Project Coordinator's Report

Introduction:

Cotton cultivation, though centuries old, needs to be continuously refined based on scientific innovations for the betterment of all stakeholders. People around the world mostly use cotton as the main fiber for textile needs. As the leading natural fiber, Cotton is an important agricultural commodity, providing income to millions of farmers worldwide. Though the research on cotton improvement was initiated in 17th and 18th century in the country, the systematic cotton research in India was started in 1921 through cotton research schemes sponsored by Indian Central Cotton Committee (ICCC). The Indian Council of Agricultural Research (ICAR) launched the All India Coordinated Research Project on Cotton (AICRP on Cotton) in the year 1967 with its Headquarters at Coimbatore (Tamil Nadu). In order to give new thrust and direction in terms of multi-disciplinary and multi-centre approaches for improved cotton cultivars and other novel cotton production and protection technologies for ensuring sustainable cotton cultivation, the Indian Council of Agricultural Research (ICAR) ensured the active involvement of 21 participating centers from 17 State Agricultural Universities across the cotton growing states. The ICAR-Central Institute for Cotton Research (ICAR-CICR), Nagpur and its Regional Stations at Coimbatore and Sirsa provide basic research support and also take part in some of the strategic research and evaluation activities of the AICRP on Cotton. The ICAR-Central Institute for Research on Cotton Technology (ICAR-CIRCOT), Mumbai and its regional units are closely associated with AICRP on Cotton in evaluating the fibre quality parameters of cotton cultivars under trial.

Major activities of various participating centres include the development of improved cotton varieties and hybrids suitable to varied ago-climatic conditions; development of location-specific crop production and crop protection technologies; development of module for suitable intercropping and rotation crop for different agro-ecological zones; production of breeder seeds of promising varieties and parents of hybrids; and conducting front-line demonstrations on improved cotton technologies and *Kisan Melas* for effective and speedy dissemination of newer technologies to the cotton growers.

Indian Cotton Scenario:

For decades, India is the leading country in terms of area under cotton in the world. As per USDA estimate, India surpassed the United States in the year 2006 and China in the year 2015 in raw cotton production and lead raw cotton production in the world during 2015-16 and is expected to produce 26.8 million bales of 480 lb from 11.8 million hectare with a productivity of 494 kg/ha (USDA estimate-March 14, 2016). The average area under cotton was only 80 lakh ha from 1960 to 2006, but it was 110 lakh ha during the last 10 years. The average cotton production, between 1960 and 2006, was just 98 lakh bales (170 kg/bale), while it hovered around 320 lakh bales in the last 10 years. The large scale adoption of biotech cotton along with improved production and protection technologies took place since 2002 made India as the second largest exporter of raw cotton. Annual Indian raw cotton export to the total production was just 4% till 2004, but from 2004 to 2015, it has increased to an average 25% besides meeting requirement of domestic textile industries. The highest export of raw cotton from India was recorded in the year 2011-12 with 129.57 lakh bales.

Gujarat, Maharashtra and Telangana are the major cotton growing states contributing around 70% of the area and 67% of cotton production in India. As per the CAB estimates, the cotton productivity is expected to be around 503 kg lint per hectare during the year 2015-16. The

year was not congenial for cotton due to both abiotic and biotic stresses which pulled down the area as well as productivity.

An area of around 14.73 lakh ha (Haryana-5.76, Punjab-4.50 & Rajasthan 4.47) was sown under cotton during 2015-16 in North zone. In general, the crop was severely affected due to whitefly epidemic in the entire zone. Hot, humid and partly cloudy weather with intermittent rains during June/July but with overall less rainfall were the important factors contributing to higher incidence. During April, May, June, July, August and September, the maximum temperature recorded was 41.7, 45.0, 43.8, 40.0, 37.2 and 38.2°C and the minimum was 15.4, 21.0, 22.6, 22.2, 25.0 and 21.6 °C, respectively. A total of 203.6 mm rainfall has been recorded during the cotton season at station observatory as against around 300 mm of average rainfall during this period. The rainfall received during April, May, June, July, August and September till date was 25.6 mm 3.0 mm, 22.8 mm, 90.4 mm, 44.6 mm, and 17.2 mm, respectively. Irrigation was supported by tube wells as well as canal water. Rainfall during the month of May also led to crust formation in many farmers' field and resowing was carried out in such cases. In 23 SMW week of May, due to high temp, there was burning of seedlings in late sown crop. The white fly incidence remained high in cotton growing areas of Haryana, Punjab and Rajasthan during this period.

Similarly, in Central and South Zone, the crop was initially exposed to moisture stress vowing to delayed onset of monsoon. In the vegetative growth phase, there was heavy rains and water logging and this was followed by drought during the peak flowering and boll development stage inducing forced boll bursting. There were reports of severe pink bollworm incidence in Andhra and Karnataka in South and Gujarat and Maharashtra in central Zone. Two Monitoring team was constituted to assess the pink bollworm damage. The Project Coordinator (Cotton Improvement) along with Dr. Chenga Reddy, Senior Cotton Breeder, ANGRAU, Guntur, monitored the cotton growing areas of Telangana and Andhra Pradesh. The second team under the Chairmanship of Dr K.R. Kranthi, Director, CICR, Nagpur visited all the cotton growing regions of Gujarat state to monitor the Pink Bollworm status. The other members were Dr A.H. Prakash, PC (Cotton), Dr (Mrs) Sandhyakranthi, Head, DCP, CICR, Nagpur and Dr M.V. Venugopalan, Principal Scientist (Agronomy), CICR, Nagpur. The report was submitted to Hon'ble Deputy Director General (Crop Science) for perusal and further directives.

