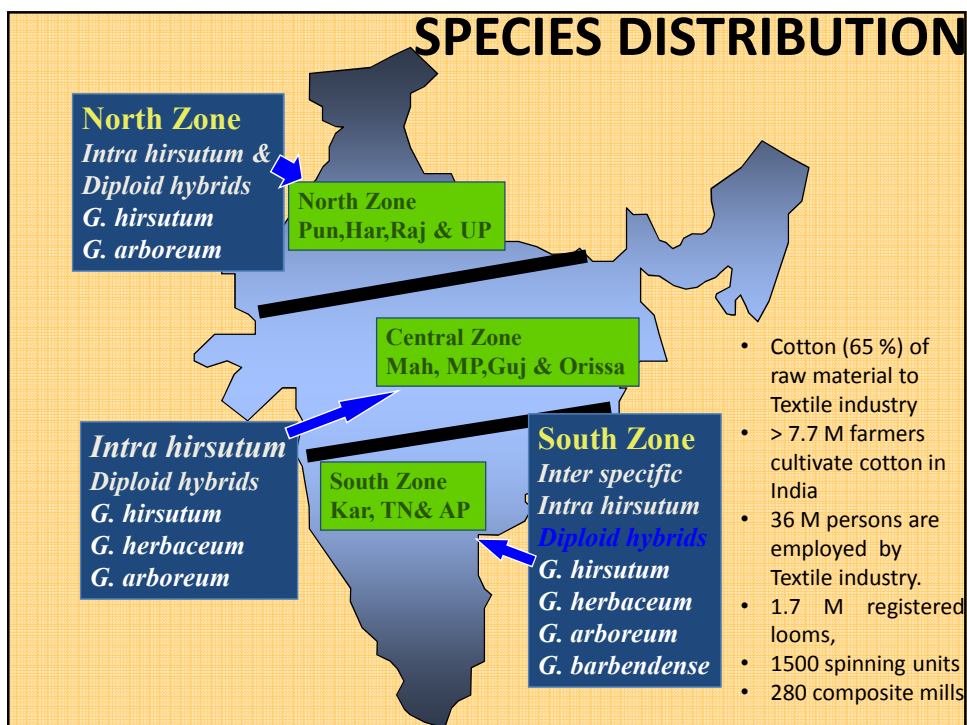
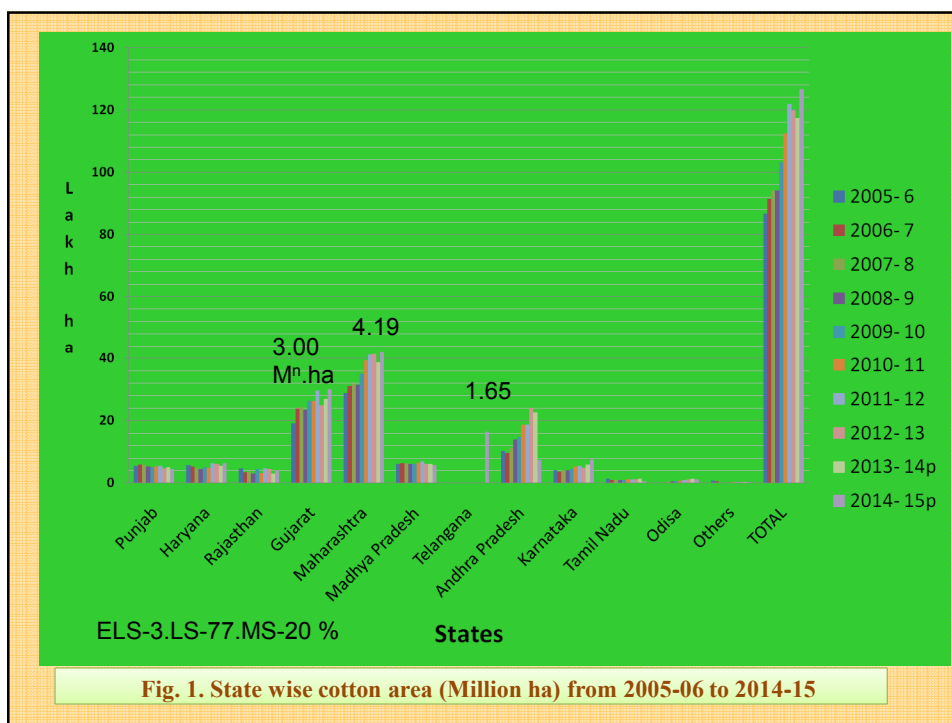


Recent developments of cotton in India

Dr. Bhuvaneshwaragouda R. Patil, Professor,
Department of Genetics and Plant Breeding
University of Agricultural Sciences
Dharwad, Karnataka, India





Area	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14p	2014-15p
Punjab	5.57	6.07	6.04	5.27	5.11	5.30	5.60	4.80	5.05	4.50
Haryana	5.83	5.30	4.83	4.56	5.07	4.92	6.41	6.14	5.66	6.39
Rajasthan	4.71	3.50	3.69	3.02	4.44	3.35	4.70	4.50	3.03	4.16
NORTH ZONE	16.11	14.87	14.56	12.85	14.62	13.57	16.71	15.44	13.74	15.05
Gujarat	19.06	23.90	24.22	23.54	26.25	26.33	29.62	24.97	26.91	30.06(II)
Maharashtra	28.75	31.07	31.95	31.42	35.03	39.42	41.25	41.46	38.72	41.92(I)
Madhya Pradesh	6.20	6.39	6.30	6.25	6.11	6.50	7.06	6.08	6.21	5.79
CENTRAL ZONE	54.01	61.36	62.47	61.21	67.39	72.25	77.93	72.51	71.84	77.77
Telangana										16.51(III)
Andhra Pradesh	10.33	9.72	11.33	13.99	14.75	18.79	18.79	24.00	22.69	7.36
Karnataka	4.13	3.78	4.03	4.08	4.55	5.45	5.54	4.85	5.94	7.60
Tamil Nadu	1.40	1.00	0.99	1.09	1.04	1.22	1.33	1.28	1.39	0.70
SOUTH ZONE	15.86	14.50	16.35	19.16	20.34	25.46	25.66	30.13	30.02	32.1
Odisha			0.50	0.58	0.54	0.74	1.02	1.19	1.34	1.25
Others	0.79	0.71	0.26	0.26	0.21	0.33	0.46	0.51	0.33	0.31
TOTAL	86.77	91.44	94.14	94.06	103.10	112.35	121.78	119.78	117.27	126.55

AICRP on Cotton Annual Report 2014-15

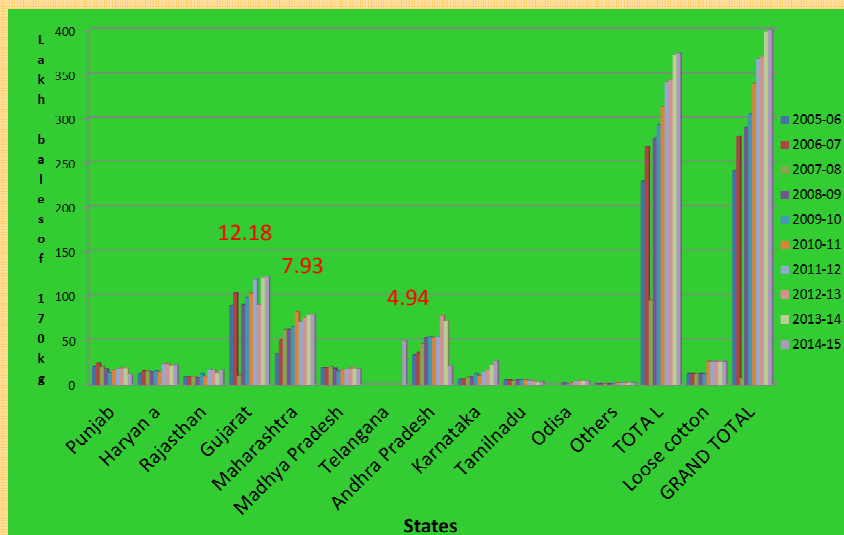


Fig. 2. State wise cotton production (Million bales of 170 kg) from 2005-06 to 2014- 15

