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ICAR-CIRCOT

2015-16
वार्षिक प्रतिवेदन
ANNUAL REPORT

Towards sustainability and inclusive growth in cotton sector.....

ISO 9001:2008

ICAR-CIRCOT

ANNUAL REPORT 2015 - 16

ICAR - CENTRAL INSTITUTE FOR RESEARCH ON COTTON TECHNOLOGY

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ICAR-CIRCOT Annual Report 2015-16

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PREFACE

Our country's cotton output was around 350 lakh bales in 2015-16, about 30 lakh bales down from last year, due to crop damage in the northern region caused by the white-fly attack. Still there is an available surplus over the estimated domestic consumption of 315 lakh bales. Weak demand and low man-made fibre prices are expected to weigh on world cotton prices in 2016-17. Strong competition from polyester continues to constrain global cotton demand. In such a scenario of falling profit margins, the growers need to look towards cotton by-products and other agro-wastes for livelihood security. Cotton stalk and other agro wastes can be utilised for making pellets and briquettes as an alternative to coal, firewood and cooking gas as well as for conversion into ethanol as an alternative to fossil fuel. This was emphasized by the Union Minister for Road Transport, Highways & Shipping Shri Nitin Gadkari while inaugurating the national seminar on value addition to cotton stalks and other agro-wastes for rural livelihood at Nagpur on June 6, 2015. He stressed upon utilizing technology, innovative thinking and fostering the spirit of entrepreneurship among the rural youth.

Advancement in agricultural technology is needed to convert waste into wealth that can provide additional remuneration to farmers. CIRCOT is continuously striving to apply the advanced tools such as nanotechnology for value addition to cotton by-products. The Institute has established unique facility, a nanocellulose pilot plant, which was inaugurated by Padma Vibhushan Dr. R. A. Mashelkar on August 21, 2015. The plant will also act as an incubation centre for entrepreneurs and as demonstration unit to stakeholders. Innovation-led growth in agriculture is essential for sustainability. Innovations in policy interventions, business models and technology creations and implementation are absolutely essential to achieve overall growth in agriculture.

The Institute is engaged in developing new technologies and refinement in already developed ones in the area of post-harvest processing of cotton. During the last year, research focus was directed on ginning and pre-ginning operations; mechanical processing, technical textiles and composites; characterization of natural fibres, yarns and textiles; chemical and biochemical processing; and entrepreneurship development. Double roller gin was studied for the effects of operating parameters on fibre quality attributes, lint productivity and energy consumption. It was learnt that blending of fibres and development of suitable finishes can improve the functionality of cotton textile materials in terms of hand feel, moisture management, thermal properties, anti-bacterial efficiency, UV blocking efficiency and crease recovery. Cotton quality database on the samples received from cotton breeders throughout the country has been generated. Spinning mills were surveyed for cotton contamination status. An eco-friendly process package has been developed for preparation of absorbent cotton using enzyme-based scouring and bleaching. An effluent treatment process has been identified based on the coagulation-flocculation method.

A technology assistance programme is being conducted in Cotton-4 countries (Benin, Burkina Faso, Mali and Chad) as well as Nigeria, Uganda & Malawi in Africa for providing development support to strengthen cotton value chain replicating India's initiatives in cotton productivity improvement, processing methods and skill development, on-farm practices and policies, post-harvest processing and value addition to benefit African countries.

The home textile industry in India is flourishing and India can become a dominant supplier of home textile products in future. Immediate action is necessary for quality improvement of long staple cotton to maintain our status as a prominent cotton producer. There is need for fundamental research in waste management, skill development, revival of the Indian eco label and formulation of Indian organic standard. Uniqueness of Indian products should be projected on a bigger scale.

The Institute conducts regular and specialised training programmes on cotton quality evaluation for farmers, personnel from cotton trade and industry. Ginning Training Centre, Nagpur conducts training courses for gin fitters and other workers in ginning industry. As many as twenty such training programmes were conducted during 2015-16.

To promote research and education in the sphere of cotton science and technology, the Institute has signed MoUs with a number of educational institutions. This enables not only carrying out joint research work but also create an opportunity to pursue postgraduate & doctoral degree programmes. There are seven Ph.D. students on roll with the Institute.

The Institute maintains liaison with different institutions including private organizations and entrepreneurs to meet their technological needs and also to generate revenue for the Institute. A total of twelve consultancies were undertaken during 2015-16 catering to the needs of various organisations.

The Institute took a small stride towards fulfilling the Govt of India's mission on enhanced energy efficiency by installing Light Emitting Diode (LED) lamps in new places and as replacements in corridors, laboratories, office rooms and meeting halls, thereby making true the slogan of 'Energy saved is energy generated'. In all, LED lamps of 1261W were installed at various places resulting into saving of 2301W as compared to the conventional mode.

Accredited by NABL and certified for ISO 9001:2008, CIRCOT is a unique referral laboratory in the country for testing cotton textiles with facilities for conducting over 160 different types of tests on textile materials and cotton by-products. During the current year, the revenue generation from testing, training, consultancy and other activities was ₹ 100.23 lakhs.

Mumbai
15 June 2016

P.G. Patil
Director

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कार्यकारी सारांश

भा.कृ.अनु.प.-के.क.प्रौ.अनु.सं. कपास के पश्च कटाई प्रक्रिया और कपास जैवमात्रा के मूल्य संवर्धन में उद्योग, किसान और अन्य भागकारकों को अनुसंधान, प्रशिक्षण, शिक्षा और प्रौद्योगिकी के व्यावसायिकरण से संबंधित विभिन्न गतिविधियों के माध्यम से तकनीकी समाधान देने के कार्य में जुडा एक प्रमुख अनुसंधान संस्थान है। वर्ष 2015-16 के दौरान यहाँ 22 अनुसंधान परियोजनाएं चल रही थी जिसमें ओटाई, कताई, गुणवत्ता मूल्यांकन और रासायनिक प्रक्रिया से लेकर नैनों प्रौद्योगिकी क्षेत्रों को लेकर थी। प्राकृतिक रेशों के अनुसंधान परियोजना में संस्थान ने भी अन्य संस्थानों के साथ मिलकर कार्य किया। इस अनुसंधान परियोजनाओं द्वारा कई प्रोद्योगिकियों को विकसित किया।

बहुआयामी इलेक्ट्रो कताई की संरचना कर विकसित किया जिससे नैनो रेशा चटाई का निर्माण किया। बहु पॅरेलल सुईयों की नई व्यवस्था से नैनो रेशों के उत्पादन में वृध्दि दिखाई दी।

संवेदक के रुप में इलेक्ट्रोस्पन रेशा चटाई के प्रयोग से फलों के पकने का पता लगाने के लिए एक नई तकनीक का विकास किया गया। रेशा चटाई के बक्से में, पैक रहने के बाद भी रंग परिवर्तन के आधार पर आम जैसे फलों के चयन के लिए उपभोक्ताओं और व्यापारियों को सुविधापूर्ण हो सकता है।

सूती वस्त्रों पर नैनो कणों के अनुप्रयोग से पराबैंगनी संरक्षक फॅक्टर और जीवाणुरोधी गुणधर्म और अग्नीरोधी सुधार कपडे पर देखे गये। जिंक ऑक्साईड आधारित संकरित नैनों कणों को बनाने की प्रक्रिया ने काम किया। प्रति दिन 10 किलो, नैनो सेल्युलोज बनाने में संयंत्र की क्षमता है और कपास लिंटरों से मायक्रोक्रिस्टलाईन सेल्युलोज से नॅनो सेल्युलोज के उत्पादन के लिए एक प्रोटोकॉल प्रक्रिया अनुकूलित की गई।

वस्त्र के अग्नीरोधी गुणधर्मो का परीक्षण करने के लिए एक युनिवर्सल अग्नीरोधी परिक्षण यंत्र की रचना कर उसे बनाया गया। खारे पानी का प्रयोग कर सूत को कम नमक से प्रतिक्रियाशिल रंजक द्वारा रंगने की प्रक्रिया को विकसित किया गया। इसमें एक तिहाई उत्सर्जक नमक की आवश्यकताओं को कम करता दिखाई दिया। एकरूपता के मामले में रंजन निष्पादन संतोषजनक पाया गया और पारंपारिक तरिके से रंगाई के समतुल्य पाया गया।

कपास चुनाई यंत्र से ओटाई के लिए एक प्रोसेस प्रोटोकॉल का विकास किया गया। पूर्व सफाई और सफाई यंत्रों की संख्या उनके परिचालन अनुक्रम में मिलकर कपास चुनाई यंत्र द्वारा उठाये गये कपास से कचरा कम करने के लिए अनुकूलित किया गया। कपास स्टीपर का प्रयोग कर फसल निकालते समय कपास को खेतों में ही साफ करने वाले यंत्र की संरचना की गई और बनाया गया। एक नये अध्ययन से यह पता चला है कि एंजाईम उपचार के माध्यम से केले के रेशे की सतह में बेहतर यांत्रिक गुण है जिसका मिश्रण सूत के साथ संभव है।

कपास / पी.एल.ए./ विस्कोस इन तीनों के मिश्रण से धागे और वस्त्र बनाने की विधी का विकास किया जिसका उपयोग विशेष तरह के वस्त्र जिससे उच्च किंमत वाले आरामदायी कमीज और टी शर्ट बनाने के लिए किया जा सकता है।

तिन से कम माक्रोनियर मूल्य के कपास में उसके वजन से 35 गुणा तेल को अवशोषित करने की क्षमता पाई गई। कपास डंठलों से नॅनो-लिग्नो सेल्युलोज बनाने की नई प्रक्रिया का विकास किया गया।

विकास की बौध्दिक संपदा अधिकार और व्यवसायिकरण की रक्षा के लिए प्रौद्योगिकी प्रबंधन काफी महत्वपूर्ण है। दो पेटंटों को इस वर्ष मंजूरी मिल चुकी है, जबकि दो नये पेटेंटदर्ज किये जा चुके है। बारह सलाहाकार सेवाएं प्रदान की जा चुकी है और प्रौद्योगिकी के व्यावसायीकरण के लिए ग्यारह संधियों पर हस्ताक्षर किये जा चुके है।

के.क.प्रौ.अनु.संस्थान का अंशशोधित कपास, वस्त्र परीक्षण उपकरण में मानक संदर्भ सामग्री के रूप में है, जो मूल्यवान यु.एस.डी.ए. स्टैंडर्ड की तरह आयातीत विकल्प है। पांच सौ चार अंशशोधित कपास के डिब्बों को तैयार किया गया और वर्ष के दौरान बेंचा गया, जिससे रू. 3,07,176/- राजस्व की प्राप्ती हुई।

मानव संसाधन विकास और वस्त्र उद्योग के लिए कुशल कारागीर बनाना और कपास जैवमात्रा के मूल्यसंवर्धन के माध्यम से किसानों को पारिश्रमिक में सुधार करने के लिए जानकारी देना काफी महत्वपूर्ण है। वर्ष के दौरान कौशल विकास कार्यकलापों में ओटाई कर्ता और उद्यमीयों के हितों के लिए ओटाई प्रौद्योगिकी और कपास गुणवत्ता मुल्यांकन पर कई प्रशिक्षण कार्यक्रम, कपास प्रजनकों, वैज्ञानिकों, विद्यार्थियों, उद्योगी और उद्यमियों के लिए अवशोषक कपास प्रौद्योगिकी और नॅनों प्रौद्योगिकी के अनुप्रयोग से उन्नति पर प्रशिक्षण दिये गये। वर्ष के दौरान कपास उपउत्पादों और जैवमात्रा से मूल्य संवर्धन के लिए किण्वन प्रौद्योगिकी पर एक लघु अवधी प्रशिक्षण दिया गया।

संस्थान ने भारत मे ही नही बल्कि अफ्रीका जैसे विकसनशिल देशों में भी कौशल विकास कार्यक्रमों का आयोजन किया। कपास तकनीकी सहकार्य कार्यक्रम को चार-सी देशों (बेनिन, बुरकिन फासो, माली और चाड), नायजेरिया, युगांडा और मालावी को विकास सहायता देने के लिए कार्यन्वित किया गया। इसी के एक भाग के रुप में, कपास पश्च कटाई प्रबंधन और मूल्यवर्धित फसल अवशेष पर एक प्रशिक्षण कार्यक्रम मोनडोव, चाड में आयोजित किया।

वर्ष के दौरान चालिस अनुसंधान शोधपत्र प्रकाशित हुए, प्रतिमाह ई न्युजलेटर प्रकाशित हो रहे है। वर्ष के दौरान संस्थान ने सात प्रदर्शनीयों में भाग लिया और पांच जागरूकता कार्यक्रमों का आयोजन किया।

संस्थान ने मेरा गाँव मेरा गौरव, स्वच्छ भारत अभियान, जय किसान जय विज्ञान एवं उर्जा बचत कार्यक्रमों में हिस्सा लिया।

वर्ष 2014-15 के लिए रिजल्टस फ्रेमवर्क डॉक्युमेन्ट (आर.एफ.डी.) में संस्थान को 97.94% स्कोर के साथ "उत्तमता" की श्रेणी में नवाजा गया।

संस्थान ने भा.कृ.अनु.प. पश्चिम खेलकुद प्रतियोगिता 2015 में चार स्वर्ण और पांच रजत पदक हासिल किये। वर्ष 2016 के आंतर संस्थान खेलकुद प्रतियोगिता में कॅरम में जीत हासिल की और टेबल टेनिस दोहरे में द्वितीय रहे।

डा.एन. विघ्नेश्वरन, वरिष्ठ वैज्ञानिक को भा.कृ.अनु.प. के प्रतिनिधि के रूप में आंतर मिनिस्ट्रीयल ऑफीशियल वर्किंग ग्रुप (आय.एफ.ओ.डब्ल्यु.जी.) डी.एस.टी. के नॅनो मिशन, नॅनो विज्ञान और प्रौद्योगिकी के राष्ट्रीय मिशनमें चुना गया।

श्रीमती के.आर. जोशी, वरिष्ठ तकनीकी अधिकारी, राजभाषा कक्ष को मुंबई में आशिर्वाद राजभाषा सम्मान से नवाजा गया।

संस्थान ने वर्ष 2015-16 के स्वीकृत बजट प्लॅन रू. 425.25/- लाख से 99.98% राशी का उपयोग किया और रू. 100.23 लाख राजस्व अर्जित किया।

EXECUTIVE SUMMARY

ICAR-CIRCOT, a premier research institute in post-harvest processing of cotton and value addition to cotton biomass, is actively engaged in generating technological solutions to industry, farmers and other stake holders through various activities related to research, training, education and technology commercialisation. During 2015-16, there were 22 research projects in diverse areas right from ginning, spinning, quality evaluation and chemical processing to nanotechnology. The Institute also participated along with other institutes in a consortia research project on natural fibres. A number of technologies were developed through these research projects.

A multi-phase electro-spinning setup was designed and developed for producing uniform nanofibre mat. The new arrangement of multiple parallel needles ensures increased production of nanofibres. A new technique has been developed to detect ripening of fruits using electrospun fibre mat as a sensor. This would facilitate an assessment of ripening of fruits like mangoes depending on the colour change in the fibre mat while still packed in the boxes.

Application of nanoparticles onto cotton fabric is found to improve the UV protection, antibacterial property and flame retardability of the fabric. A process for preparation of zinc oxide-based hybrid nanoparticles has been worked out. A nanocellulose pilot plant having a production capacity of 10 kg per day was established and a process protocol for production of nanocellulose from microcrystalline cellulose derived from cotton linters was optimized.

A prototype of the universal flammability testing machine was designed and fabricated for testing the flammability characteristics of fabrics. A low-salt dyeing process for cotton using saline water has been developed for dyeing cotton with reactive dyes. This reduces the requirement of salt for exhaustion by about one third. The dying performance in terms of uniformity was found to be satisfactory and comparable with conventional dyeing.

A process protocol was developed for ginning of machine-picked cotton. Pre-cleaning system consisting of the number of cleaning machines and their operational sequence was optimized to bring down the trash content of machine-picked cotton. An onboard cleaner has been designed and developed for on-field cleaning of cotton harvested using cotton stripper.

A new study has revealed that it is possible to make composites having better mechanical properties from banana fibres by surface modification through enzyme treatment. Cotton/PLA/Viscose tri-blended yarns and fabrics were developed, that can be used for making speciality fabrics suitable for high value shirts and T-shirts possessing enhanced wear comfort. Cottons with micronaire value below 3 were found to have good sorbent properties capable of absorbing oil up to 35 times its weight. A novel process has been developed for preparation of nano-lignocellulose from cotton stalk.

Technology management is as important as its development to protect intellectual property rights and commercialisation. Two patents were granted during this year, while two new patents were filed. Also during the year, twelve consultancies were undertaken and eleven MoUs signed for commercialization of technologies.

CIRCOT calibration cotton, a standard reference material for calibrating textile testing equipment, is an import substitute for costly USDA standards. Five hundred and four containers of calibration cotton were produced and sold during the year generating a revenue of ₹ 3, 07,176/-.

Human resource development is very important to provide skilled man power to the ginning and textile industry and impart knowledge to farmers so as to improve their remuneration through value addition to cotton biomass. Skill development activities during the year included a number of training programmes on ginning technology and cotton quality evaluation for the benefit of ginners, farmers and traders; specialized training programmes were organised on absorbent cotton technology and advances in applications of nanotechnology for cotton breeders, scientists, students, industries and entrepreneurs. A short course on fermentation technology for value-addition to cotton by-products and biomass was also organized during the year.

The Institute conducts skill development programmes not only in India but also in other developing countries like Africa. Cotton technical assistance programme is being implemented for providing development support to C-4 countries (Benin, Burkina Faso, Mali and Chad), Nigeria, Uganda and Malawi. As part of this, a training programme on post-harvest management and value addition to crop residue was organised at Mondou, Chad.

Forty research papers and 10 book chapters were published during the year. E-newsletter is being published by the Institute every month. Institute organised four and participated in seven exhibitions and conducted five awareness programmes during the year. Scientists also participated in various seminars, conferences and workshops.

As part of the *Make in India* programme a nanocellulose pilot plant was established for the production of nanocellulose from cotton linters and other lignocellulosic raw materials with a production capacity of 10 kg/day. Nanocellulose finds application in virus filtration, as stabilizers, LCD, non-caloric food thickeners, etc. in different type of industries. Further, under the same programme an Agri-business Incubation Centre (ABI) has also been established for transferring the technologies developed by the institute to the stakeholders by providing incubation facilities at the institute.

Swachh Bharat Abhiyan, the Clean India Mission launched by the Government was carried out with a lot of zeal and enthusiasm in the Institute during the year. Every employee of the institute contributed the mandatory 100 hours for the various cleanliness activities in the institute premises and its surroundings totalling for around 6000 man hours during the year.

Mera Gaon Mera Gaurav (MGMG) programme, which has been conceptualized to promote direct interface of scientists with farmers and to hasten the process of transferring the institute technologies, was implemented in 30 villages of Wardha district. Six teams of scientists for groups of five villages each were formed and various outreach activities were conducted for the benefit of the farmers.

A number of weeks like *Jai Kisan Jai Vigyan*, vigilance awareness, communal harmony and a number of national and international days like yoga day were observed at the institute.

The institute won four gold and five silver medals at the ICAR West Zone Sports Tournament 2015. At the Inter Zonal Sports Tournament 2016, the institute won in carom and came runner-up in Table Tennis Doubles. Dr. N. Vigneshwaran, Senior Scientist was nominated as the ICAR representative for the Inter Ministerial Officials Working Group (IMOWG) of DST's Nano Mission, The National Mission on Nano Science and Technology. Smt. K. R. Joshi, Senior Technical Officer, official language cell was awarded Ashirwaad Rajbhasha award during the 24th award function at Mumbai.

A number of infrastructural facilities were created during the year like upgradation of conference hall, library and scientific equipment. On the front of energy saving, normal tube lights were replaced with energy saving LED bulbs.

The Institute was rated "Excellent" with the score of 97.94% in the Results Framework Document (RFD) for the year 2014-15. The Institute ensured near complete (99.98%) utilization of the sanctioned plan budget allocation of ₹425.25 lakhs for year 2015-16 and generated a revenue of ₹ 100.23 lakhs.

1. INTRODUCTION

Since its inception way back in 1924 as Cotton Technological Research Laboratory (CTRL) under the aegis of the then Indian Central Cotton Committee (ICCC) and later under the Indian Council of Agricultural Research (ICAR), ICAR-CIRCOT has immensely contributed to the progress of post-harvest processing of cotton. The Institute has been contributing significantly to the ginning sector in the country by way of providing technological support and skilled manpower. The development of ginning machinery and material handling systems has not only helped to make the country self-reliant in modern machinery but also export it to Afro-Asian countries. Many novel machines and products, blended textiles - cotton with ramie, rubber composites for flexi check dam, miniature spinning system and village level sliver making machine, to name a few, have been developed and successfully commercialised. The Institute has played a major role as technology partner in the country's cotton breeding programme to suit industry needs.

CIRCOT calibration cotton is an import substitute for USDA reference material essential for calibration of testing instruments. Eco-friendly textile processing technologies like single stage processing, natural dyeing and Plasma treatment have been developed. Pioneering work is being carried out in the area of nanotechnology for imparting functional finishes to textile materials like anti-bacterial, UV protection, self-cleaning, hydrophobic and flame retardancy. Cotton stalk has been converted into value added products like particle boards, briquettes and pellets. Composting and degossypolization of cottonseed meal for use as feed for non-ruminants are also worth mentioning. A collaborative project with Common Fund for Commodities has amply demonstrated how income of cotton farmers can be enhanced through cotton value chain. Cotton Technology Assistance Programme (Cotton TAP) is being implemented to strengthen cotton value chain in African countries namely Cotton-4 Countries (Benin, Burkina Faso, Chad and Mali), Malawi, Nigeria and Uganda.

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

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

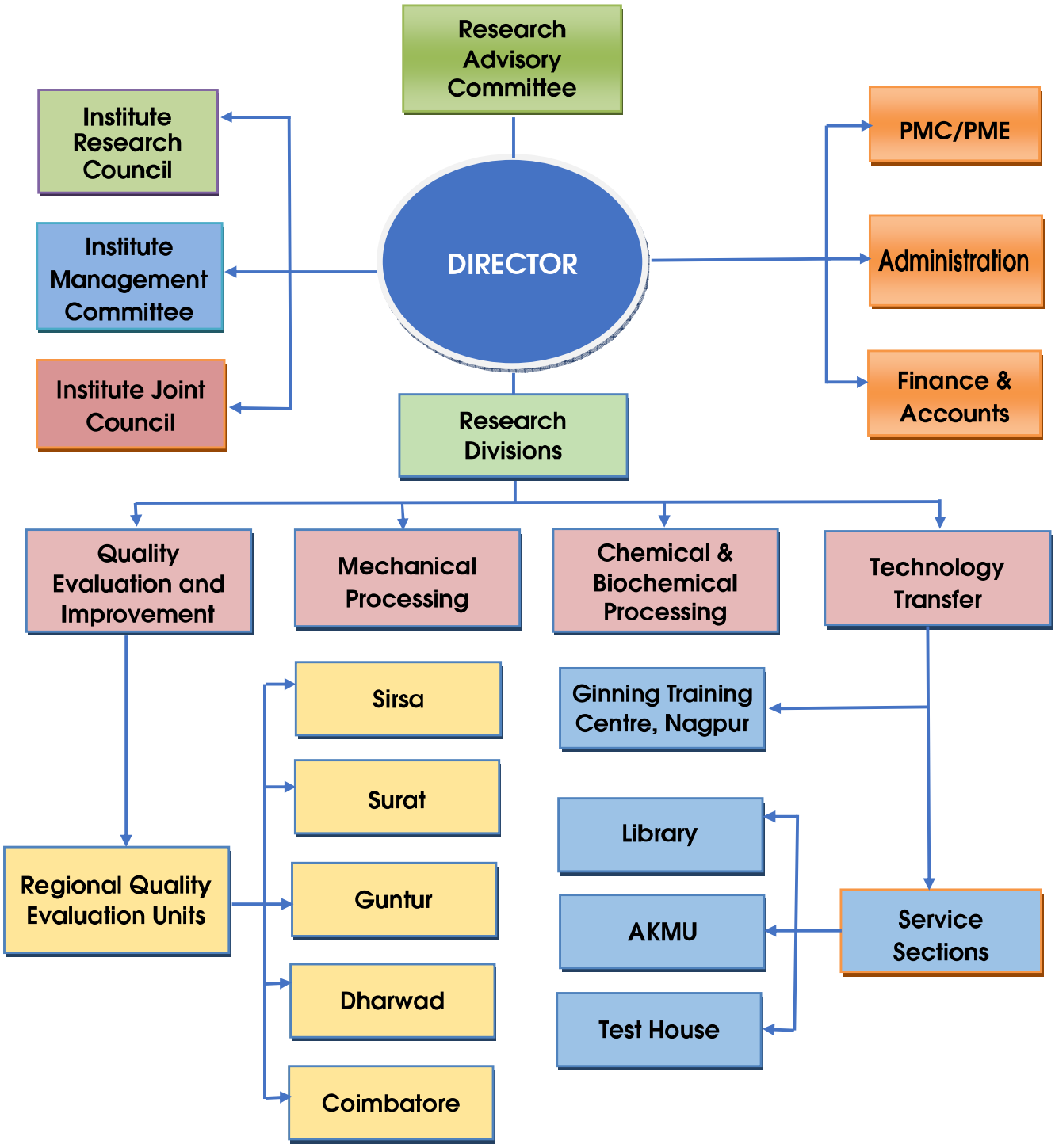

Fig. 1.1 Organogram of ICAR-CIRCOT

Organization

The organization is headed by the Director who is assisted by the Institute Management Committee (IMC), Research Advisory Committee (RAC), Institute Research Council (IRC), Institute Joint Council (IJC) and Grievance Committee. Administration and Finance & Accounts sections deal with the administration of the human resource and the finance and audit of the institute. There are a number of service sections like Library, Agricultural Knowledge Management Unit and Test House to facilitate the information services, maintaining research databank, testing and other activities.

