prof. Narendra Shah, CTARA, Mumbai; Dr. M. K. Sharma, Whole time Director & CEO, M/s. Bajaj Steel Industries Limited, Nagpur; ABI Co-PIs, scientists and incubatees Mrs. Yashni Agrawal & Mr. Anant Mundra (M/s. Greyy, Navi Mumbai); Mr. M. Sankararaj (Technical Head, M/s. TKML, Coimbatore); Mr. Irfan Ali (M/s. Sana Agro Industries Ltd., Raichur) and Mr. Sandeep Nikam, Pune were present during the meeting.

Interactive workshop with textile industries, Tiruppur

ICAR-CIRCOT in collaboration with Atal Incubation centre of NIFT TEA (AIC-NIFT TEA), Tiruppur, Tiruppur Exporters Association (TEA) and Dyers Association of Tiruppur (DAT), organized an interactive workshop on salt free dyeing technology on 1st March 2019 at Tiruppur. Tiruppur, a small town near Coimbatore, is a hub of knit processing industries with the annual turnover of Rs.40,000 crores comprising Rs.25,000 crore export and Rs.15,000 crore local market. Shri Raja Shanmugam, President, TEA, Shri. Bhopathi, CEO, DAT and Shri. S. Periasamy, CEO, AIC-

NIFT-TEA graced the function and stressed the importance of adopting salt free dyeing technology for cotton due to the implementation of Zero Liquid Discharge (ZLD) based effluent treatment at Tiruppur. Dr. P.G. Patil, Director, ICAR- CIRCOT, chief guest of the event briefed the audience about various R & D works being carried out by the institute for the benefit of textile processing industries including salt free dyeing technology. Dr. A.S.M. Raja, Principal scientist of ICAR-CIRCOT made an elaborate presentation about the eco-friendly salt free dyeing technology developed by the institute and addressed the various technical queries raised by the participants. Dr. A.Arputharaj and Dr G. Krishna Prasad, Scientists presented on technologies developed by the institute such as antimicrobial finishing, mosquito repellent finishing, flame retardant finishing, naturally coloured cotton processing, calibration cotton etc. The interactive workshop had drawn good response with participation from nearly 70 industries from Tiruppur, Erode, Karur and Bengaluru.

Interactive workshop with textile industries, Boiser

ICAR-CIRCOT in collaboration with Tarapur Industrial Manufacturing Association (TIMA) organised a one day workshop and demonstrated sustainable technologies like salt free dyeing technology, technologies to achieve Zero liquid discharge (ZLD) and antimicrobial finishing to the textile weaving and processing industries of MIDC Tarapur, Tarapur Industrial Area, Dist. Palghar, Maharashtra on 27th December 2018

SEMINARS / WORKSHOPS / LECTURE SERIES

International Workshop

An International Workshop was organised for African delegates under UN Development Account Project 1617K on "Promotion of Cotton by-products in Eastern and Southern Africa" implemented by United Nations Conference on Trade and Development (UNCTAD), Geneva during January 14-18, 2019.

There were 16 African delegates representing Zambia, Zimbabwe and Uganda along with Mr. Thierry Kalonji, COMESA, Mr. Mathias Knappe, ITC, Mr. Kris Terauds & Stefan Csordas, UNCTAD.

The visit aimed at exposing the participants with India's experience in the cotton by-product value chain. The delegation was interested in the institute technologies such as briquetting & pelleting, degossypolization of cottonseed meal, mushroom cultivation and absorbent cotton production. Various industrial visits were organized in the five days training program. The delegates were taken to industries involved in the value chain such as Producers, processors and consumers and also machinery manufacturers.

A business meet was organized on 17 January, 2019 for interaction between the African delegates and value chain operators involvedwith cotton by-products in India. The machinery manufacturers, researchers, policy makers, biomass briquettes and pellets producers, ginners, absorbent cotton producers and mushroom growers were invited under common platform in the business meet. Arrangements were made to have face to face interaction between the delegates and the industrialists. There were around 47 representatives from Industry.

Workshop on Indigo and natural dyeing

A one day workshop on Indigo and natural dyeing was organised by Dr. Sujata Saxena, Principal Scientist & Head I/c CBPD at National Institute of Fashion Technology, Kharghar, Navi Mumbai for the benefit of

traditional weavers, students and faculty on 27th September 2018

National Seminar

One day National seminar in Hindi on "Advanced Processing Technology of Natural Fibres and their Value Added Products" was organized by ICAR-Central Institute for Research on Cotton Technology, Mumbai in collaboration with Indian Fibre Society (IFS) on 2nd June, 2018 at Jubilee Hall of the institute at Mumbai. Dr. P. Alli Rani, Chairman cum Managing Director of the Cotton Corporation of India, Navi Mumbai was the chief guest and Shri Vinay Kotak, Associate Vice President of Cotton Association of India was the guest of Honour.

Dr. P.G. Patil, Director CIRCOT in his welcome address spoke on the importance of natural fibres today, the work carried out by the institute in the field of cotton and other natural fibres and the objective of organizing this seminar in Hindi. Dr. R. P. Nachane, Chairman, IFS told about the objectives and activities of Indian Fibre Society. Shri Vinay Kotak, in his speech talked about the need to establish Indian cotton as a brand. Shri R.K.Gupta, General Manager (Finance/Rajbhasha), CCI gave a presentation on the history and role of CCI. Dr. P. Alli Rani in her inaugural address expressed happiness over coming together of various organisations working on cotton and other natural fibres through this seminar and stressed upon the need to find out the ways to exploit the large fibre production base of the country for the betterment of its farmers.

Book of papers of the seminar in the form of the special Issue of the institute Hindi home magazine Ambar was released by the guests. Inaugural session ended with a vote of thanks by Dr. P.K. Mandhyan, organizing Secretary of the seminar.

It was followed by two technical sessions. The first technical session on Quality, Marketing and textile manufacture was chaired by Shri M. Ahmed, former Head of the Mechanical Processing Division of ICAR-CIRCOT and five papers were presented in this session. The second technical session on Processing and Value Addition was chaired by Dr. M.S. Kairon, former Director, ICAR-CICR, Nagpur and Dr. R.P. Nachane, former Head, Quality Evaluation and Improvement Division of ICAR-CIRCOT was the co- chairman. Six technical papers were presented in this session. The seminar ended with the vote of thanks by Dr. Sujata Saxena, Principal Scientist and joint Secretary, IFS.

Flexi Check Dam meet

An interaction meeting was held between consortium partners of ICAR Flexi Check Dam Technology and M/s. Forech Mining & Construction International LLP, New Delhi to whom the technology has been commercialized at ICAR-CIRCOT, Mumbai on August 20, 2018 to finalize the cost of rubber composite sheet to be used in the ICAR Flexi Check Dam.

Agri-Business Incubation Utsav

ICAR-CIRCOT-Agri-Business Incubation Utsav was held at ICAR-CIRCOT, Mumbai on 3rd December 2018. The incubatees and successful entrepreneurs associated with ICAR-CIRCOT-ABI Centre were facilitated on the occassion.

TECHNOLOGY AND MACHINERY DEMONSTRATION MELA – 2019

Ginning Training Centre of ICAR-CIRCOT, Nagpur organized a Technology and Machinery Demonstration Mela- 2019 on February 15, 2019. In this programme, more than one hundred cotton growing farmers from Wardha & Nagpur along with stakeholders from industries and research organizations participated.

An exhibition was also arranged to display the technology and machinery on cotton processing and by-products utilization for the farmers. Live demonstration on chipping of cotton stalks, preparation of bio-enriched compost, oyster mushroom cultivation and preparation of pellets were conducted for the benefit of farmers.

LECTURES

ICAR-CIRCOT & Indian Society for Cotton Improvement (ISCI), Mumbai jointly organized Dr. V. Sundaram Memorial Lecture on 1st May 2018 & celebrated his 90th birth anniversary. Dr. P. G. Patil, Director, ICAR-CIRCOT welcomed the guests and felicitated the family members of Dr. V. Sundaram and retired employees. Dr. Venkatesh Sundaram, Son of Dr. V. Sundaram, Former Director, ICAR-CIRCOT, The memories of Dr. V. Sundaram was shared by his family members, former directors and associates. The Dr. V. Sundaram memorial lecture was delivered by Dr. N. Vigneshwaran, Principal Scientist on "Nanotechnology & its Application in Cotton"

ICAR-CIRCOT has organized a lecture on "Solar refrigerated-evaporatively cooled (SREC) mesh fabric structures for on farm storage of perishables" delivered by Dr. Sangeeta Chopra, Principal Scientist, Division of Agricultural Engineering, ICAR-Indian Agricultural Research Institute, New Delhi on August 3, 2018 in Conference Room of the Institute. The lecture was attended by all scientific and technical staff of the Institute.

Dr. P. S. Deshmukh delivered a lecture on "Arecanut Husk Fibre Extraction" on the occasion of Annual General Meeting of Indian Fibre Society on 29-09-2018.

On 19th December, ICAR-CIRCOT in collaboration with Indian Society for Cotton Improvement organized Padmabhushan Dr. B. R. Barwale Memorial Lecture on "Biotechnology-based Solutions to Improve the Cotton Plant" with special emphasis on "Gossypol Free Transgenic Cotton Development". The lecture was delivered by Dr. Keerti Singh Rathore, Professor and Director, Texas A & M University College Station, Texas.

