

MM 5.1: Evaluation of Cotton Production Technologies for Yield, Fiber Quality and Economic Viability

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Target & Achievements :

Target	Achievements during 2004-05
To administer 17 technological interventions at 12 Centers involving 1000 cotton growers.	17 technological interventions were implemented involving 979 cotton growers.
Refinement of technologies.	Refinements were made in 9 technological interventions by 5 Centers.
Testing of 1000 samples for fiber quality parameters as influenced by cultivation practices.	809 samples were tested by 10 Centers for verification in fiber quality parameters. No significant impact of package of practices on fiber quality parameters was observed.
To work out the economic viability (comparative economics) of various cotton production technologies.	Comparative economics of more than 9 technologies were worked out across all the centers in 3 zones <i>Bt. Cotton</i> : Reduced cost on plant protection by Rs. 1944/ha in Central zone, Rs. 5850/ha in South zone. <i>IPM</i> : Added yield of 1.82 q/ha in Central zone, 2.58 qt/ha in South zone and 2.79 qt/ha in North zone. <i>INM</i> : Added returns of Rs. 3388/ha in Central zone, Rs. 5342/ha in South zone and Rs. 3340/ha in North zone.

Progress of work :

More than 16 technological interventions in 97 villages were administered to assess them on 979 farmers fields either through Verification trial or On-farm trial and the total area covered under the project is 391 ha. for implementing the technological interventions by all the 12 cooperating centers.

Crop based interventions :

In the intervention related to assess the performance of *Bt. cotton* hybrids (Table 5.1.1), it has been observed that RCH-2 *Bt. cotton* has given 19% more yield than conventional hybrid i.e. Ankur-651 at CICR, Nagpur where as at MAU, Parbhani, MECH-184 *Bt. cotton* has given 37% more yield than conventional hybrid. In South

Zone, ANGRAU Lam, Guntur reported that among three Bt. Cotton hybrids, productivity of RCH-2 (30%) is higher than MECH-184 and MECH-12.

Table 5.1.1 : Introduction of Bt Cotton

Center	Treatment (s)	Yield q/ha	% Increase in Yield	Cost of prodn (Rs/qt)	Net Returns (Rs/ha)	Input-Output Ratio
Central Zone						
CICR, Nagpur	T1: FP (Ankur- 651)	8.50	--	1,117	11,750	1.23
	T2 : RCH-2 Non Bt(Refugia)	10.15 8.90	19 % 5 %	1,004	13,612	1.33
Dr. PDKV, Akola	T1: FP (PKV Hy-2)	10.25	--	1,332	9,915	1.73
	T2: Bt cotton (MECH-162)	11.90	16%	1,595	8,380	1.44
MAU, Parbhani	T1 : FP (JK-Durga)	10.12	--	1,770	3,556	1.20
	T2: Bt cotton (MECH-184)	13.87	37%	1,275	12,018	1.71
	T1 : FP (NCS-999)	10.16	--	1,785	2,859	1.16
	T2: Bt cotton (RCH-2)	14.01	37 %	1,306	10,951	1.62
JNKVV, Khandwa	T1: FP	16.40	--	1,233	11,262	1.55
	T2: Bt. Cotton (MECH-184)	20.25	23.47%	971	21,442	2.09
South Zone						
ANGRAU, Lam, Guntur	T1 : FP (NCS-145)	24.37	---	1,299	8,048	1.25
	T2 : RCH-2	31.78	30.40%	789	26,729	2.15
	T3 : MECH 12	28.10	15.43%	941	13,056	1.53
	T4 : MECH 184	27.50	12.84%	998	12,600	1.47

While assessing the performance of some of the new cotton hybrids (Table 5.1.2), it has been observed that, hybrids CSHH 198 at CICR RS, Sirsa and LHH-144 at PAU performed better than the conventional hybrids. In South zone, NSPHH-7 developed by ANGRAU Lam, Guntur has given 7 % more yield than Bunny. Also the performance of DHB-290 and DHH-543 at UAS, Dharwad was found to be better than DHB-105 and DHH-11, respectively.

Table 5.1.2 : Performance of Hybrids

Center	Treatment (S)	Yield q/ha	% Increase In Yield	Cost of production (Rs/qt)	Net Returns (Rs/ha)	Input-output Ratio
South Zone						
UAS, Dharwad	T ₁ FP (DHB-105)	17.15	--	500	18,100	2.11
	T ₂ DHB-290	21.75	26.82%	452	28,500	2.90
UAS, Dharwad	T ₁ FP (DHH-11)	10.62	--	473	8,040	1.60
	T ₂ DHH-543	11.40	7.34%	496	10,350	1.83
Lam, Guntur	T 1:FP (Bunny)	25.60	--	1,178	11,425	1.37
	T2 : NSPHH7	27.50	7.42%	1,079	15,012	1.50

Among high yielding American cotton varieties (Table 5.1.3), it was observed that AKH-8828 developed at Dr. PDKV, Akola has given 11 % more yield than PKV-Rajat. In South zone, variety Surabhi at CICR RS, Coimbatore and Sahana at UAS, Dharwad has given 50 % and 21 % respectively more yield than LRA-5166. In North zone, variety RS-2013 at RAU, Sriganaganagar and F-1861 at PAU, Ludhiana performed better than the conventional varieties.

Table 5.1.3 : Performance of Hybrids

Center	Treatment (s)	Yield q/ha	% Increase in Yield	Cost of prodn (Rs/qt)	Net Returns (Rs/ha)	Input-Output Ratio
Central Zone						
CICR, Nagpur	T 1: FP (LRA-5166)	6.96	--	1,077	6,420	0.85
	T 2: Surabhi	7.73	11 %	983	7,860	1.03
Dr. PDKV Akola	T1:FP (PKV Rajat)	10.05	--	1,173	11,320	1.95
	T2: AKH 8828	11.20	11.44%	1,006	14,485	2.28
NAU, Surat	T1: FP (Gheti)	12.55	--	1,253	3,100	1.20
	T2: G. Cot. 23	14.70	17%	1,071	6,300	1.40
JNKVV, Khandwa	T1: FP	11.10	--	1,598	3,855	1.20
	T2: JK-4	12.80	15.31%	1,029	11,336	1.86

Cont.