Research, Consultancy, Training, Testing and Technology Transfer activities are facilitated and monitored through four research divisions: Quality Evaluation and Improvement Division, Mechanical Processing Division, Chemical & Biochemical Processing Division and Technology Transfer Division (Fig. 1.1).

Research programmes are categorised under five broad core areas as :

(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 and by-product utilization
(v) Entrepreneurship and human resource development.

With headquarters at Mumbai, the Institute has six regional units located at Nagpur, Coimbatore, Sirsa, Surat, Guntur and Dharwad.

Utilisation of funds, revenue generation and staff position as on March 31, 2016 are presented in Fig. 1.2, Table 1.1 and Table 1.2 respectively.

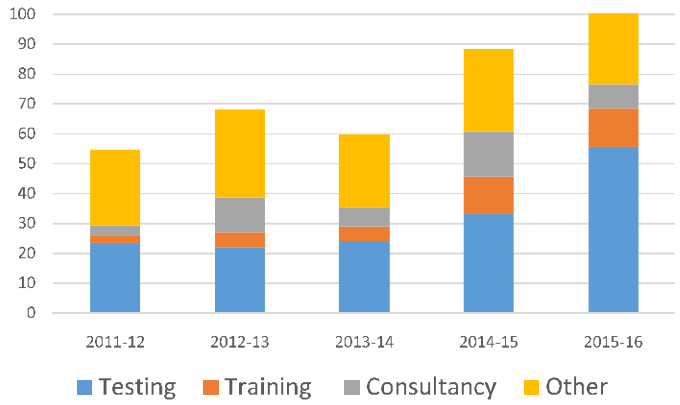

Fig. 1.2 Revenue generation (in ₹ Lakhs)

Table 1.1 Staff position (as on 31-03-2016)

Category	Sanctioned	In Position	Vacancy
Scientific	50	25	25
Technical	112	72	40
Administrative	47	29	18
Supporting	57	41	16
Total	266	167	99

Table 1.2 Funds Utilisation during the year 2015-16

₹ Lakhs

SUB HEAD	NON PLAN		PLAN	
	RE	Expenditure	RE	Expenditure
CAPITAL EXPENDITURE				
Residential Building			**103.00**	**102.96**
Equipment	3.12	3.10	16.23	16.23
Information Technology			6.41	6.41
Library Books and Journals			1.01	1.01
Furniture & fixtures	5.88	5.87	26.90	26.90
REVENUE EXPENDITURE				
Establishment Charges	1256.00	1256.00		
Overtime Allowance	0.25	0.17		
Pension & other Retirement Benefits	1394.00	1394.00		
Travelling Allowances	4.00	4.00	9.87	9.86
Research Expenses			7.99	7.99
Infrastructure	60.10	60.10	77.87	77.87
Communication	7.32	7.32		
Repair & Maintenance	50.34	50.32	124.94	124.93
HRD Domestic			2.92	2.91
Tribal Sub-Plan				
Loans & Advances	3.78	3.78		
Other	131.22	131.21	48.11	48.10
TOTAL	**2916.01**	**2915.87**	**425.25**	**425.17**

2. SALIENT RESEARCH ACHIEVEMENTS

2.1 PRE-GINNING AND GINNING

2.1.1 Fibre-seed attachment force

Cotton varieties differ in how strongly fibres are attached to seed. Cotton varieties with reduced fibre-seed attachment force have the potential for faster ginning with less energy and less fibre and seed damage. Gin stand energy consumption differs among varieties with differences presumably related to fibre-seed attachment force. A study was conducted to determine fibre-seed attachment for Indian cotton varieties.

Fibre-seed attachment force was measured with a pendulum-type SDL2 tester. The force was measured for single locule tufts of fibre on each side of the seed, oriented towards the chalazel (rounded) end of the seed, micropyle (pointed) end of the seed, and for middle portion. The instrument was calibrated for determining attachment force in terms of energy in J/g of fibre.The pendulum swing angle was measured after shearing of the fibres. The energy required to shear the fiber bundle from the seed was determined from the calibration curve. Eight varieties belonging to different staple length groups viz. Extra-Long (2), Long (3) and Short (3) were selected for the study. Three replications were taken for each of the variety and for each end i.e. Chalazal, Micropyle and Middle portion of each locule (Table 2.1). The tuft weight after trimming to uniform length was measured.

Fibre-seed attachment force was higher in case of extra-long staple cotton as compared to long and short staple cotton. The variety "Assam Comilla" had the least and "Suvin" had the highest seed attachment force among the varieties tested. Fibre seed attachment force was found to be more at Micropyle end followed by Chalazal and Middle portion of seed for all long staple and short staple cotton, however no such trend was seen in case of extra-long staple cotton.

2.1.2 Effects of moisture content and machine parameters

The effects of moisture content and machine settings on fibre quality attributes, lint productivity, energy consumption and other electrical parameters for DR gin, 1.37m (54") roller length were assessed. The moisture content was varied from 4-20% while the clearance was kept as 1.0, 1.2 and 1.4 mm for each moisture content. The results were compared based on lint productivity, energy consumption and fibre attributes.

DR gin gave maximum lint productivity of 84 kg/h at 8% moisture content for 1.2 mm clearance. The lint productivity reduced with both increase and decrease in moisture content. The reduction in lint productivity was within 5-10% range for 6-10% moisture level, however, it reduced exponentially for moisture content beyond 10%. Lint productivity reduced by over 75% for 20% moisture content. Though there was no significant variation in micronaire values and strength parameters with increase in moisture content over 8%, it lead to significant reduction in colour grade and increase in seed cuts and seed coat neps. However, ginning of cotton at higher moisture content yielded higher fibre length, possibly due to increase in fibre strength at elevated moisture content. Moreover, the fibre properties of the lint produced at 1.0 and 1.4 mm clearances were not statistically different from those at 1.2 mm clearance.

Energy consumption per unit lint production was found to be the lowest near 8% moisture level, however, it increased to maximum at 20% moisture content. It may be concluded that the optimum settings for DR gin are 8% moisture content, 1.2 mm clearance, 1/3rd of the staple length for cut off and 85 mm as fixed knife position. The forces on connecting rod, head pin and wrist pin were also calculated and failure analysis of wrist pin was done using Ansys software. The force acting on connecting rod was found to be 12251N while the force on head pin was found to be 12500 N. The resultant force on wrist pin was found to be 14200 N.

Table 2.1 Fibre-Seed attachment force (J/g) of some Indian cotton varieties

Staple	Variety	Parameter	Chalazal	Micropyle	Middle
Long	Ankur-651	Mean	3572	3663	2529
		STD	270	163	93
		CV	0.07	0.04	0.03
		Overall mean	3255		
	Mallika	Mean	3560	3921	2581
		STD	373	422	822
		CV	0.10	0.10	0.31
		Overall mean	3297		
	First Class	Mean	2272	3925	3182
		STD	604	227	869
		CV	0.26	0.05	0.27
		Overall mean	3216		
Extra Long	Suvin	Average	4830	5763	2851
		STD	1096	768	495
		CV	0.22	0.13	0.17
		Overall mean	4482		
	DCH-32	Mean	2766	4845	3464
		STD	479	782	442
		CV	0.22	0.13	0.12
		Overall mean	3692		
Short	Assam Comilla	Mean	1397	1719	1137
		STD	436	522	110
		CV	0.31	0.30	0.09
		Overall mean	1418		
	HD- 123	Mean	3494	4535	3018
		STD	430	774	678
		CV	0.12	0.17	0.22
		Overall mean	3682		
	G Cot-15	Average	3449	4727	1546
		STD	819	1074	68
		CV	0.23	0.22	0.04
		Overall mean	3241		

2.2 MECHANICAL PROCESSING: TECHNICAL TEXTILES AND COMPOSITES

2.2.1(a) Three component blended yarns and fabrics

The objective of this project is to improve the functionality of cotton textile materials by blending cotton with other functional fibres and by development of suitable finishes. The improvement in blended fabric properties in terms of feel, moisture management, thermal properties, anti-bacterial efficiency, UV-blocking efficiency, crease recovery, etc. are being studied in detail through execution of series of experiments.

Blended yarns of 40s Ne were produced using cotton, bamboo-viscose and Poly (lactic acid) fibres. The 2.5% span length of cotton fibre was 30 mm and fineness value was 3.3 Mic. The staple length of bamboo and PLA fibres was 38 mm with a fineness of 1.4D. Four different blend ratios were

produced, namely, 60/20/20 and 40/30/30, 50/30/20 and 50/20/30 of cotton/PLA/bamboo (viscose) fibres respectively. The fibres were blended in the blow room and taken through the processes of carding, drawing, roving and spun to 40s Ne yarn by using a compact ring spinning system with a TM of 4.0. The yarns were knitted into a 110 GSM single jersey structure. The grey fabrics were then scoured and bleached. As PLA is sensitive to alkali, single step combined scouring and bleaching methods were tried to reduce both the process time and the exposure to alkali. All the samples were dyed to blue colour using 0.3% and 3% shade on weight of fabric (owf) using a disperse-reactive dye system in two bath method, as was standardized earlier for PLA-cotton blends. The PLA part was first dyed with disperse dye (Dianix navy blue XF) and the cellulosic part was then dyed using a reactive dye (Procion navy blue HEXL). The dyeing was found to be uniform, and it produced evenly dyed textile (Fig. 2.1). The bleached white fabrics were tested for functional properties like hand-feel, moisture management, thermal insulation, air permeability etc.

Fig. 2.1 Three component blended fabrics

2.2.1(b) Improvement in fabric hand

It was found that the addition of PLA and bamboo (viscose) fibres contributes to the improved handle of the blended fabric. The PLA fibres contribute to the smoothness of the fabrics and the bamboo (viscose) fibres to both smoothness and softness.

The smoothness of the fabrics was found to increase by 35-58%, depending on the blend proportion and the softness by 11-19% compared to those obtained for 100% cotton (Fig. 2.2). This type of specialty fabric is suitable for making high value shirts and T-shirts that can provide enhanced comfort to the wearer.

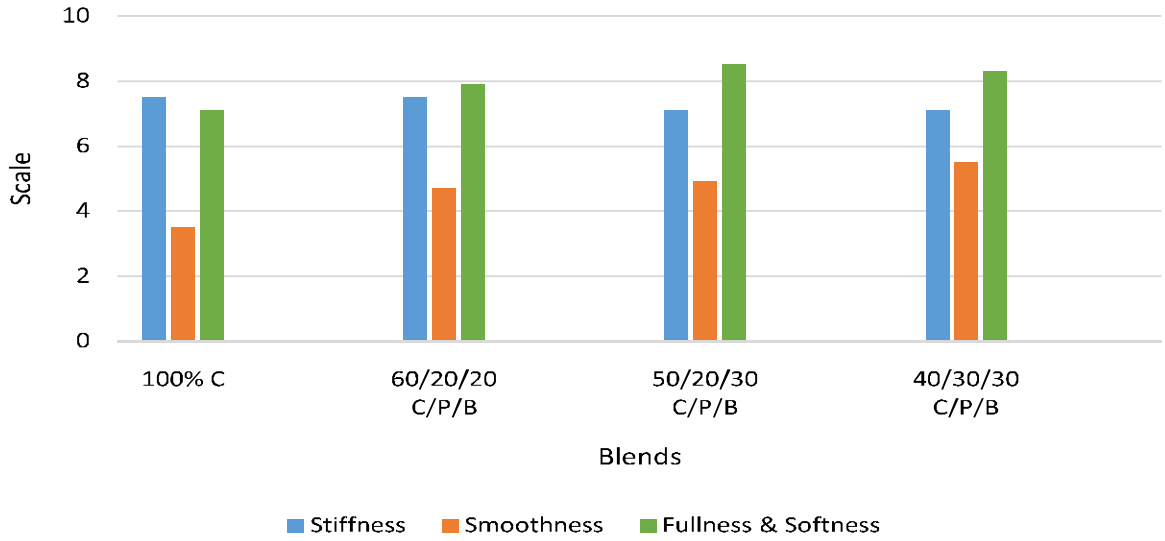

Fig. 2.2 Primary hand values of cotton/PLA/bamboo fabrics

2.2.1(c) Improvement in UV protection and antibacterial properties

In the production of cotton/bamboo (viscose) blended yarns, the blend proportions of 65/35, 50/50 and 80/20 were spun to 30s Ne by using the compact spinning technology. The yarns are next being converted into fabrics by weaving. A trial was carried out for functional finishing of cotton/bamboo (65/35) fabric using nano Zinc Oxide (ZnO) to impart UV protective and antibacterial functionalities. In-situ synthesis of nano zinc oxide particles by using wet chemical method was attempted as this method imparts better finish durability. The Ultraviolet protection factor (UPF) of treated fabric was > 40 and the treated fabric showed 100% antibacterial activity against *Klebsiella pneumonia* and *Staphylococcus aureus* after machine washing.

2.2.1(d) Cotton/Bamboo (viscose) nonwovens

For the first time at CIRCOT, a trial was taken on the production of needle-punched nonwovens from cotton/bamboo (viscose) fibres. The raw cotton fibres were mixed with bamboo (viscose) fibres in two different proportions namely, 80/20 and 60/40 and needle punched on a DILO needle loom. Fabrics of varying GSM and thickness levels were produced. Further trials are currently in progress to develop "absorbent wipes" for health and hygiene applications.

2.3 CHARACTERISATION OF NATURAL FIBRES, YARNS AND TEXTILES

2.3.1 Quality assessment of Indian cottons

A database on quality parameters has been generated on the cotton samples received from breeders throughout the country as part of the AICRP zonal (North, Central and South) and national trials. In all, technological data on 3469 samples have been reported of which 2555 samples belong to national trials while 878 cotton samples correspond to zonal Trials. Thirty Six agronomy trial samples were received. Out of the zonal trials, 150 cotton samples belong to north, 423 to central and 305 to south zone. Apart from samples analysed for different stages of trials undertaken in different zones of the country, the quality parameters of varieties recommended for release by the Central Variety Identification Committee were also assessed (Table 2.2).

Table 2.2 Quality parameters of cotton varieties

Cultivar	Species	Institution	SL (mm)	UR	Mic	Str. (g/tex)	E%	Count
TSH 0250	*G.hirsutum*	TNAU, Srivilliputhur	31.2	47	3.8	23.1	6.1	50-60s
Swadeshi 651	*G.arb x G.arb*	Ankur Seeds	29.3	49	3.7	21.6	6.8	40-50s
NACH 18	*G.arb x G.arb*	Nirmal Seeds	25.5	52	5.8	19.2	7.0	16-20s
RHCb 011	*G.barbadense*	MPKV, Rahuri	33.2	48	3.8	26.5	6.7	80-100s
RHH 0717	*G.hirsutum*	MPKV, Rahuri	26.3	50	4.2	21.6	7.0	30-40s
H 1353	*G.hirsutum*	CCSHAU, Hisar	24.3	51	5.1	17.0	6.1	16-20s
F 2228	*G.hirsutum*	PAU, RRS, Fridkot	29.1	51	3.7	21.6	6.6	40-50s
AKA 2005-3	*G.arboreum*	PDKV, Akola	25.6	49	5.5	19.6	7.0	16-20s
DHB 1071	*G.hir x G.bar*	UAS, Dharwad	35.1	47	3.5	27.2	6.4	80-100s
LD 949	*G.arboreum*	PAU, Ludhiana	20.5	53	6.1	16.4	7.0	Absorbent cotton
SCS 793	*G.hirsutum*	UAS, Raichur	29.0	49	4.0	27.2	5.5	60-100s

In 2014-15 season, 36 agronomy trial samples were received, most of which fell in medium and long length category in tandem with cotton production and its consumption by mills. Strength-wise categorization data showed that majority of samples produced fall under 'Average' category, making it pertinent to look into the matter critically. Similarly when samples were categorized by their micronaire value, most of the values were under fine and average categories, whereas there were very minimal number of samples under very fine and coarse categories as shown in Fig. 2.3.

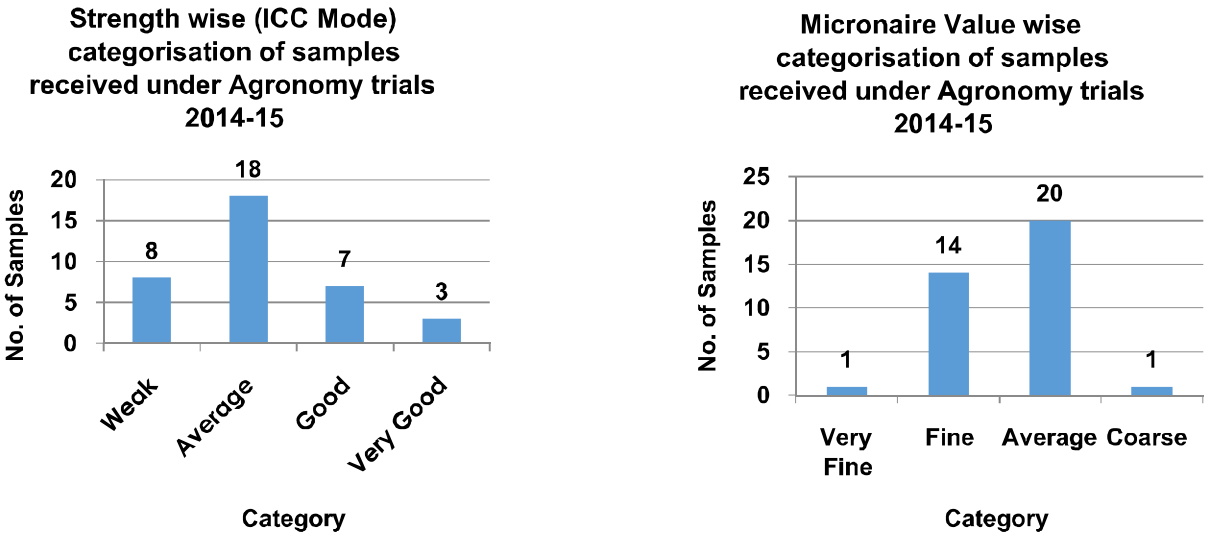

Fig. 2.3 Strength-wise and Micronaire-wise categorization of sample

2.3.2 Contamination in Indian Cotton

Information on the contamination status of cotton was collected from the spinning mills in Kolhapur and Coimbatore regions. Major cotton varieties processed in these regions include Shankar-6, Bunny, MECH, S-4, MCU-5, H-4, DCH-32, RCH, besides imported cottons from Mali and Mamboo, Ivory Coast. Cotton was procured from Gujarat, Karnataka, Madhya Pradesh, Maharashtra, Andhra Pradesh, Telangana and Tamil Nadu.

The mills are well aware of the importance of the contamination and its removal. They are predominantly using the VETAL scanner along with manual assistance for removing contamination in cotton bales. The major contaminants include white polypropylene, grease and colour marks, cloth bits, jute, metal parts, leaf bits, etc. as shown in Fig. 2.4. Plastic films were found to be a serious contaminant, while organic contaminants were insignificant. Overall status of cotton was graded as "insignificant to moderately contaminated", by these mills.

Fig. 2.4 Contaminants in Indian cotton (polypropylene, cloth bits, etc.)

2.3.3 Device for lint opening

A thorough opening of cotton lint is necessary prior to measurement of fineness by using a micronaire device. If lint samples are tested as such in the condition in which received without any sample opening and cleaning, there is every possibility of variations in the micronaire reading from the actual value. However, for increasing the speed of testing, the tendency among machine operators is to test samples as received without any further opening leading to considerably higher micronaire values. Opening of test samples removes bigger trash particles and allows proper air flow and accurate surface area measurement. Unopened samples reduce the actual surface exposed to air and offer less resistance to air flow thereby giving increased Mic readings, which are misleading. Hence proper opening of samples is very important before introducing them into the porosity chamber for micronaire measurement. Otherwise, not only erratic Mic values, but also erratic strength values can result.

Presently, many HVI testing laboratories employ trash analyser for lint opening. Some laboratories follow the method of hand opening. The extent of lint opening is not uniform and optimum in these methods and also the speed is very slow. In view of this, a project has been taken up to design and develop a device for opening of lint samples for micronaire testing. Various sub-assemblies and components of the lint opener have been designed and engineering drawings prepared using AutoCAD software (Fig. 2.5). MoU has been signed with M/s Precision Tooling Engineers, Nagpur for fabrication of the lint opener.

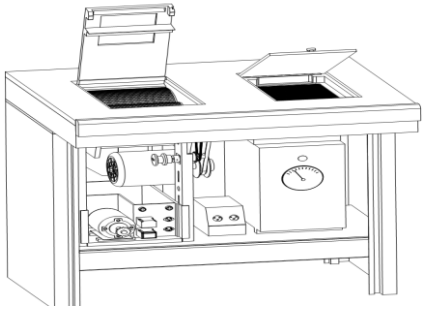

Fig. 2.5 Schematic diagram of the lint opener

2.4 CHEMICAL AND BIOCHEMICAL PROCESSING, BIOMASS AND BYPRODUCTS UTILISATION

2.4.1(a) Preparation of absorbent cotton by using a novel process

A process package has been developed for preparation of absorbent cotton using enzyme-based scouring and bleaching treatment. Absorbent cotton produced by using enzymes was compared with the conventionally produced in terms of carboxyl content, oxycellulose and relative crystallinity index using methylene blue absorption method and FTIR. The analysis showed that the formation of oxycellulose was lesser in enzymatic process compared to conventional treatment. The change in proportion of crystalline and amorphous regions was lesser in enzyme treated fibres. The developed process is eco-friendly with savings in energy, time and water along with minimum physical and chemical alterations in the fibre.

2.4.1(b) Effluent treatment process for absorbent cotton

An effluent treatment process has been identified based on the coagulation-flocculation method using alum and polyelectrolytes. By using this process, the turbidity of effluent from conventional and enzyme used processes has been reduced by 65 and 72% respectively. An activated sludge process was developed by which the COD of effluent coming out of absorbent cotton preparation process was reduced by about 50%. A process protocol was developed to reuse a part of the effluent. Absorbent cotton prepared from the reused water showed similar whiteness and absorbent values in comparison with that prepared using normal water.

2.4.2 NanoTechnology for Functional Finishing of Cotton Textiles

2.4.2 (a) Nano ZnO suspension for finishing

Beer-Lambert's law was used to find the exhaustion percentage of nano ZnO. The λ_{max} of the nano ZnO was determined using UV-visible spectrum (373nm) and standard aqueous dispersion of nano ZnO from 10-70 ppm concentrations were prepared

and absorbencies recorded. The calibration curve showed the absorbance as a function of concentration. The equation was validated by determining the known concentration of ZnO and accuracy level was found to be ± 5 ppm. The percentage of nano-ZnO picked up by the fabric was calculated from the standard OD curve obtained from standard nano-ZnO suspension.