The event was presided over by Dr. (Ms.) Usha Barwale, Director of Research, Mahyco Life Sciences Centre, Jalna. Dr. C. D. Mayee, President, ISCI and Mr. Suresh Kotak, Chairman, ISCI graced the occassion. About 100 delegates including Technical and scientific staff of the institute attended the lecture.

ICAR-Central Institute for Research on Cotton Technology in collaboration with Indian Society for Cotton Improvement (ISCI) organised Dr. V. Sundaram Memorial Lecture on 19th February, 2019 at Jubilee Hall, ICAR-CIRCOT, Mumbai.

The lecture was delivered by Prof. Dr. Paul Teng, Chairman, ISAAA and MD, National Institute of Education, Nanyang Technological University, Singapore on the topic "Disruptive Technologies in Agriculture for the Next Green Revolution – with Special Focus on Cotton". Dr. K. P. Viswanatha, Vice-chancellor, MPKV, Rahuri was the Guest of Honour and Mr. D. Narain, Vice-Chairman and Managing Director, Bayer Crop Sciences, Mumbai presided over the function. About 110 delegates attended the lecture.

Dr. Narenedra G. Shah, Professor, Centre for T'echnology Alternatives for Rural Areas (CTARA), Indian Institute of Technology, Mumbai and member of RAC delivered a lecture on "Choosing a Research Problem and Delivering a Prototype Solution: Some Case Studies in Agro-process Engineering" on 27-02-2019 during the occasion of XXV RAC meeting.

REVIEW MEETINGS

Internal Review

Consortia Research Project (CRP) on Natural Fibres is being implemented by the institute as Lead centre. One day internal review workshop was organized at ICAR-CIRCOT on 13th December, 2018. Principal Investigators of all projects from lead as well as cooperating centres viz. ICAR-NIRJAFT, Kolkata, Assam Agricultural University, Jorhat, Tamil Nadu Agricultural University, Coimbatore participated in the workshop. All scientists of the institute were also present. Dr. P.G. Patil, Director, ICAR-CIRCOT and Nodal officer for CRP-Natural Fibre project reviewed the progress of the projects. During the meeting, he emphasized that CRP projects should be carried out in fast track mode to achieve the tangible results within the given time. Totally progress of 13 projects was presented during the workshop. During concluding session, Dr. P.G. Patil asked the PIs of the projects to aim for the development of innovative products/processes which can lead to entrepreneurial development, solving the problem of the masses and beneficial to the society. The workshop concluded with the vote of thanks to the chair and all participants by Dr. A.S.M. Raja, Principal Scientist & Lead centre project coordinator of CRP- NF.

Annual Review

The Agricultural Engineering SMD of ICAR has organized one day Annual Review Workshop for CRP on Natural Fibres at College of Agricultural Engineering, Tamilnadu Agricultural University (TNAU), Coimbatore on 15-03-2019 under the chairmanship of Hon'ble DDG (Agri. Engineering) DR. K. Alagusundaram. Dr. S.N. Jha, ADG (PE) and Dr. B.S. Bisht, Former Vice Chancellor of GB Pant University of Agricultural and Technology were also present in the Review workshop.

Dr. A.S.M. Raja Principal Scientist and Lead Centre Project Co-coordinator (LC-PC) presented the overall progress of the project and also acted as Rapporteur for

the session along with Dr. S.K. Shukla, Principal Scientist, ICAR- CIRCOT. Principle Investigators of all the projects from lead as well as cooperating centres presented the progress of their respective projects. Dr. S.N. Jha expressed his satisfaction about the overall progress of the project. However, he informed that the progress can be further improved to achieve the desired results in timely manner. Dr. B.S.Bisht in his concluding remarks asked all the PIs to incorporate principles like Artificial intelligence, Internet of things, robotics, nano and bio technologies while executing the research projects to meet the requirements of stake holders.

ACCREDITATION

ISO 9001:2015 Surveillance Audit byBIS

Bureau of Indian Standards (BIS) has conducted a surveillance audit programme for the ISO 9001:2015 Quality Management System (QMS) of the Institute during 16th and 17th November 2018. MR. A.K. Bera, Scientist F and Head Textile division of BIS conducted the Audit. QEID, MPD, TTD, PME cell and Top Management & MR functions were audited for the effective implementation of ISO 9001:2015 accreditation. Based on the verification of records and physical evidences collected, interaction with the concerned officers and verification of system of internal audit and management review, the auditor concluded that institute is implementing documented quality management systems as per IS/ISO 9001:2015 effectively and also demonstrated the continual improvement in systems and processes. Dr. A.S.M. Raja, Management Representative of the ISO 9001:2015 QMS coordinated the audit programme.

OTHER EVENTS

The 95th Foundation Day of ICAR-CIRCOT / Krishi Shiksha Divas

ICAR-CIRCOT celebrated its 95th Foundation Day and Krishi Shiksha Diwas (Agricultural Education Day) on

3rd December, 2018. Dr S. S. Magar, Former Vice Chancellor, Dr BSKKV, Dapoli was the chief guest for the occasion. The program was also graced by the presence of Shri Ajit Chavan, Secretary, Textile Committee, Mumbai and Shri Suresh Kotak, Chairman, ISCI, Mumbai as Guests of Honour.

Best Employees awards for the year 2018 were also distributed during the event.

There was a rich cultural program presented by staff of the institute and members of their family.

Mahila Kisan Diwas

Mahila Kisan Diwas was celebrated in the Institute on 15th October, 2018. On this occasion an essay competition was organised in Hindi & English on the topic "Contribution of Women in Agriculture." Several employees participated in the competition. A lecture was delivered by Dr. (Smt.) Swarnajith Kaur Cheema,

Head of Department, Botany, Khalsa College, Mumbai in the Jubilee Hall of the Institute. She spoke about female farm workers, participation of women in agriculture and their significant role since time immemorial and also how their contribution can be increased. Later prizes were distributed to the winners of the essay competition.

World Soil Health Day

A sensitization meeting on the topic "Be the solution to soil pollution" as part of World Soil Health Day celebration was organized on 5th December, 2018 at 4.00 pm in which all the staff members participated. Director, Scientists and Sr. AO expressed their views on the importance of maintaining the soil healthy and pollution free. The speakers expressed that, necessary steps are to be taken to reduce soil pollution and to the possible extant create the awareness to the public.

Communal Harmony week

Communal Harmony week was observed from 19th to 25th November, 2018. National Integrity pledge was taken on 19th November, 2018. Flag Day was observed on 22nd November, 2018 and flag stickers were distributed and donations collected from the staff for the financial assistance to the children who become destitutes /orphans in communal, caste, ethnic or terrorist violences. Smt. Usha Suryavanshi, Retd. Police Inspector delivered a lecture on "Communal Harmony and National Integration" on 24th November, 2018.

Vigilance Awareness week

ICAR-CIRCOT has observed "Vigilance Awareness Week" during the period from 29th October, 2018 to 3rd November, 2018. This year the main focus of observing Vigilance Awareness Week was "Eradicate corruption- Build a New India". On 29th October, 2018 "Integrity Pledge" was administered to all the staff members of ICAR-CIRCOT by Dr. Sujata Saxena, Director In-charge, ICAR-CIRCOT, Mumbai.

On the last day i.e. 3rd November, 2018 ICAR-CIRCOT, Mumbai organized a talk on "Eradicate corruption- Build a New India" by Mr. Mukesh Prachand, Inspector, C.B.I., A.C.B., Mumbai to all staff members.

National Integrity pledge

National Integrity pledge was taken by the staff on 31 October 2018 at 10.30 am on the occasion of the birth anniversary of Sardar Vallabbhai Patel and the death anniversary of former Prime Minister Smt. Indira Gandhi.

National productivity week

National productivity week observed during 12-18 February, 2019 with the theme "Circular Economy for Productivity and Sustainability." On the occasion of National Productivity day a discussion on the topic "How one can contribute in improvement of the productivity of the Department and the Institute" was held at 4.00 pm on 18th February, 2019 in the Jubilee Hall in which staff members expressed their views.

Foundation Stone Laying Ceremony for the Type IV Quarters and inauguration of the Product Sales Counter facility

Dr. K. Alagusundaram, Deputy Director General (Agricultural Engineering) visited ICAR-CIRCOT, Mumbai on 24th October, 2018. DDG presided over the Foundation Stone Laying Ceremony for the Type IV Quarters of the institute at Mahim.

On this occasion, he also inaugurated the new Product Sales Counter facility created for sale of institute products to the general public and accentuate brand value of the institute. After the Inauguration, Dr. K. Alagusundaram, DDG addressed the institute staff in the Jubilee Hall. In his address, he shared his experience and lauded the collective efforts made by the Director and institute staff to reshape the institute. Dr. S. N. Jha, ADG (PE) in his address reiterated that ICAR-CIRCOT has shown a significant progress in the recent past. Dr. P. G. Patil on the occasion presented the achievements of the institute in the areas of Research, Skill development, revenue generation and the infrastructural changes in the Institute. Four publications related to achievements of the institute, products developed by the institute as athleisure t-shirts, health & hygiene textiles and different value added products from banana biomass were released on this occasion.