Center	Treatment (s)	Yield q/ha	% Increase in Yield	Cost of prodn (Rs/qt)	Net Returns (Rs/ha)	Input-Output Ratio
North Zone						
PAU, Ludhiana	T1 : FP (PK-54)	20.28	--	874	18,610	1.05
	T2 : F-1861	23.83	17.50%	749	24,876	1.39
RAU, Sriganga	T1: FP (Roja)	19.93	-- 18.46%	549	19,479	1.78
	T2 : RS 2013	23.61		445	23,861	2.27
	T1: FP (Roja)	20.03	-- 15.27%	520	19,290	1.85
	T2 : RS 810	23.40		447	23,375	2.23
South Zone						
CICR RS, Coimbatore	T1: FP (LRA- 5166)	22.5	--	3315	12,925	1.43
	T2: Surabhi	27.5	50%	2750	27,500	1.91
	T1: FP (Rajath)	20	--	3638	6900	1.24
	T2: Sumangala	25	25%	2735	22,650	1.83
	T1:FP (LRA-5166)	12.50	--	425	10,250	1.93
UAS, Dharwad	T2 : Sahana	15.20	21.60%	434	19,450	2.95

Regarding the performance of Desi cotton (*arboreum spp.*) (Table 5.1.4), it was observed that in Central zone, AKA-8 and Jawahar Tapti performed better than conventional Desi varieties. At CICR RS, Sirsa newly developed Desi cotton hybrid namely CICR 2 has given 21 % more seed cotton yield.

Table 5.1.4 : Performance of Desi cotton (*arboreum spp.*)

Center	Treatment (s)	Yield q/ha	% Increase in Yield	Cost of prodn (Rs/qt)	Net Returns (Rs/ha)	Input-Output Ratio
Central Zone						
Dr. PDKV, Akola	T1: FP (AKA-7)	8.53	--	988	9,482	2.12
	T2: AKA-8	9.50	11.37%	907	10,716	2.24
JNKVV, Khandwa	T1: FP	8.25	--	1,418	4,800	1.41
	T2: Jawahar Tapti	10.30	24.84%	1012	10,175	1.97
North Zone						
CICR RS, Sirsa	T1: FP (RG 8)	23	--	378	21,825	2.51
	T2: Desi cotton hy. CICR 2 (CISAA-2)	28	21.7%	374	35,600	3.40
South Zone						
UAS, Dharwad	T1 : FP (Jayadhar)	7.65	--	525	6,710	1.67
	T2 : DDhC-11	10.28	34.38%	346	10,642	2.84

Dry sowing technology (Table 5.1.5), has increased productivity to the tune of 10 % over the farmers' practice of Monsoon sowing.

Table 5.1.5 : Sowing Time

Center	Treatment (s)	Yield q/ha	% Increase in Yield	Cost of prodn (Rs/qt)	Net Returns (Rs/ha)	Input-Output Ratio
Central Zone						
CICR, Nagpur	T1: (FP) Monsoon sowing	8.09	--	1,131	10,261	1.12
	T2: Dry sowing	8.86	10 %	1,039	12,052	1.31
MAU, Parbhani	T1:FP (Onset of monsoon sowing)	8.63	--	1,501	3,958	1.31
	T2: Dry seeding	9.10	5.45%	1,478	5,476	1.41
NAU, Surat	T1: FP	13.25	--	1,206	3,898	1.24
	T2: Dry sowing	14.30	7.9%	1,132	5,263	1.33
North Zone						
PAU, Ludhiana	T1 (FP)	19.07	--	874	17,268	1.03
	T2 Timely sowing (April)	21.04	10.33%	805	20,559	1.21
South Zone						
CICR RS, Coimbatore	T1:Early sowing (May-June)	20	--	3,903	8,775	1.28
	T2:Normal sowing (Jul- Aug)	25	25%	2,798	22,025	1.79

Planting of cotton on flat beds and opening of ridges and furrows (Table 5.1.6), at last inter-cultural operation has increased the productivity by 11% over farmers' practice of sowing of cotton on flat beds without opening of ridges and furrows.

Table 5.1.6 : Rain Water Management

Center	Treatment (s)	Yield q/ha	% Increase in Yield	Cost of prodn (Rs/qt)	Net Returns (Rs/ha)	Input-Output Ratio
Central Zone						
CICR, Nagpur	T1: FP	7.71	--	1,243	9,775	1.02
	T2 : Opening of Ridges and Furrows at first inter-culture	8.61	11 %	1,154	11,625	1.17
Dr. PDKV, Akola	T1: FPT	15.80	--	1,083	19,220	2.12
	T2: Opening of R & F at 30 DAS	18.35	16.13%	960	24,575	2.39
MAU Parbhani	T1: FP (Furrow irrigation)	12.30	--	1,489	6,855	1.39
	T2: Drip irrigation	14.88	20.98%	1,327	11,134	1.59

Among the various cotton based intercropping systems (Table 5.1.7), it was observed that intercropping system of Cotton + Green gram gives 21 % more yield of seed cotton than Cotton + Black gram. In South zone, Cotton + Cowpea intercropping system gives more profit of Rs.7709/ha. than mono cropping.