2.4.2 (b) Surface energy of ZnO treated cotton fabric

The Owens, Wendt, Rabel and Kaelble method was used for calculating the surface free energy of cotton from the contact angle of water and di-iodo methane. The surface tension of the used solvent was 72.36 mN/m for water and 49.09 mN/m for di iodo methane. Only with ZnO treatment (2% OWM), the surface energy of cotton fabric was unaffected. However, with the use of binder the surface energy reduced significantly.

2.4.2 (c) In-situ synthesis of nano ZnO on cotton fabric

Woven cotton fabric was first treated with zinc nitrate solution and then dried at room temperature. After drying, the sample was treated with NaOH solution for 30 min and washed with water to maintain neutral pH. All the fabrics showed significant improvement in UPF value in comparison to control. The fabric which was treated for 20 min in zinc nitrate solution turned out to be the best in terms of UPF value.

2.4.2 (d) Synthesis of hybrid nanoparticles

Carboxy Methyl Cellulose (CMC) is a known natural polymer based anti-soiling agent and is used in many detergent formulations. In previous method, soluble starch was used as a protective colloid. In this process, 1% soluble starch was replaced by 0.1% sodium salt of CMC. Particle size 900 nm was confirmed using DLS particle size analysis. Formation of ZnO was confirmed by FTIR analysis.

2.4.2 (e) Plasma technology for denim fading

The desized denim fabric was pretreated with hydrogen peroxide, potassium permanganate and hypochlorite. The control as well as pretreated fabrics were exposed with Helium (600) and Air (400) plasma for 4 min and their absorbency and colour fading were observed. Absorbency increased in all the samples including grey fabric. Fading of colour increased in the order as-Grey<Desized<Peroxide treated < $KMnO_4$ treated.

2.4.3 Innovative finishing processes for cotton garments

2.4.3 (a) Mosquito repellent finishing of cotton textiles

In a study to impart functional finishes for cotton fabrics, three essential oils namely lemon grass, geranium and eucalyptus have been identified for mosquito repellent finishing of cotton textiles. Complex coacervation method has been used to prepare microcapsules using gelatin and gum arabic as wall materials and essential oil as a core material. Different process parameters like temperature, concentration, time, etc. were optimized. BTCA was used as hardening agent in place of formaldehyde. The prepared microcapsules were examined in light microscope and the size of the capsules was determined. The size of the particle was in the range of 5 to 20 µm. These microcapsules were then applied on to the cotton fabric by using different methods like direct, pad-dry, pad-dry-cure. The fabric was evaluated subjectively for the presence of the essential oil in terms of sensible odour intensity. The results showed that pad-dry and pad- dry-cure applied fabric retained the sensible odour up to two cycles of washes.

2.4.3 (b) Photo oxidation of indigo dyed denim

Photo oxidation of indigo dyed denim was attempted by two methods- Treating the garments with nano TiO_2 followed by exposure to UV light; and synthesis of Mn-C-TiO_2 nanoparticles considered as visible light active photo catalyst and its application.

Mn-C-TiO_2 was prepared by sol gel method under mild reaction condition as follows. A nonionic surfactant Tween 80 (T80, polyoxythylene sorbitan monooleate) was used as pore directing agent

and carbon source in sol gel method. 5 ml Tween 80 (5ml) and Manganese Acetate (3ml) were dissolved in Isopropyl Alcohol (20ml) and then Titanium Tetra Iso Propoxide (3ml) was added very slowly under vigorous stirring. After the complete addition, Acetic Acid (3ml) was added into the solution for the formation of water in the mixture to initiate the controlled hydrolysis of TTIP. The sol-gel was aged at 65°C for 24 h. To synthesize the particle the sol was dried at room temperature for 3 h and then calcined at 400°C for 3 h. The particle size of the synthesized photo catalyst was 330 ± 23.05 nm. The photo oxidative property of Mn-C-TiO_2 nanoparticle for degradation or fading of indigo dye is being investigated.

2.4.4 Non-metameric colour matching in textile

Cotton (100%) fabric of plain weave design with yarn of 20s Ne at both warp and weft was chosen for dyeing. The fabric has GSM of 300. Physical properties of RFD cotton fabrics were analyzed and also absorbency of fabrics tested to ensure uniform dyeing. Twelve different Reactive dyes were used to dye the cotton fabric to obtain self-shades of various concentrations (0.1, 0.3, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5 and 4.0). Their reflectance values were measured. Totally 120 fabric samples were prepared for the database. A set of dyed cotton fabric samples shown in Fig. 2.6 was dyed using Reactive HE3B dye at various concentrations in-order to prepare the database.

Fig. 2.6 Cotton fabric dyed with reactive red HE3B (0.1– 4.0% shade)

2.5 EXTERNALLY FUNDED PROJECTS

2.5.1 (a) Single-row cotton picker

The performance of one-row cotton picker developed by M/s. John Deere India, with refrence to effectiveness of growth regulators, defoliators and field losses were assessed. Picker assembly was attached to a 50 hp tractor through a special drive arrangement (Fig. 2.7). The cotton picker took around 90 min time and 10 litre diesel for picking an acre of cotton. In addition, field losses in terms of left over and dropped bolls on the ground were found to vary between 4-6%. The cost of mechanical harvesting has been worked out to be ₹ 4-5 per kg of seed cotton. Trash content analysis revealed that mechanically picked cotton contained around 22-25% trash, in which dry leaves were over 80% (probably because of imperfect defoliant application for Indian condition). On the contrary, hand-picked cotton contains 2-4% trash. Plant population of 30,000 plants per acre with 80x15 cm inter-row and inter-plant spacing was found to yield 1000-1200 kg cotton/acre, which is around 30-35% higher than the conventional method of cotton cultivation.

It was found that requisite crop physiology (900 mm plant height and 800 mm canopy diameter) amenable to mechanical picking could be achieved by application of 80-100 ml per acre plant growth regulator in 3-4 doses. In addition, synchronized boll opening with 85-90% opened bolls was obtained at the time of harvesting. Attempted cotton hybrids produced 15-20 bolls per plant, mostly located at top portion of the crop desired for successful mechanical harvesting. Drop-Ultra used as defoliant was found to be less effective due to its reduced efficacy below 20°C temperature causing sticking of significant amount of dry leaves over opened bolls.

Fig. 2.7 Harvesting using single row cotton picker

2.5.1(b) On-board cleaner and stripper harvester

An on-board cleaner based on sling off action is designed and developed for on-field cleaning of machine stripped cotton. The developed cleaner has been integrated with the cotton stripper. The on-board cleaner is attached at the rear side of the tractor and connected to a belt conveyor for feeding of stripped cotton. The outlet of the onboard cleaner is attached to a cotton storage basket (Fig. 2.8).

The length, width and height of the cleaner are 600, 1300, 1900 mm, respectively. It consists of a 440 mm kicker cylinder for breaking of cotton pods and bracts, a 286 mm dimeter saw channel cylinder for cleaning of cotton and a 222 mm diameter saw channel cylinder for reclaiming of cotton. The cleaned cotton was blown towards a cotton storage basket attached at the end of the stripper harvester while trash was collected at the bottom of the machine.

The onboard cleaner was evaluated for its performance at ICAR-CICR farms, Nagpur at four different clearances (13 mm, 15 mm, 14-9.5 mm and 16-12.7 mm) between saw teeth and grid bars for main cleaning cylinder and reclaiming cylinder and at three different operating speeds (390, 445 and 520 rpm). Uniform spacing of 15 mm and 445 rpm operating speed provided optimum cleaning with least impact on fibre quality parameters. The optimised cleaning efficiency and capacity of the onboard cleaner were found to be 48-50% and 1000 kg/h, respectively.

Fig. 2.8 On-board cleaner and stripper harvester

2.5.2 (a) Screening of *G.arboreum* cotton genotypes

Lint samples from five cultures received from CICR, Nagpur were evaluated for fibre properties and performance of absorbent cotton for three consecutive growing seasons (2014-16). Results showed that these were unsuitable for spinning purpose and showed consistently good performance as absorbent cotton equivalent to Phule Dhanvantary variety released for absorbent cotton applications. Results obtained for crop harvested in 2015 are presented in Table 2.3. Besides, thirteen more genotypes from 2015 crop were evaluated for fibre and absorbent cotton properties. Out of these 9 were selected for making absorbent cotton on the basis of fibre properties. The absorbent cotton prepared from all of these could meet the absorbency criteria specified by I.P. (Indian Pharmacopoeia) but only 4 samples could pass the I.P. criteria for sulphated ash.

Samples of lint from twelve cultures from crop harvested in 2016 at Nandyal were evaluated for fibre properties which were found to be suitable for absorbent cotton purposes. Absorbent cotton prepared from these lint samples was able to meet all I.P. specifications. Lint samples of twenty cultures grown at CICR, Nagpur, harvested in 2016 were analysed for fibre properties. As all of them had low tenacity and fibre length values with Micronaire >5, they were used for making absorbent cotton which is being evaluated for various performance parameters specified by I.P.

Table 2.3 Properties of absorbent cotton prepared by chemical process

Sample	Sulphated Ash (%)	Moisture (%)	*Absorbency (sec)	Sinking Time (sec)	Water Holding Capacity (g/g of cotton)	Water soluble matter(%)
CNA 2014-2	0.46	6.9	1.5	1.7	28.1	0.45
CNA 2014-3	0.42	6.9	1.6	2.0	28.3	0.40
CNA 2014-4	0.38	7.0	1.5	2.0	28.5	0.44
CNA 2014-7	0.44	7.8	1.5	2.0	27.1	0.43
CNA 2014-8	0.38	7.6	1.5	2.2	27.6	0.40
Phule Dhanvantari	0.34	7.1	1.4	2.0	28.0	0.39
Standard	**≤ 0.5**	**< 8.0**	**≤ 10.0***	**≤ 10.0**	**≥ 23.0**	**≤ 0.5**

Standard- Indian Pharmacopoeia, 1985
*Bureau of Indian standard – 2369: 1967 (reaffirmed 2000)

2.5.2 (b) CIRCOT anaerobic microbial consortium

Phule Dhanvantari cotton was selected for optimization of absorbent cotton preparation by using CIRCOT anaerobic microbial consortium. A trial conducted in rotary digester (with 600g cotton) with intermittent stirring was successful in getting uniform absorbency in treated material which could also meet the specified criteria of sulphated ash, absorbency and water holding capacity for absorbent cotton. Repetition of the trial with exhausted consortium after making up the volume with fresh consortium also produced absorbent cotton of required properties. Performance results of both trials are shown in Table 2.4. Preliminary results suggested the effluent load of the microbial process to be little lower than that of chemical process. Further work on process standardization in anaerobic digesters with liquor circulation is in progress.

Table 2.4 Properties of absorbent cotton (Phule Dhanvantari) prepared by microbial route

Sample details	Sinking Time (Sec.)	Water Holding Capacity (g/g of cotton)	*Absorbency (Sec.)	Water Soluble Matter (%)	Sulphated ash (%)
Trial 1	3.5	25.7	2.6	0.40	0.31
Trial 2	4.2	28.0	3.0	0.42	0.32
Standard values	≤10.0	≥ 23.0	≤10.0	≤ 0.50	≤ 0.5

Standard- Indian Pharmacopoeia, 1985; *Bureau of Indian standard – 2369: 1967 (reaffirmed 2000)

2.5.3 Cellulose based nanocomposite film for food packaging

2.5.3 (a) Synthesis of nano chitosan & nano chitin

Nano chitosan was prepared by Ionic gelation method. Cross-linking of chitosan (0.1% w/v) solubilized in Acetic acid (1% v/v) was carried out using 1% Sodium tripolyphosphate. Nano chitin was prepared by high speed homogenization process. Chitin (1% w/v) was suspended in 0.5% acetic acid stirred for 6 h and homogenized for 10 minutes at 22,000 rpm. There was an increased opalescence in the supernatant and appearance of fibrillation or loosening of the chitin fibrils with increasing rpm. At 22,000 rpm, bimodal particle size of supernatant is 300.8 (±25.9) nm and 1785.4 (±115.3) nm. The size analyses were supported by the TEM micrographs given in Fig. 2.9.

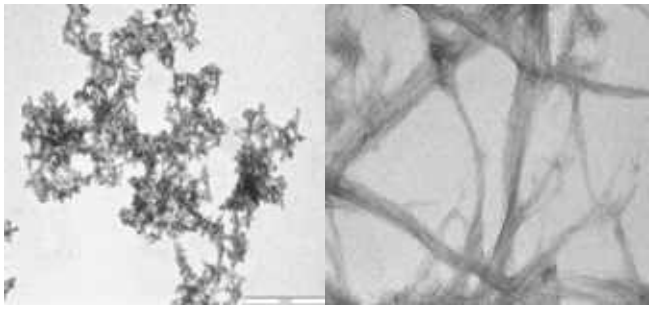

Fig. 2.9 TEM micrographs of nano chitosan and nano chitin

2.5.3 (b) Synthesis of nanocellulose on a pilot scale

Nanocellulose was prepared from cotton linters by CIRCOT's process in the pilot plant and analyzed by using TEM (Fig. 2.10). The viscosity analyses were carried out using small sample adapter and also with the help of VANE blades. In both the cases, the shear thinning behavior (reduction in viscosity while shear rate increases) was observed.

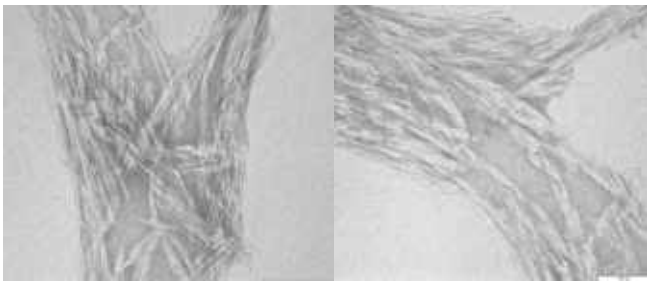

Fig. 2.10 TEM micrographs of nanocellulose

2.5.3 (c) Preparation of starch nanocomposite films

Corn starch films were prepared by a casting process in plastic moulds. Glycerol was used as the plasticizing agent. Nanocellulose was added for strength improvement and nanochitosan for imparting antibacterial activity. The process conditions were optimized and performance evaluation is underway.

2.5.4 Briquettes and Pellets

A study was conducted for the preparation of pellets and briquettes from cotton stalks in a commercial pelleting and briquetting plant. The briquettes were prepared with different particle size materials and moisture contents (Fig. 2.11). The results also showed that increase in moisture content had negative effect on formation of briquettes. The moisture content above 14% did not yield briquettes. It was concluded that briquettes prepared from material obtained from hammer mill and sieved through 1 mm sieve with 10 % moisture content had good physical properties. A pelleting system of 150 kg/h capacity for conversion of biomass, specially cotton stalks into 6, 8 and 10 mm diameter has been commissioned under this project. The pilot plant facility is being demonstrated to farmers and budding entrepreneurs.

Fig. 2.11 Briquettes prepared from cotton stalks with 10 % moisture content

2.5.5 (a) Fibrillation of coconut fibres and their characterization

Coconut fibres were fibrillated in a conical refiner, having two refining surfaces, for four time periods (10, 20, 30 and 40 min). Refined samples were collected and dried before further analysis. Chemical analysis, XRD and optical microscopy were carried out to evaluate the effect of refining on coconut fibres. Lignin content decreased from 25 to 20 % after 40 min of refining. This might have happened due to lignin leach out during refining and washing process. Ash content increased from 0.45 to 1.55 % which may contribute to the contaminants coming out of refiner during shearing action. Optical micrographs show step-by-step fibrillation of coconut fibres with increased time of refining. Initial average size was above 100 µm which was reduced to less than 20 µm after 40 min of refining (Fig. 2.12). Length also reduced to less than 1 mm from the initial average of 5 cm. The crystallinity of coconut fibres, as analyzed by XRD, was not affected significantly during refining till 40 min.

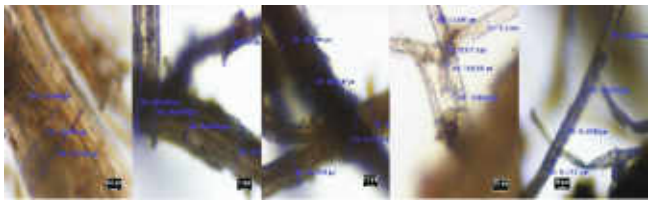

Fig. 2.12 Optical micrographs of coconut fibres before and after refining

2.5.5 (b) Preparation of epoxy resin composites

Raw and fibrillated coconut fibres were used as reinforcement material and epoxy resin as a matrix (Fig. 2.13). Raw coconut fibres were cut into approximately 50 mm size and soaked in water for 24 h in the ratio of 1:10 (Material:Liquor). Water soaked fibre was fibrillated in a conical refiner for 10, 20, 30 and 40 min and dried at room temperature.

Epofine 556 Epoxy was based on bishphenol A and epichlorohydrin. Aradur HY951 polymide based hardener was used. Initially, resin and hardener were in liquid state. When resin was added to hardener it became rigid and reached solvent free thermoset stage due to chemical reaction between resin and hardener. The control sample was prepared by mixing of resin and hardener alone (without reinforcement) in the ratio of 1:10 with curing at room temperature. Raw coconut fibre (approximately 50 mm) and reinforced coconut fibre were mixed with resin in the same mixing ratio and cured at room temperature. Similarly, all fibrillated coconut fibre reinforcement epoxy resin samples were prepared (Fig. 2.14).

Fig. 2.13 Raw and fibrillated coconut fibres

Fig. 2.14 Epoxy composite sheets from control and fibrillated samples

2.5.6 Ecofriendly method of preparing absorbent cotton

A suitable enzyme was identified for absorbent cotton processing and an eco-friendly method to produce absorbent cotton from non spinnable cotton was attempted. Cotton fibres were scoured and bleached using conventional method as per the industrial procedure. After bleaching, the whiteness index of the samples was measured by ASTM E313, Hunter and CIE methods (Table 2.5). The cotton samples were also tested for absorbency by sink test method which was found to be less than 3 sec.

2.5.7 Green technologies for dyeing of cotton

Dyeing of cotton using reactive dyes requires addition of large amounts of salt for exhaustion. In order to reduce the high salt requirement, a new process has been developed for dyeing that uses saline water.

Dyeing experiments were carried out on cotton fabric using pre-treated saline water with five reactive high exhaust (HE) dyes. The conventional exhaust dyeing of cotton with reactive dyes was carried out using 60 g/l sodium chloride as an electrolyte whereas only 20 g/l was used in the pretreated saline water. Dyeing performance and washing fastness properties of the dyed fabrics were evaluated. Dyeing performance in terms of uniformity was found to be satisfactory in pretreated saline water and comparable with conventional dyeing.

The K/S value of the dyed fabric using pretreated saline water was more or less equal to that for the conventional dyeing process (Table 2.6). Washing fastness of the dyed fabrics using pretreated saline water was satisfactory. Thus, it can be concluded that pre-treated saline water may be used for dyeing of cotton with reactive dye that requires addition of only one third amount of salt compared to conventional exhaust dyeing process.

Table 2.5 Whiteness index of bleached cotton fibres

Method	X	Y	Z	Whiteness Index
ASTM E313	79.05	81.38	89.39	59
Hunter	76.49	81.13	81.05	89
CIE	76.53	81.14	81.10	61

Table 2.6 K/S values of dyed fabric

Dyeing Method	Blue HER1	Red HE7B	Green HE4B	Orange HER	Navy Blue HER
Conventional	3.07	5.12	8.28	4.73	4.26
Pretreated saline water based	2.98	4.95	8.98	4.86	4.03

3. TECHNOLOGY MANAGEMENT

The Institute is engaged in developing new technologies and refinement of the already developed technologies in the areas of post-harvest processing of cotton, eco-friendly finishing of textiles and utilization of cotton stalks. The technologies so 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.

3.1 Intellectual property management

The Institute Technology Management Unit (ITMU) takes care of the protection of intellectual property rights for the technologies developed in the institute and is also involved in commercialization of these technologies. The various activities of the ITMU during the year are listed below (Table 3.1 and Table 3.2).

Table 3.1 Patents Granted

Sr. No.	Patent Title	Patent Number	Date of Grant	Inventors
1	Development and use of Rubber Disc with Soft Rubber Layers as Material for Self -grooving Roller in Roller Ginning Machines	266213 (Patent Application number - 1186/MUM/2005)	15.04.2015	Dr. T. S. Manoj Kumar, Shri L. John Selva Kumar, Er. V. G. Arude, Krishnavilas Krishnan Anand, Noby Joseph, Joji Joseph Thelly
2	Zinc Chloride Pretreatment of Microcrystalline for preparation of Nanocellulose by Homogenization Process	1193/MUM/2010	27.05.2015	Dr. N.Vigneshwaran, Er. Ashok Kumar Bharimalla, Er. Vilas Karande

Table 3.2 Patents Filed

Sr. No.	Date of Application	Application Number	Title	Innovator(s)
1	30/12/2015	4957/MUM/2015	Bi-axial electrospinning setup for production of nanofibre mat	Er. G. T. V. Prabu Dr. N. Vigneshwaran Dr. R. Guruprasad Dr. C. Sundaramoorthy
2	5/1/2016	201621000249	Process of natural fibre reinforced thermoplastic composite material production by fibre wrapping method and the product of the same process	Shri ManikBhowmick Shri Sekhar Das Dr. R. Guruprasad Dr. T. Senthilkumar

3.2 Technology assessment and transfer

3.2.1 Installation of rubber dams

The "ICAR Flexi Check Dam" technology developed under the NAIP was taken up for technology assessment and transfer. A team of scientists from ICAR-CIRCOT, Mumbai and ICAR-IIWM, Bhubaneshwar worked together to install two flexi check dams in Kanse village, Ambegaon Taluka, Pune District. The installation work was accomplished after conducting a series of activities such as survey for selection of suitable site, sensitization of villagers, construction of base concrete structure and installation of the textile reinforced rubberised composite sheets. The need based execution of inflation and deflation mechanism of the flexi check dam was demonstrated to the villagers.

Fig. 3.1 Demonstration of inflation and deflation of the ICAR flexi check dam at Kanse village, Ambegaon Taluka, Pune district

3.3 Awareness meets and demonstrations

3.3.1 Gujarat farmers visit GTC, Nagpur

The Agricultural Growth of Rural India (AGRI), ATMA, Junagadh, Gujarat organized an inter-state farmers training programme on July 14, 2015 when farmers from Junagadh were given demonstration on various aspects of cotton processing and by-products utilization at GTC, Nagpur.

Fig. 3.2 Junagadh farmers at GTC, Nagpur on July 14, 2015

3.3.2 Field demonstration-*cum*-awareness workshop on preparation of bio-enriched compost from cotton stalks

Ginning Training Centre, Nagpur organized a large scale field demonstration-*cum*-awareness workshop at village Tekoda, Dist. Wardha in association with Agro plus foundation, Nagpur on August 14, 2015. Mr. Y.N. Kabra, a progressive farmer from the village extended his full assistance for the organization of the workshop in which about 100 farmers participated. The workshop was meant to create awareness among farmers about on-farm bio-conversion of cotton crop residues into high value compost for soil fertility management. Dr. M.S. Kairon, Former Director, CICR, Nagpur was the Chief Guest of the programme. He insisted on avoiding burning of crop residues and highlighted the importance of recycling crop residues for better soil health management. He also shared information with cotton farmers on the best crop production management practices.

Fig. 3.3 Demonstration on preparation of bio-enriched compost from cotton stalks at village Tekoda, Dist. Wardha

Shri G.H. Wairale, Former GM, Maharashtra Cotton Federation and President, Agro Plus Foundation, Nagpur explained about the use of cotton stalks and other agro-residues for preparation of briquettes and pellets for energy. Shri Bhagwatji Dabhalkar, a progressive farmer from this village shared his experience on cotton farming and insisted on the need for immediate action on effective utilization of cotton stalk and other crop residues for preparation of compost. Dr. V. Mageshwaran, Scientist, GTC, Nagpur demonstrated the methodology for preparation of bio-enriched compost from one tonne of chipped cotton stalks.