International Yoga day

On the occasion of International Yoga Day on 21st June, 2018, Yoga workshop was organized in the institute. All the staff members participated in the event. Yogasanas were demonstrated by teachers and Instructors from Shri Ambika Yoga Kutir (Thane), Ghatkopar branch.

Shri Sudhir Sawant, Sanchalak of Shri Ambika Yoga Kutir, Ghatkopar branch briefed about the importance of Yoga and thereafter Yogasanas were performed by all the staff members under the guidance of instructors. Along with

Sanchalak, ten demonstrators/ instructors were present to guide the staff members while performing Yogasanas. Workshop concluded with vote of thanks by Dr. (Smt.) Sujata Saxena, Director In-charge.

Ambedkar Jayanti Celebration

Bharat Ratna Dr. B. R. Ambedakar's 127th birth anniversary was celebrated on April 16, 2018 in Jubilee Hall of ICAR-CIROT, Mumbai by initiative of Institute Joint Staff Committee. On the occasion the staff members expressed their views on the contribution of Dr. B. R. Ambedkar and Dr. P. G. Patil, Director in his speech elucidated on accomplishments of Dr. Ambedkar in various fields and his achievements for the society in general.

Celebration of 150th birth anniversary of Mahatma Gandhi

On the occasion of celebration of 150th birth anniversary of Mahatma Gandhi, ICAR-CIRCOT organised a "Prabhatpheri" at 9:00 am on 2nd October, 2018 in which all the staff members participated. At ICAR-CIRCOT Regional Unit, Sirsa saplings of Neem (Azadirachta indica) were planted in the campus on the day

A talk by Eminent Gandhian Dr. Chitra Redkar was arranged on 30th January 2019 as part of the series of events to commemorate 150th birth anniversary of Mahatma Gandhi.

International Women's day

The Institute celebrated International Women's day on March 08, 2019. On this occasion, Webcast of Hon'ble Prime Minister Shri Narendra Modiji's addressing Women's Self-help Groups was viewed by the staff members.

Dr. P. G. Patil, Director, introduced the gathering about history of Women's Day celebration. He emphasized on the role of women in history of India and the World. Staff members also expressed their views on the theme of the year "Think Equal, Build Smart, Innovate for Change" and the role of women in the overall development of the society. This was followed by poetry recital and speeches by the Women staff members of the institute.

Chatrapati Shivaji Maharaj Jayanti

On February 19, 2019 Chatrapati Shivaji Maharaj Jayanti was celebrated in the institute by the Institute Joint Council. All the staff members participated with enthusiasm in celebration of Shivaji Jayanti. On this occasion Dr C. D. Mayee, Former Chairman ASRB and Dr P.G. Patil, Director ICAR-CIRCOT were present in the function. Staff members spoke about the great achievements and visionary leadership of Chatrapati Shivaji Maharaj

11. Hindi Implementation

11.1 Hindi Workshops

A Hindi workshop on "भारत सरकार की राजभाषा नीति और उसके अनुपालन में समस्याएं और समाधान" was organized by Dr. Susheel Kumar Sharma Deputy General Manager (Rajbhasha), Western Railway, Mumbai for scientific, technical and administrative staff of the institute on June 23, 2018.

A one-day Hindi workshop on "हिन्द व्याकरण – समस्या और समाधान" (Correct Usage of Hindi Grammar - Difficulties and Solutions) was organized on September 01, 2018. Dr. Anant Shrimali, Assistant Director, Hindi Shikshan Yojana delivered the keynote address. Dr. Ananth Shrimali in his address said that Hindi, even though, is a well-accepted, easily comprehensible and simple language across the country, people tend to use it without understanding proper grammar. Dr. Shrimali, by quoting many examples, explained the perils of improper usage of words. He gave a very interesting speech on usage of punctuation, vowels, grammar in Hindi writing. Total 95 staff members of the institute participated in this workshop.

One day Hindi workshop on राजभाषा कार्यान्वयन एवं कार्यालयीन हिंदी (Official Language Implementation and Official Hindi) by Shri Mahendra Jain was organised for the staff on December 22, 2018.

A Hindi workshop on "हिंदी में वैज्ञानिक तथा तकनिकी लेखन" by Shri Virendra Kulkarni, Director (Rajbhasha), Nuclear Power Corporation, Mumbai was organized for scientific, technical and administrative staff of the institute on 16-03-2019.

11.2 National seminar in Hindi

One day National seminar in Hindi on "Advanced Processing Technology of Natural Fibres and their Value Added Products (प्राकृतिक रेशों की उन्नत प्रसंस्करण प्रौद्योगिकी एवं उनके मूल्य वर्धित उत्पाद) was organized at ICAR-CIRCOT, Mumbai in collaboration with Indian Fibre Society (IFS) on June 02, 2018. Dr. P. Alli Rani, Chairman and Managing Director of Cotton Corporation of India Ltd., was the Chief Guest. Shri Vinay Kotak, vice chairman of Cotton Association of India was the special guest. Dr. P. G. Patil, Director in his welcome speech stressed on the importance of natural fibres and the work being done in ICAR-CIRCOT on cotton and other natural fibres. There were two sessions namely "गुणवता, विपणन एवं वस्त्र निर्माण" and "प्रसंसकरण एवं मूल्य संवर्धन". In the first technical session, five papers were presented and six papers were presented in the second session.

11.3 Hindi Awareness Month / Week / Pakhwada / Hindi Day

हिन्दी चेतना मास / पखवाडा / सप्ताह / observed by ICAR-CIRCOT and Hindi day was celebrated on September 14, 2018.

Hindi Chetana Maas / Hindi day / Hindi Pakhavada organized in the institute to popularize usage of official language. Dr. Sujata Saxena, Director-in-Charge, in her welcome address, asked staff members to use Hindi in

daily office work with a goal to cover most of the official work in Hindi. She urged all the staff members to do more written work in Hindi during the Hindi Chetana Maas from 1stSeptember to 30th September and requested everyone to write regular comments in the files in Hindi. Staff were asked to sign only in Hindi in all official work during this period.

On this occasion, a one-day Hindi workshop on "Hindi Vyakaran Samasya aur Samadhan" was organized on 01-09-2018.

Hindi Pakhwada celebration started on 14th September, 2018. On the occasion of Hindi day, Smt. Amala Ruia, chairperson of Aakar charitable trust was the chief guest. The details of programmes being organised by the institute during the Pakhwada was presented by Dr. D. M. Kadam. All the staff member took the Hindi day pledge. An elocution competition was arranged for the staff in which many staff members participated.

The closing ceremony took place on 28thSeptember, 2018. Renowned poet and songwriter Shri Pandit Kiran Pratap Mishra was special guest at the closing ceremony and Dr. CD Mayee, Former Chairman, ASRB New Delhi was present as the chief guest. Dr. P.G. Patil In his welcome speech, appreciated the achievements of institute in Hindi Implementation during the year.
Dr. D.M. Kadam, Principal Scientist and chairman, Hindi Divas Pakhwada Organizing Committee presented the information about the Hindi fortnight and various competitions organized during the period. This was followed by poetry recital in which 10 participants took part. On this occasion, the Chief Guest Dr. C.D. Mayee In his address, appreciated the work done by the institute in Hindi. Special guest, Shri Pandit Kiran Pratap Mishra recited autobiographical poems during his address. The winners in the competitions, were given memento and certificates. The program concluded with the vote of thanks.

Following competitions were organized during the Hindi Pakhavada from 14.9.2018 to 28.9.2018

14-09-2018 Elocution
15-09-2018 Unicode Typing
17-09-2018 Essay writing
18-09-2018 Crosswords
19-09-2018 Technical Questionnaires
21-09-2018 General Knowledge Quiz
22-09-2018 Hindi Poster Exhibition
24-09-2018 Antakshari
25-09-2018 Handwriting
28-09-2018 Poetry Recital

Hindi Pakhwada in GTC, Nagpur

GTC, Nagpur also had successfully conducted Hindi Pakhwada program during the period 14 to 21,

September 2018. Dr. S.V. C. Kameshwar Rao, General Manager, Regional Remote Sensing Center, Nagpur felicitated the valedictory program as chief guest and distributed the prizes and certificates to the winners of the various events organized during the one week program.

11.4 Awards & Recognitions

Dr. Sujata Saxena, Principal Scientist & Head I/c, CBPD was felicitated during the six monthly meeting of Town Official Language Implementation Committee (TOLIC) held on May 22, 2018 for her contribution as a judge of Hindi competition on "Story writing in Hindi on shown picture".

Mrs. Nandini Deshmukh, Assistant, ICAR-CIRCOT was awarded during the six monthly meeting of Town Official Language Implementation Committee held on May 22, 2018; for bagging second prize in Hindi competition on "Story writing in Hindi on shown picture.

11.5 Hindi Publications

- Annual in-house publication Amber 2017 which incorporates popular research & technology and general articles along with poems written by staff members.
- Annual Report (Hindi) 2017-18

12. Distinguished Visitors

Dr. Trilochan Mohapatra, Secretary, DARE and DG, ICAR

Dr. Trilochan Mohapatra, DG, ICAR, visited the institute on April 21, 2018 and January 19, 2019. He interacted with all scientists reviewed the progress of work.