Table 2. State wise cotton production (lakh bales of 170 kg) from 2005-06 to 2014- 15

Area	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Punjab	20	24	20	17.5	13	16	17.5	18.5	18.5	11.5
Haryana	12	15	15	14	15	14	23	23	21	22
Rajasthan	9	9	9	7.5	12	9	16.9	15.9	12.9	15.9
NORTH ZONE	41	48	44	39	40	39	57.4	57.4	52.4	49.4
Gujarat	89	103	10	90	98	103	118.8	89.8	120.8	121.8(I)
Maharashtra	35	50	62	62	65	82	70.25	75.25	78.25	79.25(II)
Madhya Pradesh	19	19	20	18	15	17	17.3	18.3	18.3	17.3
CENTRAL ZONE	143	172	92	170	179	202	206.35	183.35	217.35	218.35
Telangana										49.4(III)
Andhra Pradesh	33	36	46	53	54	53	53.5	77.5	71.5	21.1
Karnataka	6	6	8	9	12	10	13.9	15.9	21.9	26.9
Tamilnadu	5	5	4	5	5	5	4.3	3.8	2.8	2.8
SOUTH ZONE	44	47	58	67	71	68	71.7	97.2	96.2	100.2
Odisha				1.5	1	2	3.45	3.95	3.95	3.95
Others	1	1	1	0.5	1	2	2	2	2	2
TOTAL	229	268	95	278	293	313	340.9	343.9	371.9	373.9
Loose cotton	12	12	12	12	12	26.1	26.1	26.1	26.1	26.1
GRAND TOTAL	241	280	7	290	305	339.1	367	370	398	400

AICRP on Cotton Annual Report 2014-15

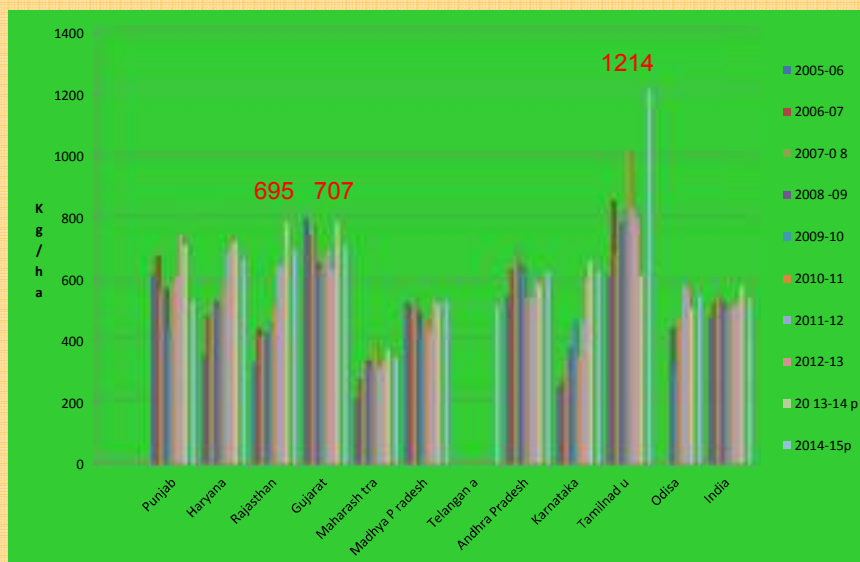


Fig.3. State wise cotton Productivity (kg/ha) from 2005-06 to 2014-15

Table 3. State wise cotton Productivity (kg/ha) from 2005-06 to 2014-15

Area	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14 p	2014-15p
Punjab	610	672	563	565	432	593	607	744	707	529
Haryana	350	481	528	522	511	587	690	719	721	665
Rajasthan	325	437	415	422	459	513	651	642	785	695(III)
NORTH ZONE	433	549	514	516	468	571	651	704	730	633
Gujarat	794	733	772	650	635	686	700	633	783	707(II)
Maharashtra	207	274	330	335	319	378	313	332	369	345
Madhya Pradesh	521	505	540	490	424	463	433	531	520	529
CENTRAL ZONE	450	477	522	472	452	498	471	452	537	498
Telangana										515
Andhra Pradesh	543	630	690	644	628	538	543	595	584	624
Karnataka	247	270	337	375	458	346	460	596	658	626
Tamil Nadu	607	850	687	780	817	1003	831	797	611	1214(I)
SOUTH ZONE	472	551	603	594	600	519	540	604	600	581
Odisha				440	315	471	583	571	507	544
India	472	521	554	524	503	513	512	525	577	537

APCB Cotton Annual Report 2014-15

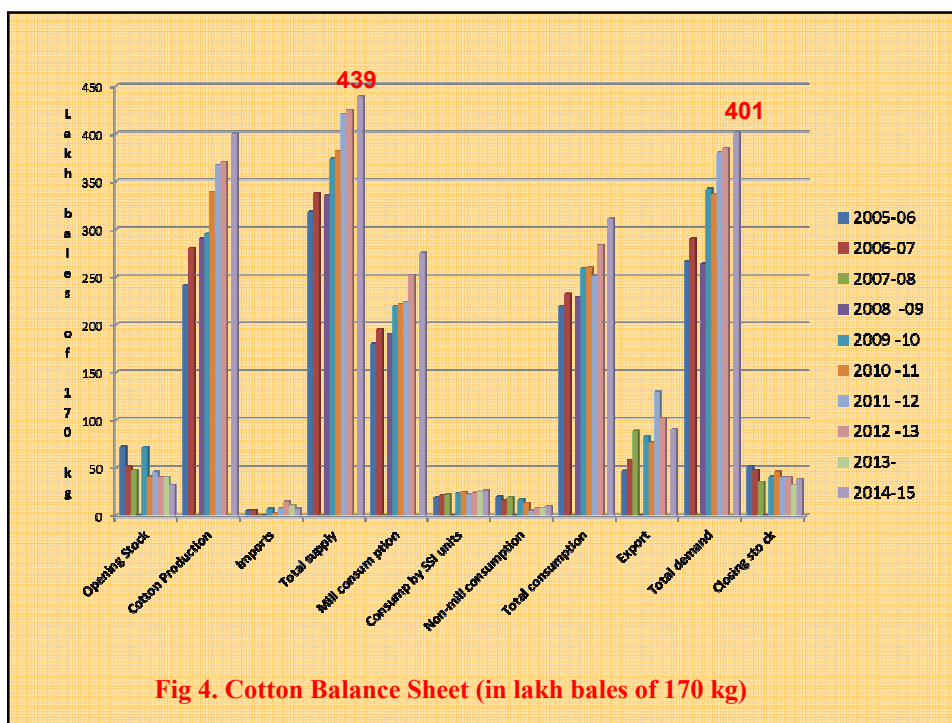


Table 4. Cotton Balance Sheet (in lakh bales of 170 kg)

	2005-06	2006-07	2007-08	2008 -09	2009 -10	2010 -11	2011 -12	2012 -13	2013-	2014-15
Supply										
Opening Stock	72	52	47.5	35.5 0	71.5	40.5	45.77	40	40	32
Cotton Production	241	280	30 7.00	290	295	339	367	370	39 8.00	400
Imports	5	5.53	6 .38	10.0 0	7	2.38	7.51	14.59	10.8	7
Total supply	318	337.53	36 0.88	335.5	373.5	381.88	420.28	424.59	44 8.80	439
Demand										
Mill consumption	180	194.89	19 5.67	190	219	221.77	223.59	251.74	26 6.00	275
Consumption by SSI units	19	21.26	22.08	20.0 0	23	24.46	22.12	23.59	24.88	26
Non-mill consumption	20	15.88	19.13	19.0 0	17	13.38	5	7.83	8	10
Total consumption	219	232.03	23 6.88	229	259	259.61	250.71	283.16	29 8.88	311
Export	47	58	88.5	35.0 0	83	76.5	129.57	101.43	11 7.92	90
Total demand	266	290.03	32 5.38	264	342	336.11	380.28	384.59	41 6.80	401
Closing stock	52	47.5	35.5	71.5 0	40.5	45.77	40	40	32	38