3.4 Jai Kisan Jai Vigyan

The ICAR-CIRCOT celebrated 'Jai Kisan Jai Vigyan' week during December 23-29, 2015 to mark the birth anniversaries of former Prime Ministers Shri Atal Bihari Vajpayee and Late Shri Chaudhary Charan Singh. Keeping in view their immense contribution for promoting use of science for the welfare of farmers, Dr. P.G. Patil, Director, ICAR-CIRCOT, initiated various activities at the headquarters and regional units as part of the celebrations. At the headquarters, Dr. C. Sundarmoorthy, Senior scientist, Technology Transfer Division delivered a lecture "Indian agriculture: Current scenario" on December 29, 2015. GTC, Nagpur organised a farmers visit on December 28, 2015 where farmers were taken to various facilities at GTC and explained about its activities related to post-harvest processing of cotton. GTC also conducted a large scale awareness workshop in Ghorad village, Seloo Tahsil, Wardha district on December 29, 2015 to create awareness among cotton farmers regarding preparation of different value added products from cotton stalks and other agro-residues. The workshop was conducted in association with Agro Plus Foundation, Nagpur and CITI-CRDA, Mumbai.

Fig. 3.4 Jai Kisan Jai Vigyan programme at Ghorad village near Wardha

The Sirsa unit of ICAR-CIRCOT organised two awareness programmes- *"Unnat Krishi Takneek Aadharit Charcha"* .on December 23, 2015 at Rangri village in district Sirsa, Rajasthan and a programme on "Accelerated process for preparation of compost from cotton plant residues" at Shahpur Begu village of Sirsa district, Haryana on December 29, 2015. The Coimbatore unit also conducted an on-farm demonstration on "Clean cotton picking technology" to local women farmers of Coimbatore district, Tamil Nadu.

3.5 Participation in Exhibitions

The Institute participated in various exhibitions and agricultural fairs organized in different parts of the country and displayed its technologies. A large number of farmers and stakeholders benefitted from these exhibitions.

Fig. 3.5 Officials of QEID unit, Coimbatore explaining clean cotton picking to women farmers in Tamilnadu

Fig. 3.7 CIRCOT stall at the 5th Global Economic Summit at Expo Centre, World Trade Centre, Mumbai on November 19-21, 2015

Fig. 3.6 ICAR-CIRCOT stall in AgriIntex 2015 at CODISSIA Trade Fair Complex, Coimbatore on July 17-20, 2015

Fig. 3.8 ISCI-CIRCOT-CITI-CRDA stall at 74th Plenary committee meeting of International Cotton Advisory Committee (ICAC) at J. W. Marriott, Mumbai on December 6-11, 2015.

Fig. 3.9 7th Agro Vision 2015 at Reshim Baug, Nagpur on December 11-14, 2015.

Fig. 3.10 Demonstration of Pelletising machine for converting cotton stalks into pellets at Technology and Machinery Demonstration Mela on March 21, 2016 at GTC, Nagpur

4. TRAINING AND CAPACITY BUILDING

Training and capacity building activities continue throughout the year in the Institute, both for its own employees including all categories of staff right from the top management to the supporting staff and for its different stakeholders including farmers, industry personnel, students and others.

The institute conducts regular training programmes on cotton quality evaluation for farmers, personnel from cotton trade and industry. Ginning Training Centre, Nagpur conducts training courses for gin fitters and other workers in ginning industry on technologies in ginning for production of clean quality cotton, maintenance of various ginning and allied machines apart from solving technical problems that arise in ginning industry. The Institute also organises customized special training programmes on spinning, quality evaluation, and chemical characterisation to benefit personnel from the industry on specific topics.

4.1 Participation in Trainings

At CIRCOT, human resource development (HRD) is a continuous process to increase knowledge, skills, education, and abilities of both its employees and stakeholders at national and international levels. Research areas were identified by scientists for possible foreign collaboration and inputs were collected from experts in different areas. The subject areas finalized for foreign collaboration include processing of machine harvested cotton, industrial application of microbial degossypolization and biopolymer based nanocomposites. A category-wise list of Institute employees deputed for skill development programmes is given in Table 4.1.

4.2 Trainings Organised

4.2.1 National Trainings

The Institute has been conducting regular training programmes for farmers, entrepreneurs and personnel employed in cotton trade, industry and ginning sectors. The list of training programmes conducted during the year 2015-16 is given in Table 4.2.

Fig. 4.1 Dr. P.G. Patil, Director, CIRCOT and Shri G.H. Wairale, President Agro-Plus Foundation, Nagpur distributing certificate to an young entrepreneur on June 6, 2015

Table 4.1 Category-wise skill development programmes

Sr. No.	Title of the Programme	Duration	Venue	Names of Staff
	Scientific			
1	Summer school training on Biomass & Biofuel Technologies Environment	July 22–Aug.11, 2015	CIAE, Bhopal	Er. Varsha Satankar
2	Life cycle analysis with SimaPro	August 12-13, 2015	SimaPro, Online Training	Dr. C. Sundaramoorthy
3	Composite material: Characterization & Application Engineering	September 22-23, 2015	Anna University, Regional centre, Coimbatore	Dr. T. Senthilkumar
4	Composite Technology	January 07-09, 2016	FRP Institute, Chennai	Dr. T. Senthilkumar
5	Competency Development for Human Resource Development for Nodal Officers of ICAR	February 10-12, 2016	NAARM, Hyderabad	Dr. T. Senthilkumar
6	Technology Commercialization & IP Management conducted by NITIE, Mumbai	March 14-15, 2016	CIRCOT, Mumbai	Dr. S. K. Chattopadhyay Dr.SujataSaxena Dr. S. V. Ghadge Dr. A. S. M. Raja Er. A. K. Bharimalla Dr. S. K. Dey Dr. N. Vigneshwaran Dr. C. Sundaramoorthy Dr.Virendra Prasad Er. V. G. Arude Er. P. S. Deshmukh Dr. V. Mageshwaran Er. ManikBhowmick Er. A. Arputharaj Dr. R. Guruprasad Er. G.T.V. Prabu Er. G. Krishna Prasad Dr. T. Senthilkumar Er. P. Jagajanantha Er. VarshaSatankar
	Technical			
7	Short Course on Capacity Building of Agricultural Library Professionals in NARS	July 22-31, 2015	PJTSAU, Hyderabad	Smt. P.R. Mhatre

8	Tailor-made course on Water & Effluent Analysis	December 07-11, 2015	Advanced Training Institute, Sion, Mumbai	Smt. Sudha Tiwari Shri R.R. Chhagani Smt. N.M. Ashtaputre Ms.Charlene P. D'Souza
9	Testing and Quality Evaluation of Packaging Materials	January 28 – 29, 2016	IIP, Mumbai	Shri M.G. Ambare Shri N. D. Kambli
10	Auto Cad, Design of Electrical Measuring Instrument	February 15-18, 2016	IDEMI, Mumbai	Shri S.N. Patil
11	Technology Commercialization & IP Management	March14-15, 2016	CIRCOT, Mumbai	Dr. M. V. Vivekanandan Sh. B.R. Pawar Sh. G.B. Hadge Smt. P.R. Mhatre
	Administrative			
12	Training Programme of MIS/FMS	June 22-24, 2015	IASRI, New Delhi	Smt. J. R. Chaukute
13	Training programme on public procurement	August 03-08, 2015	NIFM, Faridabad	Shri Sunil Kumar
14	HR and Payroll module of MIS/FMS	August 18-21, 2015	ISTM, New Delhi	Smt. S.R. Shirsat Shri P.V. Jadhav
15	Training for RTI Act., 2005	March 18, 2016	CIFE, Mumbai	Shri Y.R. Pathare Smt. T. P.Mokal, Shri S. D. Ambolkar
	Skilled Supporting			
16	Civil Defence Awareness Training Programme	March 03, 2016	ICAR-CIRCOT, Mumbai	Shri K.T. Mahida Shri M.M. Katpara Shri M.A.A. Rashid Shri G.N. Mayavanshi Shri H.B. Vesmiya Shri M.J. Sumra Shri S.K. Bobate Shri R.P. Karkate Shri V. Murugan Shri S.D. Magar Shri S.B. Worlikar Shri Sunil Tondse Shri SuhasTondse Shri D.R. Gawde Shri S.M. Chandanshive Shri P.E. Gurav Shri Mahesh C. Solanki Shri V.B. Poojari Shri M.N. Kamble Shri S.S. Surkule Shri S.P. Naik Shri D.K. Kasar

Table 4.2 Trainings imparted

Sr. No.	Title of the Training Programme	Venue	Duration	Participants Profile
1	Double Roller Ginning Technology and Cotton Quality Evaluation	GTC, Nagpur	April 20-25, 2015	Seven Entrepreneurs from Maharashtra
2	Double Roller Ginning Technology and Cotton Quality Evaluation (farmers)	GTC, Nagpur	June 01-06, 2015	Fifteen participants sponsored by Agro-Plus Foundation, Nagpur
3	Quality Evaluation of Cotton	Mumbai	July 06-10, 2015	Farmers from Akola, Staff from M/s. Arvind Mills Ltd., Akola, Cotton Association of India, Entrepreneurs from Jalgaon, Surat and Gujarat
4	Quality Evaluation of Cotton	Mumbai	July 20-24, 2015	Farmers from Akola, Staff from M/s. Arvind Mills Ltd., Akola, Cotton Association of India, Entrepreneurs from Jalgaon, Surat and Gujarat
5	Recent Advances in Cotton Ginning, Quality Evaluation and By-products Utilisation	GTC, Nagpur	July 20-25, 2015	One Entrepreneur from Raichur, Karnataka and five from M/s Gimatex Industries Pvt. Ltd., Hinganghat,Wardha
6	Quality Evaluation of Cotton	Mumbai	August 10-14, 2015	Fourteen participants from CCI
7	Quality Evaluation of Cotton	Mumbai	August 17-21, 2015	Seventeen participants from CCI
8	Double Roller Ginning Technology and Cotton Quality Evaluation	GTC, Nagpur	August 24 – 29, 2015	Five Entrepreneurs
9	Training Programme on Quality Evaluation of Cotton for Cotton Breeders / Scientists	Mumbai	August 25-27, 2015	Twenty Four cotton breeders from seed companies
10	Training Programme on Quality Evaluation of Cotton	Mumbai	August 31-September 04, 2015	Nineteen participants from CCI
11	Absorbent Cotton Technology	Mumbai	September 02-03, 2015	Ten participants from Industry, Entrepreneurs from Maharashtra, Andhra Pradesh and Students

Sr. No.	Title of the Training Programme	Venue	Duration	Participants Profile
12	Double Roller Ginning and Quality Evaluation of Cotton	GTC, Nagpur	September 7-11, 2015	Fourteen Junior Cotton Purchasers of CCI from Akola, Aurangabad, Indore, Rayagada (Odisha) and Warangal (AP)
13	ICAR Course on Fermentation Technology for Value-addition to Cotton By-products and Biomass	Mumbai	September 07–16, 2015	Eleven participants from SAU and ICAR Institutes from Gujarat, Maharashtra, Tamil Nadu and Uttar Pradesh
14	Advances in Applications of Nanotechnology	Mumbai	October 5–9, 2015	Seventeen participants from diversified fields
15	Quality Evaluation of Cotton	Mumbai	October 13–15, 2015	Fifteen participants from Agricultural Marketing Committee, Telangana
16	Quality Evaluation of Cotton	Mumbai	January 04-08, 2016	Seventeen Executives from CCI and one from M/s. DD Cotton Pvt. Ltd, Mumbai.
17	Quality Evaluation of Cotton	Mumbai	February 08–12, 2016	Fourteen CCI trainees from Adilabad, Guntur and Warangal
18	Double Roller Ginning and Quality Evaluation of Cotton	GTC, Nagpur	February 12–16, 2016	Seventeen farmers
19	Quality Evaluation of cotton	Mumbai	February 22-26, 2016	Fourteen CCI trainees from Ahmedabad, Aurangabad, Akola
20	Spectroscopic and Chromatographic Techniques for Material Characterization	Mumbai	March 02 – 05, 2016	Sixteen participants from educational institutions, State Agricultural University and R&D institutions

A training programme on "Entrepreneurship Development in the field of Biomass Management and Cotton Processing" was organised during June 1-6, 2015 at GTC Nagpur. Sponsored by Agro-Plus Foundation, Nagpur, the training programme aimed at developing entrepreneurial skills among educated unemployed youths, especially belonging to rural areas. Fifteen participants from different parts of Maharashtra attended the training, which covered almost all aspects related to cotton (i) introduction of cotton and utilization of cotton stalks and other agro-residues for value added products (ii) the cotton quality parameters, ginning technology, (iii) collection, harvesting, conversion of cotton stalks and other agro-residues into briquettes, pellets, cattle feed, power generation (iv) marketing of value added products.

In addition to the classroom and laboratory sessions, field visits to nearby industries were also arranged. The participants were benefited from the valedictory speeches by Dr P. G. Patil, Director, CIRCOT, Mumbai; Shri G. H. Wairale, President, Agro-Plus Foundation, Nagpur and Dr. J.F. Agrawal, Principal, Shri Sai College of Engineering and Technology, Bhadravati.

4.2.2 International trainings

(a) In-Country training programme at Chad, Africa

An In-country training programme on post-harvest management and value addition to crop residues was conducted at Moundou, Chad, West Africa under Cotton Technical Assistance Programme for Africa (Cotton TAP) during October 12–15, 2015. It was implemented as per the Second India - Africa Forum Summit (IAFS) with the objectives to strengthen the human resource from government R&D, production and extension professionals and entrepreneurs from private sectors in the areas of ginning, cotton quality evaluation and utilization of cotton by-products. Twenty professionals engaged in development of cotton sector-ginneries, government and private sector, policy makers, production technologists, scientists and entrepreneurs from different organizations attended the training programme. Dr. S.K. Shukla and Er. V.G. Arude conducted the programme and interacted with the policy makers including the Secretary General, Director General and Director (Training), Ministry of Agriculture, Chad for planning and implementation of future training programmes.

Fig. 4.2 Dr. S.K. Shukla and Er. V.G. Arude at Ginning Industry in Moundou, Chad, Africa

(b) In-Country training programme at Zaria, Nigeria

Under the Cotton Technical Assistance Programme (Cotton TAP) for Africa, an in-country training programme on post-harvest management and value addition to crop residues was organised at the Institute for Agricultural Research, Zaria, *Kaduna State,* Nigeria during February 23-28, 2016. The programme was aimed at strengthening human resources in R&D organisations and development of entrepreneurship in the areas of ginning, cotton quality evaluation and value addition to cotton and its by-produce in Nigeria. A batch of 43 professionals including ginners, spinners, researchers, professors and entrepreneurs participated in the training programme. Dr. S.K. Shukla and Er. P.S. Deshmukh acted as experts from the Institute. They also interacted with the policy makers from the federal ministry of agriculture and rural development, Nigeria and faculties of different departments of *Ahmadu Bello University, Zaria* in order to understand their requirements and accordingly fine tune the future programmes to be undertaken as part of the Cotton TAP for Africa.

Fig. 4.3 Dr. S.K. Shukla and Er. P.S. Deshmukh conducting an in-country training programme at Zaria, Kaduna State, Nigeria

4.3 Education

To promote research and teaching in the sphere of cotton science and technology, the Institute has signed MoUs with a number of educational institutions like VJTI, SNDT and ICT in Mumbai, BSKKV, Dapoli and UAS, Dharwad. This enablesnot only carrying out joint research work but also creates an opportunity to pursue postgraduate and doctoral degree programmes. In addition, to promote the quality of post graduate research and training in cutting edge areas, the Institute facilitates students from NARS and other organizations to access specialized guidance and facilities as per "ICAR guidelines for students to conduct research for their degree programmes as trainees at ICAR institutions". The Institute has permanent recognition by the University of Mumbai for guiding students leading to MSc and PhD degrees in physics, biophysics, microbiology and organic chemistry.

Recently, Shri Prasad Satyamurthy, a PhD student under the guidance of Dr. N. Vigneshwaran, Senior Scientist, completed his *viva-voce* on January 27, 2016 for his thesis entitled "Preparation of Nanocellulose by Controlled Fungal (*Trichoderma reesei*) Hydrolysis of Microcrystalline Cellulose and its Application in Biocomposites". Students who have registered at present for Ph.D. degree at the Institute are listed in Table 4.3.

4.4 HRD fund allocation and utilisation

More than adequate funding was available for HRD activities during the year 2015-16. Out of Rs. 2.92 lakh allocation, an amount Rs. 1.13 lakhs was expended on various HRD activities, amounting to 38.7% utilisation during the year.

Table 4.3 List of Research Topics and PhD students on roll

Sr. No.	Research Topic	Name of Student	Name of Scientist Guide	Year of Admission
1	Anaerobic retting of coconut fibres to produce textile grade fibres	Mrs. Soniya Shetty	Dr. R. H. Balasubramanya	2008
2	Study of pilling behaviour of textile fabrics	Mr. Vijay Mayekar	Dr. R. P. Nachane	2010
3	Effect of silver, zinc oxide and titania nanoparticles on nitrogen fixing, phosphate solubilizing and biofilm forming bacteria found in soil ecosystems	Mrs. Sangeeta M. Chavan	Dr. N. Vigneshwaran	2012
4	Preparation of nanofibre mats of alginate and pullulan by electro spinning and its application as nanosensor for detection of food spoilage	Ms. Komal Saraf	Dr. N. Vigneshwaran	2012
5	Microbial production and characterization of nano-lignin and its application onto cotton and linen fabrics for functional properties	Ms. Siddhi Juikar	Dr. N. Vigneshwaran	2012
6	Increasing efficacy of microbial fuel cell using modified electrodes and complex carbohydrates for electricity generation	Ms. Seema Agarwal	Dr. N. Vigneshwaran	2014
7	Immobilization of antimicrobial peptides on nanocellulose for potential use in active food packaging	Ms. Priyanka Bagde	Dr. N. Vigneshwaran	2014

5. LINKAGES AND COLLABORATION

CIRCOT maintains linkages with various organizations at national and international levels to develop newer technologies and processes in the areas of post-harvest processing, eco-friendly finishing of textiles and utilization of cotton by-products.

Linkages with stakeholders help to enhance technology assessment for refinement and technology transfer. The Institute has its quality evaluation units within the premises of other institutes and agricultural universities. Other than functioning as extension wings, these units also facilitate linkages and collaboration with host institutes. The five quality evaluation units together with the Ginning Training Centre, Nagpur and Technology Transfer Division at the headquarters promote the technologies developed by the Institute and serve as windows for technology transfer activities.

CIRCOT collaborates with national and international institutes in the field of cotton science and technology. Some of the prominent areas of collaboration are- All India Coordinated Research Project on Cotton, Technology Mission on Cotton, Nanotechnology, Natural Fibre Research and Cotton Technology Assistance Programme. Collaborating institutes include premier research organizations like CICR Nagpur and NIRJAFT Kolkata, universities like ICT Mumbai, VJTI Mumbai and BSKKV Dapoli, and private companies like Lafarge India.

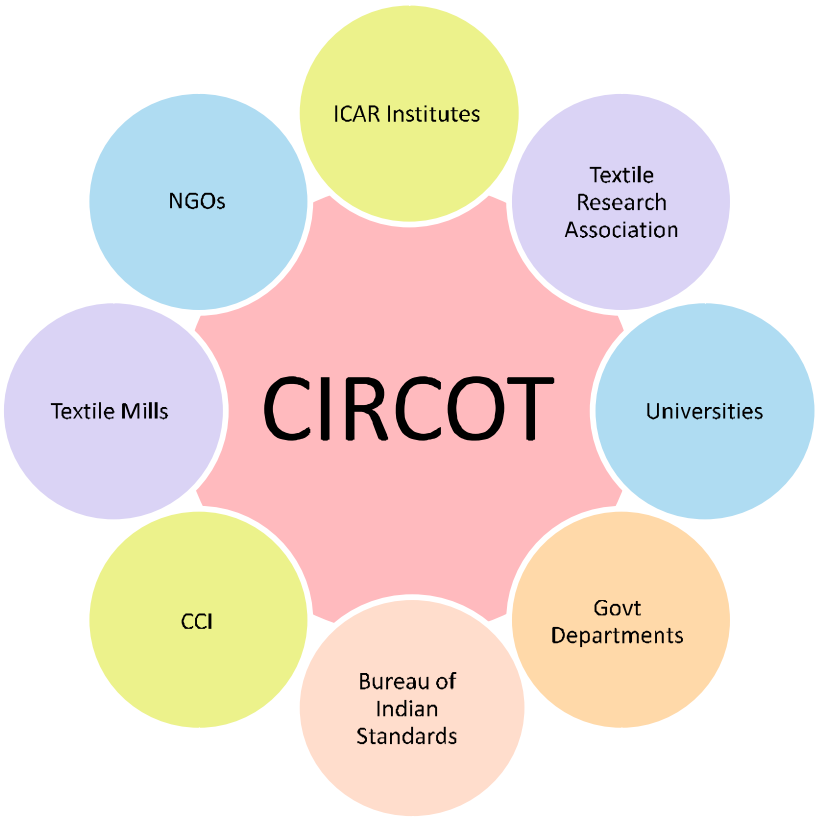

Fig. 5.1 National Linkages

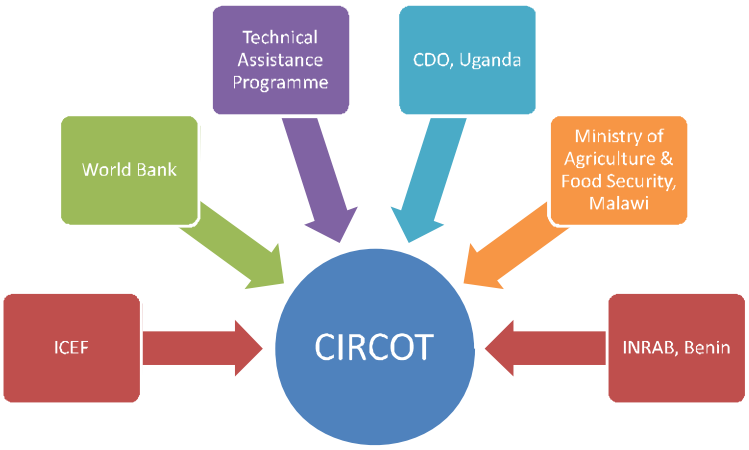

Fig. 5.2 International Linkages

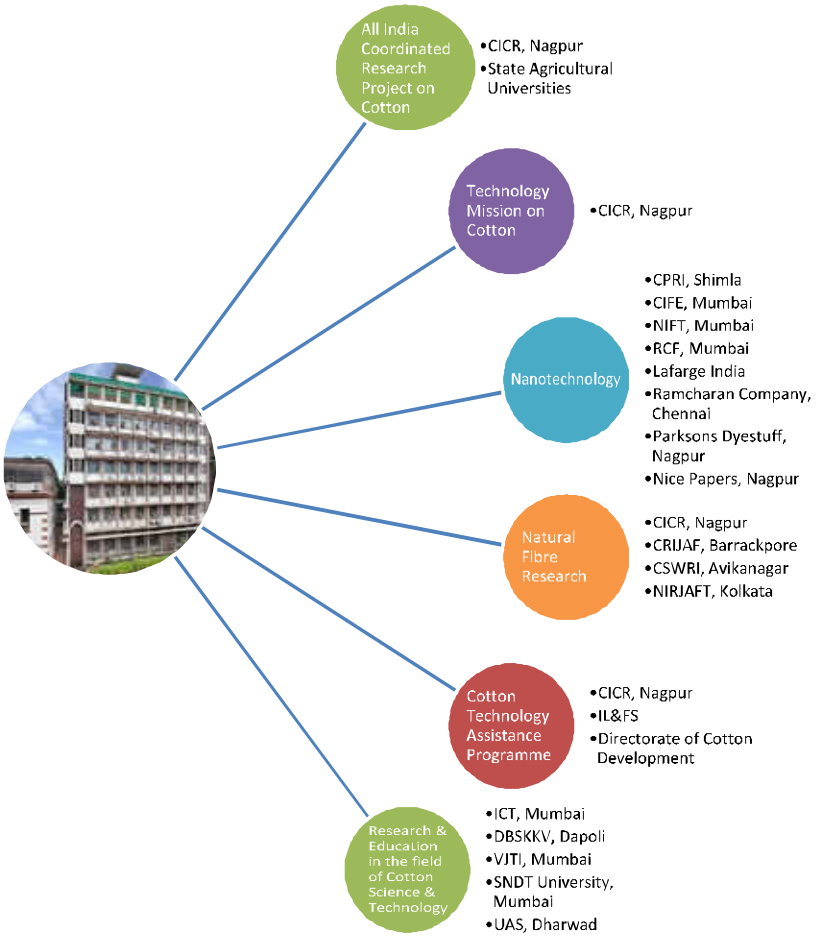

Fig. 5.3 Areas of Collaboration and Institutes

5.1 Memorandum of Understanding (MoU)

Table 5.1 MoUs signed during 2015-16

Sr. No.	Subject	Firm	Date
1	Production of nanocellulose from cotton linters and use of electrospun nanofibers in filters	Suryavanshi Spinning Mills, Secunderabad	April 04, 2015
2	Spinning performance of spin finish for P/V blend	Croda India, Navi Mumbai	April 17, 2015
3	Miniature spinning system	Trytex Machines, Coimbatore	May 08, 2015
4	Formulation with antifungal agents for applying as lubricants on synthetic yarns	IPSA TEXCHEM, Andheri, Mumbai	June 08, 2015.
5	Application of nanocellulose in cement, mortar, plaster and concrete synthesis for enhancement of functional, physical and mechanical properties	VJTI, Matunga and Lafarge India, Mumbai	February 05, 2016
6	Application of nanocellulose in rubber and allied polymers for enhancement of functional, physical and mechanical properties	Ramcharan Company, Chennai	February 05, 2016
7	Application of nanocellulose in kraft paper	Parksons Dyestuff Industries, Maharashtra	February 05, 2016
8	Development of lint opener for preparation of samples for cotton quality evaluation	Precision Tooling Engineers, Nagpur	February 05, 2016
9	Consultancy in textile materials for antibacterial treatment	Green Globe, Mumbai	February 05, 2016
10	High quality technical services relating to analytical techniques especially textile testing including specialized tests such as kawabata evaluation system	Hindustan Unilever, Mumbai	February 05, 2016
11	Microbial method for degossypolization of cottonseed meal	Irfan Ali, Karnataka	February 05, 2016

5.2 Commercial Testing

CIRCOT is one of the leading cotton testing laboratories in India. It also has the accreditation from National Accreditation Board for Testing and Calibration Laboratories (NABL) as well as from ISO.