Table 5.1.7 : Inter-cropping systems in cotton

Center	Treatment (s)	Yield q/ha	% Increase in Profit	Cost of prodn (Rs/qt)	Net Returns (Rs./ha)	Input-Output Ratio
Central Zone						
CICR, Nagpur	T1: FP (Sole cotton)	9.70	18% more profit over sole cotton	---	14,250	1.42
	T2: Cotton + Greengram(1:1)	6.41 + 4.12			16,825	1.77
Dr. PDKV, Akola	T1: FP (Sole cotton)	9.82	-12.7 %	1150	10,310	1.91
	T2: (cotton+ Greengram)	8.57	---	1424	12,200	2.02
MAU, Parbhani	T1 : FP (Sole cotton)	9.24	--	1530	4,850	1.36
	T2: Cotton + Blackgram	8.54 + 3.12	18.83%	1386	7,709	1.53
	T1: FP (Sole cotton)	9.35	--	1603	3,247	1.26
	T2: Cotton + Greengram	8.87 + 2.84	21.07%	1434	5,818	1.38
South Zone						
CICR RS, Coimbatore	T1 :Monocrop (cotton)	25		3,223	17,775	1.55
	T2 : Intercropping With Onion	27.5	10%	3,033	34,150	2.02
	T3 : Intercropping with Beetroot	27.5	10%	3,095	35,210	2.17
ANGRAU, Lam, Guntur	T 1:FP (cotton)	25.25	---	1,395	8,976	1.39
	T2: cotton + greengram	24.50 q cotton + 4 q greengram	---	1,161	15,786	1.67

Plant nutrient based interventions :

Farmers usually prefer using lower to recommended dose of chemical fertilizers. In Central zone, it has been observed that on an average 14% more yield can be achieved by adopting INM model. In North zone the practice of INM increases the productivity up to 9 % over Farmers' practice and in South zone, the increase is approximately 13% (Table 5.1.8) .

Table 5.1.8 : Integrated Nutrient Management in Cotton

Zone	Treatment (s)	Avg. Yield (q/ha)	% Increase in Yield	Cost of prodn (Rs/qt)	Net returns (Rs./ha)	Input-Output Ratio
North (3 Centers)	T 1:FP	19.88	--	744	16,133	1.21
	T 2: IPM	21.76	9.49%	651	20,856	1.64
Central (6 Centers)	T 1: FP	12.46	--	1,490	6,367	1.23
	T 2: IPM	14.10	13.96%	1,416	8,172	1.31
South (3 Centers)	T 1: FP	19.56	--	1,633	11,901	1.53
	T 2: IPM	23.05	13.41%	1,480	19,761	1.89

It has been observed that use of 2 % DAP at boll development stage has helped in reducing the boll shedding and increased the seed cotton yield by 12 % in Central zone (Table 5.1.9) .

Table 5.1.9 : Foliar Spray

Centers	Treatment	Yield Q/ha	% Increase in Yield	Cost of prodn (Rs./qt)	Net return (Rs/ha)	Input - Output Ratio
Central Zone						
CICR, Nagpur	T1: No foliar spray	9.04	-	1,106	12,600	1.26
	T2 : Spray 2% urea & DAP	10.11	12%	1,029	14,875	1.43
Dr. PDKV, Akola	T1 : FP	17.35	-	1,009	22,395	2.27
	T2 : Urea & DAP	19.68	13.42 %	919	27,173	2.50
JNKVV, Khandwa	T1 : FP	15.20	-	1,409	8,970	1.41
	T2 : 2% Urea	16.10	5.92%	1,242	12,200	1.61
NAU, Surat	T1 : FP	16.25	-	1,541	4,216	1.17
	T2 : Urea spray	16.80	3.4%	1,478	5,417	1.22
South Zone						
UAS, Dharwad	T1 : FP	13.15	-	497	11,900	1.82
	T2 : Urea spray	14.60	11.02%	495	15,900	2.20
	T1 : FP	12.16	-	501	12,300	1.95
	T2 : Planofix spray	14.20	9.52%	493	15,906	2.27

Cont.

Centers	Treatment	Yield g/ha	% Increase in Yield	Cost of prodn (Rs./qt)	Net return (Rs/ha)	Input – Output Ratio
South Zone						
Lam, Guntur	T1 : FP	24.50	-	1,245	10,635	1.34
	T2 : DAP Spray	26.25	7.14%	1,068	16,025	1.52
	T1 : FP	21.25	-	1,465	6940	1.22
	T2 : Micro- nutrients (Mgso ₄ & Boran)	23.12	8.8%	1,234	10062	1.35

IPM based interventions :

In Central zone, when all the major components of IPM in cotton were used in a rational manner. Not only farmers have reduced the dependency on chemical pesticides, but also harvested 12.05% more seed cotton. In North zone, IPM practices have increased the productivity by 11.30%. In South zone, IPM model for cotton has produced 12.32% more yield over non-IPM plots giving additional profit of Rs. 10719/ha (Table 5.1.10) .

Table 5.1.10 : Integrated Pest Management in Cotton

Zone	Treatment (s)	Avg. Yield (q/ha)	% Increase in Yield	Cost of prodn (Rs/qt)	Net Returns (Rs./ha)	Input- Output Ratio
North (3 Centers)	T 1:FP	20.57	--	612	17,593	1.64
	T 2: IPM	22.90	11.30%	460	22,141	2.37
Central (6 Centers)	T 1: FP	13.11	--	1,572	8,621	1.35
	T 2: IPM	14.93	12%	1,319	14,058	1.59
South (3 Centers)	T 1: FP	22.83	--	1,716	15,783	1.72
	T 2: IPM	25.41	12.32%	1,351	26,503	2.34

Evaluation of Fiber Quality (Table 5.1.11) :

At CICR, Nagpur it was observed that cotton grown with technological interventions like IPM, INM and DAP foliar spray has slightly more staple length and bundle strength tenacity as compared to the cotton produced from Farmers' practice. However, other parameters of fibre quality for technological intervention and farmers' practice were found to be more or less identical. Staple length of 'Surabhi' variety was found to be 30.48 mm that is comparable with cotton hybrids.

At PAU, Ludhiana, it was found that the fiber quality of cotton produced from IPM, IRM, timely sowing and seed treatment technologies were marginally more uniform as compared to the cotton produced from farmers' practice plot.

At CICR RS, Coimbatore, staple length and tenacity of Surabhi was found to be higher than Sumangala. Staple length and fineness of RCH-2 Bt. cotton was found to be less than NCS-999. The cotton hybrid NSPHH 7 recorded highest staple length of 31.34 mm. The technological interventions like INM and IPM gave more staple length than the cotton produced from farmers' practice.