State wise cotton area (lakh ha) from 2006-07 to 2015-16

State	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15p	2015-16p
Punjab	6.07	6.04	5.27	5.11	5.30	5.60	4.80	4.46	4.20	4.50
Haryana	5.30	4.83	4.56	5.07	4.92	6.41	6.14	5.36	6.48	5.76
Rajasthan	3.50	3.69	3.02	4.44	3.35	4.70	4.50	3.93	4.87	4.47
NORTH ZONE	14.87	14.56	12.85	14.62	13.57	16.71	15.44	13.75	15.55	14.73
Gujarat	23.90	24.22	23.54	26.25	26.33	29.62	24.97	25.19	27.73	27.61
Maharashtra	31.07	31.95	31.42	35.03	39.42	41.25	41.46	41.92	41.90	38.27
Madhya Pradesh	6.39	6.30	6.25	6.11	6.50	7.06	6.08	5.14	5.47	5.47
CENTRAL ZONE	61.36	62.47	61.21	67.39	72.25	77.93	72.51	72.25	75.10	71.35
Telangana									17.13	16.94
Andhra Pradesh	9.72	11.33	13.99	14.75	18.79	18.79	24.00	23.89	8.21	6.63
Karnataka	3.78	4.03	4.08	4.55	5.45	5.54	4.85	6.62	8.75	6.12
Tamil Nadu	1.00	0.99	1.09	1.04	1.22	1.33	1.28	1.52	1.87	1.29
SOUTH ZONE	14.50	16.35	19.16	20.34	25.46	25.66	30.13	32.03	35.96	30.98
Odisa		0.50	0.58	0.54	0.74	1.02	1.19	1.24	1.27	1.25
Others	0.71	0.26	0.26	0.21	0.33	0.46	0.51	0.33	0.31	0.50
TOTAL	91.44	94.14	94.06	103.10	112.35	121.78	119.78	119.60	128.19	118.81

State wise cotton production (lakh bales of 170 kg) from 2006-07 to 2015-16

State	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15p	2015-16p
Punjab	24.00	20.00	17.50	13.00	16.00	17.50	18.50	18.50	9.50	6.50
Haryana	15.00	15.00	14.00	15.25	14.00	23.00	23.00	21.00	17.50	14.00
Rajasthan	9.00	9.00	7.50	12.00	9.00	16.90	15.90	12.90	15.90	14.90
NORTH ZONE	48.00	44.00	39.00	40.25	39.00	57.40	57.40	52.40	42.90	35.40
Gujarat	103.00	110.00	90.00	98.00	103.00	118.80	89.80	120.80	104.80	97.80
Maharashtra	50.00	62.00	62.00	65.75	82.00	70.25	75.25	78.25	72.25	71.25
Madhya Pradesh	19.00	20.00	18.00	15.25	17.00	17.30	18.30	18.30	17.30	17.30
CENTRAL ZONE	172.00	192.00	170.00	179.00	202.00	206.35	183.35	217.35	194.35	186.35
Telangana									56.40	57.40
Andhra Pradesh	36.00	46.00	53.00	54.50	53.00	53.50	77.50	71.50	21.10	19.10
Karnataka	6.00	8.00	9.00	12.25	10.00	13.90	15.90	21.90	30.40	18.90
Tamilnadu	5.00	4.00	5.00	5.00	5.00	4.30	3.80	2.80	2.80	2.80
SOUTH ZONE	47.00	58.00	67.00	71.75	68.00	71.70	97.20	96.20	110.70	98.20
Odisa			1.50	1.00	2.00	3.45	3.95	3.95	3.95	3.95
Others	1.00	1.00	0.50	1.00	2.00	2.00	2.00	2.00	2.00	2.00
TOTAL	268.00	295.00	278.00	293.00	313.00	340.90	343.90	371.90	353.90	325.90
Loose cotton	12.00	12.00	12.00	12.00	26.10	26.10	26.10	26.10	26.10	26.10
GRAND TOTAL	280.00	307.00	290.00	305.00	339.10	367.00	370.00	398.00	380.00	352.00

State wise cotton Productivity (kg/ha) from 2006-07 to 2015-16

State	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15p	2015-16p
Punjab	672	563	565	432	593	607	744	800	486	340
Haryana	481	528	522	511	587	690	719	761	538	502
Rajasthan	437	415	422	459	513	651	642	605	593	609
NORTH ZONE	549	514	516	468	571	651	704	729	541	485
Gujarat	733	772	650	635	686	700	633	837	662	622
Maharashtra	274	330	335	319	378	313	332	341	316	342
Madhya Pradesh	505	540	490	424	463	433	531	628	559	559
CENTRAL ZONE	477	522	472	452	498	471	452	534	461	467
Telangana									566	582
Andhra Pradesh	630	690	644	628	538	543	595	555	559	641
Karnataka	270	337	375	458	346	460	596	590	612	556
Tamilnadu	850	687	780	817	1003	831	797	559	455	659
SOUTH ZONE	551	603	594	600	519	540	604	561	570	593
Odisa			440	315	471	583	571	548	535	544
India	521	554	524	503	513	512	525	565	503	503

Source: Cotton Advisory Board as on 02.02.2016

India has to cater to its large domestic textile industry leading to continuous raise in demand for raw cotton and is expected to consume 310 lakh bales in the year 2015-16. However the surplus production of raw cotton particularly long staple cotton has also enhanced the foreign exchange through the export of raw cotton to an extent of 80 lakh bales for the past 10 years.