Dr. K. Alagusundaram, DDG (Engg), ICAR, New Delhi and Dr. S.N. Jha, ADG(PE), ICAR, New Delhi

Dr. K. Alagusundaram, DDG (Engg), ICAR, New Delhi and Dr. S.N. Jha, ADG (PE), ICAR, New Delhi visited the institute on 24th October, 2018 for foundation stone laying ceremony & inauguration of product sales counter.

Shri Chhabilendra Roul, Additional Secretary (DARE) & Secretary (ICAR)

Shri Chabilendra Roul, Special Secretary, DARE & Secretary, ICAR visited ICAR-CIRCOT on July 21, 2018

Shri K. G. Viswanathan, Managing Director, M/s. Bank Note Paper Mill (BNPM), Mysuru

Dr. Roshan Paul, Director of Indo-German Science & Technology

Dr. Roshan Paul, Director of Indo-German Science & Technology, Gurgaon, India visited Ginning Training Center of ICAR-CIRCOT, Nagpur on 09 January 2019.

Mr. HOUSSOU Paul, Chief of Party, National Institute of Agricultural Research (INRAB), Rep of Benin, West Africa

African Official Mr. HOUSSOU Paul, Chief of Party, National Institute of Agricultural Research (INRAB), Rep of Benin, West Africa visited GTC, Nagpur on May 16,

2018. Dr. S. K. Shukla, Officer I/c, GTC briefed him about various research activities being undertaken at the centre for the benefit of farmers and industries. Mr. Paul appreciated the technologies and training facilities available at GTC, as these will be very helpful for the cotton farmers and industry in Africa.

Mr. Kris Terauds, Economic Affairs Officer, UNCTAD, Geneva

Mr. Kris Terauds, Economic Affairs Officer, UNCTAD, Geneva visited ICAR-CIRCOT and GTC of ICAR-CIRCOT during November 13-16, 2018 for finalizing the Study Visit of Participants from four African Nations

(Tanzania, Zambia, Zimbabwe and Uganda) under the UNCTAD sponsored project "Promoting Cotton by-products in Eastern and Southern Africa" during January 14-18, 2019.

Kenyan Delegation

A high level Kenyan Delegation of 22 key officials on Study tour to India for improvement of cotton sector in their country has visited the institute on September 17, 2018

Shri Rajan Agarwal, Chief Vigilane Officer, ICAR, New Delhi

Shri Rajan Agarwal, Chief Vigilane Officer, ICAR, New Delhi visited the institute on December 17, 2018 afternoon to know about the various activities undertaken in the institute.

Shri Rakesh Rathi, President, Indian Cotton Association Ltd., Bathinda

Shri Rakesh Rathi, President, Indian Cotton Association Ltd., Bathinda visited CIRCOT Unit Sirsa on 10th July, 2018.

A high level Kenyan Delegation of 22 key officials

13. Swachh Bharat Abhiyan

The Swachh Bharat Abhiyanwas launched by the Prime Minister of India as a nation-wide campaignon 2nd October, 2014 to achieve Mahatma Gandhi`s vision of "Clean India" by his 150th birth anniversary, which is approaching on 2nd October, 2019. As citizens of India, it is our solemn responsibility to help achieve the vision of "Clean India" by then.

ICAR_CIRCOT has organised various activities during the year 2018-19 towards its commitment to clean India campaign.

Institute has arranged four (4) numbers of cleanliness drives in the quarter from April – June 2018. During the period Institute has also created awareness about 'Swachh Bharat Abhiyan' during 'Mera Gaon Mera Gaurav' programme regularly organized in 3 villages of Wardha district of Maharashtra.

Swachhata Hi Seva

An awareness programme was organized to sensitize the people about swachhata hi seva programme from 15th Septemebr to 2nd October 2018. A banner was displayed in public area in locality of Matunga, Mumbai to create the awareness.

Essay writing competition was arranged in the ICAR-CIRCOT, Mumbai premises, on 17th September, 2018 from 1.30 pm to 2.30 pm. The topic for essay writing was "Plastic Pratibandh Sahi Ya Galat"

A cleaning programme was organized in nearby area of Ghatkopar quarters on 27.09.2018.Under this activity volunteers visited to the nearby residential area and shops and urged them to keep the surrounding area clean not to throw garbage in the open. During the activities local residents were informed about the benefits of cleanliness and were given lessons on health benefits of clean and hygienic surroundings.

All the employees of Ginning Training Centre, Nagpur actively participated in the cleanliness campaign organized at premises of the Centre on the occasion of celebration of "Swachhta Hi Sewa Fortnight" on 15th September 2018. Staff cleaned the GTC premises and removed the unwanted weeds from front area of the main building. In addition, a lab was also cleaned by removing the obsolete items and arranging all equipment in proper order. In-charge, GTC administered the "Swachhata Shapath" to all the employees on this occasion.

Swachhata Pakhwada

A Swachhta Pledge taking programme was organized in the Jubilee Hall of ICAR-CIRCOT, Mumbai on 16.12.2018 at 10.00 am. Dr. A.S.M. Raja, Director in-charge, administered the swachhta pledge to all the staff members of ICAR-CIRCOT. He also briefed of the activities to all the staff members which are going to be conduct during the swachhta pakhwada. All the staff members of ICAR-CIRCOT, Mumbai enthusiastically participated in the cleaning programme.

As a part of swachhata pakhwada a Kisan Diwas was arranged at village Selu Kante, Dist. Wardha by GTC of

ICAR-CIRCOT, Nagpur. Kisan Diwas is celebrate every year to commemorate birth anniversary of the 5th Prime Minister of India, Shri Chaudhary Charan Singh.

GTC of ICAR-CIRCOT, Nagpur organized **Rashtriya Kisan Diwas** as per the directions received from council at Selukate Village, Wardha Districton December 23, 2018. About 42 farmers participated in the program. During this program, the govt. initiatives for the welfare of farmers were explained. The central govt. program on Swatcha ki Seva was demonstrated to the villagers to keep clean the surrounding of village. The awareness on importance of cleanliness on prevention of spreading of any major notorious diseases in the village was created among the villagers. The list of activities of ICAR towards the farmer's welfare was explained to the farmers of Selukate village. The technologies developed by ICAR-CIRCOT for the welfare of cotton growers were detailed in the programme.

GTC, Nagpur organized technology demonstrations on agricultural technologies for conversion of waste to wealth and safe disposal of agricultural waste as per the directives received from ICAR, New Delh. Dr. S. K. Shukla, Officer In-charge, GTC, Nagpur said that apart from the cleaning of surroundings, the achievement of above said objective could actually serve the purpose of Swatchatha Hi Sewa in the development of nation.

Apart from these, cleanliness drives were organised throughout the year by the four research divisions of ICAR-CIRCOT in different sections under them and also in the Accounts and Administrative sections of the institute.

Cleanliness drive in nearby Five Gardens as part of Mahatma Gandhi's 150th Birth anniversary celebrations

14. Mera Gaon Mera Gaurav

The 'Mera Gaon Mera Gaurav' (My Village My Pride) programme launched by the Prime Minister of India in 2015, is one of major initiatives of Govt. of India, towards doubling the farm income by way of strengthening the interface of scientists with farmers and to speed up the process of technology transfer from "lab to land". Under Mera Gaon Mera Gaurav (MGMG) initiative, ICAR-CIRCOT identified and adopted 30 villages in Wardha district of Vidarbha region in Maharashtra to assist cotton growing farmers in increasing farm income. Six teams comprising of four multidisciplinary scientists of each group were formed and each team was allotted five villages for implementation of MGMG programme.

Experienced gained in two successive years was utilized to formulate the action plan for 2018-19 for sustainable cotton production and doubling farm income in the adopted MGMG villages through regular interaction with farmers, organisation of awareness programmes, field and technology demonstrations, kisan gosthis/meets, skill development and knowledge enhancement programmes, etc. In addition, the interaction of experts of other research institutes and organisations were also arranged by each group of scientists for providing crop specific package of advices to the farmers. Thus, a linkage was created between farmers, research institutes, NGO's, State departments and Industries through the implementation of MGMG programme.

In 2018-19, ICAR-CIRCOT scientists conducted **47 village visits, 12 interface meeting, 14 demonstrations and 12 awareness programs in which about 2300 farmers** from different MGMG adopted villages participated. Latest technologies, processes and products of ICAR-CIRCOT and other organisations were showcased and various farming related issues were discussed during these programmes. Farmers were demonstrated and explained various cotton contaminants, which affect cotton quality and its export potential. In addition, farmers were apprised about various central and state govt. schemes such as Crop Insurance, Clean India Mission, Pradhan Mantri Ujjwala Yojana, Right to Education, etc.

Pink Bollworm awareness

In 2018-19, Pink Bollworm (PBW) symptoms were observed at very early cotton crop production stage in most of MGMG adopted villages. ICAR-CIRCOT scientists arranged a number of kisan gosthis, field visits and interaction with PBW experts in the affected villages to suggest the remedial measures to tackle PBW menace. ICAR-CIRCOT distributed about 400 Pheromone traps in affected villages to arrest PBW insect and also coordinated with state department to create awareness about safe and effective methods for controlling PBW. ICAR-CIRCOT was part of a Mega Awareness Programme organised by The Confederation of Indian Textile Industry-Cotton Development a Research Association (CITI-CDRA) for control of PBW in which about 800 farmers and other stakeholders participated. The combined efforts of ICAR-CIRCOT, state and central agencies and other stakeholders resulted into effective control of PBW within few days of its symptoms.