At UAS, Dharwad, staple length and tenacity of cotton hybrid DHB-290 was more than DHH-543. The technological interventions like INM, foliar spray of Urea and Planifix gave more staple length than the cotton produced from Farmers' practice.

Table 5.1.11 : Evaluation of Fibre quality parameters

Sr. No	Technology Intervention	Staple length (2.5% mm)		Micronaire value (Fineness)		Bundle strength (g/tex)		Uniformity ratio (%)	
		FP	Interv	FP	Interv	FP	Interv	FP	Interv
1	Surbhai Sowing time CICR, Cbe	32.3	34.4	3.0	3.4	23.9	26.0	43.0	42.0
2	NCH-145 Institu soil moisture conservation Dr. PDKV, Akola	32.2	32.9	3.8	3.7	20.1	21.6	47.3	50.0
3	NCH-145 Inter cropping (cotton + green gram) MAU, Parbhani	26.5	26.0	3.7	3.8	20.8	21.1	46.0	48.0
4	NCH-145 IPM LAM, Guntur	29.6	29.8	3.4	3.5	21.9	22.3	41.1	43.3
5	NCH-145 INM LAM, Guntur	29.3	29.9	3.6	3.7	22.5	22.7	42.5	42.4
6	NCH-145 Spraying of Micro-nutrients (MgSo4 & Boron) LAM, Guntur	29.8	30.0	3.9	3.9	22.0	22.7	42.6	43.3
7	NCH-145 Foliar spray of DAP Dr. PDKV, Akola	28.2	29.4	3.6	3.7	19.6	19.9	50.3	50.3

Economic viability (Tables 5.1.12 - 16) :

At CICR, Nagpur input-output ratio of Bt. RCH-2 (1.33) is found to be higher than Ankur-651 cotton hybrid. However, at Dr. PDKV, Akola input-output ratio of Bt. MECH-162 was less than PKV Hy-2. Among three Bt. Cotton hybrids at ANGRAU Lam Guntur, input-output ratio of RCH-2 is higher than MECH-184 and MECH-12. In IPM model at Central zone, input-output ratio of IPM practice is found to be higher than non-IPM plots. Similarly in North and South zones, farmers practicing IPM model get higher input-output ratio than non-IPM practicing farmers. Regarding INM model at 5 Centers in Central zone, farmers practicing INM model has got higher input-output ratio than non-INM field. Input-output ratio of Dry sowing technology (1.31) is found to be higher than farmers' practice of Monsoon sowing.

Table 5.1.12 : Comparative Economics of Interventions**1. Intervention : Bt. Cotton****(Rs./ha)**

Details	Zone	
	Central (4)	South (1)
Added cost	3,442	3,851
Reduced yield	-	-
Reduced cost	1,944	5,850
Added yield (qt/ha)	2.82	7.38
Added Returns (Rs)	6,128	12,546
Net Benefit	4,630	14,545

Table 5.1.13 : Comparative Economics of Interventions**2. Intervention : IPM in cotton****(Rs./ha)**

Details	Zone		
	Central	North	South
Added cost	682	532	410
Reduced yield	-	-	-
Reduced cost	2,647	1,521	3,254
Added yield (qt/ha)	1.82	2.79	2.58
Added Returns (Rs)	3,833	4,963	4,951
Net Benefit	5,798	5,952	7,796

Table 5.1.14 : Comparative Economics of Interventions**3. Intervention : Dry sowing****(Rs./ha)**

Details	Central Zone			Avg
	CICR, Nagpur	MAU, Parbhani	NAU, Surat	
Added cost	1,529	649	200	793
Reduced yield	-	-	-	-
Reduced cost	1,500	0	0	500
Added yield (qt/ha)	0.77	0.47	1.05	0.76
Added Returns (Rs)	1,771	976	1575	1440
Net Benefit	1742	328	1375	1148

Table 5.1.15 : Comparative Economics of Interventions**4. Intervention : Rain water Management****(Rs./ha)**

Details	Central Zone			Avg
	CICR, Nagpur	PDKV, Akola	MAU, Parbhani	
Added cost	180	510	4429	1706
Reduced yield	-	-	-	-
Reduced cost	625	500	3600	1575
Added yield (qt/ha)	0.9	2.55	2.58	2.01
Added Returns (Rs)	2070	5865	5351	4471
Net Benefit	2515	5855	4522	4340

Table 5.1.16 : Comparative Economics of Interventions**5. Intervention : Foliar spray****(Rs./ha)**

Details	South Zone			
	LAM, Guntur	LAM, Guntur	Dharwad	Dharwad
Foliar Spray	DAP	MgSo ₄ & Boran	Urea	Planofix
Added cost	402	1999	750	400
Reduced yield	-	-	-	-
Reduced cost	625	570	400	500
Added yield (qt/ha)	1.75	1.87	1.45	1.60
Added Returns (Rs)	2940	3123	2900	3200
Net Benefit	3163	2494	2550	3300

Comparative economics of more than 9 technologies were worked out across all the centers in 3 zones.

Bt. Cotton : Reduced cost on plant protection by Rs. 1944/ha in Central zone and Rs. 5850/ha in South zone.

IPM : Added yield of 1.82 qt/ha in Central zone, 2.58 qt/ha in South zone and 2.79 qt/ha in North zone.

INM : Added returns of Rs. 3388/ha in Central zone, Rs. 5342/ha in South zone and Rs. 3340/ha in North zone.

Technologies Refined

CICR, Nagpur

Sr. No.	Technology	Brief description of the technology	Refinement made in the technology
1.	Dry sowing in cotton	Application of basal dose of fertilizer was a problem under dry seeding due to non-availability of soil moisture at the time of sowing	Basal dose of fertilizer was applied 10 days after emergence of cotton in dry seeding technology.
2.	Integrated Pest Management in Cotton	Use of Marigold as trap crop for controlling the bollworm in cotton. Installation of mechanical bird perchers.	<ul style="list-style-type: none"> ◆ Use of <i>Amaranthus</i> as trap crop for controlling the bollworm in cotton. ◆ Use of Sorghum/ Corn as live bird preachers.