AICRP on Cotton Annual Report 2014-15

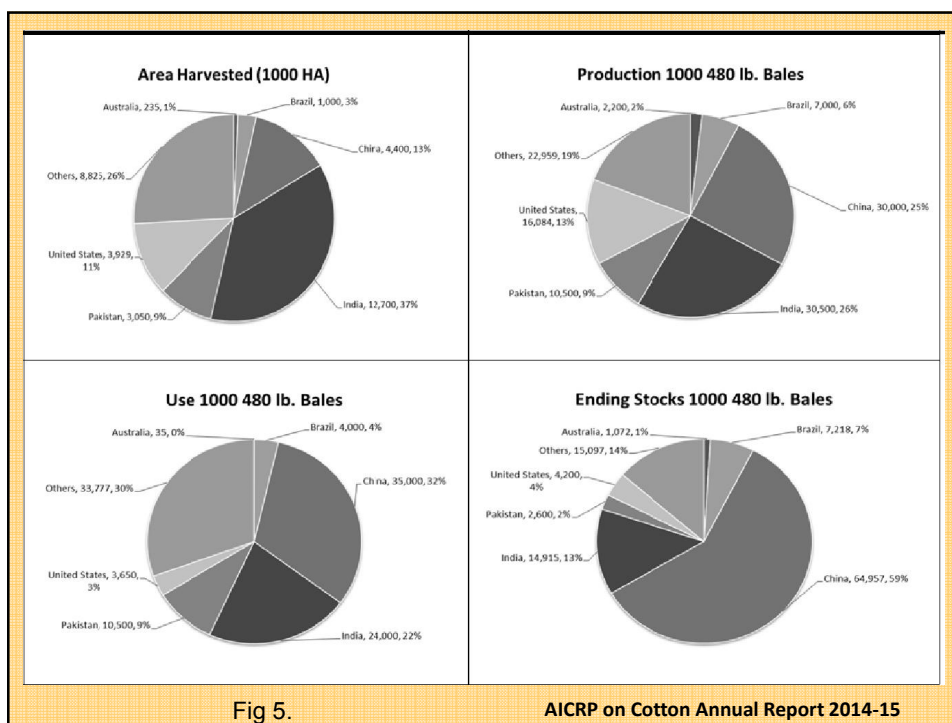




Fig 6.

Source: USDA, 2014, Analyzed by ISAAA, 2014

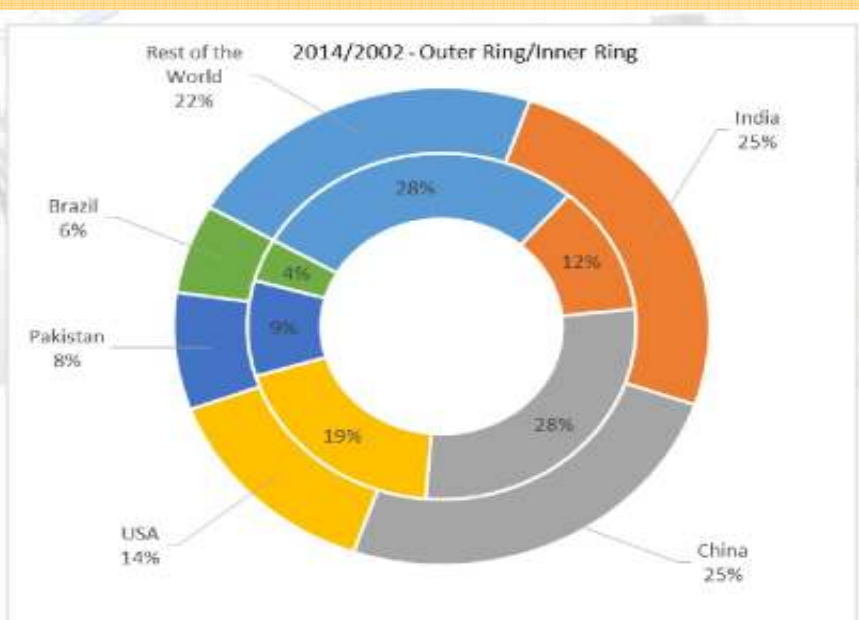


Fig 7. Distribution of World Cotton Market Share by Top Five Producing Countries, 2002 to 2014

Source: USDA, 2014

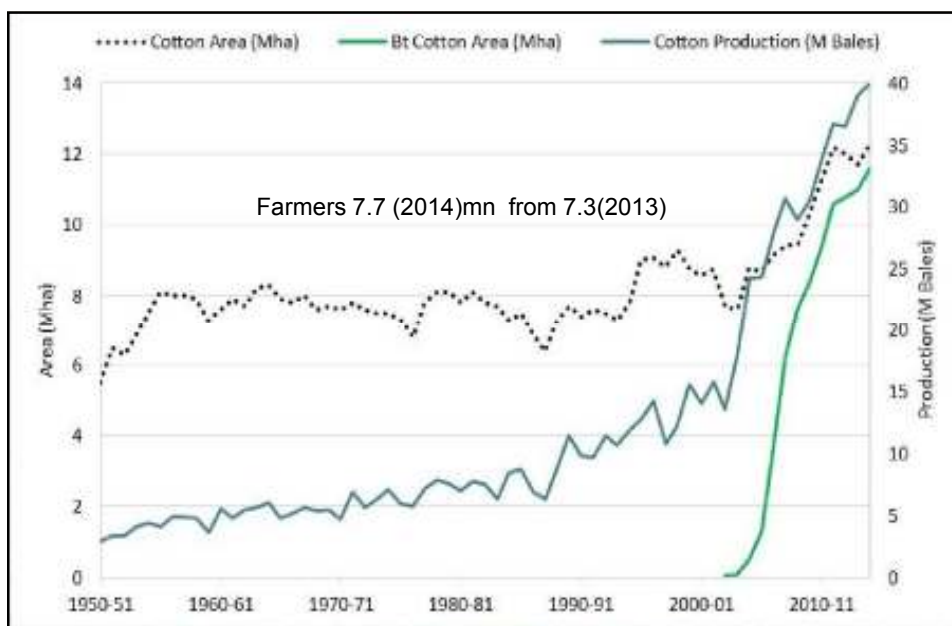


Fig 8. The Adoption and Impact of Bt Cotton on the Cotton Production in India, 1950 to 2014