At present, cotton contamination, particularly polyproline is a major problem faced by cotton processing industry. Such contaminants enter in the cotton right during picking, transportation and storage by farmers. Most of the farmers are ignorant about ill effect of contaminants mixing with cotton. In 2018-19, CIRCOT scientists arranged demonstration of different contaminants, which were detected at spinning mills to farmers and explained the problems posed by each and every contaminant during cotton processing. In addition, farmers were also educated about various cotton quality parameters and appropriate cotton harvesting and storage practices.

A Technology and Machinery Demonstration Mela-2019 was organized at GTC, Nagpur to showcase latest technologies, machinery and products on cotton processing & by-product utilisation, especially for MGMG farmers. Live demonstrations on preparation of bio-enriched compost, pellets, particle board and oyster mushroom cultivation using cotton stalks and assessment of ginning out turn, moisture content and fibre attributes, etc. were also arranged for the benefit of farmers. On this occasion, an exhibition was also organised, in which the latest technologies and processes for value addition of cotton stalks were prominently exhibited by various stakeholders. On this occasion, 10 progressive farmers from MGMG villages were felicitated.

Kisan Goshti at Village Rehaki, Dist Wardha

Farmers Interaction meet at Shegaon (Kund), Wardha Dist

Farmers' interaction meeting at Yenora Village, Wardha Dist.

Farmer's interaction meet on value-addition for additional farm income at Anji Village, Wardha Dist.

Awareness on value-addition to cotton crop residues to the farmers of Dorli village, Wardha Dist.

August gathering of MGMG farmers at Wardha Dist.

Demonstration of contamination in cotton

Village visit of subject experts at Muradgoan village, Dist Wardha

Supply of compost culture to the farmers for preparation of compost from cotton stalks and other agro-residue

Technology and Machinery Demonstration Mela conducted at GTC, Nagpur on 15-02-2019

15. Infrastructural Facilities

The Institute is well equipped with state-of-art research and testing facilities for conducting research in post-harvest processing of cotton and allied fibres.

Some of the facilities available in the Institute include

- ***Fibre Yarn and Fabric Testing Laboratory*** (With High Volume Instrument and Advanced Fibre Information System): The laboratory has all the instruments for analysing the quality parameters of the Cotton and other fibres, yarn and fabrics. Besides research this service is also provided to the Traders and other stakeholders in the cotton value chain.
- ***Nanocellulose Pilot Plant Facility:*** Capacity to produce 10 kg of Nanocellulose per day (Facility first of its kind in India): Service extended to Research organizations, Industrial stakeholders for carrying out studies on application of nanocellulose.
- Other Unique research and instrumentation facility available at the institute include Scanning Electron Microscopy (SEM); DREF Spinning Machines; Kawabata Evaluation System (KES); Atomic Force Microscopy (AFM); Thermo Gravimetric Analyser; Fourier Transformation Infrared Spectrometer; Atomic Absorption Spectrometer; Ultra High Pressure Homogenizer; Nano particle size analyser Gas Chromatography with Mass Spectrometer:
- Electrospinning Facility
- Computerised sample Weaving Facility
- Composite Lab facility
- Modern Ginning and Pressing Plant
- Cottonseed Processing Plant
- Particle Board Manufacturing Plant: One tonne per day production capacity plant is established in Nagpur. The facility is used by Incubatees to undertake scale up trials.
- Pelleting Plant

High Volume Instrument

Fourier Transform Infrared Spectrophotometer (FTIR)


Atomic Absorption Spectrometer


Gas Chromatography with Mass Spectrometer

Thermo Gravimetric Analyser and Differential Scanning Calorimeter

UV Transmittance Analyser

Gas Chromatography

The following Instruments / Equipment were procured during the year.

- Lea tester
- Temperature and RH Maintaining System
- Jumbo DR Gin
- Trash Analyser (2)
- Reactor for Enzyme Production
- Sample Applicator for HPTLC
- Smart Energy Meter
- Modular Twin Screw Extruder
- Total Organic Carbon Analyser
- Folding Endurance Tester with Precision Test Strip Cutter
- Colorimeter

Product Sales Counter

Product Sales Counter facility created for sale of institute products to the general public and accentuate brand value of the institute was inaugurated by Dr. Alagusundaram, DDG (Engg.), ICAR on 24th October, 2018.

Total Organic Carbon Analyser

Sample Applicator for HPTLC

Trash analyser

Lea Tester

Temperature and RH Maintaining System

Annexure I

ONGOING RESEARCH PROJECTS

INSTITUTE FUNDED PROJECTS

S. No.	Title	Investigators	Duration
Core Area I: Pre-Ginning and Ginning			
1	Development of an Efficient system for processing of kawadi cotton in ginneries	S. V. Ghadge (PI)	2018-20
2	Development of Trash Handling System for Control of Pink Bollworm in Cotton Ginneries	V. G. Arude (PI) Dattatreya M Kadam P. S. Deshmukh C. Sundaramoorthy S. K. Shukla	2018-20
3	Development of a rotary Tubular Drum Dryer for Quarantine of Pink Bollworm infested Cottonseeds in Ginneries	S. K. Shukla (PI) V. G. Arude V. Mageshwaran Archana Mahapatra	2018-20
Core Area II: Mechanical Processing, Technical Textiles and Composites			
4	Development of Activated Carbon Based Protective Mask	T. Senthilkumar (PI) G. Krishna Prasad A. S. M. Raja	2018-20
5	Development of High Performance Cotton Pads for Wound Dressing	G. Krishna Prasad (PI) N. Vigneshwaran T. Senthilkumar A. S. M. Raja	2018-20
6	Development of Cotton Based Smart Fabric for Warm Pads and Garments	P. Jagajanantha (PI) Sharmila Patil G. Krishna Prasad P. K. Mandhyan	2018-20
7	Development of Composite Material based Sanitary C Pad	Dattatreya M Kadam (PI) P. Jagajanantha	2018-20
Core Area III: Characterisation of Cotton and other Natural Fibres, Yarns and Textiles			
8	AICRP on Cotton (Quality Research)	P.K. Mandhyan (PI) A. Arputharaj P. Jagajanantha	2017-20
9	Development of Marker Fibres: A Tool for traceability of cotton textiles	A. Arputharaj (PI) P.K. Mandhyan G. Krishna Prasad	2018-20
Core Area IV: Chemical and Biological Processing, Biomass and By-products Utilisation			
10	Development of Suitable Solvent Extraction Process for Obtaining Low Gossypol Cottonseed Meal for Non-Ruminant Feed and Food Applications	Sujata Saxena (PI) Jyoti Dhakane	2016-19
11	Development of protocol for extraction of quality Protein from Cottonseed Meal	Manoj Kumar (PI) Sharmila Patil	2017-19

S. No.	Title	Investigators	Duration
12	Scale-up of the microbial process for degossypolization and nutritive quality improvement in Cottonseed cake	V. Mageshwaran (PI) Manoj Kumar Dattatreya M Kadam	2018-20
Core Area V: Entrepreneurship and Human Resource Development			
13	Assessment of Factors Influencing Adoption of Scientific Cottonseed Processing in India	P. S. Deshmukh (PI)	2016-19
14	Application of Nanocellulose in Paint Formulation	Archana Mahapatra (PI) Manoj Kumar A. K. Bharimalia	2017-19

EXTERNALLY FUNDED PROJECTS

S. No.	Title	Investigators	Duration
1	Industrial Adoption of ICAR-CIRCOT Paper Pulp Technology (Extra Mural - ICAR)	N. Vigneshwaran (PI) Sujata Saxena A. S. M. Raja A. K. Bharimalla P. K. Mandhyan P. S. Deshmukh C. Sundaramoorthy A. Arputharaj	2018-20
2	Agri Business Incubation Centre at ICAR – CIRCOT, Mumbai (NAIF -Incubation Fund)	A. K. Bharimalla (PI) S. K. Shukla N. Vigneshwaran P. K. Mandhyan V. G. Arude C. Sundaramoorthy V. Mageshwaran	2015-20
3	An Inclusive Agribusiness Model for Sustainable Cotton Marketing in the State of Maharashtra (NASF)	C. Sundaramoorthy (PI) V. Mageshwaran G. Krishna Prasad	2018-21
4	Valorisation of Cottonseed Meal: Extraction of Quality Protein for improving the Livelihood of Cotton Farmers (DST)	Manoj Kumar (PI) Sujata Saxena	2019-20
5	Remunerative Approaches for Agriculture and Allied Sectors Rejuvenation (RAFTAAR) Agribusiness Incubation Centre (R-ABI) (DAC&FW)	A. K. Bharimalla (PI) C. Sundaramoorthy P. S. Deshmukh V. G. Arude P. K. Mandhyan N. Vigneshwaran Sharmila Patil S. K. Shukla V. Mageshwaran	
Consortia Research Platform (CRP) on Natural Fibres			
6	Utilisation of Lignocellulosic Fibre based Biomass as Renewable Energy for Rural and Industrial Application	S. K. Shukla (PI) V. Mageshwaran S. V. Ghadge P. G. Patil A. S. M. Raja V. G. Arude	2015-20