The Institute has facilities for conducting over 120 tests on different textile materials and cotton by-products. These facilities are open to all textile mills, government departments and private sector organisations. During the year under report, a total of 29,812 samples were tested at Mumbai headquarters, GTC Nagpur and quality evaluation stations at Coimbatore, Dharwad, Guntur, Sirsa and Surat. The total revenue generated through commercial testing was over Rs. 55 lakhs (Table 5.2).

Besides regular tests, special tests were also carried out as per demand on samples received from private /government organisations and universities and they are listed in Table 5.3.

Table 5.2 Number of paid samples tested and revenue generated

Place	No. of Samples Tested	Revenue (₹)
Mumbai	4,699	23,71,046
Nagpur	9,844	11,65,576
Coimbatore	8,522	9,09,905
Dharwad	833	61,100
Guntur	5,075	9,74,346
Sirsa	839	60,060
Surat	-	14,000
Total	**29,812**	**55,56,033**

Table 5.3 Tests conducted and clientele

Test	Clientele
Alpha Cellulose	Ambika Cotseeds, Mehasana, Thakurji Solvex, Jalna
Anti Bacterial	Jawaharlal Darda Institute of Engineering & Technology
Atomic Absorption Spectrum	North Mumbai Welfare Society HS, Mumbai
Atomic Force Microscopy	ICT, Mumbai, NIRJAFT, Kolkata
Cellulose yield, Trash, Moisture	Bajaj Steel Industries, Nagpur, Thakurji Solvex, Jalna, Mulchand Phulchand Krishi Udyog, Jalna, Anjaneya Agro Tech, Harihar, LN Oils, Dharwad
DSC	CIFT, Vashi
FTIR	CIFT, Vashi, Institute of Science, Mumbai
Gossypol content	CP Aquaculture, Chennai, OM CHICKS, Pune
Honey dew	Eurotex Ind. & Exports, Mumbai
Tensile testing	RA Podar Medical college, Mumbai, VJTI, Mumbai

Test	Clientele
KES	CSTRI, Bangalore, UAS, Dharwad, Birla cellulose, Grasim Industries, Intertek India, Mumbai, Pidilite Industries, Mumbai, NIRJAFT, Kolkata, SITRA, Coimbatore
Lignin Content	VJTI, Mumbai
Linter	Ambika Cotseeds Ltd, Mehasana, Sri Anjaneya Agro Tech, Harihar
LOI	NIRJAFT, Kolkata, Delkon Textile, Faridabad, NMRL, Ambernath
Lyophilization	Krishgen Biosystems, Mumbai
Paper Testing	Mumbai University Press, Mumbai
Particle Board Testing	IARI, New Delhi
Particle size	KBP College, Vashi
Protein	AN College, Patna
Scanning Electron Microscope	Reliance Industries, Navi Mumbai, Aditya Birla, Grasim, Navi Mumbai, NIRJAFT, Kolkata, Loreal India, Mumbai, ICT, Mumbai, CoroChem, Mumbai, Indoco Remedies, Navi Mumbai, VJTI, Matunga, Mumbai, CIFE, Mumbai, CIFT, Vashi, Institute of Science, Mumbai, BATU, Mangaon, RP Gogate College of Arts & Science, Ratnagiri, Hindustan Unilever, Mumbai, IPCA labs, Mumbai, Johnson & Johnson, Mumbai, Bharati Vidyapeeth's College of Pharmacy, Navi Mumbai,
Surface Tension	Croda India, Navi Mumbai, Dura Colour, Ahmedabad
Thermal Insulation of Fabric	CSTRI, Bangalore
Thermal Conductivity of Fabric	CSTRI, Bangalore
XRD	DKTES Textile & Engineering Institute, Ichalakaranji, CoroChem, Mumbai, Institute of Science, Mumbai, CKTACS College, Panvel, Vivekanand Education Society, Chembur, Atharv Creation, Thane

5.3 Consultancy Services

The Institute maintains liaison with different institutions including private organizations and entrepreneurs to meet their technological needs and also to generate revenue for the Institute. Consultancies thus taken during the year are listed in Table 5.4.

Table 5.4 Consultancy projects carried out during 2015-16

Sr. No.	Title	Firm	Investigator
1	Application of Nanocellulose in Filters	M/s. Suryavanshi Spinning Mills Ltd. Secundarabad	Dr. N. Vigneshwaran
2	Spinning Performance of Spin Finish for PV Blend	M/s. Croda India Co. (P) Ltd. Mumbai	Dr. S. K. Chattopadhyay
3	Characterization of Nanocellulose	M/s. ITC Ltd., Bengaluru	Dr. N. Vigneshwaran
4	Total appearance value of worsted fabric	Jawaharlal Darda Institute of Engg. And Technology, Maharashtra	Dr. (Mrs.) Sheela Raj
5	Formulation with antifungal agents for applying as lubricants on synthetic yarn	M/s. IPSA TEXCHEM (P) Ltd., Daman	Dr. N. Vigneshwaran
6	Thermal characterization of protein samples	Institute of Chemical Technology, Mumbai	Dr. Virendra Prasad
7	Quantitative estimation of functional groups in soyabean amino acid treated cotton fibre	Mahatma Gandhi Institute for Rural Industrialization (MGIRI), Maharashtra	Dr. Virendra Prasad
8	Design and machinery for automatic cotton ginning pressing plant	M/s. Bajaj Steel Industries Ltd., Nagpur	Dr. P. G. Patil
9	Assessment of performance properties of cotton samples	University of Agricultural Sciences, Dharwad	Dr. (Mrs.) Sheela Raj
10	Evaluation of shear and tensile properties of fabric samples	Hindustan Unilever Ltd. Mumbai	Dr.(Mrs.) Sheela Raj
11	Evaluation of shear properties of processed fabric samples	Hindustan Unilever Ltd. Mumbai	Dr.(Mrs.) Sheela Raj
12	Microbial synthesis of nanoparticles	RCF, Mumbai	Dr. N. Vigneshwaran

6. AWARDS & RECOGNITION

6.1 RFD

The Institute RFD received an 'Excellent' rating with a total composite score of 97.94 for the annual achievements (Performance Evaluation) during the year 2014-15.

6.2 Plant Germplasm

Three light brown linted *Gossypium arboreum* genetic stocks (naturally coloured cotton) viz. CNA 405, CNA 407 (NLL- Spotted Petals) and CNA 407 (NLL- Spottless Petals) were registered by the Plant Germplasm Registration Committee of ICAR as INGRI 15005 (April,21, 2015), INGRI 15024 and INGRI 15025((August, 17,2015) respectively. A joint team of scientists and technologists from CICR and CIRCOT (Punit Mohan, B.R. Rode, K.R. Kranthi, Sujata Saxena, Ravi Nagarkar & V. Santhy) worked on their development.

6.3 Nano Mission

Dr. N. Vigneshwaran, Senior Scientist has been nominated by the DG, ICAR as a member (ICAR representative) for the Inter-Ministerial Officials Working Group (IMOWG) of DST's National Mission on Nano Science and Technology (Nano Mission) up to March 31, 2017. The IMOWG is constituted as an Expert Committee to support the Nano Mission Council (an apex level body) in carrying out the Nano Mission during XII Plan period.

6.4 Invited lectures

Dr. N. Vigneshwaran, Senior Scientist, delivered invited lectures on "Nanotechnology: Basics and Potential Properties for Application in Textiles" and "Nanofinishing of Cotton Textiles" in Faculty Development Programme on "Applications of Nanotechnology in Textile Engineering" at UP Textile Technology Institute, Kanpur during January 18–23, 2016 and on "Freeze Drying of Nanocellulose – Opportunities and Challenges" in LYOTALK 2016 FREEZE DRYING / LYOPHILIZATION conference held at The Westin Mumbai Garden City Hotel, Mumbai organized by UBC Forums on February 25, 2016.

Fig. 6.1 Dr. N. Vigneshwaran delivering a lecture at UP Textile Technology Institute, Kanpur

Er. A.K. Bharimalla, Senior Scientist attended and delivered a talk on "CIRCOT Technologies" as guest of honour for 'DestaTalk.com' website launching by Desta Global Social Enterprise, Mumbai on May 23, 2015.

Fig. 6.2 Er. Ashok Kumar Bharimalla as a guest of honour for DestaTalk.com

6.5 Best paper

Er. V.G. Arude was given best paper award for "Development of GIS and GPS based Spatial Cotton Fibre Quality Maps" in the seminar organised jointly by Cotton Research and Development Association (CRDA), Hisar and ANGRAU, Regional Agricultural Research Station, Guntur during December 17-19, 2015.

6.6 Rajbhasha Award

Smt. K.R. Joshi, Senior Technical Officer, Official Language Cell was awarded 'Ashirwad Rajbhasha Award' at Mumbai on September 23, 2015 for her valuable contribution towards implementation of Official Language in the Institute.

Fig. 6.3 Smt. K.R. Joshi receiving Ashirwaad Rajbhasha Award

6.7 Sajjan Gupta - Konark Memorial Award

Ms Siddhi Juikar, Dr N. M. Ashtaputre and Dr N Vigneshwaran bagged Sajjan Gupta - Konark Memorial Award 2016 for poster presentation on "Eco-friendly preparation of nano-lignin from cotton stalks and coconut fibres by lignolytic microorganisms" in the 6th Research Meet on Biotechnology, Environmental Sciences, Phytochemicals & Life Sciences held at Wilson College, Mumbai on January 15, 2016.

Indian society of Agricultural Engineering (ISAE) awarded 3rd prize to oral paper presentation of "Laboratory Testing of Paddy Stripping Header Mechanism" authored by G.B. Bhanage, P.U. Shahare, V.V. Aware, K.G.Dhande and P.S. Deshmukh during its 50th Annual Convention held at OUAT, Bhubaneswar during January 19-21,2016.

6.8 Sports

A total of 9 medals including 4 gold and 5 silver medals were won by the CIRCOT contingent in various events at the ICAR West Zone Sports Tournament 2015 held at Avikanagar during November 2-6, 2015. Er. GTV Prabu, Scientist, was the *Chief de Mission* and Shri Prabhudesai, ACTO and Shri Manoj Ambare, Senior Technical Assistant were the managers for the 51 member contingent. Under mens' category, gold medal was won in Carom (S.K. Parab) while silver medals were obtained in Table Tennis (P.V. Jadhav, Manoj Ambare, H.S. Koli, R.R. Gosai and S.K. Parab) and 100x4 m relay(NVKambli, Manoj Ambare, SS Surkule, Dhawal Dhodia and S.P. Naik).

However, it was the women who shone brilliantly with three golds- one by Kiran Joshi in Chess and two by Smita Paiyala in Table Tennis Singles and Carom. Smt. Smita Paiyala also obtained two silver medals, one each in Table Tennis Doubles with Smt. Vijaya Walzade and Badminton Doubles with Smt. Hemangi Pednekar, who also won silver in Chess. At the inter-zonal sports tournament 2016 held at CAZRI, Jodhpur from February 08–12, 2016, Smt. Paiyala continued to shine by winning in Carom and being runners up in Table Tennis doubles along with Smt. Walzade.

Smt. Tereza Theofilo D'Souza participated and won medals in many athletic events held in India and abroad, including the Guinness World Record event for running a single mountain during Satara Hill Half Marathon 2015 and the Australian Masters Games 2015.

Fig. 6.4 Jubilant sports contingent at ICAR West Zone sports tournament 2015 held at Avikanagar

7. PUBLICATIONS

7.1 Research papers

1. Arputharaj, A., Patil, P.F., Raja, A.S.M., Prabu, G.T.V., Chattopadhyay, S.K., Bharimalla, A.K. & Sreenivasan, S (2015): Absorbent cotton: technology and prospects. Cotton Research Journal, 6(1), 65-75.

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3. Basak, S., Samanta, K. K., Chattopadhyay, S. K. & Narkar, R. S. (2015). Thermally stable cellulosic paper made using banana pseudostem sap, a wasted by-product. Cellulose, 22 (4), 2267-2776 (NAAS rating - 9.57)

4. Basak, S., Samanta, K. K., Chattopadhyay, S. K., Narkar, R. S. & Mahangade, R (2015). Flame retardant cellulosic textile using bannana pseudostem sap. International Journal of Clothing Science and Technology, 27 (2), 247-261. (NAAS rating – 6.35)

5. Basak, S., Saxena, S., Chattopadhyay, S. K., Narkar, R. S. & Mahangade, R. (2015). Banana pseudostem sap: a waste plant resource for making thermally stable cellulosic substrate. Journal of Industrial Textiles, 1-21. Doi:152808371559158, online publication. (NAAS rating - 7.35)

6. Bharimalla, A. K., Deshmukh, P. S., Patil, P. G., & Vigneshwaran, N. (2015). Energy efficient manufacturing of nanocellulose by chemo- and bio-mechanical processes: A review. World Journal of Nano Science and Engineering, 5(4), 204-212.

7. Das, S., & Bhowmick, M. (2015). Mechanical properties of unidirectional jute-polyester composite. Journal of Textile Science & Engineering, DOI: 10.4172/2165-8064.1000207

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10. Das, S., Bhowmick, M. & Chattopadhyay, S.K. (2016) Learning from nature: Biomimetic Textiles, Man Made Textiles in India, Vol. XLIV (1), 15-22.

11. Deshmukh, P.S., Shahare, P. U., Bhanage, G.B., Dhekale, J. S., and Patil, P.G. (2016) Some engineering properties of arecanut husk aareca catechu l.: useful in waste to wealth conversion. Ind. J. Arecanut, Spices and Medicinal Plants, Vol. 18 (1), January – March.

12. Geelani, S. M. & Raja A.S.M. (2015). Eco-friendly dyeing of wool and pashmina fabric using *quercus robur* l. (fruit cups) dye and *salix alba* l. (wood extract) mordant. Journal of Applied and Natural Science, 7(1), 138-143.

13. Gotmare, V. D., Samanta, K. K., Patil, V., Basak, S. & Chattopadhyay, S.K. (2015). Surface modification of cotton textile using low-temperature plasma. International Journal of Bioresource Science, 2 (1), 37-45.

14. Guruprasad, R., Vivekanandan, M. V., & Chattopadhyay, S.K. (2015). The use of cotton as a sportswear material: A critical analysis, Cotton Research Journal, 6(1),61-64.

15. Halari, N. R., Rakshit, A. K., Chattopadhyay, S. K. & Bhowmick, M (2015). Effect of twist level and twist direction of core (double) yarn on Dref-3 spun yarn. Indian Journal of Fibre & Textile Research, 40 (2), 137-139 (NAAS rating - 6.63)

16. Krishnani, K. K., Boddu, V. M., Moon, D. M., Ghadge, S. V., Sarkar, B., Brahmane, M. P., Choudhary, K., Kathiravan, V., & Meng, X. (2015). Metals bioaccumulation mechanism in neem bark. Bulletin of Environmental Contamination and Toxicology, 95, 414-419.

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18. Kumar, A., Raja, A. S. M., Shakyawar, D. B., Pareek, P. K., & Krofa, D. (2015). Efficacy of natural dye from *gerardiana diversifolia* on pashmina (cashmere) shawls. Indian Journal of Fibre & Textile Research (IJFTR), 40(2), 180-183.

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and 2D 3D cyclone separators. International Conference on trends in Industrial & Mechanical Engineering (IC TIME 2016), Maulana Azad National Institute of Technology, Bhopal during Feb 4-6.

11. Sreenivasan, S., Sundaramoorthy,C. (2015). Cotton as a composite crop for higher and sustainable profitability. Souvenir on 74th Plenary Meeting, Mumbai during Dec 6-11.

12. Shaikh, A.J., Ambare, M.G. (2015). Kraft paper and corrugated boxes from cotton stalks for packaging of fruits. Souvenir on 74th Plenary Meeting, Mumbai during Dec 6-11.

7.4 Popular articles

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7.5 Others

1. Annual Report 2013-14 (Hindi)

2. Annual Report 2014-15 (English)

3. Annual Report 2014-15 (Hindi)

4. ICAR-CIRCOT at a Glance – April 2015

5. A Glimpse of ICAR-CIRCOT – January 2016

6. Mageshwaran, V. (2015). Training manual, ICAR short course on fermentation technology for value addition to cotton by- products and biomass. Sept. 07-16, 156 pages.

7. Patil, P.G., Sujata Saxena, Raja, A.S.M. & Arputharaj, A. (2015). Training manual on absorbent cotton technology. Sept. 2-3, 38 pages (CD format).

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9. Patil, P.G., Vigneshwaran, N., Bharimalla, A., Prasad, V., Arputharaj, A., & Prabu, G.T.V. (2016) training manual on advances in applications of nanotechnology.

10. CIRCOT Leaflet No. (126/2015) Calibration cotton.

11. CIRCOT Leaflet No. (127/2015) International training course.

12. ICAR-CIRCOT Leaflet No. (128/2015) Nanocellulose pilot plant (ecofriendly energy efficient production technology).

13. ICAR-CIRCOT Leaflet No. (129/2016). Nano zinc oxide production technology.

14. Vision 2050 document.

15. CIRCOT Leaflet No. (130/2016) Calibration cotton.

16. CIRCOT Leaflet No. (131/2016). Accelerated process for preparing bio-enriched compost from plant residues.

17. CIRCOT Leaflet No. (132/2016). Microbial process for degossypolization & nutritive enrichment of cottonseed cake.

8. RAC AND IRC MEETINGS

8.1 Research Advisory Committee (RAC)

The 21st RAC meeting was held during April 17-18, 2015 to review the progress of work during 2014-15. Chaired by Dr. P.R. Roy, Chairman, Diagonal Consulting (India), Ahmedabad, the meeting was attended by members including Dr. G.S. Nadiger, Textile & Management Consultant, Thane, Dr.(Smt.)Niyati Bhattacharya, Former Head, Department of Textiles, SNDT Women's University, Mumbai and Dr. K.K. Singh, ADG(Engg.), ICAR. Former CIRCOT Directors Dr. S. Sreenivasan and Dr. A.J. Shaikh were special invitees. A publication titled "CIRCOT at a Glance" was released during the meeting. Research progress of different divisions was presented by the concerned HODs. There was a discussion about CRP on natural fibres and CIRCOT Vision 2050. The Committee also visited the newly created nanocellulose pilot plant and electro-spinning facility at the Institute.

Fig. 8.1 Dr. P.R. Roy, Chairman, RAC releasing 'CIRCOT at a Glance' on April 17, 2015

Fig. 8.2 Visit of the 21st RAC members to the electrospinning laboratory

The 22nd RAC meeting was held on March 16 and 17, 2016, under the Chairmanship of Dr. P.R. Roy and attended by other RAC members and Dr. S.N. Jha, ADG (PE), ICAR. The meeting reviewed the progress of research during April to February 2016.

8.2 Institute Research Council (IRC)

The 115th IRC meeting was held on April 27, 2015 to monitor the progress of research carried out during 2014-15 and to discuss new project proposals. The meeting was chaired by Dr. P.G. Patil, Director, ICAR-CIRCOT and attended by all the HODs, Scientists and Technical Officers. Dr. K.R. Kranthi, Director, ICAR-CICR, Nagpur, attended the meeting as a special guest along with former CIRCOT Directors Dr. S. Sreenivasan and Dr. A.J. Shaikh. Er.V.G. Arude, Scientist, presented the Results Framework Document for 2015-16.

Half-yearly IRC meeting was held during December 22-23, 2015 in which two new projects were approved; (1) Application of Nanocellulose in Cement Concrete, Rubber Composites, Pulp and Paper for Enhancement of Functional and Mechanical Properties by Er. A.K. Bharimalla and (2) Popularization of CIRCOT Technologies on Compost and Oyster Mushroom Production using Cotton Stalks among the Cotton Growing Farmers of Vidharba Regionby Dr. V. Mageshwaran.

Fig. 8.3 XXII RAC meeting on March 17, 2016

Fig. 8.4 115th IRC meeting on April 27, 2015

9. SEMINARS / CONFERENCES / WORKSHOPS

Director, Scientists and Technical Personnel of ICAR-CIRCOT participated in the following scientific/technical conferences and seminars besides attending meetings connected with the work of the Institute.