Cotton Balance Sheet (in lakh bales of 170 kg)

	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15p	2015-16p
Supply										
Opening Stock	52.00	47.50	35.50	71.50	40.50	45.77	40.00	40.00	33.00	52.00
Cotton Production	280.00	307.00	290.00	295.00	339.00	367.00	370.00	398.00	380.00	352.00
Imports	5.53	6.38	10.00	7.00	2.38	7.51	14.59	11.51	14.39	11.00
Total supply	337.53	360.88	335.50	373.50	381.88	420.28	424.59	449.51	427.39	415.00
Demand										
Mill consumption	194.89	195.67	190.00	219.00	221.77	223.59	251.74	268.03	278.55	275.00
Consump by SSI units	21.26	22.08	20.00	23.00	24.46	22.12	23.59	25.20	26.28	25.00
Non-mill consumption	15.88	19.13	19.00	17.00	13.38	5.00	7.83	6.23	12.84	10.00
Total consumption	232.03	236.88	229.00	259.00	259.61	250.71	283.16	297.43	317.67	310.00
Export	58.00	88.50	35.00	83.00	76.50	129.57	101.43	116.96	57.72	70.00
Total demand	290.03	325.38	264.00	342.00	336.11	380.28	384.59	416.51	375.39	380.00
Closing stock	47.50	35.50	71.50	40.50	45.77	40.00	40.00	33.00	52.00	35.00

Source: CAB Estimate as on 02.02.2016, p – Provisional,

World Cotton Scenario

Commercial cotton is grown in 77 countries and 123 countries are involved in the cotton related activities. Among 123 countries, 38 countries are the major producers and also the consuming countries, while, 30 Countries are major raw cotton exporters and 25 Countries exclusively import cotton. The world cotton production is estimated to be the lowest since 2004-05 at 100.22 million bales of 480 lb in 2015-16 (USDA, March 2016), around 16% less than the last year. Area under cotton also showed a decline of 3.22 million ha (9.4%) as compared to 2014-15. The early estimate of USDA indicates that India has displaced China and has become the leading producer of cotton, while still maintaining the largest area under cotton and the second largest exporter of cotton next to the United States. India also sustained the position of being the second largest consumer of cotton and is expected to consume 24.5 million bales in 2015-16. China's cotton production was reduced to 20.60% due to the drastic reduction in area under cotton to 22.72% over the last year. Australia, Brazil, and China are the world leaders in cotton productivity.

Due to large scale import of raw cotton in China from 2010-11 to 2013-14, the country has downsized its area under cotton and production for the next couple of years. The leading raw cotton importer, China, is expected to reduce from 8.2 to 5.0 million bales this year as compared to the last year; however, likely to reserve raw cotton pool of 64 million bales this year, which is 64% of the current world raw cotton production. The average cotton productivity in Pakistan was around 670 kg/ha for the past 15 years and due to the severe infestation of CLCuV in 2015-16, the productivity plunged to 544 kg/ha, which was the lowest since 1999-2000. There was 34% reduction in cotton production in Pakistan and is expected to import around 2.3 million bales this year to meet the domestic requirements.

World cotton situation in major cotton producing countries: 2015-16

Country	Area Harvested	Production	Imports	Exports	Domestic Consumption	Ending Stocks	Yield
Australia	285	2.500	-	2.750	-0.065	1.594	1910
Brazil	950	6.700	0.050	4.200	3.050	6.932	1536
Burkina	625	1.200	-	1.300	0.015	0.350	418
China	3400	23.800	5.000	0.200	32.000	64.520	1524
Egypt	100	0.340	0.450	0.150	0.660	0.169	740
India	11800	26.800	0.900	5.500	24.500	11.186	494
Mali	580	1.100	-	1.200	0.025	0.441	413
Pakistan	2800	7.000	2.300	0.250	9.625	2.260	544
Turkmenistan	500	1.300	-	1.000	0.725	0.429	566
United States	3261	12.943	0.010	9.500	3.553	3.600	864
World	30918	100.221	34.919	34.901	109.062	103.342	705

Note: Area in 1000 ha; yields in kg/ha and quantity in million bales of 480 lb.
Source: United States Department of Agriculture as on 14th March 2016.

Identification of Cotton Genotypes for Release

During the year 2014-15, fifteen cotton cultivars / hybrids have been identified by the Central Variety Identification Committee for various agro-climatic zones as detailed below.