S. No.	Title	Investigators	Duration
7	Preparation of Micro/ Nanolignocellulose and its Incorporation in Molded Products for Improved Performance	N. Vigneshwaran (PI) C. Sundaramoorthy T. Senthilkumar Jyoti Dhakane	2015-20
8	Eco-friendly method of preparing absorbent/surgical cotton from non-spinnable cotton	P. Jagajanantha (PI) V. Mageshwaran	2015-20
9	Sustainable Green Technology for Dyeing of Cotton Textile	A. S. M. Raja (PI) Sujata Saxena A. Arputharaj T. Senthilkumar	2015-20
10	Value addition to banana pseudostem fibre	Jyoti Dhakane (PI) P. K. Mandhyan A. K. Bharimalla Sharmila Patil Archana Mahapatra	2018-20
11	Development of nanocellulose based polymer composites for packaging applications	Sharmila Patil (PI) N. Vigneshwaran Archana Mahapatra Jyoti Dhakane A. K. Bharimalla	2018-20

Annexure II

PERSONNEL

(As on March 31, 2019)

DIRECTOR

Dr. P. G. Patil
M. Tech. (P.H.E.), Ph.D. (Engg.), F.T.A., F. ISAE.

SCIENTIFIC STAFF
HQ, MUMBAI

PRINCIPAL SCIENTIST

1. Dr. S. K. Chattopadhyay, M. Tech. (Text. Engg.), Ph.D. (Tech.), F.T.A., F.T.I.
2. Dr. (Smt.) Sujata Saxena, M.Sc., Ph.D. (Organic Chemistry) Head i/c, Chemical and Biochemical Processing Division
3. Dr. Dattatreya M. Kadam, M.Tech (ASPE), Ph.D
4. Dr. A. S. M. Raja, M. Sc., Ph.D. (Textile Chemistry)
5. Dr. N. Vigneshwaran, M.Sc. (Agri.), M.B.A., Ph.D. (Agricultural Microbiology)
6. Dr. P. K. Mandhyan, M.Sc., Ph.D., A.T.A (Tech. Textiles) Head i/c, Quality Evaluation and Improvement Division

SENIOR SCIENTIST

1. Dr. (Mrs.) Jyoti M. Nath, M.Sc., Ph.D. (Electronics & Instrumentation
2. Dr. A. K. Bharimalla, M. Tech.,Ph.D.(Composite) Head i/c, Technology Transfer Division
3. Dr. P. S. Deshmukh, M. Tech., Ph.D. (Agril. Engg.) (Farm Machinery & Power)
4. Dr. C. Sundaramoorthy, M.Sc., Ph.D. (Agricultural Economics)
5. Dr. V. G. Arude, M. Tech. Ph.D. (Farm Machinery & Power)

SCIENTIST

1. Dr. A. Arputharaj, M.Sc., M. Tech., Ph.D. (Textile Chemistry)
2. Dr. T. Senthilkumar, M. Tech., Ph.D. (Textile Manufacture)
3. Dr. G. Krishna Prasad, M. Tech., Ph.D. (Textile Manufacture)
4. Shri G. T. V. Prabu, M. Tech. (Textile Manufacture) (On study leave)
5. Shri Santanu Basak, M. Tech. (Textile Chemistry)
6. Dr. P. Jagajanantha, M. Tech., Ph.D. (Textile Chemistry)
7. Dr. (Smt.) Sharmila Patil, M.Sc. (P.H.T.), Ph.D. (Agricultural Process Engineering)
8. Dr. (Smt.) Archana Mahapatra, M.Tech., Ph.D. (Agricultural Process Engineering)
9. Dr. Manoj Kumar, M.Sc., Ph.D. (Plant Biochemistry)
10. Er. (Smt.) Jyoti Dhakane- Lad, M.Tech. (P.E.) (PHT)

GTC, NAGPUR

PRINCIPAL SCIENTIST

1. Dr. S. K. Shukla, M. Tech., Ph.D. (Agricultural Process Engineering) Officer-In-Charge, GTC
2. Dr. S. V. Ghadge, M.E. (Ag.) M.B.A., Ph.D. (Farm Machinery & Power)

SCIENTIST

1. Dr. V. Mageshwaran, M.Sc. (Agril), Ph.D. (Agricultural Microbiology)
2. Er. (Ms.) Varsha Satankar, M.Tech. (Agricultural Structures and Process Engineering) (On study leave)

TECHNICAL STAFF
HQ, MUMBAI

CHIEF TECHNICAL OFFICER

1. Dr. R. D. Nagarkar, M.Sc., Ph.D.
2. Dr. (Smt.) Sheela Raj, M.Sc., Ph.D.

ASSISTANT CHIEF TECHNICAL OFFICER

1. Dr. (Smt.) Sudha Tiwari, B.Sc., Ph.D.
2. Shri T. Venugopal, B.E.
3. Dr. (Smt.). N. M. Ashtaputre, M.Sc., Ph. D.
4. Shri R. S. Prabhudesai, M.Sc., D.C.M.
5. Shri G. B. Hadge, M.Sc.
6. Dr. M. V. Vivekanandan, M.Sc., Ph.D.
7. Shri S. Banerjee, M.Sc.

8. Shri B. R. Pawar, M. Sc., LL.M.
9. Shri R. K. Jadhav, M.Sc.
10. Shri C. M. More, M.Sc.
11. Shri R. R. Chhagani, M.Sc.
12. Shri H. S. Koli, M.Sc., LL.B.
13. Dr. (Smt.) S. R. Kawlekar, M.Sc., P.I.M.R., Ph.D.
14. Shri P. N. Sahane, D.I.F.T.
15. Smt P. S. Nirhali, M.Sc.
16. Shri S. V. Kokane, M.A.
17. Er. Chandrika Ram, M. Tech. (APFE) (on deputation)

SENIOR TECHNICAL OFFICER

1. Shri K. Narayanan, B.Sc.
2. Smt. Binu Sunil, M.Sc.
3. Shri D. U. Kamble, B.Sc.
4. Smt. Bindu Venugopal, M.Sc.
5. Dr. (Ms.) C. P. D' Souza, M.Sc., Ph.D.
6. Shri R. S. Narkar, M.Sc., D.C.I.A.
7. Smt. P. R. Mhatre, B.Sc., M.Lib.
8. Smt. C. D. Prabha, M.Sc.

TECHNICAL OFFICER

1. Shri V. D. Kalsekar, B.Sc.
2. Shri M. G. Ambare, M.Sc.
3. Shri S. N. Patil, B.E. (Civil)
4. Shri N. D. Kambli, M.Sc.
5. Shri D. M. Correia, I.T.I., N.C.T.V.T. (Mechanic)

SENIOR TECHNICAL ASSISTANT

1. Smt. H. R. Pednekar, B.A., B.Lib.
2. Shri R. P. Kadam, M.Sc.
3. Smt. M. P. Kamble, B.A., M.Lib.
4. Shri A. R. Jadhav, B.Sc.
5. Shri Krishna Bara, D.H.T.

TECHNICAL ASSISTANT

1. Shri D. A. Salaskar, Driver
2. Shri P. P. Thakur
3. Shri P. G. Gavhale
4. Shri D. M. Raje
5. Shri R. R. Gosai

SENIOR TECHNICIAN

1. Shri Mahabir Singh
2. Shri S. V. Kokane, Driver
3. Shri M. M. Kadam
4. Shri S. G. Phalke
5. Shri D. J. Dhodia
6. Shri Yogesh P. Nagpure

GTC, NAGPUR

CHIEF TECHNICAL OFFICER

1. Er. D. U. Patil, B. Tech. (Agril. Engg.)

ASSISTANT CHIEF TECHNICAL OFFICER

1. Shri U. D. Devikar, M.Sc.
2. Shri S. L. Bhanuse, M.Sc.

SENIOR TECHNICAL OFFICER

1. Shri R. G. Dhakate, B.Sc.
2. Shri S. N. Hedau, B.Sc.

TECHNICAL OFFICER

1. Shri C. V. Shivgan, Cert. Elec. Supr. PWD, Cert. M. & A.W. Technician
2. Shri B.V. Shirsath, B.A., I.T.I

TECHNICAL ASSISTANT

1. Shri S. K. Parab, Cert. Cot. Spin.

QE UNIT, COIMBATORE

1. Dr. S. Venkatakrishnan, M.Sc., Ph.D., A.T.A., F.T.A, Chief Technical Officer
2. Shri S. Mukundan, M.Sc., Assistant Chief Technical Officer
3. Shri M. Bhaskar, Dip. Ref. & Air-Cond., Technical Officer

QE UNIT, DHARWAD

1. Smt. V. G. Udikeri, M.Sc., Technical Officer

QE UNIT, GUNTUR

1. Shri K. Thiagarajan, M.Sc., Assistant Chief Technical Officer

QE UNIT, SIRSA

1. Dr. Hamid Hasan, M.Sc., Ph.D., Chief Technical Officer
2. Dr. Jal Singh, M.Sc., Ph.D. Senior Technical Officer
3. Shri Umrao Meena, Senior Technician

QE UNIT, SURAT

1. Shri M. B. Patel, B.Sc., L.L.B

ADMINISTRATIVE STAFF
HQ, MUMBAI

SR. ADMINISTRATIVE OFFICER
Shri Sunil Kumar, B.A. (Hons.)