Table 9.1 List of seminars/conferences / meetings and workshops attended

Sr. No.	Title	Venue	Date	Participants
1.	Annual Group Meet of AICRP on Cotton	Tamil Nadu Agricultural University, Coimbatore	Apr 08-10, 2015	Dr. P. G. Patil, Dr. N. Shanmugam Dr. P. K. Mandhyan Sh. R. S. Prabhudesai Sh. R. K. Jadhav Dr. S. Venkatkrishanan
2.	Fourth International Conference on Natural Polymers and Biomaterials	Mahatma Gandhi University, Kottayam, Kerala	Apr 10-12, 2015	Dr. P. K. Mandhyan Dr. N. Shanmugam
3.	Workshop on Making Engineering Scientists' Contribution more Meaningful to Stake Holders and the Nation	ICAR, New Delhi	Apr 13, 2015	Dr. P. G. Patil
4.	Sectional Committee Meeting of Bureau of Indian Standards	Bureau of Indian Standards, New Delhi	Apr 24, 2015	Dr. Sujata Saxena
5.	Town Official Language Implementation Committee Meeting	Mumbai	Apr 30, 2015	Sh. Sunil Kumar, Ms. K. R. Joshi
6.	Seminar on New Developments and Technology Trends in Lightfastness Testing	Ametek Measurement & Calibration Technologies, Mumbai	May 8, 2015	Dr. A. S. M. Raja Sh. R. S. Narkar
7.	Seminar of ICAR Directors and Vice Chancellors of Agricultural Universities	ICAR, New Delhi	May 14-16, 2015	Dr. P. G. Patil
8.	Seminar on Challenges & Opportunities in Textile Processing - a Way Forward	Textile Association, Mumbai	May 21, 2015	Dr. Sujata Saxena Dr. A. S. M. Raja, Sh. A. Arputharaj
9.	43rd Joint AGRESCO 2015	MPKV, Rahuri	May 28-30, 2015	Dr. N. Shanmugam Er. V. G. Arude
10.	International Workshop on Electrospinning and Electrospraying	Indian Textiles Research Association, Coimbatore	Jun 22-23, 2015	Sh. G. T. V. Prabu
11.	Short Course on Capacity Building of Agricultural Library Professionals	Telangana State Agricultural University, Hyderabad	Jul 22-31, 2015	Mrs. Prachi R. Mhatre

12.	National Workshop on Advanced Nano Composite Materials: Characterization and Application	Anna University, Coimbatore	Sep 22-23, 2015	Dr. T. Senthilkumar
13.	Indo-German Round Table on Trade Potential in Technical Textiles	Bureau of Indian Standards	Sep 30, 2015	Dr. P. K. Mandhyan
14.	23rd Annual Conference of Agricultural Economics Research Association	CIFE, Mumbai	Dec 2-4, 2015	Dr. C. Sundaramoorthy
15.	International Conference on Humanizing Work and Work Environment and International Symposium on Community Nutrition and Health: A Social Responsibility	IIT, Mumbai	Dec 6-9, 2015	Er. V. G. Arude, Dr. S. K. Shukla
16.	Conference on Patinformatics for Technological Competitive Intelligence and Licensing	NCL, Pune	Dec 7-9, 2015	Er. A. K. Bharimalla
17.	National Symposium on Future Technologies: Indian Cotton in the Next Decade	Acharya Nagarjuna University, Guntur	Dec 17-19, 2015	Dr. S. K. Shukla Er. V. G. Arude Dr. V. Mageshwaran Er. Varsha Satankar
18.	50h Annual Convention of ISAE and Symposium on Agricultural Engineering in Nation Building: Contributions and Challenges	Bhubaneshwar	Jan 19-21, 2016	Er. P. S. Deshmukh
19.	International Conference on Trends in Industrial and Mechanical Engineering (IC-TIME, 2016)	Maulana Azad National Institute of Technology, Bhopal	Feb 4-6, 2016	Dr. S. K. Shukla
20.	One Day Cotton Seminar under National Food Security Mission (NFSM) for North Zone	Department of Agriculture, Cooperation & Farmers Welfare, New Delhi	Feb 8, 2016	Dr. Hamid Hasan
21.	Competency Development for Human Resource Development Nodal Officers of ICAR	ICAR-NAARM, Hyderabad	Feb 10 - 12, 2016	Dr. T. Senthilkumar
22.	Seminar on Commercialization of Language in the Wake of Globalization	Shipping Corporation of India, Mumbai	Feb 15, 2016	Mrs. Kiran Joshi

23.	Brainstorming Session	Centre for Technology Alternatives for Rural Areas (CTARA) IIT, Bombay	Feb 17, 2016	Dr. P. G. Patil Dr. A. K. Bharimalla Dr. N. Vigneshwaran
24.	National Workshop on Plasma Techniques for Textiles	South Indian Textile Research Association (SITRA), Coimbatore	Feb 18-20, 2016	Sh. G.T.V. Prabu
25.	International Conference on Denims- A Democracy in Fashion	Diagonal Consulting (India) at IIM, Ahmadabad	Feb 19-20, 2016	Dr. Sujata Saxena Dr. A.S.M. Raja
26.	National Workshop on Strengthening and Sustainability of E-Granth	NASC Complex, New Delhi	Feb 26-27, 2016	Mrs. Prachi R. Mhatre
27.	ITMC Meeting	CIFA, Bhubaneswar	Feb 27, 2016	Er. A. K. Bharimalla
28.	International Conference on Recent Trends in Engineering and Material Science	Jaipur	Mar 17-19, 2016	Dr. A. S. M. Raja

10. MERA GAON MERA GAURAV

The "Mera Gaon Mera Gaurav" (My Village My Pride) programme launched by the Prime Minister of India, has been conceptualized to promote direct interface of scientists with farmers and to hasten the "lab to land" process in which scientists identify villages in the vicinity of the Institutions for providing advisories and consultations to farmers for increasing farm productivity and production. It is an innovative scheme initiated by the Govt of India to provide information, knowledge and advisories on regular basis to the small and marginal farmers on various issues relevant to agriculture by adopting villages.

As per this directive, CIRCOT has identified and adopted 30 villages in Wardha district of Vidarbha region in Maharashtra.The selection of villages was finalised in a meeting of all scientists under the chairmanship of Director, CIRCOT on September 23, 2015 based on factors like predominance of cotton growing areas and proximity of villages to the Ginning Training Centre, Nagpur. Six teams comprising of four scientists each group were formed and five villages were allotted to each team as given in the Table 10.1 and photographic account of various activities conducted is depicted in figures 10.1 and 10.2.

Initially, a baseline survey was conducted in these villages to understand the livelihood conditions of farmers, crops cultivated, productivity, problems faced by them as well as various organisations dealing with it. Later, all teams interacted with the respective villagers on various issues related to cotton processing technologies in particular and other agriculturally important matters in general including *Swachh Bharat Mission*. It was insisted that farmers should not burn their cotton stalk residues, which could be used for value addition as raw material in making briquettes and pellets which are renewable alternatives of energy.CIRCOT technologies were briefed to farmers and entrepreneurs.

A "Technology and Machinery Demonstration Mela- 2016" was organized at GTC, Nagpur on March 21, 2016 where over 300 farmers from the adopted 30 villages of Wardha district and stakeholders from industry attended the program. It was aimed at demonstrating the technologies in post-harvest processing of cotton and value addition to cotton stalks and other crop residues. Dr. Sharad Nimbalkar, Hon'ble former Vice Chancellor of Dr. Punjabrao Agricultural University, Nagpur in his presidential address, expressed concerns over underutilization of cotton by-products for value addition. He emphasized that farmers should work in groups for on-farm utilization of crop residues to increase farm income. In his special address, Dr. S.K. Singh, Director, ICAR-NBSS & LUP, Nagpur explained the role of soil health card and importance of soil fertility management in crop production and reduction in cost of production. Dr. M.S. Kairon, Former Director, ICAR-CICR, Nagpur highlighted the ways to improve the soil organic carbon by solid wastes recycling. Shri Luv Bajaj, Bajaj Industries Pvt. Ltd, Nagpur insisted the young entrepreneurs to adopt ICAR-CIRCOT technologies on cotton stalks utilization. Shri G.H. Wairale, former GM, Maharashtra State Cotton Growers Federation & Co-ordinator, CITI-CRDA, Mumbai highlighted the methodologies that led to increase in cotton productivity in Wardha District.

On this occasion, 15 progressive farmers and budding entrepreneurs were felicitated for attaining higher cotton productivity and supplying chipped cotton stalks in bulk quantities to different industries for its value addition. In addition, *Soil Health Cards* mentioning the soil fertility status were distributed to the farmers covered under *Mera Gaon Mera Gaurav* programme. Live demonstration of numerous farmer friendly technologies, machines and products related to value addition to cotton and its by-produce were exhibited during the programme. Technical presentations on utilization of cotton stalks for briquettes, pellets, power generation and compost were made by various industrial entrepreneurs and scientific experts.

Table 10.1 List of villages adopted in Wardha District

Team	Scientists	Blocks	Villages
1	Dr. S.K. Chattopadhyay Dr. V. Mageshwaran Er. G.T.V. Prabu Er. Shekar Das	Selu Selu Selu Selu Selu	Amgaon Kadhiki Digras Parsodi Palasgaon
2	Dr. Sujata Saxena Sh. A. Arputharaj Dr. R. Guruprasad Ms. Varsha Satankar	Wardha Wardha Wardha Wardha Anji	Satoda Anji Dorli Majra Pavnur
3	Dr. S.V. Ghadge Er. A.K. Bharimalla Dr. T. Senthilkumar Er. P. Jagajanantha	Wardha Wardha Wardha Wardha Wardha	Bhiwapur Bhugaon Selkute Sirasgaon Waigaon
4	Er. V.G. Arude Dr. N. Shanmugam Dr.Virendra Prasad Er. Manik Bhowmick	Hinganghat Hinganghat Samudrapur Samudrapur Samudrapur	Shegaon Sawali Nandori Belghat Parda
5	Dr. A.S.M. Raja Dr. P.K. Mandhyan Dr. N. Vigneshwaran Er. G. Krishna Prasad	Deoli Deoli Deoli Deoli Deoli	Isapur Sonegaon Muradgaon Ratnapur Babhulgaon
6	Dr. S.K. Shukla Dr. S.K. Dey Dr. C. Sundaramoorthy Sh. Santanu Basak	Selu Selu Selu Selu Selu	Antargaon Ghorad Morchapur Rehaki Zadsi

Fig. 10.1 Scientists interacting with farmers of Wardha district, Maharashtra

Fig. 10.2 Technology and machinery demonstration mela at GTC, Nagpur

11. SWACHH BHARAT ABHIYAN

Swachh Bharat Abhiyan, the Clean India Mission launched by the Prime Minister was carried out with a lot of zeal and enthusiasm in the Institute during the year. All the staff of the institute contributed the mandatory 100 hours for various cleanliness activities in the institute premises and its surroundings totalling for around 6000 man-hours or 750 man-days during the year. Due care was taken during the cleanliness activities to avoid any accidents and injuries by providing proper protective gears to the employees. The institute is making all efforts to keep its premises clean and educate and inculcate the importance of cleaning in all segments of the society. The committee consisting of scientists, technical and administrative staff has been constituted under the chairmanship of the Director to execute and oversee the various activities, some of which are listed below.

Intensive cleanliness campaigns were carried out covering Institute premises. Two programmes every month were conducted to remove scrap and other unused discarded materials from various sections and divisions in the institute by the staff by forming a human chain.

Innovative activities were conducted to spread the message of cleanliness in and around the premises. Dr. H.K. Kundelia, visiting Physician at the Institute gave a talk on *Cleanliness in Daily Life* on May 18, 2015 as a part of Swachh Bharat Movement. All the Institute employees were administered the cleanliness oath on October 05, 2015. On the same day, a road show was also staged by Sangam Pratishtan, Thane emphasizing the importance of Clean India. The same show was later also performed at five gardens for awareness of the general public about the Clean India programme. The stage show gave a strong message to clean Mumbai.

The photographic account of various activities under Swachh Bharat Abhiyan carried out in the Institute during the year is given in figures 11.1 to 11.3.

Fig. 11.1 Forming human chain for cleanliness drive

Fig. 11.2 Road show on Clean India Programme at Matunga

Fig. 11.3 CIRCOT Staff taking swachhata shapath

12. EVENTS ORGANISED

12.1 National seminar on value addition

A National Seminar on "Value Addition to Cotton Stalks and other Agro-Wastes for Rural Livelihood" was organised on June 6, 2015 at GTC, Nagpur in collaboration with the Indian Society for Cotton Improvement (ISCI) and Agro-Plus Foundation, Nagpur.

Shri Nitin Gadkari, Hon'ble Union Minister for Road Transport, Highways & Shipping inaugurated the seminar which was attended by more than 350 delegates including farmers, raw material suppliers, machine manufactures, marketing agencies and banks. The minister, while delivering inaugural address as chief guest, stressed upon utilizing technology, innovative thinking and fostering the spirit of entrepreneurship among the rural youth. He urged the participants to use cotton stalk and other agro wastes for making pellets and briquettes as an alternative to coal, firewood, cooking gas and for conversion of biomass into ethanol, an alternative to fossil fuel.

Dr. C.D. Mayee, President, ISCI & former chairman, ASRB, expressed the need to amend the curricula of agricultural universities from primary agriculture to secondary agriculture. He also urged for advancement in agricultural technology needed to convert waste into wealth that can provide additional remuneration to farmers.

Dr. P.G. Patil, Director, CIRCOT highlighted the pioneering work done by the Institute in establishing a particle board demonstration plant, cotton stalk composting unit and nanocellulose pilot plant. He also urged upon the need to promote entrepreneurship in the field of agro waste management.

Dr. A.J. Shaikh, Secretary, ISCI, Mumbai; Mr GH Wairale, President, Agro-Plus Foundation, Nagpur; and Dr. S.K. Shukla, In-Charge, GTC, Nagpur shared their views on the subject. Books and leaflets published by CIRCOT and NBSSLUP were released on the occasion. Several farmers and entrepreneurs who make good use of agro waste were felicitated on the occasion.

Fig. 12.1 Hon'ble Union Minister Shri Nitin Gadkari inaugurating the national seminar

Fig. 12.2 Shri Nitin Gadkari, Union Minister,
at the particle board demonstration plant, GTC, Nagpur

Fig. 12.3 Felicitation of farmers supplying biomass for value addition

12.2 Inauguration of nano-cellulose pilot plant

ICAR-CIRCOT Nanocellulose Pilot Plant, unique facility in line with the *Make in India* efforts by the Government of India, was inaugurated by Padma Vibhushan Dr. R. A. Mashelkar on August 21, 2015. ICAR, through NAIP, funded the establishment of the nanocellulose pilot plant under ZTM-BPD project in 2013 to act as an incubation centre for entrepreneurs and demonstration plant for all stakeholders. Dr Mashelkar lauded the efforts of ICAR-CIRCOT in establishing such a world class facility that caters to the value addition of farm produce. He released a leaflet on "*ICAR-CIRCOT Nanocellulose Pilot Plant*". He also delivered the Dr. V. Sundaram memorial lecture on "Designing an Indian Agriculture Inclusive Innovation System". He strongly supported the concept of innovation-led growth in agriculture that is essential for sustainability. He emphasized the need of total innovation that includes policy level innovation, business model innovation and technology level innovation, to achieve the overall growth in agriculture. Also, he suggested that three cutting edge technologies, namely, Nanotechnology, Biotechnology and ICT should be made to work for the poor of this country. He concluded with the note of urgent requirement of inclusive innovation ecosystem in India for achieving *affordable excellence* in all spheres of life. During the event, Dr. Mashelkar was also felicitated on behalf of the Indian Society for Cotton Improvement (ISCI), Mumbai.

Fig. 12.4 Padma Vibhushan Dr. R.A. Mashelkar inaugurating the nanocellulose pilot plant

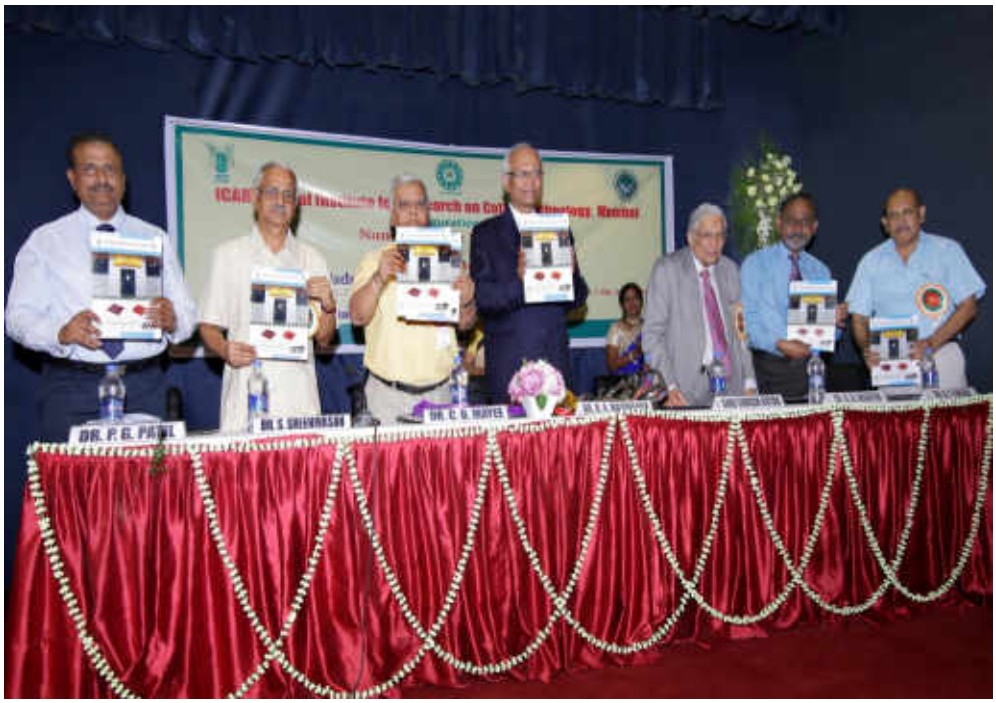


Fig. 12.5 Release of a leaflet on the nanocellulose pilot plant

Fig. 12.6 Dr. C.D. Mayee, Former Chairman, ASRB and President, ISCI, felicitating Dr. Mashelkar

12.3 Brainstorming sessions

12.3.1 Upgradation of Coimbatore centre

A brainstorming session was conducted on April 6, 2015 to gather ideas on the potential scope for expansion of the research activity at the Coimbatore centre. Dr. P.G. Patil, Director, CIRCOT briefed about the interest shown by Dr. K. Alagusundaram, DDG(Engg) to strengthen the Coimbatore regional unit. The session was attended by scientists and technical officers of the Institute. Former Directors Dr. S. Sreenivasan and Dr. A.J. Shaikh were specially invited for guidance and suggest way forward. Dr. S. Venkatakrishnan, Chief Technical Officer, presented the genesis as well as the present activities of the unit. A detailed proposal for upgradation of the QEID unit at Coimbatore has been sent to the Council.

12.3.2 Agri Business Incubator

A brainstorming session on Agri Business Incubator (ABI) was held on May 28 and May 30, 2015. Dr. R.P. Kachru, former ADG (PE), ICAR was the chairman of the meeting attended by Dr. S. Sreenivasan and Dr. A.J. Shaikh, Former Directors; Dr. K.M. Paralikar and Dr. S.G. Gayal, Former Heads; Dr. P.G. Patil, Director, Heads of Divisions and Scientists. The committee suggested modifications on the draft proposal prepared by the Business Planning Unit (BPD), especially with respect to selecting technologies for focusing on commercialization, plan of work for the project period and the self-sustainability of the unit for five years. The suggestions were duly incorporated in the final draft seeking funds under the XII plan scheme of IP&TM unit, ICAR for establishing an ABI at the institute.

12.3.3 Make in India/Made in India in textiles

A discussion on **"Make in India/Made in India in Textiles"** was jointly organized by ICAR-CIRCOT and Indian Fibre Society (IFS) on September 11, 2016. Dr. S.N. Pandey, President, IFS; Dr. S. Sreenivasan, Former Director, ICAR-CIRCOT; Dr. R.P. Nachane, Chairman, IFS; Shri R.M. Gurjar, Secretory, IFS, Dr. P.G. Patil, Director, ICAR-CIRCOT; Shri Suresh Vaidya, Textile Consultant; Shri Ulhas Nimkar, Textile Consultant; Dr. G.S. Nadiger, Former Director, Textiles Committee, and Textile Consultant; Dr. P. Varadarajan, Assessor, NABL; Dr. G.R. Anap, International Ginning Consultant; Shri Arun Roongta, Textile Consultant *cum* journalist; Shri Vidhur, Industrialist; Mr. Mepani, Industrialist and scientists participated in the discussion.

Fig. 12.7 Brainstorming session on Agri Business Incubation

Dr. S.N. Pandey, President, IFS, in his presidential address, highlighted the need for producing quality products at competitive prices. Dr. R.P. Nachane, Chairman, IFS, highlighted the positives of Indian textile industry such as high spindleage, rotor capacity, loom capacity, and manpower availability. He mentioned about increase in domestic demand for quality products touching upon the need to develop indigenous machinery. Further, he pointed out that Indian companies are performing poorly in chemical finishing and garment finishing sectors and advocated measures from central and state governments to ease policies for licensing of industries. Dr. P.G.Patil, Director, ICAR-CIRCOT pointed out that better infrastructure facilities and skill development are the core issues to be targeted for success of this initiative. He insisted on better utilization of cotton materials and training of manpower to improve productivity. Dr. S. Sreenivasan concluded the session applauding the active participation of all members.

Emerged from the brainstorming session was that home textile industry in India is flourishing and India can become dominant supplier of home textile products in future. Immediate action is necessary for quality improvement of long staple cotton to maintain our status as a prominent cotton producer and manufacturer. Need was expressed for fundamental research in waste management; skill development of manpower; revival of the Indian eco-label and formulation of Indian organic standard. Uniqueness of Indian products should be projected on a bigger scale.

Fig. 12.8 Brainstorming session on Make in India / Made in India in textiles

12.4 Industry interface meet

CIRCOT - Industry interface meet was organized on October 7, 2015 under the chairmanship of Dr. P.G. Patil, Director. Participants from the Institute included former Directors, Dr. S. Sreenivasan and Dr. A.J. Shaikh, Dr. S.K. Chattopadhyay, Dr. Sujata Saxena, Dr. N. Shanmugam, Er. V.G. Arude, Dr. A.S.M. Raja, Dr. N. Vigneshwaran, Er. A.K Bharimalla and Dr.Virendra Prasad. The Industry was represented by eminent personalities like Mr. Suresh Kotak, Chairman, Kotak Ginning and Pressing Industries, Mumbai; Mr. ML Jhunjhunwala, President, RSWM, Mumbai; Mr. J.B. Soma, Publisher of Journal of the Textile Association, Mumbai; Mr. Shiv Kanodia, Ex.Honorary Secretary, Bharat Merchants Mumbai; Mr. Manish Daga, Managing Director, Lesha Impex, Mumbai and Ms. Jigna Shah, Editor & Publisher, Textile Value Chain Magazine, Innovative Media and Information Company, Mumbai.

Responding to the industry delegates need for familiarization with institute expertise, the scientists along with the former Directors elucidated various technologies developed at the Institute, on-going research activities, future scope and potential of the developed technologies. Dr. S. Sreenivasan urged the industry to move towards polyesterization for hydrophobization of cotton fibres to enhance the scope of its application in diversified areas. Later, Er. A.K. Bharimalla described the energy-efficient protocols developed for the production of nanocellulose from cotton linters / comber noils during the visit to nanocellulose pilot plant. Dr. N. Vigneshwaran explained about the application potential of nanocellulose with the help of the samples in the exhibition room adjacent to the pilot plant. The action points that emerged out of this meeting are being considered for deciding the future course.

Fig. 12.9 Industry delegates visit the Nanocellulose Pilot Plant

12.5 Review meetings

12.5.1 Nano Cellulose pilot plant

The tenth review meeting of the sub-committee on erection and commissioning of nanocellulose pilot plant was held on April 6, 2015 under the chairmanship of Dr. P.G. Patil, Director, ICAR-CIRCOT, in the presence of expert committee members, Dr. S. Sreenivasan and Dr. A.J. Shaikh, former Directors of CIRCOT. The committee inspected the site and reviewed the actual work done during the reporting period. Er. A.K.

Bharimalla briefed about the pilot plant progress as against the suggestions made in the previous review meeting.

The eleventh review meeting of the sub-committee on erection and commissioning of nanocellulose pilot plant was held on August 7, 2015 which was chaired by Dr. P.G. Patil, Director, CIRCOT. In view of the scheduled inauguration of the nanocellulose pilot plant on August 21, 2015, the committee inspected the site and reviewed the status of the pilot plant. Er. A.K. Bharimalla briefed the progress made in the pilot plant and the trails taken in production of nanocellulose explaining all unit operations. The results of trials on applications of nanocellulose in paper, cement and plastic films along with the samples were presented by Dr. N. Vigneshwaran. The committee critically reviewed the progress and guided the team members to make required arrangements for the inauguration of the pilot plant by Padma Vibhushan Dr. R.A. Mashelkar.

Fig. 12.10 Expert committee members inspecting erection and commissioning of the nanocellulose pilot plant

12.5.2 Nanocellulose expert committee

The seventh nanocellulose expert committee review meeting was held on Oct 30, 2015 and was attended by the members including Dr. R.P. Kachru, Former ADG, ICAR; Dr. S. Sreenivasan and Dr. A.J. Shaikh, Former Directors, CIRCOT; Dr. M.S. Banerji, Former Director, IRMRA and Dr. S.P. Deshmukh, Associate Professor, ICT, Mumbai.

Giving initial remarks, Dr. Kachru congratulated the Director and his team for successful commissioning of the pilot plant which was inaugurated at the hands of Padma Vibhushan Dr. R.A. Mashelkar. He termed this as the third generation technology of CIRCOT, first generation being fibre quality and second on particle board development. He also suggested an in-depth analysis of nanocellulose & its behaviour to exploit its fullest potential in applications. Dr. S. Sreenivasan opined that participatory research with private players is essential to improve the economic viability. Dr. Banerji insisted to focus on polymer/rubber applications of nanocellulose and urged to try dispersing NCC in latex form instead of solid rubber form. Dr. Deshmukh recommended NCC based product validation in diversified fields.

Dr. Vigneshwaran presented the research progress since August 21, 2015 after the pilot plant inauguration. He elaborated on the results obtained out of NCC applications in rubber, cement concrete, plastics and paper. This was followed by a presentation from Dr. Wayal, VJTI on potential applications of nanocellulose in cement concrete. Later, Er. Bharimalla presented progress on the business activities.