MAU, Parbhani

Sr. No	Technology	Brief description of the technology	Refinement made in the technology
1.	Dry seeding	Application of basal dose of recommended fertilizer was a problem under dry seeding due to non-availability of soil moisture.	Basal dose of NPK was applied after 10-15 days of sowing instead of application at the time of sowing in dry seeding.
2.	Integrated Nutrient Management	Fertilizer dose of 50:25:25 kg NPK/ha is recommended for American varieties. Application of recommended dose of NPK in two splits such as 50 per cent N and 100 per cent P and K at the time of sowing and remaining 50 per cent N at square formation (at 30-40 days after sowing) found to be more beneficial.	<ol style="list-style-type: none"> 1. Sparying of 80 ppm CCC (Cycocel) at 60-65 DAS reduces excessive vegetative growth. 2. Application of 20 Kg N at 70-75 DAS by ring method followed by irrigation increases sympodial branches, squares, flowers and bolls. 3. Application of 20 ppm NAA (Planofix) at 75-80 DAS reduces shedding of squares, flowers and bolls.

Cont.

Sr. No	Technology	Brief description of the technology	Refinement made in the technology
			<p>4. Spraying of 10 ppm GA₃ at 85-90 DAS increases boll size and weight.</p> <p>5. Spraying of 500 ppm Ethrel after first picking (after 40 % picking) of cotton for early bursting of bolls so as to make land available for second crop.</p>

PAU, Ludhiana

Sr. No.	Technology	Brief description of the technology	Refinement made in the technology
1.	IPM	<ul style="list-style-type: none"> Gaicho 70ws treated cotton seed Spray only after ETL of 5% One spray of Confidor at the rate of 100 ml per hectare for controlling white fly. 	<p>If seed is not treated with Gaicho, treat with Pride 50gm/ha and Actara 100 gm/ha</p> <p>Spray only when it reaches second injury grade i.e. marginal cupping of leaves.</p> <p>To control white fly, spray Trizophos 1.5 lit/ha or Ethion 2 lit/ha.</p>
2.	Seed Treatment	<ul style="list-style-type: none"> Acid delinted cotton seeds are soaked for 2-4 hours. After this cotton seeds are smeared with Gaicho 70 WS (Imidacloprid) @ 5gm/kg seed for preventing damage by cotton <i>Jassids</i>. Undelinted seeds are soaked in the solution for 6-8 hours, and then it is rubbed with fine soil to remove its fuzz and ensure its uniform distribution. 	<p>Before Gaicho treatment seed can be dipped in a solution containing 0.5 gm of Emisan-6 and 0.25 gm of Streptocycline per liter of water.</p> <p>Fine ash may be used to remove fuzz over the seed.</p>

CICR RS, Coimbatore

Sr. No.	Technology	Brief description of the technology	Refinement made in the technology
1.	Intercropping in cotton	<p>Unlike the monocrop in cotton as generally raised by farmers, they were encouraged to cultivate cowpea and blackgram as intercrop for effective utilization of land and increase in yield and income and for encouraging the colonization of coccinellids, syrphids and spiders which acts as predators for aphids and parasitoids for bollworms like <i>Earias sp.</i></p>	<p>Commercial vegetables like beetroot/onion along with cowpea/blackgram under paired row technique can be more economical. The water requirement is reduced to about 15 per cent when compared to single row technique.</p>

ANGRAU, Lam, Guntur

Sr. No.	Technology	Brief Description of the Technology	Refinement made in the technology
1.	Plant protection in Bt. Cotton Dropping of flowers and squares	Spray Monocrotophos 36 EC after 40 of sowing depending upon the incidence of sucking pests. Spray of 2% Urea or DAP.	To control the sucking pests effectively, stem application technique is more effective. This technique involves the application of Monocrotophos (1: 4 ratio) or Imidachloprid (1: 20 ratio) at 20, 40 and 60 DAS to the top 1/3 rd portion of the main stem in one stroke (about two to four inches length only) with the help of a camel hair brush or with a plastic bottle specially designed for this purpose. Spraying of NAA or Borax to prevent square and flower dropping.
2.	Spacing for L761 variety	The variety (L 761) is giving very good kapas yield, which is planted on spacing of 90 x 60 cm.	A spacing of 105 x 60 cm give better yield.

SUCCESS STORIES

MAU, Parbhani :

Technological Intervention : IPM in cotton

Farmer : **Shri. Vivek Nivartirao Samale**

Village : **Takli (Kumbhakaran), Dist. Parbhani**

He is a graduate, unemployed, young member belonging to agriculture family. He has studied the difficulties of cotton growers in his village. He saw that IPM technology is not becoming popular in the village for want of difficulties in grinding the Nimboli (Neem Seed). Therefore he has purchased the grinder and started the grinding of Nimboli (Neem seed) into powder form @ Rs. 7/kg. During first year i.e. 2004-05, he has sold 16 q neem seed powder and earned Rs. 11200/- within a period of 3-4

months. The farmers of the project villages viz. Takli (Kumbhakarna), Brahmangaon and nearby villages viz. Zari, Borwand and Kubhari were convinced about the use of neem seed powder in control of bollworms in cotton as the population of predators and parasites remains undisturbed resulting in control of bollworms by these insects. The farmers were convinced about the IPM technology, but was not becoming popular because of non-availability of grinding facility which was a main constraint in adoption of this technology i.e. use of 5% NSKE spray at proper time. Therefore we have educated the people and convinced Shri. Vivek Nivartirao Samale to purchase the grinder for said purpose. He has purchased a grinder by paying Rs. 10000/- during the same season and made a business to the extent of Rs. 11200/- within a period of 3-4 months during August to November 2004. The powder of Nimboli so grinded was used for spraying over an area of 25 ha in the project village and nearby villages. Hope that the technology will definitely be adopted by many farmers on large area during ensuing season.