ADMINISTRATIVE OFFICER
Smt. Sujata Koshy, B.Com.

FINANCE & ACCOUNTS OFFICER
Shri M. Radhakrishnan

ASSISTANT ADMINISTRATIVE OFFICER
1. Shri Y. R. Pathare, B.Sc., M.B.A.
2. Smt. T. P. Mokal, M.A.(Hindi)
3. Shri K. Parleshwar,
4. Shri R. K. Pallewad, B.A.
5. Smt. S. R. Shirsat, B.A.

ASSISTANT FINANCE & ACCOUNTS OFFICER
Shri. S. V. Kasabe, B.Com, L.L.B.

ASSISTANT
1. Shri N. V. Kambli
2. Smt. N. M. Deshmukh, M.A., LL.B.
3. Shri S. D. Ambolkar
4. Shri P. V. Jadhav
5. Kum. Pooja Tiwari, B.Sc.
6. Kum. Nikky Shokeen, B.Tech.
7. Kum. Singh Himani Parmar, B.E.
8. Smt. S. P. Paiyala

UPPER DIVISION CLERK
1. Smt. S. G. Parab, B.A. (Sociology), B.A. (Hindi)
2. Smt. J. R. Chavkute
3. Shri V. M. Sable
4. Smt. B. D. Kherodkar
5. Shri S. S. Angane
6. Shri T. D. Dhamange, B.Com.
7. Shri S. N. Bandre

LOWER DIVISION CLERK
1. Smt. V. N. Walzade, B.A
2. Shri S. N. Sahane
3. Shri Avinash Aman

PRIVATE SECRETARY
1. Smt. S. D. Dudam, M.A

PERSONAL ASSISTANT
1. Smt. T. T. D'Souza
2. Smt. U. N. Bhandari

STENOGRAPHER
1. Smt. R. R. Tawde, B.Com.
2. Smt. V. R. Naik, B.A.

GTC, NAGPUR

ASSISTANT ADMINISTRATIVE OFFICER
1. Shri S. A. Telpande, M.Com

LOWER DIVISION CLERK
1. Shri R. G. Matel,

STENOGRAPHER
1. Shri R. D. Shambharkar, M.A.

SKILLED SUPPORT STAFF - HQ, MUMBAI
1. Shri M. Z. Rathi
2. Shri K. T. Mahida
3. Shri M. M. Katpara
4. Shri M. A. A. Rashid
5. Shri H. B. Vesmiya
6. Shri M. J. Sumra
7. Shri S. K. Bobate
8. Shri P. P. Patil
9. Shri R. G. Tak
10. Shri R. P. Karkate
11. Shri D. G. Gole
12. Shri M. K. Prabhulkar
13. Shri J. D. Sakpal
14. Shri V. Murugan
15. Shri S. D. Magar
16. Shri S. B. Worlikar
17. Shri Sunil R. Tondse
18. Shri V. B. Poojari
19. Shri M. N. Kamble
20. Shri S. S. Surkule
21. Shri S. P. Naik
22. Smt. Kamala Murugan
23. Shri D. K. Kasar
24. Shri Suhas R. Tondse
25. Shri D. R. Gawde
26. Shri S. M. Chandanshive
27. Shri P. E. Gurav

28. Shri Mahesh C. Solanki
29. Shri Thapa Gorkha Bahadur Ovilal

GTC, NAGPUR

1. Shri R. B. Kautkar
2. Shri R. S. Umare
3. Smt. M. M. Bhandakkar

QE UNIT, COIMBATORE

1. Shri V. Subbaiah

QE UNIT, DHARWAD

1. Shri C. J. Bagalkoti
2. Shri A. F. Gudadur

QE UNIT, SURAT

1. Shri M. G. Sosa

APPOINTMENTS

Technical

- Shri Paresh Pandit Thakur to the post of Technical Assistant (T-3) w. e. f. 05-07-2018.
- Shri Prashant G. Gavhale to the post of Technical Assistant (T-3) w. e. f. 25-07-2018.

Administrative Staff

- Shri Sainath Nana Sahane to the post of Lower Division Clerk w.e.f. 25-10-2018
- Shri Avinash Aman to the post of Lower Division Clerk w.e.f. 26-10-2018

Dr. V. G. Arude designated as Senior Scientist w.e.f. 03-01-2019 on completion of his Ph.D.

On LIEN

- Dr. Virendra Prasad, Senior scientist w.e.f 07-12-2017
- Dr. Deepak Meena, Technical Assistant w.e.f. May 09, 2016

TRANSFERS (Intra Institutional transfer)

Scientists

- Dr. (Smt.) Jyoti Mintu Nath, Senior Scientist, transferred from Ginning Training Centre of ICAR-CIRCOT, Nagpur to ICAR-CIRCOT, Mumbai with effect from 30-07-2018.
- Dr. S. V. Ghadge, Senior Scientist transferred from ICAR-CIRCOT, Mumbai to Ginning Training Centre, Nagpur with effect from 22-09-2018.

Technical

- Shri M.B. Patel, Sr. Technical Officer transferred from ICAR-CIRCOT, Mumbai to ICAR-CIRCOT Regional unit, Surat with effect from 04-05-2018
- Shri C. V. Shivgan, Technical Officer, transferred from ICAR-CIRCOT, Mumbai to Ginning Training Centre, Nagpur with effect from 04-05-2018.
- Shri S. K. Parab, Technical Assistant, transferred from MPD ICAR-CIRCOT, Mumbai to Ginning Training Centre, Nagpur with effect from 04-05-2018.

PROMOTIONS

Sr. No.	Name of Staff	Grade to which Promoted	Effective Date of Promotion
1.	Dr. P. K. Mandhyan	Principal Scientist	21-04-2017
2.	Dr. S. V. Ghadge	Principal Scientist	21-07-2017
3.	Shri. B.V. Shirsath	Technical Officer	10-09-2016
4.	Shri. D. M. Correia	Technical Officer	18-09-2016
5.	Shri. Krishna Bara	Senior Technical Assistant	11-05-2016
6.	Shri. D. M. Raje	Technicl Assistant	23-04-2017
7.	Shri. R. R. Gosai	Technical Assistant	23-04-2017
8.	Shri. N. K. Shaikh	Technical Assistant	11-04-2017
9.	Smt. S. R. Shirsat	Assistant Administrative Officer	24-01-2019

Administrative

- Shri K. Parleshwar, Assistant Administrative Officer transferred from Ginning Training Centre, Nagpur to ICAR-CIRCOT, Mumbai with effect from 25-07-2018.
- Shri S. A. Telpande, Assistant Administrative Officer transferred from ICAR-CIRCOT, Mumbai to Ginning Training Centre, Nagpur with effect from25-07-2018.

Supporting

- Shri M.G. Sosa, Skilled Supporting Staff transferred from ICAR-CIRCOT, Mumbai to ICAR-CIRCOT Regional unit, Surat with effect from 04-05-2018
- Shri A.F. Gudadur, Skilled Supporting Staff transferred from ICAR-CIRCOT, Mumbai to ICAR-CIRCOT Regional unit, Dharwad with effect 04-05-2018

RESIGNATION

- Dr. R. Guruprasad, Scientist, Mechanical Processing Division, ICAR-CIRCOT resigned from Agricultural Research Service with effect from April 28, 2018.

RETIREMENTS

- Shri G. G. Mistry, B.Sc., Senior Technical Officer, Q E Unit of ICAR-CIRCOT, Surat superannuated on May 31, 2018.
- Smt. V. V. Janaskar, Assistant Administrative Officer retired voluntarily from service w.e.f. January 02, 2019.
- Smt. S. R. Shirsat, Assistant Administrative Officer superannuated on March 31, 2019.
- Shri G. N. Mayawanshi, Skilled Supporting Staff, ICAR-CIRCOT superannuated on April 30, 2018.
- Shri D. B. Temgire, Skilled Supporting Staff, ICAR-CIRCOT superannuated on May 31, 2018.