Fig. 12.11 Nanocellulose expert committee review meeting

12.5.3 Stake holders meet on development of on-board pre-cleaner

Cotton harvester with on-board pre-cleaner is being designed and developed in collaboration with CICR, Nagpur and M/s Mahindra and Mahindra. A meeting of stakeholders was held on July 9, 2015 for deliberations over the technology in developing stage and the terms and conditions of the agreement to be entered with Mahindra & Mahindra. Chaired by Dr. K.R. Kranthi, Director, CICR, Nagpur, the meeting was attended by Dr. P.G. Patil, Director, CIRCOT, Mumbai; Dr. A.J. Shaikh, Former Director, CIRCOT; scientists from CICR and CIRCOT and representatives from M/s Mahindra and Mahindra.

12.6 Launch workshop of ABI, Institute-Industry interface meet and MoU signing ceremony

The Launch workshop of the Agri-Business Incubation Centre was held on February 5, 2016 at ICAR-CIRCOT, Mumbai along with the Institute-Industry Interface meet and Signing of the MoU's with the stakeholders. Shri Suresh Kotak, Chairman, Kotak Foundation, Mumbai was the Chief Guest on the occasion. Dr. S. N. Jha, ADG(PE), ICAR, New Delhi, Dr. S. Sreenivasan, Former Director, CIRCOT, Mumbai and Shri Rajeeb Roy, MD, Agriplast Tech India Private Limited, Bengaluru were the Guests of Honour.

Dr. P. G. Patil, Director, ICAR-CIRCOT, welcomed all the dignitaries and presented the Institute's achievements and the services provided to the stakeholders. Two video documentaries, one on "ICAR-CIRCOT" and "Nanocellulose Pilot Plant" were released by the Chief Guest. Four publications *viz.*, ICAR-CIRCOT Hindi E-newsletter, ICAR-CIRCOT English E-newsletter, pamphlet on Nano Zinc Oxide Production Technology and brochure on "A Glimpse of ICAR-CIRCOT" were released by the dignitaries.

Seven Memoranda of Understanding (MoUs) were signed between ICAR-CIRCOT and its stakeholders viz., Veermata Jijabai Technological Institute, Mumbai & Lafarge India Private Limited, Mumbai; M/s. Ramcharan Company Pvt. Ltd., Chennai; M/s. Parksons Dyestuff Industries Pvt. Ltd., Nagpur and M/s. Laxmi Govind Paper & Pulp Mill Private Limited, Nagpur; M/s. Precision Tooling Engineers, Nagpur; M/s. Green Globe Mumbai; M/s. Hindustan Unilever Limited, Mumbai and Shri Irfan Ali, Raichur, Karnataka for technology licensing, incubation and consultancy services.

Fig. 12.12 Shri Suresh Kotak, Chairman, Kotak Foundation during the talk

12.7 BIS Surveillance Audit

The Bureau of Indian Standards (BIS) conducted the mandatory surveillance audit for ISO 9001:2008 accreditation on June 11-12, 2015. Shri M.D. Chilakwad, team leader and Shri G.P. Kanchi, an expert, conducted the audit in all the divisions and sections of the Institute and expressed satisfaction over the functioning of quality management system of CIRCOT as per ISO 9001:2008.

12.8 Hindi Implementation

A one-day Hindi workshop was organized on June 20, 2015 for scientists to do their official work in Hindi. Eleven scientists were benefited by this workshop. Shri Suresh Jain, ex Hindi officer of NITIE, Mumbai and Dr. M.L. Gupta, Assistant Director, Hindi Teaching Scheme took part in the workshop. Smt. Kiran Joshi, Hindi officer also discussed ways to improve Hindi language implementation in the institute.

Hindi Week was celebrated in the institute from 7 to 14 September, 2015. A variety of interesting competitions were organized for the staff members

in poetry recitation, essay, drafting/noting, crosswords, translation, general knowledge and antakshari. It was inaugurated by Dr. Anant Shrimali, Assistant Director, Hindi Shikshan Yojana and well-known Humour Poet & Manch Sanchalak. He lauded the consistent progress of official language implementation at the Institute.

Kavi sammelan was organized on September 14, 2015, the concluding day where eminent poets Shri Suresh Mishra, Dr. Vanamaalee Chaturvedi, Shri Sagar Tripathy, Shri Ras Bihari Pandey, Smt. Pramila Sharma and Shri Vidyabhooshan Tiwari participated and recited some of their beautiful original compositions. The poets also graced the occasion as chief guests and distributed the certificates and awards to the winners of competitions held during the week. The annual awards for rendering official works originally in hindi went to clerical employees Mrs. S.P. Payala and Mrs. S.R. Shirsat. The annual Chal Vaijayanti shield for maximum official work in Rajbhasha went to Technology Transfer Division and Administrative Section. The employees who passed Hindi Prabodh and Pravin were also honoured on the occasion.

Hindi week was also celebrated at Ginning Training Centre, Nagpur during which various competitions were held to promote awareness for official language. Smt. Madhuri Raulkar, eminent gazal singer and Dr. Manoj Pandey, Professor, RSTM University, Nagpur attended as chief guests at Nagpur.

12.9 Vigilance Awareness Week

Vigilance Awareness Week was celebrated at the institute during October 26 - 31, 2015. The staff were administered Vigilance Oath on the first day. On the concluding day, Dr. A.S.M. Raja delivered a talk on Preventive Vigilance as a Tool of Good Governance.

12.10 Communal Harmony Week

Communal Harmony Week was observed in the Institute. The members of the staff of the Institute were administered Communal Harmony Oath on November 19, 2015.

12.11 Anti-Terrorism Day

Anti terrorism day was observed at the Institute on May 21, 2015 to mark the 23rd death anniversary of former Prime Minister of India Shri Rajiv Gandhi. On the occasion, Dr. P.G. Patil, Director, CIRCOT administered "Anti-Terrorism Day" pledge to all the employees for promoting peace.

12.12 Sadbhavana Diwas

Sadbhavana Diwas was observed in the Institute on August 20, 2015. Official staff took pledge to work for "the emotional oneness and harmony of all the people of India regardless of caste, region, religion or language" and to resolve all differences "through dialogue and constitutional means without resorting to violence".

12.13 National Unity Day

National Unity Day was observed on October 31, 2015 to mark the birth centenary of Shri Sardar Vallabhbhai Jhaverbhai Patel, one of the founding fathers of the Republic of India. On this day, Dr. P.G. Patil, Director administered the oath and the staff took pledge to maintain the unity and integrity of the country.

12.14 Constitution Day

In commemoration of the 125th birth anniversary of Bharat Ratna Dr. Babasaheb Ambedkar, "Constitution Day" was observed on November 26, 2015 as per the Government's directive to celebrate the day every year as the Constitution Day. On this day, the staff were administered Oath by the Director to preserve the constitution of the Country.

12.15 Lectures

Food for Health by Dr. R.T. Patil, Former Director, ICAR-CIPHET, Ludhiana and Director, Technocrats Institute of Technology, Bhopal on April 7, 2015.

Textile Processing Industry – Quality & Ecological Perspectives – Ecolabels by Dr. G.S. Nadiger, Member, RAC on April 18, 2015.

Cotton Technical Assistance Programme (Cotton TAP) for Africa for conducting In-country training programme on post-harvest management and value addition for crop residues and site selection for setting up regional knowledge cluster *cum* training centre on post-harvest &ginning technologyby Dr. P.G. Patil, Director and Er. A.K. Bharimalla, Sr. Scientist on April 24, 2015.

Cleanliness in Daily Life by Dr. H.K. Kundelia, visiting physician at ICAR-CIRCOT, Mumbai on May 18, 2015.

Uncertainty Measurement by Shri R.A. Shaikh, Quality Manager, BTRA on August 13, 2015.

Deputation Report – Visit to Chad under Cotton TAP for Africa by Er. V.G. Arude, Scientist on October 30, 2015.

Nano-Starch: Preparation and Characterization by Shri Dukare Ajinath Shridhar, Scientist (on ARS probation to ICAR-CIRCOT) on January 25, 2016.

Rheological Behaviour of Nanocellulose by Er. Bibwe Bhushan Ratnakar, Scientist (on ARS probation to ICAR-CIRCOT) on January 25, 2016.

Versatile Coir and Jute Textiles by Dr. U.C. Sarma, Member RAC & Director, Indian Jute Industries Research Association (IJIRA) on March 16, 2016.

Deputation Report – Visit to Nigeria under Cotton TAP for Africa by Dr. S.K. Shukla and Er. P.S. Deshmukh, Sr. Scientist and Scientist on March 16, 2016.

Fig. 12.13 Kavi Sammelan during Hindi week

13. DISTINGUISHED VISITORS

Parliamentary Committee on Agriculture and Farmers Welfare

1. Hon. Shri Hukmdev Narayan Yadav, *Chairman*
2. Hon. Prof. Richard Hay
3. Hon. Shri Md. Badaruddoza Khan
4. Hon. Dr. Tapas Mondal
5. Hon. Shri Janardan Mishra
6. Hon. Shri Ajay Nishad
7. Hon. Shri Mukesh Rajput
8. Hon. Shri C. L. Ruala
9. Hon. Shri Arjun Charan Sethi
10. Hon. Shri Satyapal Singh (Sambhal)
11. Hon. Shri Mohd. Ali Khan
12. Hon. Shri Ram Nath Thakur
13. Hon. Shri Shankarbhai N. Vegad

Ministry of Agriculture and Farmers Welfare

Dr. Sanjeev Kumar Balyan, Hon. Minister of State for Agriculture and Farmers Welfare

ICAR / SAU / GOI / State Govt / Other Officials

1. Dr. S. Ayyappan, Secretary, DARE and DG, ICAR
2. Dr. K. P. Viswanatha, VC, The Mahatma Phule Krishi Vidyapeeth (MPKV), Rahuri
3. Dr. Tapas Bhattacharyya, VC, Dr . Balasaheb Sawant Konkan Krishi Vidyapeeth, Dapoli
4. Dr. B. Venkateswaralu, VC, Vasantrao Naik Marathwada Krishi Vidyapeeth Parbhani
5. Dr. R. G. Dani, VC, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola
6. Shri Appaji C. S. Nadgouda, Govt. of Karnataka (Special Representative)
7. Dr. T. Prabhushanker, IAS, Assistant Secretary, DARE
8. Dr. Kavita Gupta, Textile Commissioner, Ministry of Textiles, Govt of India
9. Dr. N.K. Krishna Kumar, DDG (Horticulture)
10. Dr. K. Alagusundaram, DDG (Engg)
11. Dr. S.N. Jha, ADG (PE)
12. Dr. K. R. Kranthi, Director, CICR, Nagpur
13. Dr. K.K. Singh, Director, CIAE, Bhopal
14. Mrs. Seema Chopra, Deputy Director (Official Language)
15. Dr. V.K. Kothari, Emeritus Professor, IIT Delhi
16. Shri K.V. Deshmukh, Director of Agriculture, Govt. of Maharashtra
17. Dr. Pitam Chandra, Former Director, CIAE, Bhopal
18. Dr. Rafiq M. Choudhry, International Cotton Advisory Committee
19. Shri Suresh Kotak, Chairman, Kotak
20. Dr. O. G. Kakde, Director, VJTI, Mumbai
21. Dr. Balwinder Singh, PAU, Ludhiana
22. Dr. R.K. Gumber, PAU, Ludhiana
23. Dr. G.S. Butter PAU, Ludhiana
24. Shri Mahesh Sharda, President, Indian Cotton Association Limited, Bathinda
25. Shri Dhiren N Sheth, President, Cotton Association of India
26. Shri Mahesh Sharda, President, Indian Cotton Association, Bhatinda

Fig. 13.1 Chairman & Members of Parliamentary Committee on Agriculture and Farmers Welfare at the Institute on January 23, 2016

Fig. 13.2 Dr. Sanjeev Kumar Balyan, Hon. Minister of State for Agriculture and Farmers Welfare visiting the Institute on March 17, 2016

Fig. 13.3 Dr. S. Ayyappan, Secretary, DARE and DG, ICAR
inaugurating the nanocellulose products exhibition centre on October 03, 2015

Fig. 13.4 Dr. N.K. Krishna Kumar, DDG (Horticulture), ICAR
at the SEM facility on April 10, 2015

Fig. 13.5 Shri Appaji C. S. Nadgouda, Govt. of Karnataka (Special Representative) in discussion with CIRCOT Scientists on January 05, 2016

Fig. 13.6 Dr. K. Alagusundaram, DDG (Agril Engg), ICAR at nanocellulose plant on July 13, 2015

Fig. 13.7 Dr. T. Prabhushanker, IAS, Assistant Secretary, DARE, Ministry of Agriculture and Farmers Welfare at Yarn Testing Section on October 20, 2015

Fig. 13.8 Delegates from Egypt, Zimbabwe, Kenya, Mali, Uzbekistan, Sudan, Uganda and Zambia at GTC, Nagpur on December 12, 2015

Fig. 13.9 Dr. Rafiq M. Choudhry, Head, Technical Information Section, ICAC, Washington looking at the nanocellulose pilot plant on December 05, 2015

Fig. 13.10 Dr. Kavita Gupta, Textile Commissioner at GTC, Nagpur on December 26, 2015

Fig. 13.11 Director CIRCOT welcoming Dr. S.N. Jha, ADG (PE), ICAR at CIRCOT on Feb. 06, 2016

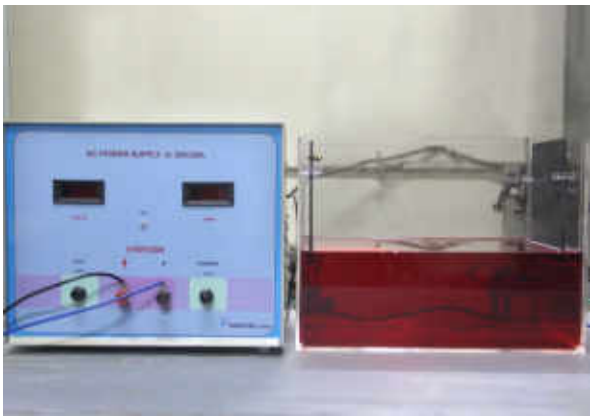
Fig. 13.12 Mr. K.V. Deshmukh, Director of Agriculture (Extension & Training), Govt. of Maharashtra at the nanocellulose pilot plant

14. INFRASTRUCTURAL FACILITIES

Table 14.1 Infrastructural facilities created during the year 2015-16.

Sr. No.	Equipment/ Facility	Supplier	Cost, lakh ₹	Use
1.	Pelletiser	M/s Vidarbha Sales, India	7.80	For converting cotton stalks into pellets. Capacity is 150 kg/h. Pellets of 6, 8 and 10 mm sizes can be produced.
2.	Chipper	M/s Maharashtra Engineering Works, Malkapur	1.75	For chipping cotton stalks. Capacity is 2 tons/h. Chipped length of stalk can be varied from 30 to 50 mm.
3.	Photo-Oxidation Unit	M/s Heber scientific, Chennai	1.63	For tertiary effluent treatment by alteration of a dye/toxic molecule by photons.
4.	*GaBi* LCA Software	M/s thinkstep, Germany	4.03	For life cycle analyses of textile products
5.	Digital moisture meter	M/s Delmhorst, USA	0.63	Indicates moisture content of hay with a measuring range of 6-40%. An 18 inch probe for measuring moisture of heaped biomass.
6.	Electrolysis reactor	M/s Mobtron Enterprises, Chennai	0.99	For decolonization and degradation of dyes
7.	TDS meter	M/s Eutech instruments	0.73	Indicates the Total Dissolved Solids (TDS) in a solution.
8.	Adsorption column	M/s Omsan Engineering works, Thane	0.42	To study the Dye/Toxic chemicals removal efficiency
9.	Peristaltic pump	M/s Miclines India, Chennai	0.90	Liquid flow control
10.	Conference Hall	M/s Konam enterprises	16.87	For conducting meetings, seminars and workshops. Renovated conference hall has a seating capacity of 60 with improved lighting and ventilation.
11.	Library	-	8.72	For purchase of books, standards and renewal of annual subscription to journals & online databases.

Renovated Conference Hall having a seating capacity for 60 persons



Electrolysis Reactor for decolonization and degradation of dyes

Cotton stalk pelletizing unit installed at GTC, Nagpur

Cotton stalk chipping unit installed at GTC Nagpur

TDS Meter for Measuring Total Dissolved Solids

Digital Moisture Meter for measuring moisture in heaped biomass

ANNEXURE - I

Annual performance evaluation report of ICAR-CIRCOT RFD for the year 2014-15

Sr. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target / Criteria Value					Achievements	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent 100%	Very Good 90%	Good 80%	Fair 70%	Poor 60%		Raw Score	Weighted Score		
1	Development of post-harvest technologies and machinery for better utilization of cotton, other textile fibres and their by-products.	40	Development of process protocols for cotton and blended textiles	Process protocols developed	Number	22	8	7	6	5	4	8	100	22	114.3	---
			Development of value added products	Value added products developed	Number	18	5	4	3	2	1	5	100	18	125.0	---
2	Quality evaluation and improvement of Indian cottons and their value added products	20	Evaluation of breeders' samples as per CIRCOT norms	Breeders' samples evaluated	Number	12	10200	8500	6800	5100	3400	11941	100	12	140.5	---
			Evaluation of commercial samples	Commercial samples evaluated	Number	8	9600	8000	6400	4800	3200	21767	100	8	272.1	As this year cotton prices were below MSP, the CCI being the Govt. organisation purchased about 80 lakh bales

Sr. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target / Criteria Value					Achievements	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent 100%	Very Good 90%	Good 80%	Fair 70%	Poor 60%		Raw Score	Weighted Score		
																of cotton thereby farmers got benefited. It is mandatory for CCI to test all samples through government test labs hence they sent large number of samples to CIRCOT and its regional stations.
3	Technology transfer, training, consultancy and IPR management	20	Patent/commercialisation/partnership	Patent specifications filed/MOU signed/ Renewed	Number	7	8	7	6	5	4	8	100	7	114.3	---
			Training to industry personnel	Training programmes conducted on ginning & fibre technology	Number	7	18	15	12	9	6	24	100	7	160.0	As per stakeholders demand, six numbers of specialised training programm

Sr. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target / Criteria Value					Achievements	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent 100%	Very Good 90%	Good 80%	Fair 70%	Poor 60%		Raw Score	Weighted Score		
																es other than regular programmes were conducted.
			Demonstration of Technologies	Demonstration/ exhibitions/ awareness meets organised/ Participated	Number	6	17	14	11	8	5	17	100	6	121.4	---
*	Publication/Documentation	5	Publication of the research articles in the journals having the NAAS rating of 6.0 and above	Research articles published	Number	3	5	4	3	2	1	7	100	3	175.0	Some of the accepted articles by journals were published earlier than anticipated.
			Timely publication of the Institute Annual Report (2013-2014)	Annual Report published	Date	2	June 30, 2014	July 2, 2014	July 4, 2014	July 7, 2014	July 9, 2014	July, 28, 2014	0	0	---	Delayed due to problems in compilation and administrative hurdles in placing the order

Sr. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target / Criteria Value					Achievements	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent 100%	Very Good 90%	Good 80%	Fair 70%	Poor 60%		Raw Score	Weighted Score		
																for printing
*	Fiscal resource management	2	Utilization of released plan fund	Plan fund utilized	%	2	98	96	94	92	90	99.9	100	2	---	---
*	Efficient Functioning of the RFD System	3	Timely submission of Draft RFD (2014-15) for approval	On-time submission	Date	2	May 15, 2014	May 16, 2014	May 19, 2014	May 20, 2014	May 21, 2014	May 3, 2014	100	2	---	---
			Timely submission of Results for RFD (2013-14)	On-time submission	Date	1	May 1 2014	May 2 2014	May 5 2014	May 6 2014	May 7 2014	April, 21, 2014	100	1	---	---
*	Enhanced Transparency / Improved Service delivery of Ministry/Department	3	Rating from Independent Audit of implementation of Citizens' / Clients' Charter (CCC)	Degree of implementation of commitments in CCC	%	2	100	95	90	85	80	98.5	97.0	1.94	---	---
			Independent Audit of implementation of Grievance Redress Management (GRM) system	Degree of success in implementing GRM	%	1	100	95	90	85	80	100	100	1	---	---

Sr. No.	Objectives	Weight	Actions	Success Indicators	Unit	Weight	Target / Criteria Value					Achievements	Performance		Percent achievements against Target values of 90% Col.	Reasons for shortfalls or excessive achievements, if applicable
							Excellent 100%	Very Good 90%	Good 80%	Fair 70%	Poor 60%		Raw Score	Weighted Score		
*	Administrative Reforms	7	Update organizational strategy to align with revised priorities	Date	Date	2	Nov. 1 2014	Nov.2 2014	Nov. .3 2014	Nov. .4 2014	Nov. 5 2014	Oct, 20, 2014	100	2	---	---
			Implementation of agreed milestones of approved Mitigating Strategies for Reduction of potential risk of corruption (MSC)	% of Implementation	%	1	100	90	80	70	60	100	100	1	--	---
			Implementation of agreed milestones for ISO 9001	% of implementation	%	2	100	95	90	85	80	100	100	2	---	---
			Implementation of milestones of approved Innovation Action Plans (IAPs)	% of implementation	%	2	100	90	80	70	60	100	100	2	---	---
														Total Composite Score	97.94	
														Rating	Excellent	

ANNEXURE - II

LIST OF ONGOING PROJECTS

Sr. No.	Title	Investigators	Duration
	INSTITUTE PROJECTS		
	Pre-Ginning and Ginning		
1	Evaluation of Engineering and Economic Performance of High Capacity Rotary Knife Roller Gin for Indian Cottons and Optimization of Machine and Process Parameters for Efficient Ginning	Er. V. G. Arude Dr. S. K. Shukla	2012–16
2	Investigation of Forces Acting on Different Components of Double Roller (DR) Gins under Different Working Conditions	Er. Varsha Satankar Dr. P. G. Patil Dr. S. K. Shukla Er. V. G. Arude	2015–17
	Mechanical Processing : Technical Textiles and Composites		
3	Development of Innovative Fibre Blends and Finishes for Improved Functionality of Cotton Textiles	Dr. R. Guruprasad Dr. S. K. Chattopadhyay Er. G. T. V. Prabu Er. G. Krishna Prasad Dr. T. Senthilkumar Dr. P. K. Mandhyan Dr. Sujata Saxena Shri A. Arputharaj Dr. Virendra Prasad Dr. N. Vigneshwaran	2012–17
	Characterisation of Cotton and other Natural Fibres, Yarns and Textiles		
4	Development of Objective Fabric Handle Model for Indian Market	Dr. N. Shanmugam	2012–16
5	Quality Assessment and Performance Improvement of Indian Cottons	Dr. P. K. Mandhyan Dr. S. K. Dey Er. G. T. V. Prabu	2012–17
6	Energy Efficient Technology for Preparation of Absorbent Cotton for Decentralized Sector	Dr. A. S. M. Raja Shri A. Arputharaj Dr. R. D. Nagarkar Dr. N. M. Ashtaputre	2013–16

Sr. No.	Title	Investigators	Duration
7	Functional Finishing of Cotton Textiles using Nano and Plasma Technology	Shri A. Arputharaj Dr. Sujata Saxena Dr. Virendra Prasad Dr. P. K. Mandhyan	2013–16
8	Survey on the Contamination Status in Indian Cotton	Dr. C. Sundaramoorthy Dr. P. G. Patil Dr. P. K. Mandhyan	2014–16
9	Design and Development of Lint Opener for Preparation of Samples for Micronaire Testing	Dr. S. V. Ghadge Dr. S. K. Shukla Er. V. G. Arude Er. A. K. Bharimalla Dr. C. Sundaramoorthy Dr. P. G. Patil	2015–17
Chemical and Biological Processing, Biomass and Byproducts Utilisation			
10	Advanced Technology to Predict Dye Recipe for Non-metameric Colour Matching in Textile	Er. P. Jagajanantha Dr. A. S. M. Raja Dr. C. Sundaramoorthy Er. A. K. Bharimalla	2015–17
11	Development of Innovative Dyeing and Finishing Process for Cotton Garments	Dr. A. S. M. Raja Dr. Virendra Prasad Shri A. Arputharaj Dr. Sujata Saxena	2015–18
12	Popularization of CIRCOT Technologies on Compost and Oyster Mushroom Production using Cotton Stalks among the Cotton Growing Farmers of Vidharba Region	Dr. V. Mageshwaran Dr. C. Sundaramoorthy Er. Varsha Satankar	2016–17
13	Application of Nanocellulose in Cement Concrete, Rubber Composites, Pulp and Paper for Enhancement of Functional and Mechanical Properties	Er. A. K. Bharimalla Dr. N. Vigneshwaran Dr. P. G. Patil	2016–17