Source: CAB, 2014; Blaise *et al.*, 2014; Analyzed by ISAAA, 2014

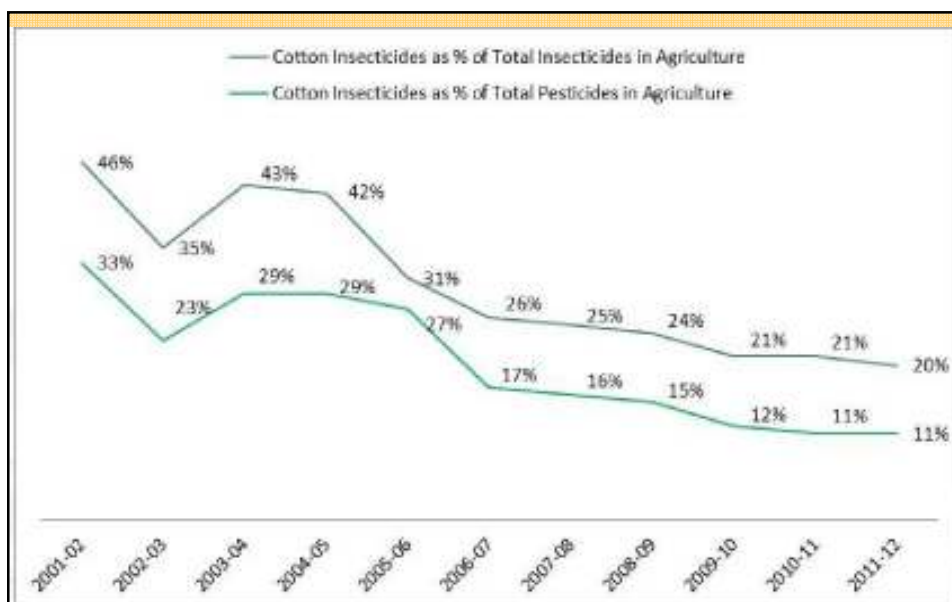
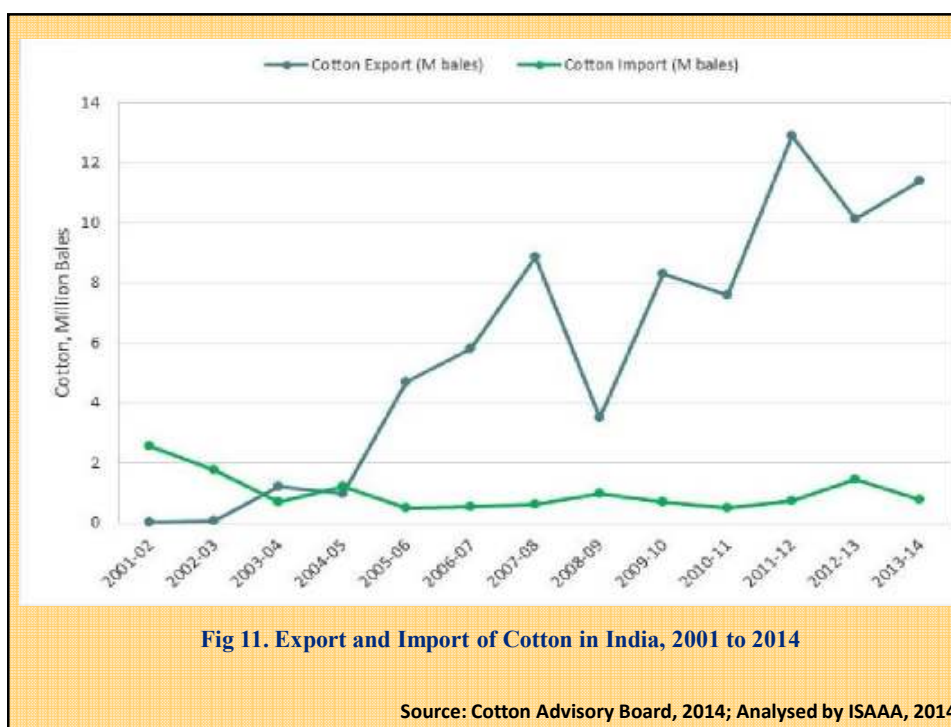
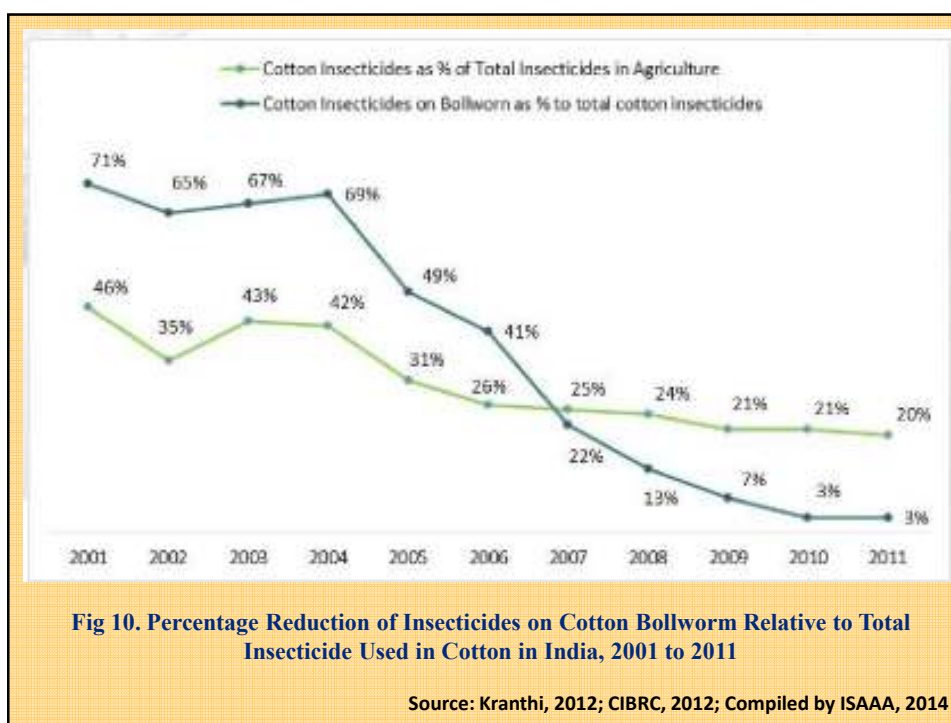


Fig 9. Percentage Reduction of Insecticides on Cotton Relative to Total Insecticides/Pesticides Used in Agriculture in India, 2001-2011

Source: Kranthi, 2012; CIBRC, 2012; Compiled by ISAAA, 2014



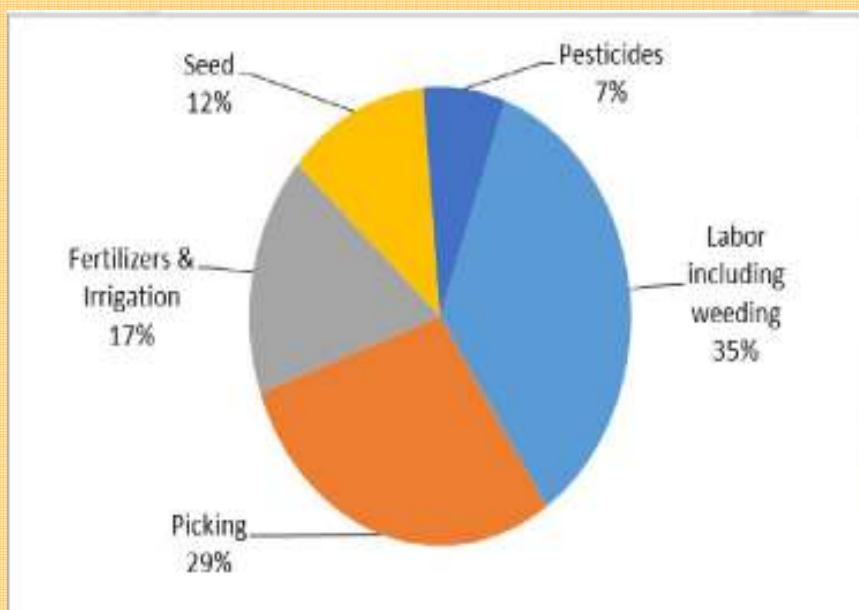


Fig 12. Distribution of Cost of Cotton Cultivation Post Bt Cotton Era

Source: Adopted from Mayee and Choudhary, 2013

Table 5. Thirteen Years of Adoption and Commercial Release of Bt Cotton

Year	% of Bt cotton events	% of Bt cotton hybrids	% of seed companies selling Bt cotton	Adoption of Bt cotton (Mha)	Total cotton area (Mha)	% Bt cotton area	# of Bt cotton farmers (Million)	% of single gene Bt cotton	% of double gene Bt cotton	Cotton production (M Bales)	Cotton yield (Kg/ha)	Total insecticides to control bollworms (Metric tons)
2002-03	1	3	1	0.05	7.7	1	0.05	100	-	13.6	302	4470
2003-04	1	3	1	0.1	7.6	1	0.08	100	-	17.9	399	6599
2004-05	1	4	1	0.5	8.9	6	0.3	100	-	24.3	463	6454
2005-06	1	30	3	1.3	8.9	15	1.0	100	-	24.4	467	2923
2006-07	4	62	15	3.8	9.2	42	2.3	96	4	28	521	1874
2007-08	4	131	24	6.2	9.4	66	3.8	92	8	31.5	567	1201
2008-09	5	274	30	7.6	9.4	81	5.0	73	27	29	525	652
2009-10	6	522	35	8.4	10.3	81	5.6	43	57	30.5	503	500
2010-11	6	780	35	9.4	11.0	85	6.2	30	70	31.2	475	249
2011-12	6	884	40	10.6	12.2	88	7.0	18	82	35.3	493	222
2012-13	6	1097	44	10.8	11.6	93	7.2	10	90	33.4	489	-
2013-14	6	1167	45	11.6	12.25	95	7.7	4	96	39	541	-