OBITUARY

Shri. N. K. Shaikh, Technical Assistant expired while in service on 14-12-2018

Annexure III

LIST OF COMMITTEES

Institute Management Committee (IMC)

- **Dr. P.G. Patil,** Director, (Chairman)
- **Dr. S.N. Jha,** ADG (PE), ICAR, New Delhi
- **Dr. (Smt.) S. Kranthi,** Head, Crop Protection Division, ICAR-CICR, Nagpur
- **Dr. S.N. Chattopadhyay,** Principal Scientist, ICAR-NINFET, Kolkota
- **Dr. A.L. Kamble,** Scientist, ICAR-NIASM, Baramati
- **Dr. V. Kharche,** Associate Dean, Govt. Agriculture College, Dr. PDKV, Akola
- **Shri D. B. Sawale Patil,** Buldana, Maharashtra, Representing agriculture/rural interest
- **Smt. K. S. Somvanshi,** Pune, Maharashtra, Representing agriculture/rural interest
- **Shri Sunil Kumar,** Sr. AO, Member Secretary

Research Advisory Committee (RAC)

- **Dr. Nawab Ali,** Former DDG (Agril. Engg.), ICAR, (Chairman)
- **Dr. G.S. Nadiger,** Research Advisor (SASMIRA) & Former Director (Textile Committee), Mumbai
- **Dr. A. Rakshit,** Executive Director, Indian Technical Textiles Association, Mumbai
- **Dr. N. G. Shah,** Professor, Centre for Technology Alternatives for Rural Areas, IIT, Mumbai
- **Dr. B. K. Behera,** Profesor & Head, Department of Textile Technology, IIT, Delhi
- **Dr. D. Nag,** Former Director, NIRJAFT, Kolkata
- **Dr. P.G. Patil,** Director, ICAR-CIRCOT, Mumbai
- **Dr. S. N. Jha,** ADG (PE), ICAR, New Delhi
- **Dr. V.G. Arude,** In-charge PME Cell, Member-Secretary

Project Monitoring and Evaluation Committee (PMC)

- **Dr. P.G. Patil,** Director, (Chairman)
- **Dr. (Smt.) S. Saxena,** In-charge Head, CBPD
- **Dr. P.K. Mandhyan,** In-charge Head, QEID
- **Dr. A.K. Bharimalla,** In-charge, TTD
- **Dr. V.G. Arude,** In-charge PME Cell, Member secretary

Priority-setting, Monitoring & Evaluation (PME) Committee

- **Dr. V.G. Arude,** Senior Scientist, In-charge
- **Dr. A.K. Bharimalla,** Senior Scientist
- **Dr. N. Vigneshwaran,** Principal Scientist
- **Dr. P.K. Mandhyan,** Principal Scientist
- **Dr. C. Sundaramoorthy,** Sr. Scientist, Nodal Officer, PME

Priority-setting, Monitoring & Evaluation (PME) Cell

- **Dr. V.G. Arude,** Senior Scientist, In-charge
- **Dr. C. Sundaramoorthy,** Sr. Scientist, Nodal Officer, PME
- **Shri K. Narayanan,** STO
- **Smt. H. R. Pednekar,** STA
- **Shri Anand R Jadhav,** STA

Institute Technology Management Committee (ITMC)

- **Dr. P.G. Patil,** Director, (Chairman)
- **Dr. (Smt.) S. Saxena,** In-charge Head, CBPD
- **Dr. V.G. Arude,** In-charge, PME Cell
- **Dr. N. Vigneshwaran,** Principal Scientist, CBPD
- **Dr. B.B. Nayak,** Principal Scientist, CIFE, Mumbai
- **Dr. C. Sundaramoorthy,** Senior Scientist, Member Secretary, IRC
- **Dr. A.K. Bharimalla,** Member Secretary

Institute Technology Management Unit (ITMU)

- **Dr. A.K. Bharimalla,** Sr. Scientist, In-charge
- **Dr. N. Vigneshwaran,** Principal Scientist
- **Dr. P.K. Mandhyan,** Principal Scientist
- **Dr. M.V. Vivekanandan,** ACTO
- **Shri G.B. Hadge,** ACTO

Institute Joint Staff Council

- **Dr. P.G. Patil,** Director, (Chairman)
- **Dr. P.S. Deshmukh,** Sr. Scientist
- **Dr. (Smt.) S. S. Patil,** Scientist
- **Shri B. R. Pawar,** ACTO
- **Shri S. N. Patil,** Technical Officer
- **Shri C. V. Shivgan,** TO

- **Shri Sunil Kumar,** Senior Administrative Officer
- **Shri S. V. Kasabe,** A. F & AO
- **Shri Y. Pathare,** AAO, Member Secretary
- **Shri M K Prabhulkar,** Secretary ,CJSC Member
- **Shri P.V. Jadhav,** Assistant, CJSC Member
- **Mrs. Nandini Deshmukh,** staff side
- **Shri S. D. Magar,** SSS, staff side

Internal Complaints Committee

- **Dr. (Smt.) S. Saxena,** Principal Scientist, In-charge Head, CBPD, (Chairperson)
- **Smt. P.R. Mhatre,** STO, Member Secretary
- **Dr. P. K. Mandhyan,** Principal Scientist
- **Dr. (Smt.) A. Mohapatra,** Scientist
- **Smt. S. Charankar,** Principal, Dr. BNM College of Home Science, Mumbai
- **Smt. S. Koshy,** AO
- **Smt. P. S. Nirhali,** ACTO

Staff Welfare Fund Committee

- **Dr. P.K. Mandhyan,** Principal Scientist, (Chairman)
- **Shri D.U. Kamble,** STO
- **Shri S.V. Kasabe,** (AF&AO)
- **Shri P.V. Jadhav,** Assistant
- **Smt. S. Koshy,** AO, Member Secretary

ISO-9001:2008 Management Committee

- **Dr. P.G. Patil,** Director, (Chairman)
- **Dr. (Smt.) S. Saxena,** Principal Scientist, Head In-charge, CBPD
- **Dr, V.G. Arude,** Senior Scientist, In-charge, PME Cell
- **Dr. P.K. Mandhyan,** Principal Scientist, In-charge Head, QEID
- **Dr. A.K. Bharimalla,** Senior Scientist, Head In-charge, TTD
- **Dr. A.S.M. Raja,** Principal Scientist, Management Representative
- **Dr. A. Arputharaj,** Scientist
- **Administrative Officer**
- **AF&AO**

Sports Committee

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- **Dr. P. Jagajanantha,** Scientist
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- **Smt. S. Paiyala,** Assisatnt

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- **Shri S. V. Kasabe,** AFAO
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- **Dr. G. Krishna Prasad,** Scientist
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- **Dr. A. K. Bharimalla,** Senior Scientist
- **Dr. P.K. Mandhyan,** Principal Scientist
- **Smt. P.R. Mhatre,** Senior Technical Officer
- **Shri Sunil Kumar,** Senior Administrative Officer
- **Shri M. Radhakrishnan,** FAO
- **Smt. S.Koshy,** AO
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- **Dr. A. K. Bharimalla,** Senior Scientist and In-charge Head TTD
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- **Smt. P. S. Nirhali,** ACTO

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- **Dr. P. G. Patil,** Director (Chairman)

Nominated Members

- **Dr. P. K. Mandhyan,** Principal Scientist
- **Shri Sunil Kumar,** SAO
- **Shri S. V. Kasabe,** AF&AO

Elected Members

- **Dr. P.S. Deshmukh,** Senior Scientist (Elected from Scientific Category)
- **Shri B. R. Pawar,** ACTO (Elected from Technical Category)
- **Smt. Smita P. Paiyala,** Assistant (Elected from Administrative Category)
- **Shri Mahesh Solanki,** S. S. S (Elected from Skilled Supporting Staff Category)
- **Shri Y. R. Pathare,** AAO (nominated by Director)

Committee for Celebrating 150th year of Mahatma Gandhi

- **Shri Sunil Kumar,** Sr. AO, (Chairman)
- **Er. Jyoti Dhakane-Lad,** Scientist
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VISION

Global Excellence in Cotton Technology

MISSION

To provide scientific and managerial interventions to post-harvest processing and value addition to cotton and other natural fibres and utilization of their by-products to maximize economic, environmental and societal benefits.

MAIN SERVICES/TRANSACTIONS

Sr. No.	Services/Transactions	Responsible Persons
1	Commercial Testing: Fibre, Yarn, Fabric, Garment, Spinnability, Non- Lint Content, Linter, Seed, Paper, Chemical and Biochemical Tests of Textile Materials, ECO, SEM, XRD, etc.	Mrs. P. S. Nirhali Assistant Chief Technical Officer Incharge, Test House Phone Ext 456 / 457 circottest@gmail.com, cottontest@rediff.com
2.	Imparting Training to Stakeholders	Dr. A. K. Bharimalla Technology Transfer Division Phone Ext 467 ashokbhari72@gmail.com and Dr. S. K. Shukla Ginning Training Centre, Nagpur Phone (0712) 2500592 , 2500289 skshukla2000@gmail.com
3.	Supply of Calibration Cotton	Dr. P. K. Mandhyan Quality Evaluation and Improvement Division Phone Ext 447 pkmandhyan@gmail.com
4.	Consultancy and Technology Transfer	Dr. A. K. Bharimalla Technology Transfer Division Phone Ext 467 ashokbhari72@gmail.com

Public Grievance Officer

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For Further Information, Contact

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हमारा उद्देश्य
OUR MOTIVE

पारदर्शिता को बढ़ावा देने के लिए
To Promote Transparency

जवाबदेही कोबढ़ावा देने के लिए
To Promote Accountability

सूचना का अधिकार अधिनियम, 2005 की घोषणा के अनुसरण में निम्नलिखित अधिकारियों को इस संस्थान में जनसूचना अधिकारी, सहायक जनसूचना अधिकारी और अपीलीय प्राधिकारी के रूप में नामित किया गया है ।

In Pursuance of the promulgation of Right to Information Act, 2005, the following Officers are designed as CPIO, Assistant CPIO and Appellate Authority at this Institute-

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