Cultivar	*Species*	Institution
LH 2256	*G. hirsutum*	PAU, Ludhiana
SVHH 139	*G.hir X G.hir*	Shaktivardak Seeds
RHB 0711	*G.hir x G. bar*	MPKV, Rahuri
NHH 250	*G.hir X G.hir*	MAU, Nanded
NH 635	*G. hirsutum*	MAU, Nanded
NDLH 1938	*G. hirsutum*	ANGRAU, Nandyal
TSHH 0629	*G.hir X G.hir*	TNAU, Srivilliputur
MRC 7377	*G.hir X G.hir*	Mahyco Seeds
RHH 0707	*G.hir X G.hir*	MPKV, Rahuri
MCHB 7945	*G.hir x G. bar*	Mahyco Seeds
MRC 7385	*G.hir X G.hir*	Mahyco Seeds
RAHH 455	*G.hir X G.hir*	UAS, Raichur
MRDC 235	*G.arb x G.arb*	Mahyco Seeds
JLA 505	*G. arboreum*	MPKV, Jalgaon
MR 68	*G. hirsutum*	MR Seeds

Breeder Seed Production

As quality seed availability is a key component in enhancing productivity, an effective maintenance of Nucleus and Breeder seed programme was undertaken by the concerned participating centres of AICRP on Cotton. The Breeder seed production as per the Department of Agriculture, Cooperation and Farmers Welfare indent for the year 2015-16 was taken up at different centres of AICRP on Cotton and at ICAR-CICR, Regional Station, Coimbatore. The production was over and above the indent in almost all the locations.

Breeder Seed Production during 2015-16

S.No	Variety Name	Indent (Q)	Production (Q)	Surplus / Deficit
1	AKA-8	0.75	1.50	0.75
2	AKA-7 (AKA 8307)	1.25	1.50	0.25
3	AKH-081	0.25	1.00	0.75
4	AKA-5 (AKH-605)	1.00	2.00	1.00
5	Suraj	0.15	0.30	0.15
6	SUMANGALA (CWROK-165)	0.01	0.05	0.04
7	SURABHI (VRS-7)	0.11	0.50	0.39
8	MCU-5 VT	0.10	0.50	0.40
9	JAYALAXMI (DCH-32) (DS-28)(F)	0.02	0.00	-0.02
10	F 1861	0.70	0.70	0.00
11	F-1378	1.05	1.05	0.00
12	F-1054	0.45	0.45	0.00
13	F-846	0.80	0.80	0.00
14	F-505	0.50	0.50	0.00
15	HD 432	0.50	10.00	9.50
16	HD-123	1.90	9.00	7.10
17	AAH-1 (F)	0.09	0.15	0.06
18	AAH-1 (M)	0.04	0.07	0.03
19	H-1098	1.40	4.00	2.60
20	Phule LJA-794	0.50	0.30	-0.20
21	JKHY-2	0.01	0.25	0.24
22	LK-861	0.01	0.03	0.02
23	NH-615	0.25	0.30	0.05
24	NARASIMHA (NANDYAL-1325)	0.01	0.20	0.19
25	PA-183	0.01	0.01	0.00
26	RG-542	3.00	2.00	-1.00
27	RS-2013	0.35	0.00	-0.35
28	RS-810	0.05	0.00	-0.05
29	RST-9	1.95	0.00	-1.95
30	RG-8	4.65	3.40	-1.25
	TOTAL	21.86	40.56	

Field Evaluation of Bt Cotton Hybrids for Reaction to Cotton Leaf Curl Virus Disease under North zone- 2015-16:

As per the directives of the Hon'ble Deputy Director General (Crop Sciences), ICAR, New Delhi, a session on Public - Private Interaction was held under the chairmanship of Dr C.D. Mayee, Ex- ASRB Chairman, during the Annual Group Meeting of the All India Coordinated Research Project on Cotton on 8.4.2015 at Tamil Nadu Agricultural University, Coimbatore. The session was Co-Chaired by Dr N. Gopalakrishnan, ADG (CC) and Dr K.R. Kranthi, Director, CICR, Nagpur. The following technical programme was formulated for the evaluation of Bt Cotton Hybrids for reaction to CLCuD in North zone.

Locations of Testing: Five: Haryana (Hisar & Sirsa); Punjab (Bhatinda& Faridkot) & Rajasthan (Sriganganagar)

The trials conducted were

1. Released hybrids –Normal date of sowing
2. Pre-release hybrids –Normal date of sowing
3. Second year trial of only moderately tolerant entries (Both Pre-released and Released Bt hybrids) found during 2014-15 with normal date of sowing

The report was submitted to Council for further needful.

Weekly Advisory for Cotton Cultivation

Under the directives of the Director, CICR, Nagpur and active participation from scientists of AICRP on Cotton and ICAR-CICR, 32 weekly advisories were issued to cotton farmers in nine regional languages. The advisory included sowing recommendation, agronomical interventions, nutrient management, irrigation scheduling, pest and disease management. The advisories were uploaded at ICAR-CICR website (www.cicr.org.in/weekly_advisory.htm). Periodical monitoring of pest and disease was carried out by AICRP scientists across centres and timely advisories have been issued especially for whitefly and CLCuD. Pink bollworm damage and surviving larvae on Bollgard-II hybrids have been recorded from different regions in Gujarat, Andhra Pradesh, Telangana, Maharashtra and Karnataka. Immediate monitoring and management measures were recommended in the CICR advisory to prevent any further damage.

In North Zone, the farmers were alerted that cotton crop sown after 31st May will be highly prone to leaf curl virus. The other precautions included avoiding excess use of urea, Use mixed NPK as split, Yellow sticky traps at 1 trap per 100 sq. metre, Spraying of 5% Neem Oil, Castor Oil, Fish Oil, Rosin Soap or Nirma and Insect growth regulators such as Diafenthhiuron, Buprofezin, Pyroproxyfen, Spiromesfin and Emamectin benzoate. Under unavoidable circumstances farmers may use ethion or triazophos preferably as soil application. Spray recommended in the morning or late in the evening and targeted towards mid and lower canopy of plant. KNO_3 @ 2 kg/acre spray was recommended. Cotton leaf curl virus appeared at almost all locations.