Source: Compiled by ISAAA, 2014

Table 6. Adoption of Single and Double Gene Bt Cotton Hybrids in India, 2006 to 2014 (Millions Hectares and Percentage)

Number of Genes	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Double	-	0.15 (4%)	0.46 (8%)	2.04 (27%)	4.82 (57%)	6.60 (70%)	8.70 (82%)	9.7 (90%)	10.4 (94%)	11.2 (96%)
Single	1.3 (100)	3.65 (96%)	5.74 (92%)	5.56 (73%)	3.58 (43%)	2.80 (30%)	1.90 (18%)	1.1 (10%)	0.6 (6%)	0.4 (4%)
Total	1.3 (100%)	3.80 (100%)	6.20 (100%)	7.60 (100%)	8.40 (100%)	9.40 (100%)	10.6 (100%)	10.8 (100%)	11 (100%)	11.6 (100%)

Source: Compiled by ISAAA, 2014

Table 7. Commercial Release of Different Bt Cotton Events in India, 2002-2014

No.	Crop	Gene(s)	Event	Developer	Status	Year of Approval
1	Cotton*	cry1Ac	MON-531	Mahyco/Monsanto	Commercialized	2002
2	Cotton*	cry1Ac and cry2Ab2	MON-15985	Mahyco/Monsanto	Commercialized	2006
3	Cotton*	cry1Ac	Event-1	JK Agri-Genetics	Commercialized	2006
4	Cotton*	fused genes cry1Ab and cry1Ac	GFM Event	Nath Seeds	Commercialized	2006
5	Cotton*	synthetic cry1C	MLS-9124	Metahelix Life Sciences	Commercialized	2009

2014-70 cotton hybrids

Source: Compiled by ISAAA, 2014

Table 9. Thirteen Years of Adoption of Bt Cotton in India, by Major States*, 2002 to 2014 (Thousand Ha)

State	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Maharashtra	25	30	200	607	1,840	2,800	3,130	3,396	3,710	3,960	3,995	3,860	3,950 (32%)
Andhra Pradesh	8	10	75	280	830	1,090	1,320	1,049	1,650	1,820	1,935	2,100	2,275
Gujarat	10	36	122	150	470	908	1,360	1,682	1,780	1,930	2,015	2,130	2,525 (21%)
Madhya Pradesh	2	13	80	146	310	500	620	621	610	640	605	620	560
Northern Region*	-	-	-	60	215	682	840	1,243	1,162	1,340	1,390	1,365	1,425
Karnataka	3	4	18	30	85	145	240	273	370	570	520	580	610
Tamil Nadu	2	7	5	27	45	70	90	109	110	220	220	194	110
Others	-	-	-	-	5	5	5	8	8	120	120	146	115
Total	50	100	500	1,300	3,800	6,200	7,650	8,381	9,400	10,600	10,800	10,995	11,570

Source: Analysed and Compiled by ISAAA, 2014

Table 10. Deployment of Approved Bt Cotton Events/Hybrids/Variety by Region in India in 2014

Event	North (N)	Central (C)	South (S)	North/Central (N/C)	North/South (N/S)	Central / South (C/S)	N/C/S	Total Hybrids
BG-I ¹	42	52	42	14	1	53	13	217
BG-II ²	142	154	146	11	11	211	59	734
Event-I ³	9	8	7	0	0	17	1	42
GFM Event ⁴	22	28	17	4	0	28	1	100
MLS-9124 ⁶	0	0	0	0	0	2	0	2
Total	215	242	212	29	12	312	75	1,097

1,2 Mahyco 3 JK Seeds 4 Nath Seeds and 6 Metahelix

Source: Analyzed and Compiled by ISAAA, 2014

**Table 11. Value of the Total Pesticide Market in India in 2001 and 2010
Relative to the Value of the Cotton Insecticide Market**

Item/Year	2001	2006	2010
Total pesticide market (in million US\$)	US\$713 million	US\$748 million	US\$1,707 million
Cotton insecticides as % of total pesticide market	33%	17%	11%
Total insecticide market (in million US\$)	US\$504 million	US\$404 million	US\$952 million
Cotton insecticides as % of total insecticide market	46%	26%	21%
Value in US\$ millions of cotton bollworm market & (savings due to Bt cotton) in 2004 over 2010	US\$160 million (in 2004)	-	US\$25 million (Savings of US\$135 million, or 85%, compared with 2004)

Source: Kranthi, 2012; CIBRC, 2012; Chemical Industry, 2012; Compiled by ISAAA, 2014

**Table 12. Contribution of Cotton Oil to the Edible Oil Sector
in India, 2002-03 and 2013-14**

Item	2002-03	2013-14
Cotton production (million bales)	13.6	39.1
Cottonseed production @ 310kg/bale (million tons)	4.21	12.1
Retained for sowing & direct consumption (m tons)*	0.50	0.1
Marketable Surplus (million tons)	3.71	12
Production of washed cottonseed oil (12.5%) (m tons)	0.46	1.5

Source: COOIT, 2010; AICOSCA, 2010; CAB, 2014; Compiled by ISAAA, 2014

Table 13. Economics of Bt cotton cultivation in maharashtra, Andhra Pradesh and Punjab

Items	Maharashtra	Andhra Pradesh	Punjab	India
Seed cotton yield (Kg/ha)	1640	1875	2086	1867
Gross income (Rs/ha)	69,405	75,000	88,581	77,562
Cost of cultivation (Rs/ha)	36,520	35,214	35,442	35,725
Net income (Rs/ha)	32,885	39,786	53,139	41,837
	\$ 506	\$ 612	\$ 817	\$ 643

Source: Adopted from Mayee and Choudhary, 2013



Major Insect Pests of Cotton in India

Sl. No.	Insect Pest	Scientific Name	Crop age (days)
Sucking pests :			
1.	Jassids	<i>Amarasca biguttula</i>	1 - 50
2.	Aphids	<i>Aphis gossypii</i>	1 - 50
3.	Thrips	<i>Thrips tabaci</i>	1 - 60
4.	White fly	<i>Bemesia tabaci</i>	35 - 110

			
JASSIDS	COTTON APHID	THRIPS Adult	WHITEFLY Adult

Boll Feeders

- | | <u>Crop age in days</u> |
|--|-------------------------|
| 1. Spotted boll worm
<i>Earias vitella</i>
<i>Earias insulana</i> | 35 - 110 |
| 2. Pink Bollworm
<i>Pectinophora gossypiella</i> | 65 - 100 |
| 3. American Bollworm
<i>Helicoverpa armigera</i> | 65 - 110 |



Return of the Minor pests



The Mirid bug (*Creontides biseratence* Distant)

Reduced insecticide use on Bt-cotton has resulted in the survival and multiplication of the minor pest mirid bug, which damages squares and flowers mostly



Solenopsis mealybug, *Phenacoccus solenopsis*

The insect weakens the plants by sucking the sap from leaves, twigs, stems, and sometimes from the roots and also from fruiting bodies. The entire plant may be stunted and shoot tips develop a bushy appearance. In affected plants bolls are deformed, fewer, and smaller in size. The pest secretes sweet honey dew which encourages the development of black sooty mould, adversely affecting photosynthetic activity. The honey dew also attracts ants which in turn help in the dispersion of mealy bugs from plant to plant.



The tobacco caterpillar, *Spodoptera litura*

Cry1Ac is less effective on *Spodoptera*

Reduced pyrethroid use on Bt-cotton causes pink bollworm & spodoptera to re-emerge as major pests.