CICR, Nagpur

The major reasons for the interest in *Bt* cotton in India is attributed to the highly skewed quantum of insecticide use in cotton, which has severe consequences for agro-eco-system. As per one estimate, about 50 per cent of pesticides are used on cotton alone which occupies less than 5 per cent cropped area in the country. Major share of pesticide use is against the American bollworm *Helicoverpa armigera*. The American bollworm has a damage potential of 60-80 per cent and has developed resistance to almost all groups of conventional insecticides. After getting the approval from Govt. of India, the MAHYCO/Rasi Seed companies has marketed the genetically engineered cotton hybrid with *Bt* gene which makes the crop resistant to *Heliothis*. Considering the potential for *Bt*. cotton and adverse publicity it has received in national press, it was decided to assess this technology on farmers field under TMC MM-I MM 5.1 project of the Central Institute for Cotton Research, Nagpur. When the proposal was mooted, many farmers refused to take *Bt*. cotton on their lands because of the bad publicity it has received in press. One brave farmer Sh. Dhanraj Hiwase, aged 50 years of Tishty village in Kalmeshwar Taluka of Nagpur district came forward to sow the *Bt*. cotton on his one acre farm. His family members tried to restrain him from taking *Bt*. cotton, because they were worried about the effect on soil and damaged to other crops.

The Team members of TMC MM 5.1 under the leadership of Dr. Hemchandra Gajbhiye, utilized the trait of innovativeness possessed by Sh. Hiwase and trained him in the use of Bt. cotton technology at the Central Institute for Cotton Research, Nagpur.

One packet of RCH-2 Bt. cotton hybrid which contained 450 gm of Bt cotton and 120 gm of Non-Bt. cotton as refugia was sown on his one acre plot on Jun. 21, 2004. Many cotton growers in the village were gathered at the time of sowing just to see how the Bt. cotton seed looks like. It was almost like a village Mela on Dhanraj's farm. Very close watch was kept by the TMC MM 5.1 team, which visited the field every week. Hiwase was keeping his fingers crossed. After all, he has taken this trial against the wishes of his family members, particularly his father, aged more than 80 years. Because the seed was treated with Imidacloprid, the sucking pests did not attack the crop, so was his other cotton crop which was also treated with Imidacloprid. Difference was noticed by one of the neighbor of Sh. Dhanraj, when the crop came to squaring stage. He noticed that *Heliothis* has already made a way in adjoining fields, where as Dhanraj's Bt. cotton field is free from heliothis. The news spread like wild fire and hundreds of villagers started flocking to Dhanraj's Bt. cotton field. They suspected that Dhanraj might have sprayed some pesticides, but Dhanraj's father who himself was astonished to see the crop free of *heliothis*, swear that not a single spray of pesticide has been given to this particular field. From then onwards Dhanraj's stature in village kept on raising with every development of crop. It was almost a drought like situation this year, which gives water stress to plants during the second fortnight of November, thus reducing the yield considerably. But Dhanraj was a happy man with harvesting his first picking in first fortnight of November itself. He did four pickings and every picking became neighbors envy. He has harvested 520 kg of seed cotton from 0.32 ha, whereas refugia non-Bt gave him only 150 Kg from 0.08 ha. His other non- Bt give him 350 kg from 0.40 ha. Putting in terms of money he has earned additional Rs.9400/- from growing Bt. cotton. All most all Agriculture Officers of the district visited the field of Dhanraj and one of them has rightly observed that Dhanraj Hiwase's this field is best in district in this draught year. Everybody was touched when Sh. R. R. Patil, Hon'ble Deputy Chief Minister, Govt. of Maharashtra honored him on Kisan Samman Day at 'Vasantrao Naik Smruti Pratishthan', Pusad, dist. Yavatmal. Today, Dhanraj does not stop praising the efforts of Dr. H. Gajbhiye and

his TMC MM 5.1 team in putting faith in him and his ability of doing new things on his farm. Meeting Dhanraj Hiwase alone is very difficult now a days, because he is always surrounded by other cotton growers who want to share his experiences. Dhanraj's most proud achievement as he puts it, is the smile he could bring on his father's old wrinkled face.

ANGRAU, Lam, Guntur

Technological Intervention : Bt.Cotton cultivation

Farmer : V. Sambasiva Rao

Village : Gundlapalem

Sri.Vuyyuru Sambasiva Rao, of Gundlapalem, Medikonduru mandal had cultivated RCH-2 Bt cotton during 2004-05 season under the TMC MM 5.1 Project along with check NCS-145 (Bunny).With timely sowing and proper cultivation practices, he recorded highest kapas yield of 42.5 qtl/ha by incurring Rs 28,146/- on cost of cultivation. He had given 8 chemical sprays to Bt cotton when compared to 14 sprays in check plot. He realized Rs 39,979/- as net returns and higher Cost-Benefit Ratio of 1: 2.42, where as in check plot he realized a Cost- Benefit Ratio of 1:1.62 only. With the better performance of RCH-2 Bt, the other farmers in the village are ready to cultivate that Bt in the next kharif season.

Technological Intervention : Spraying of Micronutrients

Farmer : B.Sanjeev Reddy

Village : Peesapadu

Sri. B.Sanjeev Reddy, of Peesapadu village in Krosuru mandal had adopted the technology intervention **Spraying of Micronutrients** during 2004-05 season under the TMC MM 5.1 Project.. By spraying micronutrients viz.MgSo4 and Boron, he recorded a kapas yield of 25.40 qtl/ha by incurring Rs 26,175/- on cost of cultivation.. He realized Rs 13,804/- as net returns and higher Cost-Benefit Ratio of 1:1.52, where as in check plot he realized a Cost- Benefit Ratio of 1:1.22 only. The other farmers in the village are ready to Spray micronutrients in the next kharif season.

Technological Intervention : Performance of NSPHH

Farmer : T. Sambhi Reddy

Village : Jagamguntlapalem

Sri. T. Sambhi Reddy, of Jangamguntlapalem, Medikonduru mandal cultivated NSPHH 7 during 2004-05 season under the TMC MM 5.1 Project along with check NCS-145 (Bunny). He recorded highest kapas yield of 30.75 qtl /ha when compared to other farmers (29 qtl/ha). He realized higher gross returns, net returns and Cost Benefit Ratio than other farmers. The cost of cultivation, Gross returns and net returns of the farmer were Rs. 29,986/-, Rs. 50,737/- and Rs. 20,751/- per ha respectively .He also realized higher Cost Benefit Ratio of 1:1.69. Due to the better performance of NSPHH7 Cotton hybrid with good fibre properties, the other farmers in the village are ready to cultivate NSPHH7 in the next kharif season.