In Gujarat, the farmers were advised to terminate cotton crop in December without extending it further to control Pink bollworm incidence. The recommendations also included to dispose the previous year cotton stalks lying on the bunds. Old cotton seed stored in godowns or

homes serve as a carry over for pink bollworm moths. If the seeds are infested, these may be destroyed immediately. If unattended, pink bollworm can cause heavy damage in October. Farmers were advised not to use mixtures especially those containing pyrethroids. This can result in whitefly resurgence.

In Maharashtra during the second week of November 2015, Jassid infestation was above ETL in districts of Wardha (38.56% villages) and Jalna (38.04% villages). Jassid infestation was above ETL in the range of 10-30% in villages of Chandrapur (18.42%), Nanded (11.67%) and Aurangabad (10.55%), whereas, <10% in villages of Akola (7.86%), Nagpur (8.48%) and Chandrapur (4.46%). In Amravati district, whitefly population crossed ETL in 13.38% villages. Nagpur district was also affected by leaf reddening (66.51% villages). This was followed by Ahmednagar (44.80%), Yeotmal (43.37%), Parbhani (34.46%), Aurangabad (30.43%), Amravati (22.18%), Chandrapur (17.10%), Buldhana (17.09%), Beed (15.64%), Jalna (15.30%), Washim (14.72%), Akola (10.04%), Nanded (8.68%) and Dhule (5.20%).

Monitoring Committee report of AICRP on Cotton Trials

Four teams were constituted for monitoring of AICRP on Cotton trials during the year 2015-16. Suggestions/recommendations made by the team shall be discussed during the Annual Group Meeting for follow-up action. The constituted committee and brief report submitted by the committee presented below.

Monitoring Committee

Zone/States	Breeder	Agronomist	Entomologist	Pathologist
North Zone (Punjab, Haryana & Rajasthan - Sriganga Nagar)	Dr. B. G. Solanki, NAU, Surat	Dr. T. H. Rathod, PDKV, Akola	Dr. Bheemanna, UAS, Raichur	**Dr. D. Monga, CICR, Sirsa**
Central Zone (Gujarat, Banswara of Rajasthan, Madhya Pradesh)	Dr. Amala Balu, TNAU, Coimbatore	Dr. Aladakatti, UAS, Dharwad	**Dr. B. Dharajothi, CICR,Coimbatore**	-
Central Zone (Maharashtra &Bhavanipatna)	**Dr. Nidagundi, UAS, Raichur**	**-**	Dr. Rishikumar, CICR, RS, Sirsa	Dr. K. B. Pawar, MPKV, Pune
South Zone (Andhra Pradesh, Karnataka & Tamil Nadu)	**Dr. S. Manickam, CICR, Coimbatore**	Dr. Kulvir Singh, PAU, RRS, Faridkot	Dr. S. Parsai, RVSKVV, Khandwa	Dr.,J. Beniwal, CCSHAU, Hisar

North Zone Monitoring Reports:

General Comments: The AICRP team led by Dr. Monga visited the centres from 28-9-15 to 2-10-15. All the centres conducted trials as per the technical programme. In addition, all the centre also had conducted Evaluation of Released and Pre-released By Hybrids for tolerance to CLCuD. There was an outbreak of whitefly in epidemic form during the season. The Analysis pinpointed towards

delayed sowing and congenial weather conditions for whitefly multiplication. In addition, cultivation of susceptible hybrids, indiscriminate use of insecticide mixtures and faulty spray technology were other important factors. In general, the *G. hirsutum* trials were badly affected by whitefly followed by CLCuV at most of the centres. *Desi* trials were comparatively less affected by whitefly.

Central Zone Monitoring Reports:

Two teams were constituted to monitor the trials in Central zone.

The Team-I monitored Gujarat, Madhya Pradesh and Western Rajasthan district of Banswara from 26.10.15 to 2.11.15.The Team-II visited Odisa and Maharashtra from 25-31 October, 2015.

The general comments made by the committee are:

- All the trials were conducted as per the technical programme at NAU-Surat, JAU-Junagadh, ARS-Banswara, RVSKVV-Khandwa & Indore. Dhanalakshmi seeds, Himatnagar also conducted BR.05a NT as per the technical programme.
- Trial on *barbadense* variety DB-40 is not acceptable because of the poor population due to the failure of germination.
- In Khandwa, the trial Agron-II for developing suitable agronomy for Bt cotton was not conducted
- In the Crop Protection trials, infestation of pink bollworm was observed as critical in Surat and Junagadh. Parawilt was noticed in all the trials at Junagadh.
- At all four centres, all the approved trials were conducted as per technical programmes and the survey for key and emerging pests in cotton under farmers fields for weekly advisory were also conducted. Infestation of pink bollworm was observed as critical under experimental fields and farmers' fields in Surat and Junagadh.
- Parawilt was noticed in all the trials at Junagadh. In the Pathology trial Path 2b at Junagadh, treatment differences were not visible because of the lack of disease incidence.
- In Khandwa, the crop was in boll formation and development stage and in some trials, plant population was very less and the crop stand was very poor. The intercrop raised under HDPS trial was cluster beans instead of Cowpea which was a deviation from the technical programme.