Flower bud maggot or gall midge of cotton (*Dasineura gossypii*) (Cecidomyiidae : Diptera)



Mealy bug infesting cotton plant, Square, Green boll and flower



The scenario since 2002



Bt-cotton area increased to 7.6 M ha.(2008-09) to 12.26 in M ha(2014-15) India

Majority farmers have harvested bumper crop of Bt-cotton

Few farmers have also complained of low yields

Three Bt-hybrids in 2002 & 2003; Four Bt-hybrids in 2004, 20 Bt-hybrids in 2005, 32 in 2006 & 101 hybrids identified in 2007-08.

Presently 1167(G.hxG.h+G.b) Bt-hybrids released .

Bollgard II Round up ready cotton(BG-II RRF)

More than 210 events

>70 seed companies are pursuing Bt-cotton in India

Consequences of Bt-Cotton Introduction in India



1. Insecticide use declined.
2. Reduced pyrethroids use.
3. Susceptibility to sucking pests.
4. Emerging as a new pests, mirid bugs, mealy bug and *Spodoptera* re-emerging Pink bollworm.
- 5 *H. armigera* & whitefly are taking a backseat
6. Increased leaf reddening problem.
- 7 Parawilt, rust, gray mildew occurrence on Bt cotton.
- 8 Increased yield and less trash cotton.

Risk Management/ Crop Management



- Do not allow illegal Bt-cotton proliferation (fuzzy seeds)
- Crop rotation will break the cycle
- Border crop with densely planted pigeonpea (spot applied with chlorpyrifos) & intercropping with pigeonpea will help immensely
- Do not disturb mealybug affected plants.
- Spot/soil application with acephate or malathion for affected plants, uproot & destroy
- Keep fields clean of weeds. Spray surrounding weeds (especially Parthenium) with chlorpyrifos and destroy later.
- Conservation and deployment of natural enemies – *Anagyrus kamali*, *Cryptolaemus montrizouri*
- Application of Chlorpyrifos 20EC @ 2.0ml/lit or profeniphos 50EC @ 2.5ml/lit or acephate 75SP @ 2.0g/lit. Neem oil, Karanja oil, Fish oil rasin soaps are also effective
- Spot application or soil drenching of insecticides around infested localized patch is also effective.

Foliar nutrition

- Twice Foliar spray of 2% Urea or DAP + 1% Mg SO₄ at 80 & 100 DAS
- Spray planofix @ 0.25 ml/lit at 70 & 90 DAS
- Twice foliar spray of MOP (KCl)
- Four foliar sprays of 2% KNO₃



Leaf reddening

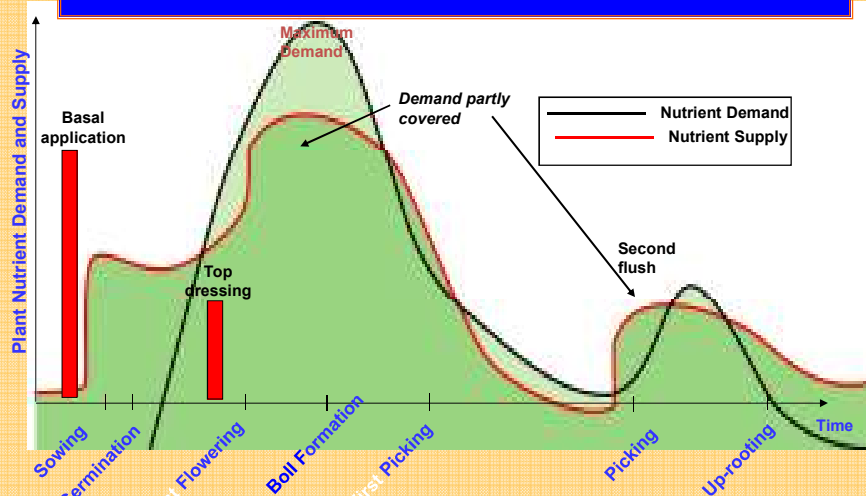
Management;

Soil application of 25 kg Mg SO₄ (Basal)

- Foliar spray of 1% MgSO₄ + 1 per cent all 19 or Urea

@ 60, 75 and 90 DAS

Timing of nutrient supply in cotton crop



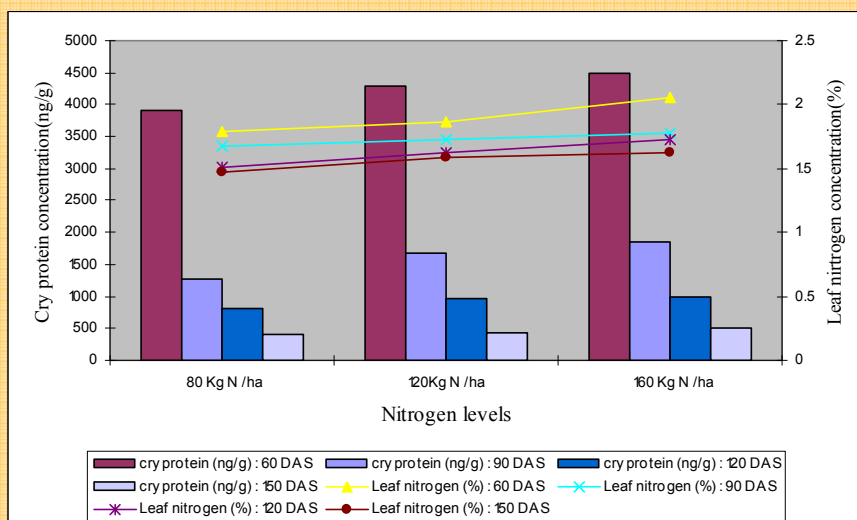
Split application of N & K fertilizers:

At Sowing: 25% N & K + 100% P fertilizers

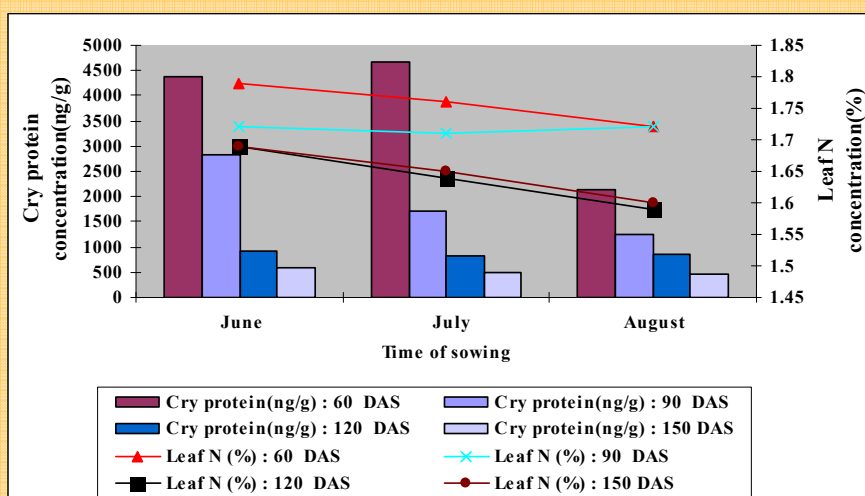
At 30 DAS: 50% N & K

At 60 DAS: 25% N & K

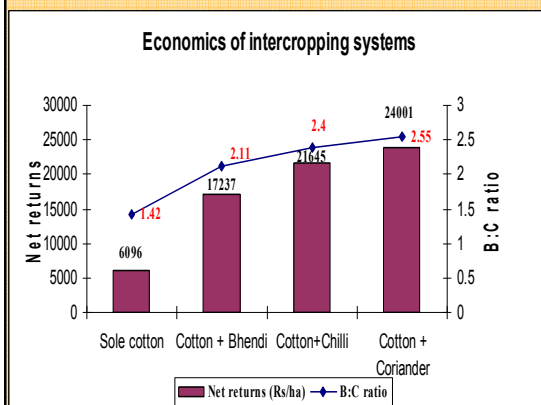
Effect of nitrogen levels on cry protein and leaf nitrogen concentration in Bt-cotton