Technological Intervention : Produce your own seed (L 761)

Farmer : P.Satyanarayana

Village : Jonnalagadda

Sri. P. Satyanarayana of Jonnalagadda, Guntur Rural mandal cultivated **L 761** cotton variety during 2004-05 season under the concept of produce your own seed. He recorded highest kapas yield of 30.00 q /ha which was on par with the private cotton hybrids. ..The cost of cultivation, Gross returns and net returns of the farmer were Rs 25,345/-, Rs 49,500/- and Rs 24,155/- per ha respectively .He also realized higher Cost Benefit Ratio of 1:1.95. He produced 50-55 kgs of L 761 seed and he will be able to supply to other farmers for the next season.

CICR RS, Coimbatore :

Paired Row Technique (Intercropping with beetroot)

Mrs. Poovathal, Kanjapally, Coimbatore district, Tamil Nadu cultivated Surabhi under Paired row technique during the season 2004-05 for the first time after the implementation of one of the interventions viz., **“Paired Row Technique (Intercropping with beetroot)”** under the project TMC MM 5.1. entitled “Evaluation of Cotton Production Technologies for Yield, Fibre Quality and Input Output Ratio” by the Central Institute for Cotton Research, Regional Station, Coimbatore. The farmer used 2 kg/ac of delinted Surabhi seeds for sowing and adopted 4’ spacing between two pairs of rows and 2’ x1.5’ spacing within two rows. She used 300g of beetroot seeds from Namdhari seeds with size 9 for sowing in 30 cents as intercrop in cotton field in

between the pairs of rows. As this was the first year, initially she faced problems with the germination of the beetroot seed as lot of care has to be given during the seedling stage. Anyway through gap filling, she was able to overcome the problem. She applied fertilizer based on soil test recommendations. In the initial stages, water was provided to the beetroot crop once in 3 days. After 70 days, beetroot was harvested and the ridges and furrows were rectified. Weed menace was almost controlled in her field due to the intercrop. The growth of cotton crop was good with more sympodial branches, extra squares and an average of 80 bolls per plant. She applied 2 kg DAP and 1 kg Potash as foliar spray @ 10 tanks per acre. Before the TMC MM 5.1 project implementation, the farmer was totally unaware about this technique. She is an innovative kind of farm woman who likes to give a try for any new technique which seems to be remunerative for her. In that way, after following the paired row technique as taught by experts from Central Institute for Cotton Research, Regional Station, Coimbatore, she could reap added benefits. Due to this technique, an additional cost of Rs. 1200/- was to be incurred but she could get an additional benefit of Rs.5000/- per acre. She obtained a yield of 3t from 30 cents. She sold the produce @ Rs. 6/kg. The additional net returns obtained per ac was Rs. 5000/-. The Input Output Ratio was 1:2.15. The farmer felt that this is a very good and highly remunerative technique. She expressed her wish to go for the same technique if water availability is satisfactory for the next season.

'Sumangala' farmers

Farmer used 2 kg/ac of delinted **Sumangala** seeds for sowing and adopted 3X2.5" spacing and did not face any germination problem He applied fertilizer based on soil test recommendations. Last year he was trained in Integrated Pest Management in cotton in Surabhi. He tried the same techniques in Sumangala field also this year. He cultivated blackgram as intercrop and cowpea as bund crop and planted maize and castor in borders as trap crop. The growth of crop was good with more sympodial branches, extra squares and an average of 70 bolls per plant. He applied 2 kg DAP and 1 kg Potash as foliar spray @ 10 tanks per acre. Castor crop planted along the borders helped the farmer to monitor the laying of prodenia eggs. After crossing the ETL, he gave one spray Metasystox @ 50 ml/tank along with Neem Seed Kernel Extract (NSKE). The adult moths were monitored using pheromone traps. He did detopping @ 80 – 100 days after sowing to arrest the vegetative growth leading to

formation of squares at the top leaves.. Hence the farmer was able to get an increased yield by following IPM technologies in Sumangala. Before the TMC MM 5.1 project implementation, the farmer sprayed pesticides for 15 times. But after following IPM practices as taught by experts from Central Institute for Cotton Research, Regional Station, Coimbatore, the farmer gave only three sprays and did not use pyrethroids. Therefore 60-70 per cent reduction in plant protection cost was obtained. Due to the adoption of Sumangala variety, an additional yield of 30 per cent was obtained when compared to previous year's crops wherein he had gone for Rajath, LRA 5166, Bunny etc. He obtained a yield of 25 q/ha. He sold the seed cotton @ Rs. 2,000/q. The cost of production was Rs. 2735/q. The net returns obtained was Rs. 22650/ha. The Input Output Ratio was 1:1.83. The farmer felt that Sumangala is a very good crop with less cost coupled with increased yield under rainfed conditions that he would cultivate the same variety for the next year too as the water availability in his field is getting reduced drastically.

NAU, Surat

Technological Intervention : Produce your own seed (L 761)

Farmer : Vinodbhai Parbhubhai Patel

Village : Kavitha, Dist. Bharuch

He is practical farmer involving himself in all agricultural operations along with his family members. He visited Main Cotton Research Station, Surat frequently to get new information on IPM technique. Under TMC MM 5.1 Project with technical guidance of Dr. V. Kumar, Res. Scientist (cotton) and Dr. M.J. Pavasia, Assoc. Research Scientist and CCPI TMC MM 5.1 project, a demonstration plot on IPM technology was given to Sh. Vinodbhai. He implemented IPM strategies like deep ploughing in summer, seed treatment, installation of Pheromone traps, release of Trichogramma cards, raising of Castor and Marigold as trap crops, spraying of HNPV, use of Neem products etc. Based on the results of demonstration, the farmer himself and farmers from nearby villages realized the importance and advantages of IPM technology.