Central Zone Team 2 Monitoring Reports:

- At OUAT, Bhawanipatna all the trials of breeding and agronomy trials were conducted as per the technical programme. Growth of cotton was satisfactory and crop stage was at boll initiation and development.
- At CICR, Nagpur (Rainfed trial), all the experiments were conducted as decided in the AGM. Growth of cotton was satisfactory and crop stage was in boll initiation and development. The incidence of wilt was observed in the breeding plots.
- At PDKV, Akola, delayed rainfall led to delayed sowings of all the trials. Growth of cotton was satisfactory and crop stage was at boll initiation and development. The concerned scientist recorded all the observation as per technical programme.
- Under Agronomy trials, Growth of cotton was satisfactory and crop was at boll bursting stage in popular Bt and both organic farming and moisture conservation trials. News Paper

mulch could not be undertaken in MC Trials due to heavy wind. Lucerne failed due to excess rains in August. Agronomic requirement of *Hirsutum* variety, hybrids and HDPS trials were sown in July. There was 25-28 day moisture stress under early sown trials but performance was better.

- At Cotton Research Station, though the trials were sown in time, there was a moderate to long dry spell; however, the growth of cotton was found to be satisfactory and crop was at boll initiation and development.
- In Agronomy trials at Parbhani, Growth of cotton was satisfactory and crop was at boll bursting stage .There was 35 – 40 days moisture stress during season but performance was better. Boll worm complex was noticed in non Bt trials.
- At MPKV, Rahuri, Maharashtra (Irrigated), growth was satisfactory and crop was in boll bursting stage. The concerned scientist recorded all the observation as per technical programme. The results were shown during monitoring of experiments.
- All the agronomy trials at Rahuri were conducted as per protocol. Whitefly infestation was severe and was not controlled. Growth of cotton was satisfactory and first picking was over. Pink Boll worm complex was noticed in non Bt trials.
- Entomology trials at OUAT, Bhawanipatna: At the time of monitoring, the crop was in boll development and maturity stage. Crop condition and field sanitation at the time of monitoring was very satisfactory. The infestation of leaf roller was prominent in the trial. Many entries showed less attack of jassid. The trial was conducted as per protocol and there was no any deviation from protocol. The natural infestation of sucking pests was quite adequate for these studies. The trial is acceptable. The infestation of leaf roller was prominent in the trial. The entries GHV 500, GSHV 159, TCH 1777, NDLH 1938, GTHV 04/13 and GISV 267 showed promise against the jassids as compared to others. Population dynamics to develop suitable forecasting model trial, high jassid and leaf roller population was noticed at the time of monitoring. In the trial on Efficacy of the insecticides against sucking pests, good crop stand was observed in all the plots. Crop was in boll development stage. Leaf roller population was noticed at the time of monitoring.
  In Integrated Pest Management for HDPS trial, good crop stand was observed in all the plots. Crop was in boll development stage. Leaf roller population was noticed at the time of monitoring. The visual differences were observed in the modules. The IPM module showed enhanced overall growth as compared to module 2. The trial is acceptable.

South Zone Monitoring Reports:

Crop Improvement: At Dharwad and KSSC, all the trials were conducted as per technical programme. Though sowing was done at proper time, due to adverse weather condition throughout the cropping season, forced bursting was noticed in all the trials. The trial in charge was advised to prepare the lint samples for fibre quality evaluation from first picking only. At Raichur, all the trials were conducted as per technical programme. However, the irrigated trials were conducted mostly as rainfed trials with only protective irrigation and were not irrigated at appropriate stage for want of water. Hence, the trial in-charge was asked to follow the irrigation schedule at the critical stages in future.

At Nandyal, the trials were conducted as per the approved technical programme. However, the trials suffered due to prolonged drought at the early stage and from excessive moisture at flowering and boll formation stage, which led to square and boll shedding, especially in

desi trials. At Lam, in some of the trials, due to mechanical operations, plants in some entries got lost and the trial in-charge was advised to follow the missing plot technique to analyze the data appropriately.

At Coimbatore, all the allotted trials were conducted as per technical programme. All the plants exhibited forced pre-mature boll bursting in the trials sown on 22-07-2015. Hence, the trial in-charge was advised to collect kapas from fluffy opened bolls for fibre quality evaluation from first picking only. The fibre quality data may be considered only when the checks confirm to their original fibre quality. The trials sown on 19-08-2015 suffered because of excessive moisture due to continuous wetting by frequent rainfall during flowering stage which led to square and boll shedding. At Srivilliputhur, all the trials were conducted as per the technical programme. In spite of hardship caused by inclement weather during entire crop growth, the trials were in very good shape. Varietal trials were better than hybrid trials, because the hybrids showed severe leaf reddening, square and boll shedding and were exhibiting forced pre-mature boll bursting. In contrast, entries in varietal trials, were looking healthy with proper mature boll bursting. Since no farmers in the vicinity are cultivating interspecific hybrids, the said trials may be stopped from next season.

Crop Production: At Dharwad, sowing of most of the agronomic and biochemistry trials was slightly delayed but overall condition of the trials was good. There was poor germination of S*tylosanthusscabra in* organic cotton production trial. Since sufficient rainfall was received, the differences in rainfed vs. irrigated in Physiology trial 1 may be trivial. At Raichur, sowing of most of the agronomic trials was slightly delayed but overall condition of the trials was good. At Nandyal, overall condition of the Agronomy trials was good, except Agron. V trial due to severe water stress. There was poor germination of lucerne and *Stylosanthusscabra* inorganic cotton production trial. At Coimbatore, overall condition of the trials was average. Plant population as per the protocol was mostly lacking in all the trials. Proper field sanitation was also lacking. There is a scope of greater improvement by adopting recommended agronomic / field management package.