Effect of sowing time on cry protein concentration and nitrogen concentration in leaf at different days after sowing in Bt-cotton



Intercropping in Bt. cotton



- Coriander is remunerative intercrop in cotton
- Coriander as vegetable harvested at 30-45 DAS
- Hoeing operation after 30 DAS

Refuge strategy for India

5 Rows of non-Bt around Bt cotton



Bt-resistance management strategies



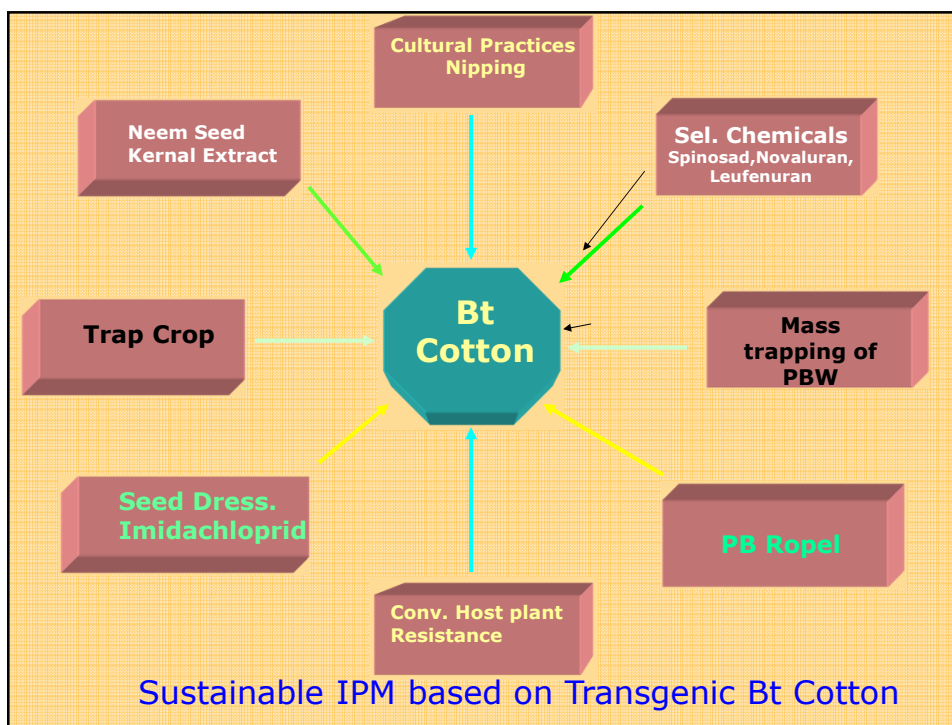
In addition to a 2% refuge area of African Marigold /Redgram.
(One marigold plant attracts *H. armigera* as much as 10 non-Bt cotton plants can)

Hand-picking of surviving larvae from Bt-cotton fields during September in North, October in Central & November in South India

IGRs such as Emamectin or Novaluron or Spinosad are effective on Cry1Ac resistant *H. armigera*

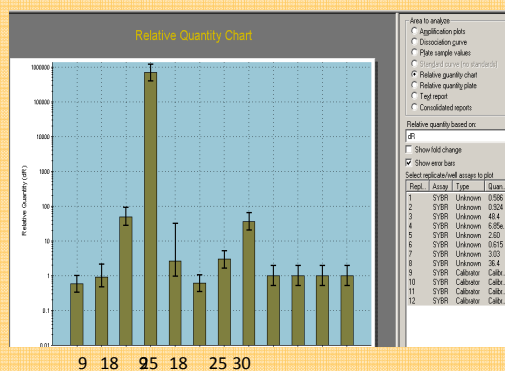
Spray any one of these on Bt cotton at **100-110 days** after sowing to reduce the population of the **Bt-surviving bollworms**

Destroy residual pupae by **deep ploughing** in Bt-cotton fields immediately after final harvest



COTTON FIBRE TECHNOLOGY WORK DONE AT UAS DHARWAD

**Molecular
characterization
and validation of
fiber strength
genes with fiber
specific promoter
for improvement
in cotton**



RILs mapping population CICR, Nagpur

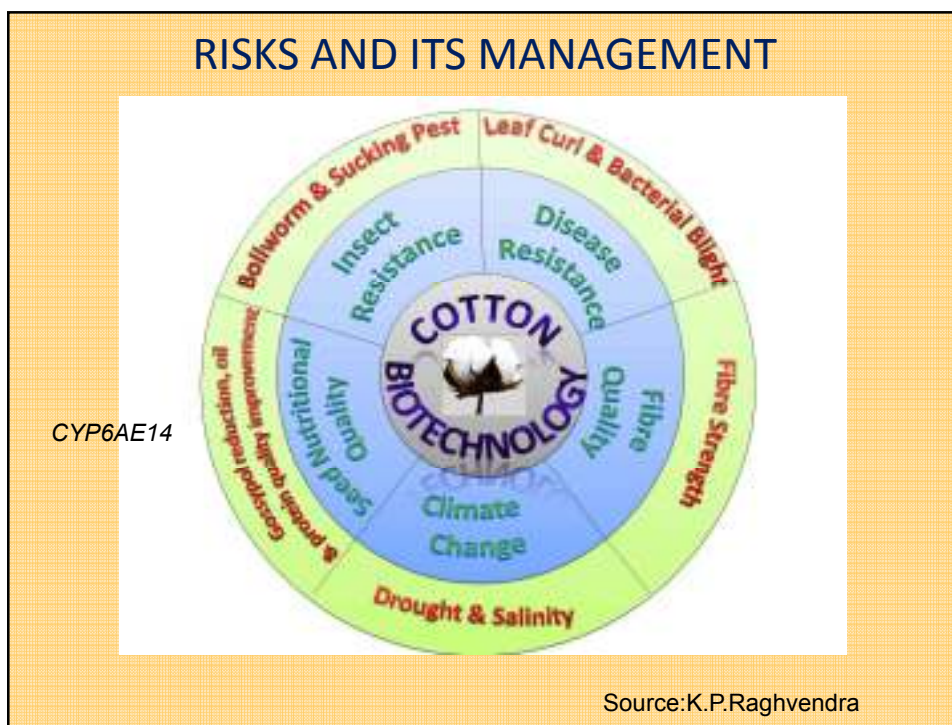
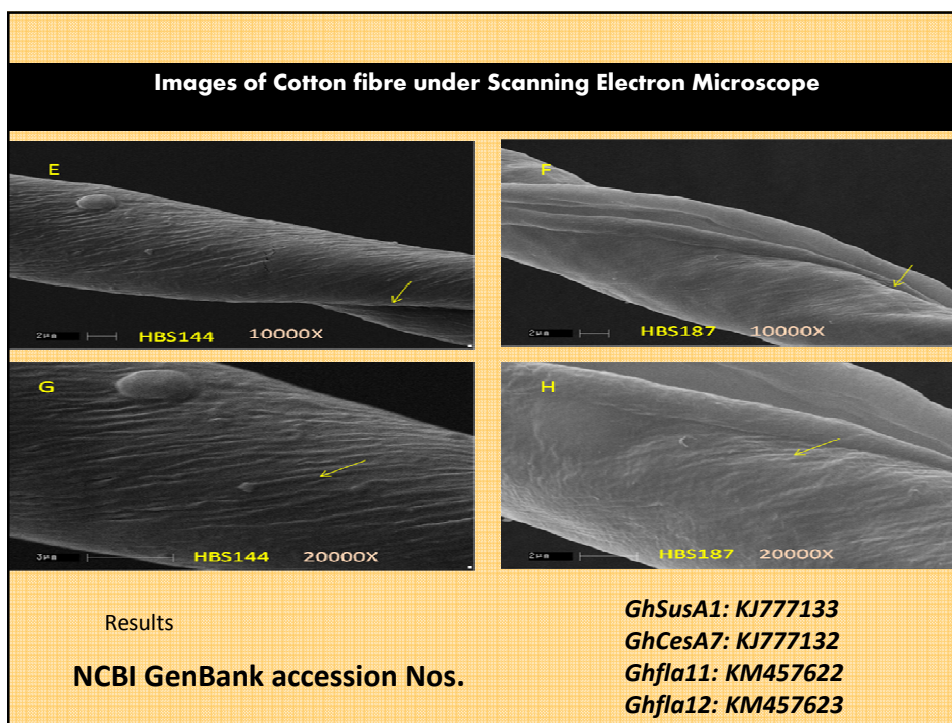
RILs	Fiber strength	Species
High	25 g/tex	<i>G. hirsutum</i>
Medium	22 g/tex	<i>G. hirsutum</i>
Low	17 g/tex	<i>G. hirsutum</i>