Sh. Vinodbhai set an example for fellow farmers on IPM technology in cotton by reducing the insecticides sprays and obtained a record yield of 35 qt/ha. He got net income of Rs. 30358/ha deriving a benefit of Rs. 1.93 for each rupee invested.

Other activities

CICR, Nagpur :

Training programme :

- Organic farming in Cotton' at village Tishti on Jan. 27, 2005. More than 100 farmers participated.
- 'Vermi-compost unit' at village Tishti on Jan. 29, 2005. More than 100 farmers participated.

TMC Farmer honoured :

- Sh. Dhanraj Anandrao Hiwase, a client farmer of the project in village Tishti, Taluka- Kalmeshwar Dist. Nagpur has been awarded by "Vasantrao Naik Smruti Pratishthan, Pusad" Dist. Yavatmal as Ideal farmer. He received the award at the hands of Sh. R. R. Patil, Hon'ble Deputy Chief Minister, Govt. of Maharashtra on Dec. 31, 2004.

Popular Article :

- Hemchandra Gajbhiye and R.T. Katole (2004) "*Barani kapas ki shushk bowai.*" Unnat Krishi, May-June : 12-14

Live-in-Radio programme :

- Dr. Hemchandra Gajbhiye "Integrated Pest Management in cotton" on Nov. 8, 2004 on All India Radio, Nagpur.
- Dr. Hemchandra Gajbhiye "Cotton Marketing" on Dec.2, 2004 on All India Radio, Nagpur.

PDKV, Akola :**Extension activities :**

Sr. No.	Particulars	Frequency
1.	Popular articles published	20
2.	Script to Akashwani	13
3.	Participation in Krishi Melawa/ charcha satra	8
4.	Training programmes	5
5.	Participation in exhibition	5
6.	Farmers visits	2250

One Krishi Melawa (Field day) was organized by this Research Unit, at Bhaurad, Dist. Akola, on dt. 8-11-04. About 200 farmers from Bhaurad & surrounding villages attended the field day. During this melawa the scientists from the Cotton Research

Unit explained the various production technologies, which are to be adopted by the farmers for increasing the cotton production. The participant farmers were also visited the demonstration organized by this on the farmer's field.

Another Krishi Melawa was organized at village Vairagad Dist. Buldana on 3.12.04. About 185 farmers in the Vairagad & near by villages were actively participated in the Krishi Melawa. Programme was started with the visit to the OFT's on different cotton technologies. Scientist of Cotton Research Unit has delivered lecturers on different cotton technologies adopted by the farmers and answered to the queries from the farmers.

MAU, Parbhani :

- Field trip was organized at Project village Takli (Kumbhakaran) of Parbhani district on 28th September 2004. Dr. Badrinarayan Deshmukh, Progressive farmer of Takli (Ku.) was Chief guest of the function. The participant farmers visited the demonstration plot of Bt cotton, testing of American hybrid PHH-316, Cotton + Blackgram intercropping system etc. On this occasion, there was valuable discussion on cotton production technology between farmers and Dr.A.N.Giri, Cotton Agronomist and CCPI, TMC MM 5.1, CRS, MAU, Parbhani. About 30 farmers have participated in the field trip.
- Second field trip was organized at Project village Brahamangoan of Parbhani district on 29th September 2004. Shri. Ramrao Kishanrao Kaldate, Farmer of Brahamangaon was Chief guest of the function. The participant farmers visited the demonstration plot of Bt cotton, IPM, IRM etc. On this occasion, there was valuable discussion on cotton production technology between farmers and Dr.A.N.Giri, Cotton Agronomist and CCPI, TMC MM 5.1 and Dr.N.R. Patange, SRA (Entomology) CRS, MAU, Parbhani. About 25 farmers have participated in the field trip.
- Shetkari Melawa of cotton growers from Takli (Ku.), Brahmangaon, Kok, Borwand and Zari villages was organized at Cotton Research Scheme, MAU, Parbhani on 5th November 2004 under TMC MM 5.1 in joint collaboration with ToF (Long-season Training on IPM), Dept. of Agriculture, Parbhani. About 100 farmers have participated in the melawa.

Popular Articles

- Three popular articles on cotton production technology were published in *Sheti-Bhati* magazine published by Directorate of Extension, MAU, Parbhani.

- One folder on 'Five point programme' written by Prof. M.H.Chavan, Dr. A.N.Giri, and Dr.P.S. Kapse has been released by the hands of Dr. V.M.Pawar, Hon'ble vice-chancellor, MAU, Parbhani on 15th August, 2004.

JNKVV, Khandwa :

The Director, Cotton Development, Mumbai Dr. Anupam Barik and members of **NALMOT** (National Level Monitoring Team) alongwith Principal Scientist (Cotton) Dy. Director Agriculture and S.D.O. Agriculture have visited on 6th November, 2004 and discussed with farmers about the production technology of cotton. Dr. Anupam Barik addressed the farmers emphasizing on the need to minimize the cost of cultivation and to grow good quality cotton.

CICR RS, Sirsa :

Kisan Divas at village Fatehpuria on 18.10.2004.

ANGRAU Lam, Guntur :

A field day of Bt. cotton farmers was organized on 4.12.2004 at Jonnalagadda to gather feed back information on the performance of Bt. (RCH-2, MECH -12 and MECH-184). Nearly 30 Bt. farmers were participated in that meeting.

RAU, Sriganaganagar :

Organized one day On Campus training of TMC MM 5.1 Project farmers at KVK, Sriganaganagar.

NAU, Surat :

Sr. No.	Particulars	Place	Date
1.	Khedut Shibir	Sarbhani Tal. Amod, dist. Bharuch	06-11-2004
2.	Khedut Shibir	Dhawati Tal. Karjan, dist. Vadodara	24-12-2004
3.	Khedut-Din	Regional Cotton Research Station, Bharuch	31-12-2004
4.	Khedut Shibir	Kelod Tal. Amod, dist. Bharuch	11-01-2005