Crop Protection (Entomology): At Dharwad, all the five trials were conducted as per the technical programme in a satisfactory manner. Shoot weevil and Mirid Bugs infestation was observed. At Raichur, of the five trials conducted, Ent 1(a) and Ent 1(b) trial entries were not replicated properly. Shoot weevil and Mirid Bugs infestation was observed. At Nandyal, of the five trials conducted, Ent 1(b) trial entries were not replicated as per statistical requirements. Further, in Ent2 trial, only one application of neonicotinoids was given. Pink Boll worm incidence was noticed in Bt. Hybrids (BG II). At LAM, Pink Boll worm incidence was noticed in Bt. Hybrids (BG II). At Coimbatore and Srivilliputhur, Ent 1(b) trial entries were not replicated as per statistical requirements. Further, in Ent 2 trial, plot size was very small (200 sq. metre each). Sanitation needs to be given importance.

Crop Protection (Pathology): At Dharwad, all the trials were conducted as per technical programme. Crop stand and field sanitation were good. However, crop growth was affected by less and uneven distribution of rains. Multiple resistances were found in genotype SVA-1118 against Alternaria blight, Bacterial blight, Grey mildew and rust diseases.

Financial statement of AICRP on Cotton for the year 2015-16 (Total Saction of Rupees 1520 Lakhs)

S.No	Name of the Centre	Pay	Contg	TA	Total	TSP
1	GUNTUR	93.75	5.25	1.30	100.30	0.00
2	NANDYAL	45.00	2.25	0.56	47.81	0.00
3	KANPUR	36.00	1.50	0.37	37.87	0.00
4	HISAR	84.00	5.25	1.30	90.55	0.00
5	KHANDWA	71.25	4.50	1.12	76.87	0.00
6	INDORE	30.00	1.50	0.37	31.87	0.00
7	JUNAGADH	48.75	3.00	0.75	52.50	0.00
8	NANDED	63.75	3.00	0.75	67.50	**4.00**
9	RAHURI	58.50	3.00	0.75	62.25	0.00
10	PUNE	18.75	0.75	0.18	19.68	0.00
11	BANSWARA	48.75	3.00	0.75	52.50	0.00
12	SURAT	105.00	6.00	1.50	112.50	**5.00**
13	BHAWANIPATNA	51.00	3.00	0.75	54.75	0.00
14	AKOLA	78.75	4.50	1.12	84.37	0.00
15	FARIDKOT	82.50	4.50	1.12	88.12	0.00
16	BHATINDA	54.75	3.00	0.75	58.50	0.00
17	RAICHUR	43.50	2.25	0.56	46.31	0.00
18	SRIGANGANAGAR	66.00	3.75	0.94	70.69	0.00
19	COIMBATORE	56.25	3.00	0.75	60.00	**1.00**
20	SRIVILLIPUTUR	56.25	3.00	0.75	60.00	**1.00**
21	DHARWAR	93.75	6.00	1.50	101.25	**3.00**
22	BANGALORE	33.75	2.25	0.56	36.56	0.00
24	**Sub Total**	**1320.00**	**74.25**	**18.50**	**1412.75**	**14.00**
25	PC Cell	0.00	70.00	23.25	**93.25**	**0.00**
26	TSP	0.00	0.00	0.00	**14.00**	**14.00**
27	**Grand Total**	**1320.00**	**144.25**	**41.75**	**1520.00**	**14.00**

Front Line Demonstrations (FLD) under NFSM-Commercial Crops

Since 1996-97, the All India Coordinated Research Project on Cotton has been conducting FLD on cotton through its network centers and through ICAR- Central Institute for Cotton Research and its regional stations in Coimbatore and Sirsa. The objectives of the programme are demonstrating the usefulness of the latest improved crop production and protection technologies to the farmers, reducing the time gap between technology generation and its adoption, enabling the scientists to obtain direct feedback from cotton farmers and suitably reorient their research programmes to develop appropriate technology packages and creating effective linkage among scientists, extension personnel and farmers. Until 2013, these demonstrations were conducted on

Production Technology, Integrated Pest Management and on Farm implements under Technology Mission on Cotton, Mini Mission II. From 2014-15 onwards, these FLDs have been conducted under National Food Security Mission (NFSM) (Commercial Crops).

During the year 2015-16, under National Food Security Mission (NFSM) (Commercial Crops), 245 Front Line Demonstrations on Integrated Crop Management (ICM) on cotton, 157 Front Line Demonstrations on Desi / ELS cotton / ELS cotton seed production and 136 Front Line Demonstrations on intercropping with cotton were conducted by sixteen centres of All India Coordinated Research Project on Cotton with a budget outlay of 35.00 lakh rupees as against the proposed budget of 47.50 lakhs.