Sr. No.	Title	Investigators	Duration
EXTERNALLY FUNDED PROJECTS			
Ministry of External Affairs, Govt. of India			
14	Technical Assistance Programme (TAP) to Strengthen Cotton Value Chain in Cotton 4 Countries (Benin, Burkina Faso, Chad & Mali) and Malawi, Nigeria and Uganda in Africa	Dr. P. G. Patil Er. A. K. Bharimalla Dr. S. K. Shukla Er. V. G. Arude Dr. C. Sundaramoorthy Dr. (Smt.) Jyoti Nath Er. P. S. Deshmukh	2012–16
ICAR – Technology Mission on Cotton, Mini Mission			
15	Development of Cotton Picking Machinery for Small Scale Cotton Production System	Dr. S. K. Shukla Er. V. G. Arude	2013–17
16	Agro Techniques for High Density Planting System and Surgical Cotton Varieties: Evaluating Promising Genotypes for Yield and Surgical / Absorbent Properties	Dr. (Mrs.) Sujata Saxena Dr. R. D. Nagarkar Shri R. S. Prabhudesai Dr. S. V. Ghadge Dr. (Mrs.) N. M. Ashtaputre	2013–17
ICAR - Collaborative Project with CPRI, Simla			
17	Cellulose based Nanocomposite Film for Application in Packaging	Dr. N. Vigneshwaran Er. A. K. Bharimalla Dr. Virendra Prasad Shri A. Arputharaj	2014–17
ICAR - Extra Mural Project			
18	Preparation of Specialty Grade Pulp from Cotton Linters for Production of Security Paper	Dr. Virendra Prasad Dr. (Mrs.) Sujata Saxena Dr. A. S. M. Raja Dr. P. K. Mandhyan Shri A. Arputharaj	2015–17
ICAR - Agri Business Incubation			
19	Agri-business Incubation Centre at ICAR-CIRCOT, Mumbai	Er. A. K. Bharimalla Dr. S. K. Shukla Dr. N. Vigneshwaran Dr. P. K. Mandhyan Er. V. G. Arude Dr. C. Sundaramoorthy Dr. V. Mageshwaran Dr. S. Venkatakrishnan Dr. Hamid Hasan Shri Bharat Pawar	2015–17

Sr. No.	Title	Investigators	Duration
ICAR - Consortia Research Project			
20	Ecofriendly method of preparing absorbent/surgical cotton from non-spinnable cotton	Er. P. Jagajanantha Er. A. K. Bharimalla Dr. P. K. Mandhyan Dr. S. K. Shukla Dr. V. Mageshwaran Ms. Varsha Satankar	2015–17
21	Sustainable Green Technology for Dyeing of Cotton Textile	Dr. A.S.M Raja Dr. Virendra Prasad Shri A. Arputharaj Dr. T. Senthilkumar	2015–17
22	Preparation of Nanolignocellulose and its incorporation in Polymer Composites for Improved Performance	Dr. N. Vigneshwaran Er. A. K. Bharimalla Dr. Virendra Prasad Dr. C. Sundaramoorthy Dr. T. Senthilkumar	2015–17
23	Utilisation of Ligno-cellulosic Fibre based Biomass as Renewable Energy for Rural and Industrial Application	Dr. S. K. Shukla Dr. V. Mageshwaran Er. Varsha Satankar Dr. C. Sundaramoorthy Dr. S. V. Ghadge Dr. P. G. Patil Dr. A. S. M. Raja Er. V. G. Arude	2015–17

ANNEXURE - III

PERSONNEL
(as on 31.03.2016)

SCIENTIFIC STAFF at HQ

DIRECTOR

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

HEADS OF DIVISION

Dr. S. K. Chattopadhyay,
M.Tech. (Text.Engg.), Ph.D. (Tech),
F.T.A.,C. Engg., F.I.E., C.Text., F.T.I. (Manchester)
Principal Scientist (Textile Manufacture)
Head I/c, Mechanical Processing Division

Dr. (Smt.) Sujata Saxena,
M.Sc., Ph.D.
Principal Scientist (Organic Chemistry)
Head I/c, Chemical and Biochemical Processing Division

Dr. A. S. M. Raja, M. Sc., Ph.D.
Senior Scientist (Textile Chemistry)
Head I/c, Quality Evaluation and Improvement Division

Shri A. K. Bharimalla, M. Tech.
Senior Scientist (Composite)
Head I/c, Transfer of Technology Division

SENIOR SCIENTIST

Dr. S. V. Ghadge, M.E.(Ag), M.B.A., Ph.D.
Senior Scientist (Farm Machinery & Power)

Dr. S. K. Dey, M. Tech. (Text. Engg.), Ph.D. (Engg.)
Senior Scientist (Physics)

Dr. N. Vigneshwaran, M.Sc. (Agri.), M.B.A., Ph.D.
Senior Scientist (Agricultural Microbiology)

Dr. P. K. Mandhyan, M.Sc., Ph.D., A.T.A.
Senior Scientist (Technical Textiles)

Dr. Virendra Prasad, M.Sc., Ph.D.
Senior Scientist (Organic Chemistry)

Dr. C. Sundaramoorthy, M.Sc., Ph.D.
Senior Scientist (Agricultural Economics)

SCIENTIST

Shri V. G. Arude, M. Tech.
Scientist (Farm Machinery & Power)

Shri P. S. Deshmukh, M. Tech.
Scientist (Farm Machinery & Power)

Shri Manik Bhowmick, M. Tech.
Scientist (Textile Manufacture)

Shri A. Arputharaj, M.Sc., M. Tech.
Scientist (Textile Chemistry)

Dr. R. Guruprasad, M. Tech., Ph.D.
Scientist (Textile Manufacture)

Shri G. T. V. Prabu, M. Tech.
Scientist (Textile Manufacture)

Shri G. Krishna Prasad, M. Tech.
Scientist (Textile Manufacture)

Dr. T. Senthilkumar, M. Tech., Ph.D.
Scientist (Textile Manufacture)

Shri Santanu Basak, M. Tech.
Scientist (Textile Chemistry)

Dr. P. Jagajanantha, M. Tech., Ph.D.
Scientist (Textile Chemistry)

TECHNICAL STAFF

ASSISTANT CHIEF TECHNICAL OFFICER

Dr. R. D. Nagarkar, M.Sc., Ph.D.
Dr. (Smt.) Sheela Raj, M.Sc., Ph.D.
Shri M. Mohan, M.Sc., Dip.J.
Shri R. S. Prabhudesai, M.Sc., D.C.M.
Shri G. B. Hadge, M.Sc.
Dr. M. V. Vivekanandan, M.Sc., Ph.D.
Shri B. R. Pawar, M. Sc., LL.M.
Dr. (Smt). N. M. Ashtaputre, M.Sc., Ph. D.
Shri R. K. Jadhav, M.Sc.
Shri S. Banerjee, M.Sc.
Shri C. M. More, M.Sc.
Shri R. R. Chhagani, M.Sc.
Shri H. S. Koli, M.Sc., LL.B.
Shri D. N. Moon, B.Sc.
Dr. (Smt.) S. R. Kawlekar, M.Sc., P.I.M.R., Ph.D.

SENIOR TECHNICAL OFFICER

Dr. (Smt.) Sudha Tiwari, B.Sc., Ph.D.
Shri T. Venugopal, B.E.
Shri S. M. Gogate, B.Sc.
Shri K. Narayanan, B.Sc.
Shri S. V. Kokane, M.A.
Smt. P. S. Nirali, M.Sc.
Shri P. N. Sahane, D.I.F.T.
Smt. Binu Sunil, M.Sc.
Shri D. U. Kamble, B.Sc.
Smt. N. A. Sonkusle, B.Sc.
Smt. K. R. Joshi, M.A. Hindi Translator
Smt. Bindu Venugopal, M.Sc.

TECHNICAL OFFICER

Smt. C. D. Prabha, M.Sc.
Dr. (Kum.) C. P. D' Souza, M.Sc., Ph.D.
Shri R. S. Narkar, M.Sc., D.C.I.A.
Smt. P. R. Mhatre, B.Sc., M.Lib.
Shri V. D. Kalsekar, B.Sc.
Shri C. V. Shivgan, Cert. Elec. Supr.PWD,Cert. M. & A.W.Technician

SENIOR TECHNICAL ASSISTANT

Shri N. D. Kambli, M.Sc.
Shri M. G. Ambare, M.Sc.
Shri S. N. Patil, B.E. (Civil)
Shri D. M. Correia, I.T.I., N.C.T.V.T. (Mechanic)
Smt. H. R. Pednekar, B.A., B.Lib.

TECHNICAL ASSISTANT

Shri R. P. Kadam, M.Sc.
Smt. M. P. Kamble, B.A., M.Lib.
Shri A. R. Jadhav, B.Sc.
Dr. Deepak Meena, B.A., M.Lib., M. Phil., Ph.D., PGDCA
Shri Krishna Bara, D.H.T.
Shri D. A. Salaskar, Driver
Shri S. K. Parab, Cert. Cot. Spin.

SENIOR TECHNICIAN

Shri D. M. Raje
Shri R. R. Gosai
Shri N. K. Shaikh
Shri Mahabir Singh
Shri S.V. Kokane
Shri M. M. Kadam
Shri S. G. Phalke

TECHNICIAN

Shri D. G. Gole
Shri Yogesh Nagpure
Shri D. J. Dhodia

ADMINISTRATIVE STAFF

ASSISTANT ADMINISTRATIVE OFFICER
Smt. S. Koshy, B.Com.
Shri Y. R. Pathare, B.Sc., M.B.A.
Smt. T. P. Mokal, M.A.(Hindi)
Shri R. K. Pallewad, B.A.

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

ASSISTANT
Smt. V. V. Janaskar, B.Com., M.A.(Hindi)
Smt. S. R. Shirsat, B.A.
Shri N. V. Kambli
Smt. N. M. Deshmukh, M.A., LL.B.
Shri S. D. Ambolkar
Shri P. V. Jadhav

UPPER DIVISION CLERK
Smt. S. G. Parab, B.A. (Sociology), B.A. (Hindi)
Smt. S. P. Paiyala
Smt. J. R. Chavkute
Shri V. M. Sable
Smt. B. D. Kherodkar
Shri S. S. Angane
Shri T. D. Dhamange, B.Com.

LOWER DIVISION CLERK
Shri S.N. Bandre
Smt. V.N. Walzade, B.A.

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

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

STENOGRAPHER
Smt. R.R. Tawde, B.Com.
Smt. Viniya Rajesh Naik, B.A.

SKILLED SUPPORT STAFF

Shri M.Z. Rathi
Shri M.K. Ghadge
Shri D.B. Temgire
Shri C.S. Salvi
Shri K.T. Mahida
Shri M.M. Katpara
Shri M.A.A. Rashid
Shri G.N. Mayawanshi
Shri H.B. Vesmiya
Shri M.J. Sumra
Shri S.K. Bobate
Shri P.P. Patil
Shri R.G. Tak
Shri R.P. Karkate
Shri C.D. Acharekar
Shri M.K. Prabhulkar
Shri J.D. Sakpal
Shri V. Murugan
Shri S.D. Magar
Shri S.B. Worlikar
Shri S.R. Tondse
Shri V.B. Poojari
Shri M.N. Kamble
Shri S.S. Surkule
Shri S.P. Naik
Smt. K. Murugan
Shri D.K. Kasar
Shri S.R. Tondse
Shri D.R. Gawde
Shri S.M. Chandanshive
Shri P.E. Gurav
Shri M. C. Solanki

GTC, NAGPUR

IN-CHARGE
Dr. Sujeet Kumar Shukla, M.Tech., Ph.D.
Senior Scientist (Agricultural Process Engineering)

SENIOR SCIENTIST
Dr. (Mrs) Jyoti M. Nath, M.Sc., Ph.D.
Senior Scientist (Electronics & Instrumentation)

SCIENTIST
Dr. V. Mageshwaran, M.Sc., Ph.D.
Scientist (Agricultural Microbiology)

Ms. Varsha Satankar, M.Tech.
Scientist (Agricultural Structure and Process Engineering)

SR. TECHNICAL OFFICER

Shri V.L. Rangari, M.Sc.
Shri U.D. Devikar, M.Sc.
Shri S.L. Bhanuse, B.Sc.
Shri R. G. Dhakate, B.Sc.
Shri S.N. Hedau, B.Sc.

SR. TECHNICAL ASSISTANT
Shri B.V. Shirsath, B.A., I.T.I.

TECHNICIAN
Shri Umrao Meena

ASSISTANT ADMINISTRATIVE OFFICER
Shri K. Parleswar

ASSISTANT
Shri S.A. Telpande, M.Com.

LOWER DIVISION CLERK
Shri R. G. Matel

STENOGRAPHER (GR. III)
Shri R. D. Shambharkar, M.A.

SKILLED SUPPORT STAFF

Shri M. P. Tohokar
Shri J. P. Patel
Shri R. B. Kautkar
Smt. M.M. Bhanddakar
Shri R. S. Umare

COIMBATORE

Dr. S. Venkatakrishnan, M.Sc., Ph.D., A.T.A., F.T.A.
Chief Technical Officer

Shri K. Thiagarajan, M.Sc.
Asst. Chief. Technical Officer

Shri M. Bhaskar, Dip. Ref. & Air-Cond.
Technical Officer

Shri V. Subbaiah
Skilled Supporting Staff

DHARWAD

Smt. V.G. Udikeri, B.Sc.
Senior Technical Assistant

Shri C.J. Bagalkoti
Skilled Supporting Staff

Shri A.F. Gudadur
Skilled Supporting Staff

GUNTUR

Shri S. Mukundan, M.Sc.
Asstt. Chief Technical Officer

Shri Vijay Kumar Sutar
Technician

SIRSA

Dr. Hamid Hasan, M.Sc., Ph.D.
Asstt. Chief Technical Officer

Dr. Jal Singh, M.Sc., Ph.D.
Asstt. Chief Technical Officer

SURAT

Shri G.G. Mistry, B.Sc.
Senior Technical Officer

Shri M.G. Sosa
Skilled Supporting Staff

Shri M.B. Patel, B.Sc., L.L.B.
Senior Technical Officer

APPOINTMENT

Dr. P.G. Patil, Head, TTD appointed as Director, ICAR-CIRCOT, Mumbai w.e.f. 21-03-2016.

PROBATION CLEARANCE

SCIENTIST
Dr. R.Guruprasad
Shri G.T.V. Prabu
Shri G. Krishna Prasad
Dr. T. Senthilkumar
Shri Shantanu Basak
Shri Shekar Das

TECHNICAL ASSISTANT
Shri A.R. Jadhav
Dr. Deepak Meena
Shri Krishna Bara
Shri D. J. Dhodia

TECHNICIAN
Shri Umrao Meena
Shri Yogesh Nagpure
Shri Vijay Kumar Sutar

SKILLED SUPPORT STAFF
Shri M.C. Solanki

TRANSFERS

SCIENTIFIC

Dr. S. V. Ghadge, Sr. Scientist transferred from ICAR-NIASM, Baramati to ICAR-CIRCOT, Mumbai on 21-04-2015.

Dr. N. Shanmugam, Pr. Scientist transferred from ICAR-CIRCOT, Mumbai to ICAR-CSWRI, Avikanagar on 05-12-2015.

Shri Shekar Das, Scientist transferred from ICAR-CIRCOT to ICAR-CSWRI, Avikanagar on 05-12-2015.

TECHNICAL

Shri K. Narayanan, Sr. Technical Officer transferred from Quality Evaluation Unit, Dharwad to ICAR-CIRCOT, Mumbai on 27-04-2015.

ADMINISTRATIVE

Shri K.Parleshwar, AAO transferred from ICAR-CIRCOT, Mumbai to GTC, Nagpur on 29-05-2015.

Shri Yogesh Pathare, AAO transferred from GTC, Nagpur to ICAR-CIRCOT, Mumbai on 30-05-2015.

Shri Sunil Kumar, Administrative Officer transferred from ICAR-CIRCOT to ICAR-DOGR, Pune as SAO with additional charge of SAO, Directorate of Floriculture Research, Pune on 31-08-2015.

SKILLED SUPPORTING STAFF

Shri R.S. Umare, Skilled Supporting Staff transferred from headquarters to GTC, Nagpur on 23-11-2015.

PROMOTIONS

Name of Staff	Grade to which Promoted	Date of Effect
Dr. Sujata Saxena	Principal Scientist (Organic Chemistry) RGP Rs. 10,000	27-07-2011
Dr. Virendra Prasad	Senior Scientist (Organic Chemistry) RGP Rs. 8,000	16-04-2014
Dr. C. Sundaramoorthy	Senior Scientist (Agricultural Economics) RGP Rs. 8,000	11-08-2014
Shri R. K. Pallewad	Assistant Administrative Officer	30-05-2015
Shri S. N. Bandre	Upper Division Clerk	09-12-2015

DEPUTATIONS ABROAD

Name of the Programme	Place	Period	Names of Scientists
In-country training Programme on Post-harvest Management & Value addition to Crop Residue under Cotton TAP	Chad, Africa	October 11-17, 2015	Dr. S. K. Shukla Er. V. G. Arude
In-country training Programme on Post-harvest Management & Value addition to Crop Residue under Cotton TAP	Nigeria	February 23 – 27, 2016	Dr. S.K. Shukla Er. P.S. Deshmukh

RETIREMENT

Name of Staff	Designation	Date of Retirement
Shri S. Vancheswaran	Sr. Technical Officer	31-08-2015
Shri N. V. Bansode	Asst. Chief Technical Officer	31-08-2015
Shri M. B. Gurave	Skilled Support Staff	30-04-2015
Shri D. M. Chougule	Skilled Support Staff	31-05-2015
Shri R. C. Rokde	Skilled Support Staff	30-06-2015
Shri B. R. Satam	Skilled Support Staff	31-08-2015
Shri A. R. Chutale	Skilled Support Staff	31-01-2016

ANNEXURE - IV

LIST OF COMMITTEES IN ICAR-CIRCOT
(as on 31.03.2016)

Research Advisory Committee (RAC)

Dr. P. R. Roy	Chairman
Dr. A. Wadood	Member
Dr. U. S. Sarma	Member
Dr. G. S. Nadiger	Member
Dr. (Mrs.) Niyati Bhattacharya	Member
Assistant Director General (PE)	Member
Director, ICAR-CIRCOT	Member
Er. V. G. Arude	Member Secretary

Project Monitoring and Evaluation Committee (PMC)

Dr. P. G. Patil, Director	Chairman
Dr. S. K. Chattopadhyay, In-charge Head, MPD	Member
Dr. (Smt.) Sujata Saxena, In-charge Head, CBPD	Member
Dr. A.S.M. Raja, In-charge Head, QEID	Member
Er. A. K. Bharimalla, In-charge Head, TTD	Member
Er. V. G. Arude, In-charge PME Cell	Member Secretary

Priority-setting, Monitoring & Evaluation (PME) Cell

Er. V. G. Arude, Scientist	In-charge
Dr. N. Vigneshwaran, Sr. Scientist	Member
Er. A. K. Bharimalla, Sr. Scientist	Member
Dr. P. K. Mandhyan, Sr. Scientist	Member
Dr. R. Guruprasad, Scientist	Member
Dr. C. Sundaramoorthy, Scientist	Nodal Officer
Sh. M. Mohan, ACTO	Member
Smt. Prachi Mhatre, TO	Member
Smt. H. R. Pednekar, STA	Member

Result Framework Document (RFD)

Er. V. G. Arude, Scientist	Nodal Officer
Dr. A. S. M. Raja, Sr. Scientist	Member
Dr. C. Sundaramoorthy, Scientist	Member
Sh. M. Mohan, ACTO	Member

Institute Technology Management Committee (ITMC)

Dr. P. G. Patil, Director	Chairman
Dr. S. K. Chattopadhyay, In-charge Head, MPD	Member
Dr. (Smt.) Sujata Saxena, In-charge Head, CBPD	Member
Dr. B. B. Nayak, PS, CIFE	Member
Sh. M. Mohan, ACTO	Member
Er. A. K. Bharimalla, Sr. Scientist	Member Secretary

Institute Technology Management Unit (ITMU)

Er. A. K. Bharimalla, Sr. Scientist	Officer-in-charge
Dr. N. Vigneshwaran, Sr. Scientist	Member
Dr. P. K. Mandhyan, Sr. Scientist	Member
Er. Manik Bhowmick, Scientist	Member
Dr. M. V. Vivekanandan, ACTO	Member
Sh. G. B. Hadge, ACTO	Member

Women Complaint Cell

Dr. (Smt.) Sujata Saxena, Incharge, Head, CBPD	Chairman
Smt. Rohini Jadhav	Member
Er. V. G. Arude, Scientist	Member
Dr. (Smt.) Sheela Raj, ACTO	Member
Smt.Viniya Nayak, Stenographar	Member
Smt. S. R. Shirsat, Assistant	Member
Smt. S. G. Parab, UDC	Member Secretary

Staff Welfare Fund Scheme

Dr. P. K. Mandhyan, Sr. Scientist	Chairman
Dr. R. Guruprasad, Scientist	Member
Shri D. U. Kamble, Sr. Tech Officer	Member
Shri S. V. Kasabe, (AF&AO)	Member
Shri P. V. Jadhav, Assistant	Member
Smt. Sujata Koshy, AAO	Member Secretary

Innovation Cell

Dr. P. G. Patil, Director	Chairman
Dr. (Smt.) Sujata Saxena, In-charge Head, CBPD	Member
Sh. V. G. Arude, Scientist	Member
Dr. A.S.M. Raja, Sr. Scientist	Member
Er. G.T.V. Prabu, Scientist	Member Secretary
Dr. R. D. Nagarkar, ACTO	Member
Administrative Officer	Member
AF&AO	Member

ISO-9001:2008 Management Committee

Dr. P. G. Patil, Director	Chairman
Dr. S. K. Chattopadhyay, Head In-charge, MPD	Member
Dr. (Smt.) Sujata Saxena, Head In-charge, CBPD	Member
Dr. A. S. M. Raja, Head In-charge, QEID	Member
Er. A. K. Bharimalla, Head In-charge, TTD	Member
Administrative Officer	Member
AF&AO	Member
Sh. M. Mohan, ACTO	Member

ANNEXURE - V

CITIZEN'S / CLIENT'S CHARTER

for

ICAR-Central Institute for Research on Cotton Technology
Adenwala Road, Matunga, Mumbai – 400 019.
Phone : (022) 24127273/76, 24184274/75 , Fax:022-24130835
Website : http://www.circot.res.in

ISO 9001:2008

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 / Transaction (s)	Responsible person
1.	Commercial Testing: Fibre, yarn, fabric, garment, spinnability, non-lint content, linter, seed, paper, chemical and biochemical tests of textile material, ECO test, SEM and XRD test, etc.	**Mr. K. Narayanan** Sr. Technical Officer (T6) In-charge, Test House, CIRCOT, Mumbai Phone: 022-24127273/76, 24184274/75. Ext - 456/457 E-mail : cottontest@rediffmail.com, circottest@gmail.com
2.	Imparting Training to stakeholders	**1. Er. A. K. Bharimalla** Sr Scientist , TTD, CIRCOT, Mumbai Phone : 022-24127273/76, 24184274/75 , Ext-467/121 E-mail : ashokbhari72@gmail.com **2. Dr. S.K Shukla** Senior Scientist & Officer In-charge, GTC, Nagpur Phone : 0712 2500592 , 0712 2500289 E-mail : gtc_ngp@rediffmail.com, skshukla2000@gmail.com
3.	Supply of Calibration Cotton	**Dr. A.S.M. Raja** Head-In-Charge, QEID CIRCOT, Mumbai Phone : 022-24127273/76, 24184274/75 Ext. : 447 E-mail : asmraja16475@gmail.com
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ANNEXURE - VI

सूचना का अधिकार

ISO 9001:2008

हमारा उद्देश्य
OUR MOTIVE

पारदर्शिता को बढ़ावा देने के लिए
To Promote Transparency

जवाबदेही को बढ़ावा देने के लिए
To Promote Accountability

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

In Persuance of the promulgation of Right to Information Act, 2005, the following Officers are designed as CPIO, Assistant CPIO and Appellate Authority at this institute.

केन्द्रीय लोक सूचना अधिकारी
Central Public Information Officer

श्रीमती सुजाता कोशी

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भारतीय कृषि अनुसंधान परिषद

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