RILs mapping population UAS, Dharwad

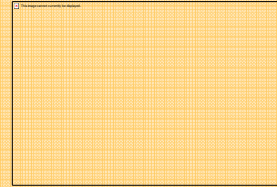
Species	RILs	Fibre strength (g/tex)
<i>G. hirsutum</i>	HBS 144	28.0 (High)
<i>G. hirsutum</i>	HBS 187	20.0 (Low)
<i>G. arboreum</i>	Arb 1	22.9 (High)
<i>G. arboreum</i>	Arb 2	19.7 (Low)

Gene expression analysis: qPCR (*GhcesA1*, *GhcesA2*, *GhcesA7*, *GhcesA8*, *Ghcnbl4*, *Ghfla3* and *GhMT1*) using RIL mapping population to established correlation with high fibre strength.

Among them *GhcesA1*, *GhcesA2*, *Ghfla3* and *Ghcnbl4* showed strong association and higher gene expression during secondary wall synthesis.



COLOUR-COTTON RESEARCH WORK DONE AT UAS DHARWAD



- **ORGANIC CULTIVATION**
 - LESS ENVIRONMENTAL POLLUTION
- **NO USE OF SYNTHETIC DYES**
 - LESS TOXICITY AND LOWERS COST
- **PREMIUM PRICING POSSIBLE**
 - EXPORTS, NICHE MARKETS

Hirsutum Colour Cottons



Dark Brown



Medium Brown



Cream



DDCC-1



Dark brown *G. hirsutum* Natural Colour Cotton



Development of colour in naturally coloured cotton 30 DAP



Development of fibre colour in Dharwad Brown Hirsutum (DBH-2) genotype *in vivo*



Spectrum of lint samples of naturally coloured cotton



Spectrum of lint samples of naturally coloured cotton



Spectrum of lint samples of naturally coloured cotton



Yarn and fabric of colour-cotton



Clothes & Garments made from Naturally Coloured Cotton

CLEISTOGAMY TO FACILITATE SELF POLLINATION



GENE INDUCING CLEISTOGAMY EG PEACH, PLUM, JASMINE

HIGH DENSITY PLANTING SYSTEM



High density cotton planting for improving rainfed cotton productivity in Vidarbha

Effect of planting density on seed cotton yield (kg/ha) of different genotypes 2012-13

Genotype	45x15cm (148,000/ha)	60x15 cm (111,000/ha)	90x15 cm (74,000/ha)	Mean
NH 615	2512	2633	2201	2449
NH 545	2550	2830	2839	2740
ADB 39	3009	2539	2535	2694
SURAJ	2748	2976	2632	2785
PKV 081	3011	2798	2355	2721
KC 3	3071	3113	2709	2964
RS 875	2555	1911	1776	2080
CSH 3178	2795	2468	2501	2588
MDLH 1	1690	1813	1519	1674
LRK 516	2814	2643	2345	2601
F 2383	2379	2142	2081	2201
H 6 Bt	3756	4074	3581	3804
H 8 Bt	2868	3596	2945	3136
Mean	2751	2733	2463	
CD 5%				581.9

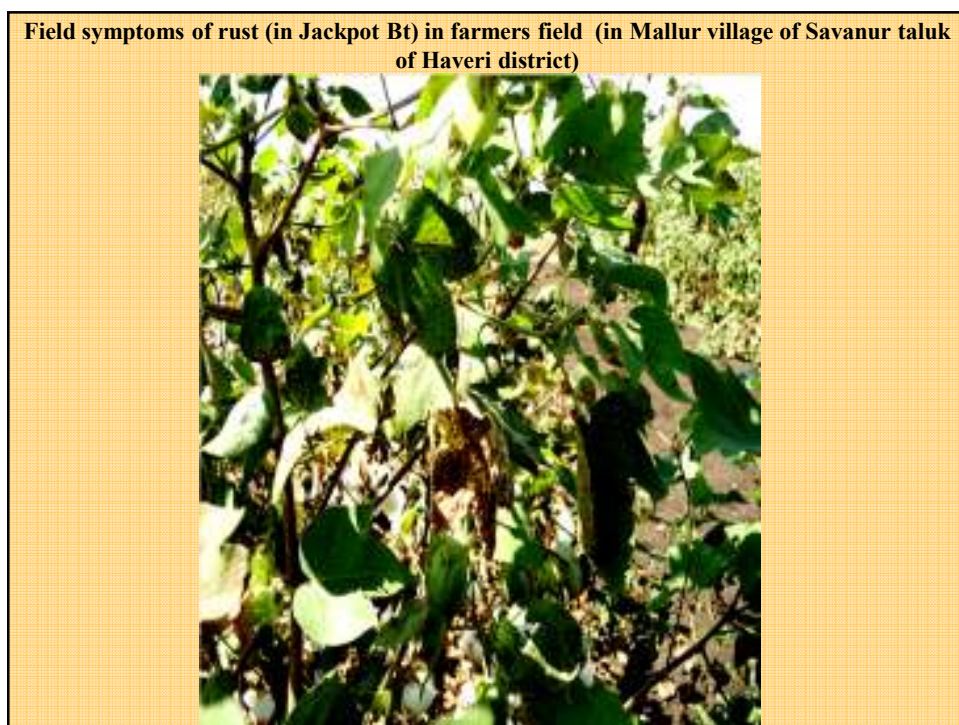
AICRP on Cotton Annual Report 2014-15

Top ranking entries under HDPS at various AICCIP Center's

Rainfed (45x15 cm)				148000 plants/ha) Irrigated (60x15 cm)			
Akola	Nagpur	Nanded	Aruppukottai	Nandyal	Dharwar	Coimbatore	Guntur
GSHV01/1338	NH-615	NH-615	AKH-081	NH-545	BS-41	GSHV01/1338	GSHV01/1338
NH-615	BS-41	NH-545	ADB-39	NH-615	CNHO-12	TCH-1705	TCH-1608
NH-545	NH-545	BS-41	TCH-1605	CNHO-12	TCH-1705	BS-41	CNH-1109
GJHV-460	GJHV-460	DCS-115	CNHO-12	AKH-2006-2	CNH-1109	CNH-1109	ADB-39
ADB-39	AKH-081	NH-615	NH-545	BS-41	Sahana	Suraj	AKH-081

(Compiled from: AICCIP, 2012)





Genotype SVA-1118 showing consistent resistant reaction to foliar diseases



MECHANIZATION OF COTTON PRODUCTION

- Self- propelled check row planters, solar powered sprayers and pickers
- Self propelled automated Planting Machines, especially to suit machine pickers, which are likely to become popular in view of the acute labor shortages. Recently, brush type pickers have been developed as alternatives to spindle type machines.
- CICR,N has developed many implements and devices including a planter, battery operated sprayer, which have been commercialized.
- Several Indian patents and three international patents have been granted in South Africa, China and Uzbekistan. Farmer usable Bt-detection kits were developed and commercialized.

Thank you

Dr K.R.Kranti, Director, CICR, Nagpur

Dr B.M.Khadi, Director of Research, UAS Dharwad

**Former Director, Central Institute for Cotton Research, Nagpur
INDIAN COUNCIL FOR AGRICULTURE RESEARCH, NEWDELH**

International Cotton Advisory Committee, Washington DC