The Front Line Demonstrations conducted under NFSM-FLD through AICRP on Cotton during 2015-16

S. No	Centres	FLDs on ICM		FLDs on Desi / ELS cotton / ELS cotton seed production		FLDs on Intercropping in cotton	
		A	C	A	C	A	C
1	PAU, Faridkot	20	20	20	20	-	-
2	HAU, Hisar	20	20	20	20	-	-
3	RAU, Sriganganagar	20	10.8	10	4	-	-
4	MPUAT, Banswara	10	-	10	-	-	-
5	CICR, Sirsa	5	5	40	37	-	-
6	NAU, Surat	20	10	10	10	20	10
7	JAU, Junagadh	20	20	-	-	20	20
8	JNKV, Khandwa	20	10	-	-	15	10
9	PDKV, Akola	20	12.8	-	-	15	12
10	MAU, Nanded	20	20	20	20	15	15
11	MPKV, Rahuri	10	10	-	-	15	15
12	CICR Nagpur	10	16.4	10	6.4	15	3.6
13	UAS, Dharwad	10	10	25	25	15	15
14	UAS, Raichur	10	25	25	4	20	-
15	UAS, Chamrajnagar	10	30	-	-	15	-
16	TNAU, Coimbatore	10	10	-	-	15	15
17	CICR, Coimbatore	15	15	10	10*	20	20*
Grand Total		**250**	**245**	**200**	**156.4**	**200**	**135.6**

(**A** – No. of FLDs allotted in hectare; **C** – No. of FLDs conducted actually in hectares)

* Conducted under Summer Irrigated Condition

Tribal Sub-Plan Programme

Under the AICRP on Cotton- Tribal Sub Plan (TSP), a sum of Rs. 14 lakh was utilised to conduct training programme, demonstrations and other extension programs to disseminate the cotton production technologies exclusively to the tribal cotton farmers for improving their livelihood status

Centre wise budget utilized for TSP during 2015-16

S.No	Centres	Budget
1	MAU, Nanded	4.00
2	TNAU, Srivilliputhur	1.00
3	NAU, Surat	5.00
4	UAS, Dharwad	3.00
5	TNAU, Coimbatore	1.00
	Total	**14.00**

Implementation of PVP legislation, 2001 and DUS testing of cotton under ICAR-SAU system

During the year 2015-16, this programme was carried out with the objective to Establish and maintain database on extant cotton varieties, Conduct DUS test of New candidate, Varieties of common knowledge, Farmers varieties and essentially derived varieties, maintenance breeding of reference cotton varieties, morphological characterization of extant cotton varieties and also Registration of extant cotton varieties under this act. This programme is implemented ICAR-Central Institute for Cotton Research, Nagpur; National Seeds project Unit, UAS, Dharwad; Department of Cotton CCSHAU, Hisar; National Seeds project Unit, PAU, Ludhiana; Department of Cotton, MPKV, Rahuri; and ICAR-Central Institute for Cotton Research, Regional Station, Coimbatore being the nodal center.

The data base on cotton varieties has been updated. Seed multiplication, Characterization and purification of Reference and Example varieties have been done in 77 varieties. Reference collection of 65 *G. hirsutum*, 3 *G. barbadense*, 8 *G. arboreum* genotypes were characterized and are being maintained.

At ICAR-CICR, Regional station, Coimbatore, field trials for the establishment of Distinctiveness, Uniformity and Stability of new cotton genotypes, varieties of common knowledge, farmers Variety and Essentially derived variety were conducted in tetraploid and diploid cotton. There were 68 new candidate varieties in second year of testing trial, which were *G. hirsutum*. In the first of testing there were 49 new candidate varieties, 12 Varieties of common knowledge, one farmers variety and 19 essentially derived varieties along with 19 Initial varieties were taken up. 60 reference varieties were grown along with above trials for comparison of essential characteristics of candidate varieties. Essentially derived varieties and their corresponding Initial varieties were grown in unprotected and protected environment.

The above trials were conducted as per the protocol of test guidelines of tetraploid and diploid cottons, respectively. Field sowings were taken up on 10.8.2015, 29.8.2015, 11.9.2015 and 12.9.2015 in randomized block design with 3 replications. Germination count at 12 DAS in corresponding field was recorded in all the entries. Hypocotyl pigmentation was recorded before 20 DAS at seedling stage. In the vegetative phase, leaf characteristics such as colour, hairiness, appearance, gossypol glands, nectaries, petiole pigmentation, and shapes were recorded. During the flowering stage characteristics such as stem hairiness, stem pigmentation, plant height, growth habit, Bract type, time of flowering , petal colour, petal spot, stigma, anther filament colouration, pollen colour, male sterility, boll bearing habit, boll colour and shape, boll surface and prominence

of tip, boll opening, boll weight were recorded. Sample bolls and fiber samples have been collected in all the plots. Seed characteristics such as seed fuzz, fuzz color, seed index and ginning per cent will be recorded. The fiber properties viz., fibre color, length, strength, fineness, uniformity, maturity are to be observed through High volume instrument at CIRCOT unit of Coimbatore. The characteristic measurement and visual assessment was done in randomly selected ten plants in each plot. The claimed characters of the applicant were compared with characters of reference varieties for establishment of Distinctiveness Uniformity and Stability of candidate genotypes.

During 2015-16, one application for variety Central cotton CCH 2623 for registration, under PPV&FR Act, 2001 was submitted through NBPGR. Monitoring of DUS trials was conducted on 7.11.2015 at MPKV Rahuri, on 19.11.2015 at CICR, Nagpur and on 13.1.2016 at CICR, Regional station, Coimbatore under the chairmanship of Dr.K.R.Kranthi, Director, CICR, Nagpur.

***